University of Cape Town

Embedding risk management within new product and service development of an innovation and risk management framework and supporting risk processes, for effective risk mitigation: an action research study within the Information and Communication Technology (ICT) Sector

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By

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Abstract

At first glance, innovation and risk management seem like two opposing disciplines with diverse objectives. The former seeks to be flexible and encourages enhanced solutions and new ideas, while the latter can be seen as stifling such innovative thinking. Since there is a failure rate of as many as eight out of every ten products launched, it is perhaps necessary for organisations to consider applying more structured approaches to innovation, in order to better manage risks and to increase the chances of delivering improved goods and services. A risk management approach is well suited to address the challenge of failure, as it focuses not only on the negative impact of risks but also on the opportunities they present. It aligns these with the strategic objectives of the organisation to increase the chances of its success.

The research objective of this study was to establish how to embed risk management within the innovation divisions of an organisation to ensure that more efficient products and services are delivered to customers. To achieve this end, action research was conducted in a large organisation operating in a high-technology environment that launches many diverse products and services and rapidly expanding service offerings to other industries. The study took four years to complete and delivered multiple interventions that successfully embedded risk management within the organisation, leading to changed behaviours and double-loop learning.

Two main knowledge contributions are offered by the study. Firstly, a generic and empirically validated integrated Innovation and Risk Management Framework (IRMF) is developed and guides new product and service development by considering both best practices and risks. Secondly, a risk dashboard is designed as a design science artefact within the action research cycles, which consolidates all the knowledge that was generated during the study. This is ultimately a visual interface to support stage-gate decision making. Since the context of the study was broad, extensive and complicated, the use of mixed-method research complemented and expanded on the findings by providing another layer of support and validation.

This thesis highlights the complexity of innovation and presents the need for an organising framework that will encourage innovation but is sufficiently flexible to cater for diverse needs and risks. The study delivers several other, valuable contributions regarding what, how and why incidents occur within the real-world context of new product and service development. Several generic artefacts, such as risk processes and maturity frameworks, are also developed, which can guide risk and new product and service development practitioners to deliver more efficient product and services. This study offers several novel approaches to evaluating risks and provides practical support and recommendations, addressing shortcomings of fragmented research in similar, but smaller-scale studies that have been conducted in information systems. It is the premise of this

research that a much wider number of risks need to be managed as new products and services are developed, than was noted in previous studies. Effective risk management in new product and service development could lead to competitive advantage for organisations by increasing knowledge and facilitating sustainable, informed risk decision-making.

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Declaration

(1) I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

(2) Each contribution to, and quotation in this study from the work(s) of other people has been attributed, and has been cited and referenced.

(3) The study is my own work.

(4) I have not allowed and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

I would like to extend my appreciation to Dr. Jean-Paul Van Belle for his guidance and enthusiasm regarding the study.

To my loved ones, I thank you out of the bottom of my heart. None of this would have been possible if it was not for your unwavering support and love.

I am immensely grateful that I have a select group of friends, who are incredibly inspiring. Thank you for the overwhelming assistance in reading; commenting and motivating me to complete this thesis, you have my heartfelt appreciation.

I further wish to offer my gratitude to my former risk team. Without your and commitment to excellence, a study of this magnitude would not have been possible. I also extend this appreciation to the organisation for allowing me to do this research and supporting the risk team in our vision of building a better society.

I dedicate this thesis to all of you. I hope I did you proud.

Signature Signed by candidate

Janine Joubert
(JBRJAN004)

Date: ____________________

1. Chapter 1– Introduction and Background

1.1. Introduction

Innovation is one of the main forces that drives productivity and a successful, sustainable organisation. Innovation capability is a primary indicator of organisation performance (Crossan and Apaydin, 2010) and presents both opportunities and risks. Innovators are required to take on risk to exploit opportunities while at the same time innovation is complex and by its very nature risky.

The creation of new products is a core mechanism to create value for the organisation (Deschamps and Nayak, 1995). Development of new products and services (as an important source of revenue generation) is vital to ensure the continued success of organisations (Nambisan, 2003; Cooper, 2004) and products launched in the previous five years introduced as much as 49% of the revenue of top-performing organisations (Pauwels, Silva-Risso, Srinivasan and Hanssens, 1993). Despite considerable investments, consumer innovations are subject to an 80% failure rate (Ernst, 2002; Cooper and Brentani, 1991) even before launch (Park and Kim, 2011). Innovation projects fail in terms of project cost overruns (average 42%) and schedule delays (up to 22 months), as well as failure to achieve the prescribed technical performance of the product (Francis, Golden and Woods, 2010).

Risks are inevitable, and disregarding risks can lead directly to product failures (Sarbacker and Ishii, 1997). The risk profile of New Product and Service Development (NPSD) is elevated owing to inherent complexity that is aggravated by competitive pressures, short innovation cycle time frames, the introduction of new technology and changing business models. The chance of delivering a successful Product and Service (P&S) is greatly enhanced by dealing effectively with risk (Bartlett, 2002; Dey, 2002; Elliot, 2001; Oehmen, Ben-Daya, Seering and Al-Salamah, 2014; Leskinen and Borenius, 2010). In short, better risk management increases the likelihood of introducing successful new P&S.

The study of innovation has become increasingly popular and is considered a promising field of study in terms of delivering practical research to aid organisations to design improved products and services (Eris and Ysar 2006; Di Benedetto and Nakata 2012; Ostrom, 2010). However, despite the interest, several areas remain under-researched. In particular the launch of services (rather than products) (Evanschitzky, Eisend, Calantone and Jiang, 2012). Despite the existence of numerous innovation research papers, comprehensive frameworks for managing risks in innovation (especially service innovation) are scarce (Yen, Wang, Wei, Hsu and Chiu, 2012).

Correspondingly, researching risks associated with innovations has also received increased attention (Wu, Huang, Yen and Popova, 2012). Research on Risk Management (RM) in innovation are regarded as an emerging research opportunity by both academics and those with a conferred interest in developing new P&S. However, limited research exists with regards to how RM should be optimally implemented within a P&S innovation environment (Oehmen et al. 2010). There are few studies on how an RM system has to be built and even fewer on establishing RM practices within New Product Development (NPD) processes.

At the time of writing this thesis, only a few RM studies on innovations had been published. This research bridges the research gap by studying innovation in NPSD over a four year period. An Innovation and Risk Management Framework (IRMF) is introduced for the effective management of risks related to NPSD within the Information and Communications Technology (ICT) sector. The framework offers an additional advantage that has not been exploited by previous research, by consolidating both innovation and risk factors to improve the delivery of NPSD innovations.

Good risk management practices are established to improve the chances of a successful P&S. The unique characteristics of P&S are considered and the IRMF can be adapted correspondingly. The IRMF provides a generic functional model for designing and implementing RM within NPSD.

This Action Research (AR) study took place over numerous cycles within an ICT organisation, both on Business-to-Consumer (B2C) as well as Business-to-Business (B2B) services. The research is motivated by the requirements of industrial practice (Krishnan and Ulrich, 2001) and expected to be of practical relevance to various interested parties to bridge the disconnection gap between research and practice (Sein, Henfridsson, Purao and Lindgren, 2011).

Innovation practitioners that have responsibility for the implementation of P&S innovations would be interested in how to implement more effective innovations and reduce the probability of unsuccessful P&S. The attention of RM and/or audit professionals would be drawn to the specific risks and controls that are required as well as the RM practices that were implemented. Organisations would be interested in how to aid the development of more successful P&S as sustainable innovation remains critical to the success of organisations.

This research should be of interest to academics who study RM as well as those who studies innovation. Innovation and RM are concepts clearly understood by academics, but practical guidelines which can be applied within organisation settings are lacking. This study provides practical approaches to anticipate and respond effectively to prospective risks within NPSD. As such, it allows RM to be implemented as a strategy that can improve NPSD. Subsequent sections will provide a broad understanding of the scope and nature of the research problem to be investigated.

1.2. Research Problem

This section investigates challenges that exist in innovation studies. Firstly the gaps in innovation research are considered. Papastathopoulou and Hultink (2012) analysed NPSD research over the past 27 years and concluded that more research is required in fields other than financial services. Additionally, more longitudinal research is needed to document the changing patterns of NPSD over time (Menard, 1991). More focus is required on the development of services (intangible) innovation rather than product (tangible) innovations and research areas such as Business-to-Business (B2B) (Spohrer and Maglio, 2008; Leiponen, 2005). Papastathopoulou and Hultink (2012, p. 10) urges researchers to design research that 'synthesizes existing New Product Development (NPD) and New Service Development (NSD) knowledge in an integrative innovation model (that) could provide the compass for future research attempts in the important and growing field of NSD'.

Furthermore, limited research was conducted, regarding decision-making at the individual NPD stage-gates (McNally and Schmidt, 2011). Certain activities within the NPSD process were regarded as insufficiently researched, such as the commercialization of innovations (Adams, Bessant and Phelps, 2006). The extent to which functional divisions contribute to the NPSD lifecycle phases were identified as a shortcoming (Ernst, 2002). New areas of knowledge are necessary to promote NPSD theory and practice (Di Benedetto and Nakata, 2012). Gaps identified in the innovation research are researched in this thesis.

Innovation literature is abundant, but perspectives are diverse. Numerous ontological and epistemological interpretations were used to conduct innovation research (Wolfe, 1994). A comprehensive theoretical model of innovation success determinants does not exist (Ernst, 2002). Crossan and Apaydin (2010) consider innovation research to be grounded on weak theory. A lack of uniform definitions foster fragmented innovation research (Ernst, 2002), and a broader investigation of NPSD factors is required to capture innovation factors comprehensively (Evanschitzky, Eisend, Calantone and Jiang, 2012; Crossan and Apaydin, 2010). Referring to these criticisms, innovation research is deficient in terms of both breadth and depth of research. Also, the inconsistent application of NPSD factors leads to incompatible results.

The integration of RM within the study of NPSD has not been adequately researched. Specifically, there has been a lack of empirical studies that explore how RM practices should be integrated within NPSD (Oehmen et al. 2014). Studies have indicated that the relationship between determinants and innovation success is not purely positive or negative, and therefore, both positions should be integrated into an overall conceptual framework (Homburg and Kuehnl, 2013). RM practices should not exclusively focus on the negative but also consider positive factors that could enhance NPSD performance.

Sufficient information does not exist about what happens inside the RM process. De Bakker, Boonstra and Wortmann (2010, p. 499) articulate the research opportunity that will be explored during the AR iterations of this study as:

> ...what happens inside the risk management process; what risk management practices are used within a project, which stakeholders are participating in these practices, how these risk management practices influence stakeholders, and how do these practices influence project success? These are relevant questions, to which the risk management approach so far has not provided satisfactory answers, and neither does it give a truthful representation of how stakeholders actually behave.

From the literature review, it can be concluded that NPD is the most studied area of innovation research. Yet, several aspects of NPD were scarcely researched. The current status of the research is described in Table 1. In cases where research papers were not found that explored the research agenda (Column 1) the status was indicated as unexplored and where only a limited number of research papers were found, the availability of research was indicated as scarce. Where more than 20 research papers could be found, research was indicated as explored. An indication is additionally provided as to the extent to which the suggested gap in research will be covered in this study.

Table 1: The Status of Innovation Research

Research Agenda	Status of Research (as of 2015)	Extent to which Explored in this Study
Innovation in ICT and Telecommunication	Scarce	The research fully explores innovation in the telecommunication / ICT industry by conducting action research is an organisation that provides Telco services, as well as insurance, financial services and mobile health products for consumers as well as business-to-business (B2B) P&Ss.
Longitudinal research	Unexplored	Fully explored as the research is conducted over a 4-year period allowing changing patterns to be studied.
B2B innovation	Scarce	Fully explored as B2B services are included during AR iteration two and three.
Service innovation	Explored	Fully explored as the organisation predominantly provides services, which are thoroughly researched.
Integration of NPD and NSD frameworks	Scarce	Fully explored as the research allows comparisons between NPD and NSD and integration of findings into a framework.
Stage/gates	Scarce	Partially explored since decision-making practices during stage/gates are discussed in the research findings.
Activities within NPSD process	Explored	Partially explored since the 'idea generation' phase is not fully supported but all of the other activities that are conducted during the NPSD process are explored by this study.
Innovation culture & resources	Explored	Fully explored since innovation culture is explored as a dimension within the risk framework.
Contribution of functional divisions	Scarce	Partially explored as the resources responsible for the different activities are identified during research and final consolidation of IRMF.
Integration of risk management processes within NPSD	Scarce	Fully explored as the main objective of the research.

Table 1 indicates gaps in the research that are partially and fully explored and addressed in this dissertation. The research aims to provide knowledge that can hopefully be described as a 'useful, valid description of the world', which provides practical ideas of how more positive changes can be introduced (Argyris, Putnam and McLain Smith, 1985, p. 8).

1.3. Research Question

The next section explores the research questions and provides further qualification of the scope of the research.

1.3.1. Primary and Secondary Research Questions

The primary research question states:

How can organisations manage risks and opportunities and design and implement comprehensive frameworks and systematic processes to embed risk management within new product and service development effectively, yet allow sufficient flexibility to accommodate unique products and services characteristics?

The research objective is:

Embed risk management within New Product and Service Development (NPSD), by development of an Innovation and Risk Management Framework (IRMF) and supporting risk processes, for effective risk mitigation: An Action Research (AR) study within the Information and Communication Technology (ICT) Industry.

The major themes of the research are innovation and RM. The framework is not intended to be prescriptive as a step-by-step methodology that needs to be followed. The IRMF and supporting risk processes provide generic guidelines that can be adapted to the context of the organisation and the specific requirements of NPSD. Secondary questions that are more prescriptive are indicated below.

Secondary Research Questions:

1. What are the primary risks NPSD face within an ICT context?
2. How can RM be effectively embedded within an NPSD context?
3. What are the differences between managing risks for B2B innovation and B2C innovation?
4. Can RM frameworks and risk processes support effective risk mitigation within NPSD?

Additional themes are introduced during the research process as it relates to the methods of AR and Design Science (DS).

1.3.2. Refinement and Discussion

The scope of the research objective is qualified according to the definitions provided in Table 2. The dimension being studied is defined and further qualified by indicating a scenario where the dimension will be absent.

Table 2: Definition of Research Question

Dimension	Definition	Alternative / Qualification
Embed	Making RM an intrinsic part of the day-to-day activities of NPSD (Hindson, 2011).	If RM is not embedded, it is likely that some risk awareness will exist, but no action would be taken to embed RM.
Risk management	Coordinated set of activities to optimise the management of potential opportunities and adverse effects (ISO 31000, 2009).	If RM practices were absent, decision-making would not be based on consideration of risks i.e. reckless decision-making. It is also probable that risks will only be considered based on the negative side of RM as in ITIL risk definition, which excludes alignment to organisational objectives and considering opportunities.
New	The 'newness' of a P&S can vary from low to high depending on perspectives of (1) new to the world; (2) new to the industry; (3) new to the organisation; (4) new to the market and (5) new to the customer (Murthy et al. 2008). The dimension of innovativeness is measured from the perspective of the organisation rather than the industry following on research conducted by Green et al. (1995) and focus on newness as new to the organisation, market and customer. New in P&S can include new technology, new process, new features, new uses and new designs (Murthy et al. 2008).	If new P&S are not developed, it is likely that the P&S range can become obsolete which entails that the organisation is unable to compete effectively in the marketplace. Highly innovative projects are treated differently than less innovative projects. Radical innovations (new to the world with a deveopment timeframe of ten years or more) were not studied. The framework could not be applicable to radical innovations. However, many P&S were investigated that were new to the ICT industry.
Product & service development	Systematic process of designing, creating and marketing to get the new P&S to the market to benefit customers.	Lack of a systematic NPSD process can be characterised as unpredictable and unstable, similar to CMM-model level 1 characteristics of inadequate and reactive planning, following short-cuts, risk exposures and late or no involvement of key disciplines (Dooley et al. 2001).
Framework	The RM framework that is developed for managing risks within NPSD is called the Innovation and Risk Management Framework (IRMF). A risk management framework is the set of components that provides the foundation for designing, implementing, monitoring, reviewing and improving risk management (ISO 31000, 2009).	If no risk framework is in place, it is possible that a lack of mandate for managing risk exists, risk policies will not be integrated with overall organisational strategy and operational frameworks. An absent RM framework would be operationalised as limited dedicated risk resources, plans, activities and processes. No reporting or review would take place to improve the framework (ISO 31000, 2009).

Dimension	Definition	Alternative / Qualification
Risk processes	Systematic application of policies, procedures and practices to perform RM activities such as communicating, establishing context, identifying, analysing, evaluating, treating, monitoring and reviewing risk (ISO 31000, 2009).	Lack of robust risk processes could result in no or limited alignment between RM and objectives, no clear identification of risks and controls and lack of assurance covering all levels of the organization (IIA, 2010). Risk processes would also not be seen as an integral part of the NPSD process and will not be tailored and embedded in culture and practices (ISO 31000, 2009).
Effective	ISO 31000 (2009) provided 11 principles of effective risk management which are (1) value protection (2) integrated in organisation (3) risk decision-making (4) address uncertainty (5) systematic, structured and timely (6) based on best information (7) tailored (8) considers culture (9) transparent and inclusive (10) dynamic, iterative and responsive (11) facilitates continues improvement of organisation. The criteria for effectiveness are expanded in Chapter 3: Research Approach, Section 3.5.5.	Ineffective RM could be characterised at the lowest level of the 11 principles according to IIA (2010) considers (1) risk techniques do not consider different levels of exposure; (2) RM is seen as an add-on task; (3) Uninformed decision-making; (4) lack of documented uncertainty; (5) unstructured, ad-hoc and chaotic; (6) insufficient information; (7) out-of-box and not matching organisation operations; (8) processes are not aligned to culture; (9) lack of involvement of key stakeholders; (10) Process do not change in line with organisation changes; (10) RM process do not mature in line with other organisational processes.
Risk mitigation	Risk treatment process to modify risk that can involve avoiding the risk, taking the risk to pursue an opportunity, removing the risk source, changing the likelihood, changing the consequences, sharing the risk with other parties and retaining the risk by informed choice (ISO 31000, 2009)	Insufficient risk mitigation are indicated by irrational risk decision-making and a lack of sound judgment during risk treatment (IIA, 2010). Inferior risk mitigation will be further demonstrated by risk treatments that fail to identify secondary risks, do not balance costs and efforts and not prioritising risk treatment (ISO 31000, 2009).

The measurement of these aspects as advocated by the Institute of Risk Management (IRM) and the Institute of Auditing (IIA) is discussed in Chapter 3: Research Approach, Section 3.5.5.

Two further aspects of the definition require qualification. Firstly the IRMF (despite claiming to be comprehensive about RM practices required within NPSD) does not provide metrics. Adams-Bigelow (2006) state that 'best practices' frameworks do not provide performance criteria that can be evaluated over time. Performance metrics are excluded since these criteria are reliant on the specific business objectives of the organisation (Chan, 2004). Detailed metrics are excluded from the framework, to allow transferability of results to other organisations and contexts. A generic maturity framework is however suggested that can be customised to the requirements of the organisation and be utilised to develop improvement criteria.

Secondly, the research focuses on the process of turning inventions into innovations. The Organization for Economic Cooperation and Development (OECD, 1991) definition of innovativeness (which is used in this study) states that an invention only becomes an innovation once it is successfully introduced in the marketplace. Once an invention (striving to be an innovation) becomes part of the NPSD process will it receive attention by this research. The manner of coming up with inventions or innovative ideas are not comprehensively covered by this research study.

It is further necessary to define AR and ICT. AR is defined by Hult and Lennung (1980, p. 247) as:

> Action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhances the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understanding of change processes in social systems and undertaken within a mutually acceptable ethical framework.

A robust AR study conforms to quality criteria as advocated by Lau (1999), Avison, Lau, Myers and Nielsen, 1999, De Vries (2007) and Iversen, Mathiassen and Nielsen (2004). Conformance to the AR quality criteria is defended in Chapter 3: Research Approach, Section 3.3.4.

ICT covers a wide range of perspectives, including economic sectors and business activities (Zuppo, 2012). Both perspectives will be used for clarity. ICT as an industry is defined by the OECD (2007) as the production of goods and services with the primary intent to fulfil or enable the function of information processing and communication by electronic means, including transmission and display. ICT as a business activity is defined by the ITIL glossary as the 'application of science to the processing of data according to programmed instructions in order to derive results. In the widest sense, ICT includes all communications, information and related technology'.

The OECD (2007) excludes broadcasting (allocated to the content and media sector) from the definition of ICT despite having ICT and content characteristics. Some broadcasting P&S were launched by the organisation but discarded mainly due to unprofitability. This study does not research broadcasting P&S. The sector being studied is ICT since the telecommunication operator expanded widely during the AR cycles into other business areas to seek alternative sources of revenue.

Since this study is conducted within the domain of the IS discipline, the applicability of studying NPSD within IS is subsequently discussed.

1.4. IS Research Context

The subsequent section qualifies the research topic within the discipline of Information Systems (IS). Walsham (1993) advocates for IS studies to have a deep understanding of the environment and the process whereby IS influence the context. The research enhances knowledge in the discipline of IS that takes place within the context of two reference disciplines, namely RM and NPSD.

IS, as an academic field, was first established in the 1960s drawing from management, organisational and computer science theory (Hirschheim and Klein, 2003). NPD is a relatively young interdisciplinary field of study (Nambisan, 2003). Even newer than NPD is the field of NSD, since the first article on this field was published in an academic journal in 2008 (Papastathopoulou and Hultlink, 2012). RM first started during the 1970's to manage the downside of risk (McKinsey, 2008). However prior to that, important theoretical foundations were already being laid by supporting RM theories such as game theory (John van Neumann and Oskar Morgenstern, 1944) and chaos theory (Edward Lorenz in 1961) and tools like brainstorming (Alex Osborne, 1961) and Delphi methods (Olaf Helmer and Norman Dalkey, 1950). IS, RM and NPSD can then be considered as all being relatively new and interdisciplinary in nature.

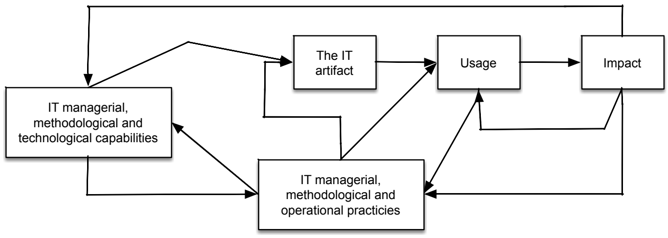

Figure 1: Benbasat and Zmud (2003) Nomological Net

IS expanded from a technology focus to include analysis of the human element (Argyris, 1971). Since IS developed from a variety of existing disciplines, IS seemed to lack unique identifiers which Benbasat and Zmud (2003) describe as an 'identity crisis'. The core properties of the IS discipline are indicated in Figure 1 and discussed below to establish the studies alignment towards the concepts and phenomena of the IS discipline.

- **The IT Artefact:** IT artefacts (P&S), are designed by using hardware and software to produce the end-service embedded within a specific context. The P&S IT artefact can consist of a brand new IS development, implementation of a new technology, integration with new systems or technologies or enhancements to existing services.

- **IT Capabilities and Operational Practices:** The study also investigates what Benbasat and Zmud (2003, p. 186) refer to as the 'managerial, methodological, and technological capabilities… and operational practices involved in planning, designing, constructing and implementing IT artefacts'. Mathiassen (2002) asserts that NPD is an instance of 'technology-related organisational change' where the research activities are based on IS theory as well as reference disciplines.

- **The IT Artefact Usage:** The study additionally investigates the outcomes of developing the NPSD artefacts which directly relate to the use of the artefact.

- **The IT Artefact Impact:** The impact of the artefacts (both intended and unintended) is analysed during the AR cycles.

The role of technology (described as the 'immediate nomological net' by Benbasat and Zmud, 2003) in NPSD can, therefore, be interpreted as all the theoretical and practical knowledge, skills and artefacts that can be used to develop P&S as well as the delivery systems. Technology is the devices and knowledge that mediate between inputs and outputs which create new P&S. The role of technology in the innovation process is one of being the principal output of the innovation.

Further, to the IS identity crisis of Benbasat and Zmud, (2003), Wan, Fang and Neufeld (2007) found that 84% of all papers over a 32 year period in IS have at least one reference discipline term in the title or abstract. IS research hence draws from reference disciplines. A trend is developing whereby research is becoming increasingly interdisciplinary in nature (Hitt, 1998). Nambisan (2003) provides further evidence of this trend by advising that the creation of new journals and departments as well as special issues of journals is becoming more interdisciplinary in nature.

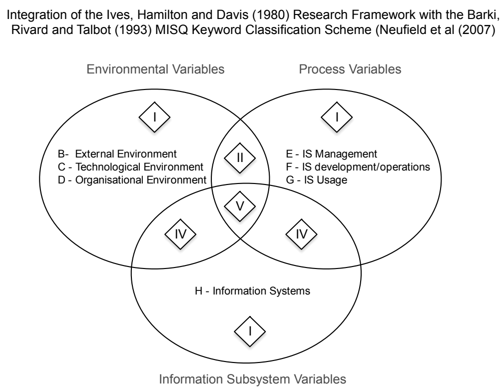

Figure 2: IS Research Typology (Wan et al. 2007)

Hamilton and Ives (1980) imply that IS research should focus on one or more of the following aspects: (1) the product of an IS development process; (2) an organisational context which informs the scope of the IS including constraints and (3) a process that links IS to the organisational environment. An IS research typology classified into seven variable groups is indicated in Figure 2. Type I research focuses on one variable, while other research categories combine ideas (using two variables) from different categories while type V research integrates variables from all three groups.

Hamilton and Ives (1980) typology implies that IS research prefers to exclusively focus on IS (as in type I papers) or cross-integrate many ideas (as in type V papers) (Wan et al. 2007). Type V research was distinguished as being the most valuable contextual setting for IS research (Hamilton and Ives, 1980). As this research focuses on multiple variables (type V), it would contribute to the distinctive characteristic of the IS research field, which Wan et al. (2007) claim to be the integration of reference disciplines within IS.

The next question which is yet to be answered is whether NPSD and IS are suitable reference fields. Nambisan (2003) argue that three criteria make IS suitable as a reference discipline for NPSD since (1) both disciplines are of similar maturity; (2) both fields are interdisciplinary in nature; and (3) the value of research contributions can be increased by infusing IS within NPD.

NPSD innovation entails the development of an IT artefact that places the research securely within the IS discipline. P&S innovation is described as the multidisciplinary and systematic design and development of integrated processes, business models and technology (Ehrenhöfer, 2012) or the process of co-creation to deliver value through diverse configurations of people, technology and shared information (that includes regulations) (Maglio and Spohrer, 2008). Technology is therefore considered to be an integral part of P&S Innovation.

Expanding on the function of technology during innovation, Bolton and Saxena-Iver (2009) describe several roles: (1) technology supports innovation through flexible design to increase value delivery to the customer; (2) technology increases stakeholder value by improving efficiencies and reducing cost; (3) technology convergence has created new market opportunities and increased competition; (4) technological advances allow incremental and radical innovations to be delivered faster with shorter NSD lifecycles and merging stages of the NSD lifecycle; and (5) rapidly growing technologies such as search services, biometrics, smart cards, M-commerce, Location Based Services (LBS) impact on IS sellers, information providers, competitors and influence the IS market (Shugan, 2004 quoted by Bolton and Saxena-lyer, 2009, p. 91). IS, therefore, plays a major role in NPSD.

Additionally Information Technology (IT)/IS risks within NPSD are researched. RM in NPSD innovation includes all the technology, knowledge and processes that are required to initiate, build, commercialise and maintain the P&S. The Information Systems Audit and Control Association (ISACA), in its RiskIT methodology consolidated into Control Objectives for Information and Related Technology (COBIT, 2003), describes IT risk as business risk associated with the use and adoption of IT within an organisation. The term IT, typically excludes telecommunications technology while data networks and systems that support information processing are included (ITIL, 2011). IS can be defined in terms of function and structure (Fuad, 2011, p. 26). IS function refers to the medium used to record, store and disseminate information. From a structural perspective, IS consists of a cohesive structure of people, processes, data, models and technology to serve an organisational purpose. Both IS and IT risks will be included in this study.

The study is cross-functional to achieve the objective of developing a comprehensive framework that features both innovation and RM aspects to increase the chances of successful organisational P&S innovation. The study combines knowledge from various reference disciplines to interpret and inform IS practices. A large set of P&Ss developed over several years are studied (rather than one P&S development instance). The P&S development is contextualised within an actual P&S development environment within an ICT organisation. The research topic of RM and NPSD can thus be considered as suitable to study within the IS discipline.

1.5. The Value of the Research

It is the contention of Biemans (2003, p. 524) that quantitative studies, as the prevailing method of NPD studies, have some shortcomings since:

> NPD research requires a methodological make-over. NPD researchers need a renewed focus on describing the real-world complexity of product development and develop tools to assist managers in improving their NPD efforts rather than on maximising the number of publications that can be wrung from a data set through statistical pyrotechnics.

IS research has been criticised for lacking practical relevance (Keen, 1991; Benbasat and Zmud, 1999). IS researchers do not cater to the practical everyday needs of practitioners who do not read scientific journals nor offer solutions that can be applied within daily work environments (Moody, 2000; Baskerville 1999). Instead of only focusing on the IS research component, Kock, Avison, Baskerville, Myers and Wood-Harper (1999) suggest that IS research should 'serve two masters', meaning that the needs of the business should also be considered in addition to the IS community in general. AR is offered as a solution to introduce practical relevance to IS research.

AR is considered to be the most appropriate methodology to be applied when development practices are introduced within organisations. Certain key characteristics of AR make it suitable for the purpose of IS studies namely: (1) AR improves understanding of complex social IS domains that consist of multiple variables; (2) AR solves business problems while expanding scientific research; (3) AR takes place in collaboration between actors to increase competencies; and (4) AR facilitates the study of change processes (Baskerville, 1999; Hult and Lennung, 1980).

Hult and Lennung (1980) support the sentiment that 'action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhancing the competencies of the respective actors'. Baskerville and Wood-Harper (1996) enthusiasm about the application of AR within IS research is evident when AR is described as 'a paragon of the post-positivistic research methods. It is empirical, yet interpretive. It is experimental, yet multivariate. It is observational, yet interventionist'. De Kock et al. (1992) corroborate AR as being suitable for the study of IS phenomena since richer research data is gathered during the collaboration process. Moreover, since the client determines the research objective, the findings will be more relevant to the organisation and the wider industry.

The foremost objective of IS research is to introduce practical applications to improve professional IS practices. AR correspondingly expands knowledge and understanding within the IS domain. Considering these characteristics of AR, it can be considered as a valuable approach to study IS phenomena. AR is appropriate for this study as the research intends to study change processes. The research problem is framed via the development of research questions. Changes are introduced during the different iteration cycles to address the research problem, and the impact of these changes is studied.

Organisations are keen to identify any practices that will allow them to deliver more successful P&Ss (Barczak and Kahn, 2012). More comprehensive tools to manage P&S knowledge and support decision-making in new P&S development is desirable. Krishnan et al. (2001) state that research in NPSD must be motivated by the requirements of industrial practice. Evenschitzky et al. (2012) however argue that innovation science has aligned to NPSD practices due to close collaboration between consultants and academics. Hence, the practice gap in innovation research is inconsequential when compared to other research disciplines. Nonetheless, significant NPSD research gaps remain that can be bridged by this study, which could be of practical relevance to various stakeholders and interested parties. These include:

- **Academics that Study Innovation:** Because factors that impact on innovation are studied as well as the major risks during the innovation cycle, knowledge in the research community will be expanded. The study mainly focuses on service innovation and both consumer and B2B innovations. Both areas are seen as under-researched areas. The study will additionally consider the major phases of the NPSD lifecycle as well as many different types of P&S innovation, such as cloud computing, Machine to Machine (M2M), mobile health and mobile money services. In the words of Peters (2006, p. 124) 'the development and use of an NPD best practice framework is a critical element in driving a successful new product program'.

- **Academics that Study Risk Management:** The study identifies risk factors that impact on P&S innovation as well as providing processes and a framework that guides activities which would aid the development of more successful P&S. Further value to risk academics is added, since categories of risks are presented within B2C and B2B innovation. Frameworks are useful 'as a tool to allow discussion of where we stand' concerning research gaps and practitioner recommendations (Kleinschmidt, 2006, p. 121). Since the framework provides a comprehensive analysis of best practices and risks, it would present a valuable step in the direction of providing a 'best practices framework'.

- **Action Research Academics:** AR academics would be interested in the scope and techniques incorporated in the study. The scope of the AR study covers a large number of projects compared to conventional AR research. The study could provide valuable input into designing studies dealing with large-scale, multi-dimensional phenomena that are multi-faceted concerning role players, technology, risks and P&S. Due to the many challenges that are presented by an AR study, compared to conventional thesis research (Dick, 1993), AR practitioners could be interested in how these challenges were overcome.

- **Design Science Academics:** DS academics would be focused on how the researcher designed a DS artefact during the study and how these contribute to the DS body of knowledge. How the researcher applied DS within the AR study in an organisational setting could be of additional interest to DS academics.

- **Innovation Practitioners:** Innovation practitioners would be concerned with the identification of critical factors that need to be considered for successful P&S development as well as the primary risks that need to be mitigated. Practitioners that are committed to improvement could find the framework of interest as it provides a structured framework of best practices and risks. A framework can assist by pointing to the ‘specific best practices that need to be employed and internalized to drive success’ (Peters, 2006, p.124).

- **Risk Management Practitioners:** Practitioners of RM are interested in the practices and risks identified as being essential for innovation and how this should be managed. Also, what RM techniques work best and how these can effectively be deployed. Both successful and unsuccessful AR risk interventions could be of practical relevance.

- **Organisations:** Organisations that launch P&S to the B2B and B2C market could be attracted to learning about the factors that will assist in achieving more successful P&S. Organisations can also use the IRMF to identify and prioritise the key areas where gaps exist, and improvement efforts can be focused (Adams-Bigelow, 2006). In the words of Peters (2006, p.124) ‘it can serve as a benchmark for progress to measure the effectiveness of improvement programs’ and can additionally be used across organisation and industries to ‘facilitate external benchmarking discussions and can provide the structure to allow cooperation among partner and supplier firms’. Notargiacomo (2006, p. 123) expands on the usefulness of a framework by stating that it would provide ‘a common language to share learning and issues’ and ‘foster the development of tools and training programs’.

The practical value of the research can be demonstrated since the framework considers best practices to improve innovation which should lead to higher quality P&S. A risk and innovation framework drive robust processes and pro-activeness that leads to improving efficiencies as noted by Cooper and Kleinschmidt (2005). Adams-Bigelow (2006) advises that frameworks are continually evolving and as new best practice research emerges the framework should be updated. The researcher takes cognisance that best practices are at best temporal until new research becomes available.

1.6. Length and Content

Compared to a conventional IS thesis, an AR thesis can be challenging. Firstly, the literature review is more demanding as the scope of the literature research is not clearly defined at the beginning of the research period and evolves during the AR iterations. Secondly, AR research is complex and takes place over longitudinal periods that are demanding on the researcher in terms of time and effort required (Biemans, 2003). Pettigrew (1990, p. 274) confirms that the researcher can often feel overwhelmed by the challenge of collecting longitudinal change data, which he describes as a ‘highly complex social and intellectual task'. AR would consequently be more challenging to report for thesis purposes and more likely result in more pages than a conventional thesis (Dick, 1993).

Thirdly, it is difficult to 'use a conventional format to write it up effectively' as AR is 'more demanding and more difficult' (Dick, 1993. p. 12). It therefore, seems appropriate that the examiner could allow some elements of creativity and flexibility to ensure the reporting of the study. Using mixed methods and developing meta-inferences from qualitative and quantitative data produce similar difficulties regarding formats. Bryman (2007) points out that not only are two sets of data gathered, but both sets need to be described as well as the methods that were used to develop the meta-inferences which produce difficulties to publish results in journals due to the length restrictions imposed. It can, therefore, be expected that the thesis will be lengthier than a traditional study.

Since a comprehensive theoretical model of innovation factors to support NPSD has not been developed (Nada, 2010), the researcher has conducted a review of the innovation literature by analysing best practices that stimulate innovation. A best practice is a method that has proven to be successful during the practical application thereof (Olsen, Walker and Ruekert 1995; Dooley, Subra and Anderson, 2001).

However, it was not as simple as recording these best practices, as several challenges became apparent. The first challenge was to decide whether to study only (intangible) *service* factors or also investigate innovation factors as they relate to (tangible) *products*. The second concern related to how to structure the dimensions of the framework. How the researcher addreses these concerns is subsequently discussed.

Since the organisation launches both P&S, the context of the study required consideration of both. While the organisation launches mainly services, it also bundles physical products such as handsets and other tangible products. Organisational practitioners, as well as some researchers, refer to services as products. In these cases, where the researcher’s intent was to review the two streams independently, the researcher would change the wording accordingly. During the risk analysis, the researcher used the synthesis approach.

The reviewer may find the separate recording of P&S factors during the innovation literature review as repetitive since the information seem similar. The separate recording of P&S assisted the researcher in obtaining a deeper level of understanding of the parallels and dissimilarity between the critical success factors as they apply individually. In essence, it validated the implementation approach followed during the AR iterations.

The second concern related to how to structure the dimensions of the framework. During the innovation literature review, a four-dimensional framework was chosen to structure the literature review, which was expanded to additional dimensions during the risk literature review. Again, the reviewer might consider this format to be repetitive in some instances. However, it serves to provide strong evidence for the approaches applied during the AR cycles and supports the development of the risk interventions. The literature review in itself followed a cyclical approach where each subsequent cycle added to achieving a deeper level of clarity.

There is abundant research that studies product innovation. A common practice during thesis write-up is to quote many researchers who are supportive of a particular practice, to indicate its relative importance. However, the researcher abandoned this approach as it impacted on the readability of the thesis. Instead, these factors are summarised in additional tables in Appendix 3: Framework Summaries.

Additional difficulties arose owing to the high number of variables and complexity inherent to studying RM in NPSD. Action researchers have to validate the approaches applied continuously. Various methods can be applied within RM and AR. As the thesis is subject to page limits, it was problematic to convey both acknowledgement and awareness of other methods and validate the basis for choosing a specific approach. In these cases, supplementary information was added to Appendix 8: Additional Information, while, in others, alternative approaches were noted but not discussed in detail, since a clearly specified validation for using a certain approach existed.

Throughout the thesis, the term ‘theory’ are applied in two senses: one in the narrow, academic sense of 'espoused theory' as codified in the academic body of knowledge through journal articles and conference papers, and sometimes in the wider sense as used by professionals and practitioners when they refer to a wider body of accepted knowledge, i.e. including also standards (ISO), best practices and established practitioners publications. This reflects the dual role of researcher and practitioner in which the researcher was operating. The context will always clarify which sense/meaning is used.

Supplementary literature reviews were performed during the AR cycles to provide a theoretical basis to validate findings. It is considered normal AR practice resulting due to the interplay between operational, empirical and theoretical work (Goldkuhl, 2012).

In summary, Dick (1993, p.61) describes writing an AR thesis as challenging since ‘you have to write very succinctly, yet do so without undermining your thesis or your justification’. The researcher acknowledges that the thesis might be slightly longer than a conventional thesis, but trusts that the justifications are sufficiently persuasive to allow the additional pages.

1.7. The Structure of the Report

The development of the research is discussed in some detail, to allow a solid understanding of the complexity of research.

Chapter 1 indicates that the study follows an AR process over four years to study innovation practices in an ICT organisation based in South Africa. The problem of effectively managing risks in innovation leads to the researcher’s direct involvement in innovation projects. Clarification of the research objectives takes place by introducing the research objectives and questions.

Chapter 2, the concepts relating to best practices in innovation and risk management are brought together within a literature review. The literature review are analysed in two sections, namely Innovation and Risk Management. During the innovation section, independent analysis of products and services takes place to determine what individual best practices stimulate each and whether these factors are similar.

Still within the literature review in Chapter 2, the Innovation section is expanded with analysis of the literature on management of risks, and frameworks are analysed guiding more efficient RM during NPSD. The second part of the chapter introduces the methods for analysing risks in NPSD. Innovation risks identified are categorised into dimensions. The researcher utilised the same dimensions employed for development of the innovation framework. The difference is that during the innovation literature review, these dimensions only included best practices but during the risk literature review, the focus was on perceived risks as identified by risk researchers and the innovation dimensions were expanded to cater for risks. The risk framework compiled based on the literature review provided the theoretical basis for analysing risks during the NPSD AR cycles. The literature review chapter concludes with a presentation of a preliminary IRMF that sets out both best practices and risks.

Chapter 3 describes the research methods and validation. Furthermore, it discusses the philosophical foundation, AR and DS approaches and design of the methodology, followed by an evaluation of the research criteria to ensure robust research. Multiple mixed methods are used, including quantitative analysis, which is additionally reviewed to ensure robustness. The development of valid and robust meta-inferences are further explained.

Chapter 4, describes the AR iterations, starting with an analysis of the problem situation and the interventions required. Updates of the risk framework and risk processes took place during each consecutive AR cycle. The scope and context of the business expanded throughout the AR iterations. During AR iteration one, only B2C was considered, but by the end of AR iteration 3, B2B, mobile health, insurance and even expansion into other geographical countries occurred. The format of the chapter is inspired by Iversen et al. (2004) ‘research practice' to study RM in Software Process Improvement (SPI). An DS artefact is additionally developed during AR iteration three.

Chapter 5 describes the research results. The chapter is organised according to the knowledge contributions, which are an effective format for presenting and justifying the AR approach (Dick, 1993). The research results start with an explanation of the final framework, followed by a detailed discussion of each of the dimensions of the framework, enriched with data from the quantitative questionnaires and interviews.

Chapter 6 formulates the conclusions based on the research findings and theories and recommends effective RM practices. The section analyses the AR and DS research contributions offering two primary contributions. Firstly, providing approaches to managing risks more effectively within these areas expands knowledge of NPSD. Secondly, the RM approach offers a framework for analysing and mitigating risks with the ability to tailor RM approaches to P&S contexts.

Chapter 7 summarises and discuss the generalisable findings of the research concerning the research question, NPSD and RM results and explains the research contributions to AR and DS. The section argues that the IRMF and risk processes delivered using the AR and DS methods, are transferable to other ICT organisations and contexts and that significant knowledge contributions are made to NPSD, RM and IS.

Chapter 8, concludes by crystallising the research contributions regarding the empirically validated, research-based framework and risk processes, offer some limitations as well as future research opportunities. It is argued that AR and DS proved to be highly effective in delivering new knowledge that leads to sustainable improvements in the organisation.

2. Chapter 2 – Literature Review

2.1. Introduction

This research focuses on innovation, the factors that make innovation successful and how these success factors can be magnified and risks can be overcome. The literature review will highlight the research themes by discussing the various contributions that researchers have made in the field of Innovation and RM.

The continued sustainability of an organisation is increasingly dependent on how successful it is in NPD (Cooper, 2001). Conservative projections indicate that NPD accounts for one-third of organisational revenues (Nambisan, 2003) while more liberal projections calculate the figure at 60% for the most successful organisations (Chen, Lee and Tong, 2007). A factor that distinguishes top-performing technology organisations from those organisations lagging in competitiveness was that they were more efficient at managing their NPD processes (Belbaly, Benbya and Meissonier, 2007).

During the NPD lifecycle, a considerable amount of uncertainty exists which could have negative consequences for the product as well as the organisation (Chin et al. 2009). NPD teams are increasingly driven by a ‘faster-better-cheaper’ philosophy; facing constant pressure to reduce the cost and time associated with NPD, yet continue to provide innovative solutions (Cooper, 2003). Managing risks becomes increasingly important as it provides an effective means to ensure success (Cooper, 2003).

Innovation practices clearly demonstrate the two sides of RM – the opportunities essential to progress and the risks that can negatively impact on the organisation (Leithead, 2000). Risk is modelled by considering the likelihood and consequences of undesirable events as well as risks associated with not pursuing an opportunity (ISO 31000, 2009). Taking risks in an informed manner, analysing both the benefits and negative consequences of the risks, could lead to greater level of return (Kallman, 2005).

Williams (1995) state that 'one aspect of the future is obvious: all new undertakings will be accomplished in an increasing complex technical, economic, political and social environment', indicating that projects will need to deal with a broader range of issues and problems to ensure their success. The design of new P&S systems in complex environments has many associated risks. An inherent characteristic of NPS innovation is pressure instituted by competitors, shorter development timeframes, changing markets and customer requirements, new technologies and increased regulatory pressures (Luo, Li, Zhang and Shim, 2010).

It has been established that the higher the innovation characteristics of a P&S, the greater the risk (Kessler and Chakrabarti, 1999; More, 1982; Olsen et al. 1995). High-technology services are inherently complex due to a multitude of cross-functional resources, vendors, stakeholders, customers and new business models that distribute risk over a wide area of the organisation. For instance, technology risks are responsible for cost overruns of 45% and schedule overruns of up to 22 months during the development of large US defence-related development programs (Olechowski et al. 2012).

RM has become progressively more vital in the innovation literature (Keizer, Voss and Hallman, 2005). RM techniques that function well in traditional stable environments are not equally successful in dynamic, complex and high-paced environments, which could infer that risk approaches should be flexible and more dynamic.

In the following sections of the literature review, the two streams of theory applicable to the research question will be combined, namely Innovation Management and RM. Each theme will be analysed to obtain a clear understanding of the context, key concepts and relationships of interest applicable to the study, following the approach advocated by Miles and Huberman (1994). Subsequent sections will increase understanding of the scope and nature of the research problem and explore the basis for providing an IRMF.

2.2. What is Innovation?

2.2.1. Definition of Innovation

Historically, innovations relate to the development of new P&S. An early definition of innovation refers to the real-world implementation of ideas that do not rely on inventiveness but entrepreneurial capabilities (Schumpeter, 1939). Drucker (1985) advances the awareness that innovation is linked to entrepreneurial business activities when he states that innovation is instrumental to the discovery of new business or service opportunities.

The concept of innovation has since been expanded to include many additional aspects. Innovation can be described as 'the successful exploitation of new ideas' (DTI, 1998, p.1) and 'new technology or a combination of technologies that offer worthwhile benefits' (McDermott and O'Connor, 2002 p. 424). The OECD (1991) definition comprehensively captures innovation as an 'iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based intervention which leads to development, production and marketing tasks striving for the commercial success of the invention' (Garcia and Calantone, 2002, p. 112).

The OECD (1991) definition recognises three major characteristics of an innovation. Firstly, an innovation should not merely occur but should also be successfully introduced and adopted in the marketplace. An innovation is not equivalent to an invention. An invention becomes an innovation only once the economic value is obtained by diffusion in the market place (Garcia and Calantone, 2002). Secondly, innovation is an iterative process, which suggests that innovation is cyclical and improved versions of innovations are continuously introduced to the market. Varying degrees of innovativeness can thus be inferred. Thirdly, the definition is comprehensive enough to acknowledge that many different types of innovation can exist in an organisation. Innovation can accommodate a range of dissimilar innovation aspects, which could include P&S, process as well as technological innovation. This study focuses on one aspect of innovation, namely P&S development.

NPSD creates stakeholder value by providing new and improved P&S, processes and business models (Ostrom et al. 2010). This definition infers that product innovation can impact on multiple aspects of the organisation to include the provision of services provided by service type organisations but also products delivered by manufacturing organisations. Manufacturing firms should not only focus on providing products but also service offerings as a key competitive differentiation (Yen et al. 2012). Crossan and Apaydin (2010, p. 1155) provide a comprehensive definition of innovation as both a process and an outcome as:

> '[p]roduction or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services and markets; development of new methods of products [and services]; and establishment of new management systems'.

The definition captures the fact that innovation is intended to deliver value and cater for a wide net of associated constructs and models, which provides an accurate description of the context of this thesis.

2.2.2. Service Innovation Research Approaches

Services have different characteristics from products, such as intangibility. The question is whether the results from research studies on tangible products can be generalised to service contexts. Maglio and Spohrer (2008) contend that the answer is not obvious since insufficient academic attention has been focused on services.

Hull, Coombs, and Peltu (2000) suggest that service innovation studies follow mainly three approaches: (1) assimilation; (2) demarcation; and (3) the synthesis approach. 'Assimilation' infers that product innovation concepts are effortlessly transferable to services innovations, but this approach has been criticised for ignoring the unique attributes of services (Yen et al. 2012). On the opposite spectrum of assimilation is the second approach, namely 'demarcation' which focuses on the distinctive characteristics of services. This emphasis on the unique attributes of services makes it challenging to transfer knowledge from products to services (Yen et al. 2012). The third approach, namely 'synthesis', combines the two streams rather than studying them separately. The synthesised model assumes that the underlying critical success factors that promote innovation are similar but that the importance of the dimensions fluctuates depending on whether it is a product or service (Nijssen et al. 2006).

As more NPD organisations are starting to provide services, (rather than services being exclusively allocated to the domain of NSD), the synthesis approach is preferred and followed by researchers (Yen et al. 2012), and also the approach that will be followed in this thesis. However, P&S will initially be demarcated to obtain a more detailed understanding of the importance of innovation factors as they relate to each.

2.3. Successful Product Development

This section aims to provide criteria and evidence of good innovation practices. Most of the factors that are indicative of successful product innovation will be included in the IRMF. Consideration of these factors by innovation teams during the NPSD process could increase their chances of launching more successful products. As earlier alluded to, services are exempt from this section and will be investigated separately starting from Section 2.5 of this chapter

2.3.1. Product Innovation Dimensions

Researchers have made few attempts to group product innovation success factors in distinct dimensions. Cooper and Kleinschmidt (1995) establish dimensions such as NPD process, strategy, organisation, culture and management commitment. Leonard and Sensiper (1998) suggest that these dimensions fail to consider the role of components such as retaining and developing knowledge during the NPD cycle. Montoya-Weiss and Calantone (1994) produce a four-dimensional framework consisting of 'strategic, market-environment, development process and organisational factors', considering a wider perspective that includes organisational factors as well as the overall new product development process. Henard and Szymansky (2001) expand on the initial set of dimensions by producing an additional dimension that considers the characteristics of the 'product'. The 'product' dimension evaluates the advantages of the product (technological sophistication) and the degree to which it meets the customer's needs (regarding the price and advantages).

The researcher has examined variables of 'product' (the fifth dimension introduced by Evanschitzky et al. 2012) and deduced that these variables could readily be accommodated within the existing four dimensions introduced by Montoya-Weiss and Calantone (1994). Since 'customer characteristics' essentially reflect an understanding of the customer requirements and the target market, they can be combined with the dimension of market factors. Since 'product advantage' evaluates the extent to which the customer perceives the product to be superior when compared to competitive offerings it relates to customer requirements accounted for within the dimension of market-environment factors. The researcher has reverted to the original four dimensions of the

Montoya-Weiss and Calantone (1994) framework but renamed the four key dimensions as Strategy, Market, Process and Organisational factors. Since the field of inquiry is complex and involves multiple variables, the researcher has endeavoured to simplify the dimensions.

Further research by Kahn, Barczak and Moss (2006) divides NPD into six dimensions, which were expanded by Kahn, Barczak, Nicholas, Ledwith and Perks, 2012) to seven dimensions. The dimensions of 'strategy, process and market' remained similar, but 'market' was renamed to 'research' to reflect learning about customers, competitors and macro-environmental forces. 'Organisational culture' was apportioned into 'project climate' (addressing intra-company and project-specific people issues) and 'company culture' (cross-company values and extra-company alliances and partnerships). A distinct 'commercialisation' category was created to reflect issues about marketing and launch of products. A supplementary 'metrics and performance' dimension consolidated facets to measure NPD performance. The researcher has evaluated the categories and assessed that these dimensions can be accommodated as sub-dimensions of the original four dimensions of Montoya-Weiss and Calantone (1994).

The following section will explain the different variables that are considered to underlie the dimensions and provide indications of the relative importance of the dimension to ensure successful product innovation. Since innovation research lacks uniform agreement on dimension descriptions and content (Papastathopoulou and Hultink, 2012), a definition for each category will be formulated at the end of the innovation section of this chapter.

2.3.1.1. Strategy and Portfolio Management

Dyers and Song (1998) label an innovation strategy as the means by which the organisation will compete by way of its NPD plans. De Brentani, Kleinschmidt and Salomo (2010) expand on the definition by signifying the alignment of strategies and resources with an intention to succeed in a competitive and complex marketplace. Organisational strategy, therefore, focuses on the intended end result and long-term implications for the business (Meskendahl, 2010).

Alignment to an effective strategy is a primary determinant of NPD performance (Cormican and Sullivan, 2004; De Brentani et al. 2010; Szymanski and Henard, 2001). According to Cooper and Kleinschmidt (1995), it is the second-most important indicator of a successful NPD programme (surpassed only by the robustness of the NPD processes). One of the requirements for a successful innovation strategy is the expectations that it should provide a strategic focus that emphasises both long-term as well as short-term plans to guide individual NPD projects (Cooper and Kleinschmidt, 1995).

The NPD strategy should align with the strategic objectives of the organisation (Bessant, 2003; Miller and Friesen, 1982). Both strategic fit and impact are criteria that should be considered (Cooper, 1999). The strategic fit between the product and the brand image considers how the product contributes to the strengthening of the reputation of the organisation (Keizer, Halman and Song, 2002). Strategic impact investigates how well the product will assist the organisation in achieving the business strategy and support an improved brand name. Cooper, Edgett and Kleinschmidt (2002) suggest that approximately 65% of product companies think they are effective in developing an NPD strategy.

It is probable that the internally focused practices of the organisation will provide indications of how strong strategic alignment is (Adams, 2006). Effective alignment is designated when supporting structures and systems are affiliated with the strategy (Tipping and Zeffren, 1995). Factors that require alignment include the market, technology, human resources and research and development (R&D) activities (Evanschitzky et al. 2012).

An effective innovation strategy should be embedded in the culture and behaviours of the organisation, (O'Brien, 2003) and verified by long-term commitment and clear allocation of resources (Cooper, 2004). The chances of a successful product are greatly increased if the organisational competencies are already considered during the initiation phase (Cooper, 1999). Further factors that can be used to identify the innovation readiness capacity of an organisation include resource capability, customer profile and the use of innovative technology, processes and structures (Snydern-Halpern, 2002).

A key theme that emerges during analysis of the strategy dimension is portfolio management (Cooper and Kleinschmidt, 1995; Cormican and O'Sullivan, 1991). Portfolio management assists with managing resource constraints as resources are rapidly consumed during the innovation process (Cebon and Newton, 1999). Close alignment should exist between the objectives of the product and the achievement of business goals and strategies (Parry et al. 2009). Organisation strategy and portfolio management differ according to the scope of application. Organisational strategy is the organisation-wide choices made to compete in a market, while portfolio management takes place within the NPSD organisation to evaluate and select strategic NPD projects regarding how well they contribute to the overall objectives of the organisation (Meskendahl, 2010).

The effectiveness of portfolio management is often viewed as a key determinant of competitive advantage (Cooper, Edgett and Kleinschmidt, 1999). According to Cooper et al. (1999), organisations that were the most proficient at innovation, developed qualitative and quantitative criteria to select and evaluate the suitability of products for the portfolio. These organisations additionally utilised formal tools and techniques with clear selection criteria that were consistently applied to select between various NPD projects to add to the portfolio.

Cooper, Edgett, and Kleinschmidt (2002) informs that most organisations rate their portfolio management as weak and that less than 21% consider their portfolio management to be well executed. Portfolio management selection criteria often utilise scoring models that are based on financial indicators such as cost/benefit analysis, net present value and return on investment, since the portfolio method is utilised to optimise the trade-off between investments and the associated risks. The monetary consequences of the cost structure versus the profit generated (through a variety of revenue sources) should be considered (Cooper, 1999). The use of multi-dimensional measurement models, rather than mere financial models is more successful at predicting long-term impact of the product on the sustainability of the organisation (Meskendahl, 2010). Examples of measurement models include the Balanced Scorecard (Kaplan and Norton, 1996) and the 19-Dimension Scoring Model proposed by Cooper (1999). The latter evaluates products based on criteria such as reward, business strategic fit, strategic leverage and probability of commercial success, as well as the likelihood of technical success. Cooper et al. (2002) suggest that formal tools, techniques and qualitative criteria should be applied and consistently followed during portfolio selection.

Successful product portfolios typically balance short-term and long-term projects, provide a good representation of the different types of product categories and represent both high and low risk projects as well as small and large products (Cooper et al. 1999; Meskendahl, 2010). The type of products should include new ventures, new categories, new platforms and derivative products (Davis, 2002). The contribution of the P&S to the overall portfolio should also consider potential to expand the P&S into a family of P&S offerings (Keizer et al. 2002).

Portfolio management is heavily influenced by the culture of the organisation. The commitment of executive management to portfolio selection can be analysed by scrutinising the extent to which investment strategies and supporting structures (systems and resources) are made available and how these resources are aligned to achieve the organisational strategies (Tipping and Zeffren, 1995). Further determinants of successful portfolio management establish the technological delivery gap by analysing the complexity of the solution and availability of limited resources and skills (Cooper and Edgett, 2002). The entire value chain activities should be considered to determine what resources are required, the core competencies that are necessary to execute the business model and the network of partner agreements that should exist to efficiently offer and commercialise value (Cooper, 1999).

Innovation should be embedded as a strategic initiative within the wider organisational strategy (Goffin and Pfeiffer, 1999; O'Brien, 2004). The organisation's innovation readiness thus forms part of the strategy dimension. Social innovations (e.g. improving health and education) and sustainability projects are emerging as new strategic initiatives (Nidumolu, Prahalad and Rangaswami, 2009). Organisations are conscious of introducing social goals through the 'triple bottom line' (people, planet and profit) to enhance consumer brand (Di Benedetto and Nakata, 2012).

2.3.1.2. Market Orientation

When business culture is aligned to the dimension of ‘market’ the organisation will utilise market information effectively to create profitable products and deliver superior customer value (Langerak, Hultink and Robben, 2004). The researcher has identified three primary research themes related to the ‘market’ dimension: (1) an understanding of the market and competitive environment; (2) mindfulness of customer and stakeholder needs; and (3) marketing activities. The market dimension will subsequently be discussed in terms of these broad themes.

Competitor and Competitive Activity

An understanding of competitors and competitive activity has a direct effect on the success of products (De Brentani, 1995a). An extremely competitive market was established as a significant risk factor for NPD (Cooper, 1985; Cooper, Edgett, and Kleinschmidt, 1998; Montoya-Weiss and Calantone, 1994) that could elevate the probability of product failure (Cooper, 1979; Song and Parry, 1997a). Effective analysis and monitoring of the market and competitive environment are key requirements for a successful product (Varhaegde et al. 2002; Griffin et al. 1983). An accurate analysis of market potential (Balbontin, Yazdani, Cooper and Souder, 1999), as well as competitive analysis (Calantone and Benedetto, 1988), is dependent on the availability of integrity of information.

Customer

Market research is utilised to create superior value offerings to customers (Langerak et al. 2004) and it should meet sufficiently high quality standards to obtain a detailed understanding of customer needs (Atuahene-Gima, 1995). The product team should have a good understanding of customer needs within the market segment and translate these requirements into the functionality that is necessary for the customer (Berry and Hensal, 1973; De Brentani, 1995; Edgett and Jones, 1991; Martin and Horne, 1993). The product characteristics should consequently endeavour to meet the customer requirements concerning price, product advantage and technological sophistication (Evanschitzky et al. 2012).

Accurate understanding of customer needs is the third biggest indicator of product success (Cooper et al. 1999; Haverila, 2010). Customer needs also relate to speed of acceptance. If there is little demand for the new product, it is unlikely that it will be successful. Diffusion of innovation factors can be applied to ensure acceleration of product acceptance (Rogers, 1983). Adoption factors include relative advantage, ability to trial the product and the ability to observe the functioning of the product. Rogers (1983) further advises that the values of the customer should match those of the products. Customers’ past experiences and the degree of complexity of the product can negatively impact on adoption.

In addition to the customer value proposition, customer risk perception should be considered. Customer risk, from the perspective of the organisation, resides in developing the right product according to the exact needs of the customer and the extent to which these requirements are translated into product functionality (Davis, 2002). From the perspective of the customer, risks relate to doubt and uncertainty as to whether a product might fulfil their expectations and fear as to whether its use might present problems or risks (Mehrjerdi and Dehghanbaghi, 2013).

According to Lau, Tang and Yam (2010), a customer may experience the following aspects of risks: (1) Performance risk: Product benefits do not meet advertised standards; (2) Financial risk: Concern about unexpected financial cost of purchase and/or product maintenance and/or vulnerability to fraud; (3) Time risk: Concern about the time and effort lost in product research and subsequent purchase of a product which does not meet expectations; (4) Psychological risk: The risk that the product will negatively impact on the customer's self-image; (5) Social risk: The risk that the product may lead to embarrassment amongst the customer's social group; (6) Privacy risk: The risk of abuse of personal information without knowledge or permission; and (7) Physical risk: Usage of the product might present physical risks to the customer or others. During the customer needs analysis, these risk aspects should be considered.

An emerging trend that positively impacts on the understanding of customer requirements is to integrate the customer as an active participant during the NPD process (Gruner and Homburg, 1999). If customers perceive a product to be too complex, they will be less willing to adopt it. A unique area of product innovation research was designing products for radical simplicity and facilitating emotional connections as introduced by Apple (Di Benedetto and Nakata, 2012).

The overall customer experience can be enhanced by combining Customer Relationship Requirements (CRM) with customer functionality expectations. The objective of CRM is to improve customer satisfaction and loyalty over the lifecycle of the product (Khodakarami and Chan, 2014).

Marketing

The proficiency of marketing activities is a valuable input to the NPD process (De Brentani, 1995; Evanschitzky et al. 2012; Souder, Buisson and Garret, 1997). Skilled marketing resources are a primary indicator of a successful product (Calantone and Benedetto, 1988; Souder and Song, 1997), and an effective market strategy ensures accurate targeting of the market through the use of appropriate marketing channels (Calantone, 1988). The strategy should include a definition of the target market and positioning of the product within the target market, the marketing approach (below and/or above the line), marketing channels and marketing mix (Parry and Song, 1994).

The marketing approach should include the identification of the 4 Ps of marketing, namely: Product, Pricing, Place and Promotion (Kotler and Keller, 2006). An effective marketing strategy succeeds in promoting the product by targeting the intended market via effective marketing channels. The marketing strategy should also consider marketing the product to internal staff (De Brentani, 1989) as well as ensure that front-line staff can efficiently service customers (De Bakker, Boonstra and

Wortmann, 2010). Communications to internal staff allow staff to act as internal promoters of the product.

Commercialisation is concerned with turning the product into a commercial success and is the process which immediately precedes the testing phase (Crossan and Apaydin, 2010). Commercialisation includes activities intended to take the product to market, such as marketing and sales (Booz et al. 1982; Song and Montoya-Weiss, 1998). Proficiency of commercialisation activities can be measured by review of the sales, distribution and promotional targets (Song and Parry, 1996).

2.3.1.3. Innovation Process

Researchers agree that an efficient product innovation process is critical to innovation (Evanshitzky et al. 2012; Montoya-Weiss and Calantone, 1994; Szymanski and Henard, 2001). According to Cooper (2004), a robust NPD process is the main predictor of a successful product. Other researchers consider a formal NPD process as a critical success factor (De Brentani, 1995; Edgett and Jones, 1991; Mishra, Kim and Leë, 1996) and the absence of a formal process, as a critical risk factor (Berglund, 2007; Mu, Peng and MacLachlan, 2009; Nada et al. 2010; Riek, 2001)

An efficient and formal NPD process is apportioned into distinct stage/gate processes with milestones, checkpoints and stop/go decision points (Cooper, 2001). Formal stage/gate processes are followed by 47% of organisations compared to the 21% that do not adhere to formal NPD processes, according to Cooper et al. (1999). Adams-Bigelow (2004) suggests that as many as 60% of organisations do not adhere to formal stage/gate processes.

From the preceding description of an official NPD process, it is evident that the stages, stage/gate processes as well as the activities that support the overall NPD process (such as project and product management) contribute to the delivery of a successful product. The next sections review these activities.

Process Stages

NPD activities are categorised into distinct critical development stages, similar to the Systems Development Lifecycle (SDLC). Table 84, available in Appendix 8 provides a comparison between three methodologies as advocated by Booz et al. (1982); Cooper et al. (2002) and Song and Parry (1998).

The main difference between the three approaches is that Song and Parry (1998) and Cooper et al. (2002) combine ‘idea development’ and ‘screening’ while Booz et al. (1982) approaches them as two different phases. More subtle differences are revealed upon closer inspection of the activities that are contained within the phases. Booz et al. (1982) restrict strategic planning to the context of the particular product, while Song and Parry (1998) link strategy to a wider organisational perspective, by advocating alignment with organisational strategy.

Cooper et al. (2002) introduces an additional phase, namely post-launch review, which takes place approximately three months after the product launch. The objective is to evaluate the performance of the product against the projected success criteria. Similarly, Atuahene-Gima (1995) recommends that post-launch or post-implementation reviews (PIRs) be performed in order to establish lessons learnt. Shostack (1984) refers to the post-implementation review as a post-introduction audit to ensure that the product and surrounding processes remain efficient. To prevent recurrence of the same problems Cooper (2008) suggests conducting root cause analysis, which could assist with a deeper understanding of the problem, allowing more precise measures to be implemented.

An NPD process will largely follow the stages of (1) idea generation; (2) concept development; (3) planning (design of the product specification); (4) development; and (5) launch (testing and commercialization) and maintain (post-implementation review) phases. Variations from the generic NPD process could exist as long as the types of activity that is conducted within each stage are sufficiently robust (Chiesa and Masella, 1996).

Sizable projects should accommodate all NPD phases since problems could arise when stages are skipped (Cooper et al. 1999). Not all NPD projects move through all phases, as enhancements (minor changes) can follow a 'light' process while products with moderate risks associated can use a 'fast-track' process (Cooper, 2008). However, when developing incremental versions of existing products, it is probable that some stages can be skipped since prior knowledge about the product exists. Song and Montoya-Weiss (1998) dispute that phases can be skipped as all four NPSD phases are significant determinants for both new and incremental products. Riek (2001) is supportive of the notion that skipping phases could lead to 'launch and fix' mode.

The speed of innovation has been shown to improve customer satisfaction and quality (Adams et al. 2006). Innovation speed is measured as duration, speed and performance against schedule (Cebon and Newton, 1999; Chiesa, Coughlan and Voss, 1996; Hauser and Zettelmeyer, 1997).

Stage/Gate Processes

Conceptual gates are bridged to proceed from one phase of the NPD lifecycle to the next. These formal processes are presented by Cooper (1998) as 'stage/gate' processes. An efficient NPD process is characterised by distinct stages, which function as milestones and checkpoints (stop/go decision points) (Cooper et al. 2002).

A robust NPD process ensures a quality product (Berglund, 2007). The stages and criteria are explained in Table 85: Generic stage/gate criteria of the NPSD process, available in Appendix 8. The five stages are built on the NPD methodologies proposed by Booz et al. (1982); Cooper et al.

(2002) and Song and Parry (1988). Table 85 explains the minimum criteria that are needed for each of the five gates. An effectiveness stage/gate process acts as a funnel and reduces the number of products until only the very best selection of products remain for implementation.

A flexible NPD process increases product performance. Therefore, stage/gate processes are not always sequential in nature, and activities may overlap (Cooper et al. 1999). Alternatives to 'stage/gate' processes include project methodologies such as Total Design, Cycle-time Excellence and Phased Development (Jenkins et al. 1997). The stage/gate processes from Cooper et al. (2002) have arguably received the most attention in the popular literature and are probably more widely utilised in practice. Limited research has however been undertaken with regard to how decisions should be made at the individual NPD stage/gates and indicates opportunities for researchers (McNally and Schmidt, 2011).

NPD Stage Activities

Proficiency of activities (carried out during the NPD phases) influences the success of new products (Ernst, 2002; Song and Parry, 1988; Szymanski and Henard, 2001). These activities include marketing, supply chain, finance, business model, partners and vendors (Berglund, 2007; De Brentani, 1993; Keizer et al. 2005; Montoya-Weiss and Calantone, 1994; Mu et al. 2009). Successful integration of these functions into the NPD process was regarded as a success factor (Evanschitzky et al. 2012).

Story and Easingwood (1993a) ascertain that certain activities of the NPD process are more important and should receive more attention. These activities include internal marketing and synergy, technological advantage, market research, intermediary support and responsiveness (speed of development). Further activities that are conducive to the creation of successful products include development, marketing testing and market orientation (Cooper, 2001). The stage where the portfolio of products is approved for development is of primary importance according to Song and Parry (1996). While there seems to be a lack of agreement amongst researchers regarding what the critical NPD stages and activities are, it was considered important to continually assess the project during the various phases to ensure that unprofitable products are not developed (Cooper and Kleinschmidt, 1995). It is also probable that the importance of activities can differ according to the lifecycle of the NPD. For instance, the importance of technological capabilities diminishes once the transition from development to commercialization takes place, upon which marketing capabilities become more important (Kelm, Narayann and Pinches, 1995)

Researchers agree that work conducted during the initial phases of the NPD process has a bigger impact on the success of new products (Montoya-Weiss and Calantone, 1994). Solid up-front work (to define and justify the product), significantly increases the potential of successful products and correlates strongly with financial performance (Cooper, 1999).

In addition to the activities already described which form part of the 'process' dimension, other activities were also considered essential, namely collaboration with suppliers and customers as well as financial management and ensuring that sufficient funds exist to support the product during the lifecycle (Kerssen-Van Drongelen and Bilderbeek, 1999). Cost advantages derived from the new product are an important influence during the NPD lifecycle (Gruner and Homburg, 1999).

Another area that requires attention during the NPSD lifecycle is an assessment of the competencies of all the value chain elements that is required for the new product to reach its intended customer base (Davis, 2002). A product is more likely to be successful if the organisation has full control over all of the value chain requirements and the requirements can be addressed internally within the organisation. Alternatively, a strategy can be developed to ensure that external parties can fulfil some of these value chain requirements (Davis, 2002).

The product manager is the resource vested with the overall responsibility for developing a successful P&S. Effective performance of the product manager is a key input that could facilitate the development of successful products (Edgett and Jones, 1991).

Project Management

The innovation process is complex as input activities differ on a product-by-product basis. Five project management factors were deemed to be critical success indicators for new product innovation, namely a cross-functional project team, a strong project leader, end-to-end responsibility for the project by the NPD team, team commitment and effectiveness of communication between team members (Cooper and Kleinschmidt, 1995). These aspects align more to the softer cultural aspects of project management. Crossan and Apaydin (2010) view the key success factors of effective innovation project management to consist of efficiency (speed and duration) and effective utilisation of tools, paired with collaborative practices between teams and customers, supported by suitable communication techniques. Both technical project management and cultural aspects are therefore important aspects of project management in NPSD.

The project team apply project management criteria to scope the project and to develop and monitor timelines (Cooper, 2001). Project managers should ensure efficient project delivery (within the NPD process) and apply collaboration tools to aid communication efficiently (Adams et al. 2006).

The project manager plays a significant role during innovation. It is, therefore, important to establish the effectiveness of the project leader role by evaluating his/her decision-making capabilities (Cooper and Kleinschmidt, 1995). It entails that project managers should be vested with the authority to make decisions that have a direct impact on the product development project.

The project manager oversees all projects during NPD. Since various projects take place simultaneously, it is critical to retain valuable information (Davis, 1998; Hull, Coombs and Peltu, 2000). Knowledge management (KM) is the process of controlling the 'explicit' and 'implicit' knowledge held by the organisation (Pitt and Clarke, 1999). Three areas were found to be of particular importance to retain NPD knowledge, namely (1) idea generation; (2) existence of a knowledge repository; and (3) retaining information during communication flows (Pitt and Clarke, 1999). The application of KM criteria to screen new ideas during the idea generation phase, significantly increased the probability of a successful product (Cooper, 2001). The purpose of a knowledge repository is to retain lessons learnt during the product lifecycle. It is essential to retain and classify NPD information (such as new and existing information and/or internal and external) (Pitt and Clarke, 1999).

The extent to which organisations have the capacity to absorb and apply new knowledge, termed as their 'absorptive capacity', positively relates to innovation and performance (Tsai, 2001). Too-strict rules and procedures could inhibit decisions by hampering access to new sources of information and reduce innovation capabilities (Vyakarnam and Adams, 2001).

2.3.1.4. Organisational Factors

A supportive organisational culture and resources are one of the five new areas of knowledge needed to advance NPD innovation theory and practice in future (Di Benedetto and Nakata, 2012). Lack of understanding of NPSD organisational culture hinders research (Ernst, 2002). For this study, organisational factors that contribute towards stimulating a climate of innovation include characteristics such as organisational design, leadership, communication and quality of resources (Balbontin et al. 1999; Cooper et al. 2005; Montoya-Weiss and Calantone, 1994).

The following section analyses organisational factors according to broad themes explored by researchers. Firstly, the overall culture of the organisation is researched as it creates an environment for innovation, followed by establishing guiding principles for effective top management support. Thereafter, the structural components guiding innovations are analysed, such as hierarchical, team structure, and resourcing aspects.

Organisational Culture / Climate of Innovation

A supportive culture and climate significantly contribute towards successful product development (Cooper and Kleinschmidt, 1995; Cormican and O'Sullivan, 2004). Culture encompasses shared organisational values, assumptions and beliefs (Johnson and Scholes, 1984). An effective innovation culture shares values, perceptions and assumptions that influence NPD team behaviour (Schein, 1985). The definition is similar to Evanschitzky's et al. (2012, p.37) definition of organisational climate that refers to the 'extent to which the day-to-day decisions are governed within the organisation or group that shares values and norms'.

Establishing the overall innovativeness of an organisation cannot occur by assessing the performance of individual (micro-level) products, since single innovations reflect attributes of the specific innovation, rather than that of the organisation (Damanpour, 1991). Organisational influences are only evident when innovations are grouped into products with similar characteristics or produced by a particular organisational function. This research studies both organisational and programme level aspects to increase the validity of research findings. The study of multiple innovations over a longitudinal five-year period allow an even deeper level of appraisal.

Assessment of the overall innovation capacity or innovation readiness of an organisation includes evaluation of the capability of internal resources, end-users profile, technology, knowledge, organisational processes and structures, organisational objectives, management and administrative support practices (Snyder-Halpern, 2002). Similar constructs (but using different terminology) drive performance at a macro-level (company-wide analysis). Criteria include high-quality new product process; clear product strategy; adequate resources; senior management commitment; entrepreneurial climate; senior management accountability; strategic focus and synergy; high-quality development teams and cross-functional teams (Cooper and Kleinschmidt, 1995).

Damanpour’s (1991) overall inhibitors and enablers of organisation innovativeness are slightly different, concentrating on organisational structure and resourcing, rather than strategic and process components. The determinants of organisational innovation are noted as specialisation, functional differentiation, professionalism, managerial attitude, knowledgeable technical resources, administrative intensity, slack resources and communication (internal and external) (Damanpour, 1991).

It is concluded by Martín-de Castro, Delgado-Verde, Navas-López and Cruz-González (2013) that a positive correlation existes between innovation culture and product innovation. However, how is such a culture developed? Von Solms and Von Solms (2004, p. 277) suggest that an appropriate innovation culture can be encouraged by leadership via the expression of 'collective values norms and knowledge'. Measurement of culture presents further challenges. However, measurement instruments exist that can gauge the culture of an organisation such as Team Climate Inventory (TCI) and the KEYES instrument (Amabile, Conti, Coon, Lazenby and Herron, 1996; Anderson and West, 1998). Leading by example can thus contribute positively towards the development of an appropriate innovation culture.

Top Management Support

The behaviour of senior management is an important indicator of innovativeness (Dougherty and Cohen, 1995). Management plays multiple roles in promoting innovation and creating conditions that are supportive of innovation (Crossan and Apaydin, 2010). Management can stimulate a successful innovation culture by inspiring team performance through communicating clear goals, encouraging autonomy and promoting calculated risk taking (Crossan and Apaydin, 2010).

If senior management accepts personal accountability for a product, the chance of a successful product intensifies (Cooper and Kleinschmidt, 1995). Termination of the product during the NPD lifecycle is less likely with executive support (Balachandra, 1984). Hence, the role of the senior manager is to promote the product and overcome internal resistance. However, poor leadership may result in launches of inferior products, costing time and money (Cooper, 1999). Ernst, (2002) contends that research supporting senior management involvement is inconclusive regarding whether participation leads to product successes or failures.

Senior management characteristics conducive to innovativeness include: tolerance of ambiguity; self-confidence; openness to experience; unconventionality; originality; rule governess; authoritarianism; independence; proactivity; determination to succeed; personal initiative; and managerial tolerance of change (Crossan and Apaydin, 2010, p. 1170). The criteria are expanded to consider factors such as education and age, tenure, diversity of background and experience and extra-industry ties. An innovative CEO is confident, adaptable, willing to take on challenges and determined to succeed (Crossan and Apaydin, 2010). Leading by example, being disciplined and supportive of best practices and quality in product innovation are effective leadership skills, supportive of successful innovations (Cooper, 2001).

When management is incentivised to achieve short-term profits, incremental developments rather than substantial innovations will result with an adverse impact on the overall innovativeness of the organisation (Brockhoff, 1997 cited by Ernst, 2002).

Organisational Structure

An organisational structure dedicated to the development of new products is conducive to ensuring more successful new products (Ernst, 2002). The two organisational structures that are identified as suitable for innovation include matrix and task force models (Larson and Rogers, 1998). Barczak (1995) disagrees that a matrix structure is suitable and finds task force models to be the only organisational structure contributing positively towards successful products. Hauschildt (1997) cited by Ernst (2002) affirms that when time to market is critical, the utilisation of task forces deliver superior performance when compared to other organisational structures. Since Barczak's (1995) study took place in the telecommunications industry a task force structure should then also be considered as a suitable alternative for this study.

Both flexibility and decentralised decision-making aid innovation. Decision-making centralised at the top of the organisation negatively impacts innovation (Burns and Stalker, 1961). Retaining power of decision at the top neutralises the benefits of a decentralised organisational structure and task force and negates the advantages of team autonomy (Thamhain, 1990). Moreover, centralised decision-making inhibits organisational flexibility (Burns and Stalker, 1961). Flexibility shows a responsiveness to adapt to and address change during the NPD lifecycle (Rothwell, 1992), as well as a willingness to experiment and try new procedures to improve the product (Abbey and Dickson, 1983).

Human Resources and Skills

Having skilled resources is designated as a primary indicator of a successful product by Calantone and Benedetto (1988) and Souder et al. (1997). Proficient sales and marketing skills (Souder et al. 1997), as well as excellent project management skills are considered to be essential for product innovation (Balbontin et al. 1999). Factors that accelerate innovations are resource allocation, commitment to differentiated funding, annual turnover of resources and slack resources (Crossan and Apaydin, 2010). Unused capacity or slack time allows resources time to experiment and resolve uncertainties that might arise during the product lifecycle and to address risks (Kimberley, 1981). Allowing resources the freedom to experiment contributes to an innovation culture. Freedom is crucial for both group and individual autonomy (Abbey and Dickson, 1983; Zien and Buckler (1997).

An innovative organisation has motivated employees with high morale. Job satisfaction and contentment with the reward structures are criteria used to assess morale and motivation (Keller, 1986; Miller et al. 1982). Management actions that stimulate motivation focus on providing a clear mission, goals and strategy, structure and systems, resource allocation, organisational learning and culture (Crossan and Apaydin, 2010).

Certain generic teams' characteristics are considered to be conducive to innovation. Teams that comprise of members with diverse skills and experience from different functional areas of the organisation significantly improve innovation (Damanpour, 1991; Griffin, 1997), and teams with mixed demographics (sex, age, education) positively influence innovation (Amabile, 1998). High levels of education and self-esteem also enhance the effectiveness of project teams (Bantel and Jackson, 1989; Kessler et al. 1996).

The existence of a product champion is identified as a success factor by Barczak (1995) and Rothwell et al. (1974). Product champions guide projects through potential obstacles, and senior management plays the role of power product champions (Ernst, 2012).

Effective communications are essential to innovation practices. Positive internal communication flows influence innovation by facilitating the flow of ideas (Damanpour, 1991). The effectiveness of communication is calculated by counting the frequency (number) of internal and external communications, the level at which each occurs and the parties who are communicated to (Cebon and Newton, 1999). Other more subjective measures of communication include assessing participation in extra-organisational professional activities and the extent to which consultation with suppliers takes place (Parthasarthy and Hammond, 2002).

2.3.1.5. Product Factors Summary

Kahn et al. (2012) rate the importance of the different product dimensions in priority order as: strategy; research; commercialization; process; company culture; project climate; and metrics. Kahn's et al. (2012) dimensions relate to the terminology of this study in order of strategy, market, process and organisation. Cooper and Kleinschmidt (1995) find the order of importance to be (as translated to the four dimensions used in this study) as NPD process, strategy, organisation and market. It seems that there is no academic consensus on the relative importance of the different dimensions.

Table 25: Summary of Factors that Stimulate Innovation Per NPD Category, available in Appendix 3, consolidates the previous discussion into the four dimensions of strategy, market, process and organisational factors. Some of the factors were moved from the categories that were originally allocated by NPD researchers, such as Montoya-Weiss and Calantone (1994) who placed ‘top management support’ as part of the ‘development’ dimension. Top management support was moved to organisational factors to fit the definition of this study. Moved factors are indicated with an asterisk (refer to Table 25). The factors as presented by the researchers, as well as the preceding discussion regarding the general themes, allow a more precise definition for each dimension. The definitions of the dimensions suitable for the purpose of this study and in the context of NPSD are subsequently explained.

Strategy: The strategy dimension is defined as the selection of a portfolio of priority products for development based on how well these products would contribute to the achievement of the long-term business goals and strategic objectives of the organisation, with consideration of technology, market, finance, innovation and resource capabilities. All elements relating to the selection of portfolio management and alignment of the product to organisational and innovation strategy are combined within ‘strategy’. The definition is not only confined to a strategy within the NPD division, but also expanded to include the broader strategy and mission of the organisation (Kahn et al. 2012).

Market: When analysing the market orientation, the elements that are most consistently mentioned by researchers are customer, competitor and marketplace and marketing activities. Market factors consolidate these and other closely related aspects. The definition of market orientation factors is understanding the competitor and target market opportunities (and risks) as well as key stakeholder and customer needs to enable effective design, communication, marketing and promotion of the product.

Process: Process factors indicate the key functional activities that are required to determine the success of P&S as NPSD process, project management, product management and financial management. All of these factors are consolidated within the main dimension. The definition of the process dimension is compliance with a robust NPD process that allows product, project, financial and other supporting activities performed proficiently to ensure a quality P&S.

Organisational culture: Organisational culture is about what organisational actors do and how behaviours influence the performance of the organisation as it manifests in artefacts and basic assumptions (Da Veiga and Eloff, 2010). As it is hard to establish attitudes of product-development team members as well as top management, the category can only understand the extent to which attitudes materialise into physical behaviours. The definition of organisational culture is creation of a climate of innovation by creating a favourable work environment, by demonstrating supportive leadership, encouraging open communication channels, cross-functional teamwork and sufficient allocation of resources to support the product during its entire NPD lifecycle.

In the next section, 'services' rather than products are investigated. The section starts with an explanation of factors differentiating products from services.

2.4. Differentiating Products from Services

The vast majority of innovation research focuses on tangible products rather than services, despite services dominating the economy and growing at a significant rate (Papastathopoulou and Hultink, 2012). The following factors, commonly referred to by researchers as the ‘IHIP’ characteristics, are seen as the characteristics of services, namely: Intangibility; Heterogeneity; Inseparability of service from the supplier; and Perishability (Parry, Newnes and Huang, 2011; Berry, 1980). A telecommunication service example is used to clarify these distinctions.

Services consist predominantly of processes rather than physical objects. A new handset would be a product while access to the telecommunication service using a certain tariff package is an intangible service. The customer is unable to feel, taste or touch a tariff package. The service is inseparable from the organisation as the consumer needs to be a customer of a particular Mobile Network Operator (MNO) before they can utilise the service. The service can vary in quality because the consumer could have a different service experience depending on the type of handset and the customer interface where the service is consumed. The degree of variation depends on the standardisation of the system and the technology applied at the client interface. Services are inherently perishable and not held in inventories, but produced and consumed simultaneously. Ownership is mentioned as another distinction, indicating that an entity exists independently from its owner (Hill, 1999). The distinction is not always clear since ownership of services is in some instances transferable (as in the case for products).

Neither products nor services are pure and may move across a spectrum from pure goods to pure services while those in the middle have characteristics of both (Shostack, 2001). Some products can also have one or more distinctive features that make the 'services versus goods' difference inappropriate (Yen et al. 2012).

Vargo and Lusch (2008) also contest the distinction between products and services by deriving the concept of a ‘service-dominant logic’ where the focus is on creating value for the customer. Customers predominantly obtain value from the use of the product via the services it provides. A case in point is the telecommunication industry. A handset not connected to a telecommunications operator is unable to communicate and would lose some of its value. Clear distinctions between products and services are fading as service industries, such as banking, offer physical products like cards, and hardware providers offer support services to customers (Yen et al. 2012).

Thinking has shifted from seeing products and services as distinct entities. Viewing products and services as combined systems delivers more value to the customer and offers potential for designing innovative combinations (Parry et al. 2011). Nevertheless, the service specific literature will be analysed to obtain a deeper understanding of specific service factors that contribute towards the delivery of innovative service solutions.

2.5. Successful Service Innovation

The next section discusses essential innovation factors for services, continuing with the four dimensions previously identified. Some service researchers refer to services as products even when it is explicitly clear that they are discussing a service. In the next section, the researcher will refer to these instances as services rather than products.

2.5.1. Strategy and Portfolio Management

New services are introduced primarily to increase profitability, respond to competitor actions and fit with the existing service portfolio (Davison, Watkins and Wright, 1989). A service innovation strategy should reflect the business strategy of the organisation and ensure that the proper behaviours are established to stimulate innovation performance (Yen et al. 2012). A synergistic fit should exist between the organisation, the market and the service (De Brentani and Cooper, 1992; Edgett and Parkinson, 1994).

Investments in research and development (R&D) were often not considered to be a significant strategic indicator for service companies (Hipp and Grupp, 2005) since existing services mostly consist of incremental services (enhancements to existing services) that do not require significant financial investment (Atuahene-Gima, 1996).

The type of services should fit the current portfolio of the organisation (Martin and Horne, 1993). Typical symptoms of ineffective portfolio management include a lack of focus on the organisation’s priorities, frequent re-allocation of priority projects and projects that are developed despite not appearing on the roadmap (Mensing and Veldhoen, 2004). It could be possible that portfolio management could be even more important during service innovation due to the rapid consumption of resources during the innovation process (Crossan and Apaydin, 2010).

2.5.2. Market Orientation

A good understanding of the market has been found to be a critical success indicator for services (Atuehene-Gima, 1995). Services must target specific market segments where a definite need exists for a service. Targeting could entail design of different customer profiles for the service, which would demonstrate an improved understanding of customer requirements (Bortree, 1991; Edgett and Jones, 1991). An understanding of the market should also include an understanding of the customer needs. Inadequate research into customer needs and limited market testing can lead to a lack of customer acceptance (Edvardsson, Haglund and Mattson, 1995).

Customer information is predominantly utilised during three stages of the NSD process, namely idea generation; business evaluation; and marketing plan preparation (Martin and Horne, 1995). For banking services, it has been found that services often lack relevance to the customer (Berry and Hensal, 1973). In more successful services, there is higher customer involvement during NSD (Martin and Horne, 1995). Marketing should be effective at communicating the benefits of the service (Berry and Hensal, 1973). The 4 Ps of the marketing mix (product, price, place and promotion) have been expanded to include an additional P (for process, people and physical evidence) for services (Booms and Bitner, 1981).

Considerations of customer risks in addition to benefits are valuable. It is necessary to communicate explicitly the relative advantages of the innovation and reduce the perceived risk and complexity of the service. Customers are reluctant to adopt services that incorporate new technologies, as this requires substantial behaviour changes; therefore, a risk-free trial is proposed (Berry and Hensal, 1973).

Testing of the market is lacking in service innovation, since test marketing is costly and marketing research often lacks integrity (Mohammed-Salleh and Easingwood, 1993). Another explanation is that extensive market testing would leak the service idea and offer the opportunity for competitors to respond (De Jong and Vermeulen, 2013). When the service shows clear benefits and the market potential is validated, extensive market testing is not considered to be a requirement (Mohammed-Salleh and Easingwood, 1993).

2.5.3. Innovation Process

Of equal benefit within the service-development environment is following a structured development process (De Brentani, 1989 and 1995a; Edgett and Jones, 1991; Langeard et al. 1986). It is not only the existence of a formal NSD process that is important, but also the quality thereof. Top-performing organisations score highest on the quality of execution (Edgett, 1996). Shostack (1984) identified four essential characteristics for effectiveness, namely (1) objectivity; (2) precision; (3) fact-driven; and (4) methodology based. Criteria are similar to those proposed by risk methodologies to ensure effective risk-based practices.

A robust process delivers benefits such as increased quality of services to customers, reduces the cost of developing services and eventually leads to more innovative services (Easingwood, 1986). An effective NSD process enhances company reputation and loyalty, increases adoption of existing services, improves NSD capability and provides new directions to the organisation (Easingwood and Percival, 1990).

Service Development Process

Successful services utilise a more comprehensive and systematic NSD process than less successful services (Edgett, 1994). Scheuing and Johnson (1989), developed a process specifically for development of new services (refer to Appendix 5, Table 86). The model consisted of 15 distinct activities, which suggest that service innovation could potentially require more phases than NPD. However, the activities can still be consolidated (in line with those of product development) into distinct areas. Four main phases include the generation and screening of ideas; planning and analysis of business and market requirements; service development and testing and commercialisation. Stage/gate procedures are designed around these four stages, and suggestions are that NSD follows the same generic process as NPD.

Researchers have indicated that organisations which launch services often partially conform to an NSD process. Financial institutions, in particular, follow limited NSD processes (Johne and Harborne, 1985; Scheuing and Johnson, 1989) and activities found to be lacking include development, testing (including test marketing) and formal idea generation (Bowers, 1989; Easingwood, 1986). The activities most consistently performed are business analysis and commercialisation (Bowers, 1989). Garden-Ellson et al. (1986) have found that if the early stage activities are comprehensively and robustly conducted, fewer mistakes will occur later. It would then seem that reducing uncertainty early during the NPSD lifecycle could assist in reducing risks.

When analysing the different activities within NSD processes, more differences (when compared to NPD) become apparent. The ideas for service innovation seem to originate mostly from senior management (Johne and Pavildis, 1996). However, Johne (1994) does suggest that service organisations should rather attend to the ‘voice of the market’ before considering the ‘voice of the company’ or the voice of senior management.

Organisations that are more successful in service innovation follow a more formal and proactive approach to NSD, spend more revenue on NSD and link rewards to performance (Drew, 1995b).

Drew (1995a) further finds that top-performing organisations use shorter development cycles. However, Reidenbach and Moak (1986) establish that top-performing banks took longer to develop services (when compared to their non-performing counterparts). The longer timeframes resulted from the top-performing banks following a more structured NSD process and performing more phases of the NSD lifestyle (Reidenbach and Moak, 1986).

Research generally is in support of NSD following a robust process. However, Edvardsson et al. (1995) argue that a detailed, formal NSD might stifle creativity and innovation. The objectives of the service largely determine the activities of the NSD process to follow (Easingwood, 1986). When a service is copied from a competitor (a 'me-too' service), speedy implementation is essential that could lead to the bypass of certain activities.

Fast service development has become a competitive necessity to increase responsiveness towards competition and accommodate the fast-changing needs of customers. Organisations that succeed in rapid innovation benefit from enhanced reputation and innovative image (Drew, 1995b). The 'first mover' advantage is described as credibility that cannot be achieved merely through advertising (Tufano, 1992). The speed of service development is measured in terms of development time as well as response time (Silvestro, Fitzgerald, Johnston and Voss, 1992). Response time calculates how long it takes to adopt an external concept of a service (Silvestro et al. 1992).

Reidenbach and Moak (1986) indicate that innovative companies spend approximately 20% of their time on service testing and test marketing phases of the NSD process. The planning and the idea generation stages were regarded as the least important, whereas the development of the service specifications and the evaluation thereof were regarded as the most important.

Additional Process Factors

A distinguishing factor of service research (when compared to products) is the importance assigned to the technical design of the service. Particular attention should be paid to critical incident points and standardisation, as well as unusual activities and the integration of suppliers and partners into the development process (Edvardsson and Olsson, 1996). Technological design should consider the fit of the new service within the technology, especially if there is a degree of interdependence between existing and new services (including customer service systems) (Lovelock, 1984). Additionally, the extent to which the new service varies from existing services such as time utilisation variations (i.e. counter-cyclical services) must be considered.

Blueprints can be used to model the service process (Edvardsson and Olsson, 1996). However, Lovelock (1984) advises that service plans often fail as the operational requirements of the organisation override customer concerns. Two sets of blueprints are therefore recommended (one for the company and one from the client's perspective). Shostack (1984) recommends utilising modular modelling and blue printing to encourage creativity and facilitate proactive problem solving.

Shostack (1984) further suggests that diagrams should include all the main functions of the service and identify all points of failure, as well as relationships between the front and back office. The actual service could deviate from these prescriptions regarding quality, duration and customer satisfaction but this should occur within acceptable tolerances (Shostack, 1984).

Meyer and Zack (1996) introduced an architectural framework for information services based on the development of platforms. Every service should be developed as a technology platform to facilitate the speedy development of incremental new services and exploit the potential of a niche market. The platform design should be seamless with standardised procedures to ensure that the marginal cost of adding new service variants remains cost-effective. Inflexible, slow organisational and technical systems are barriers to innovation (De Brentani, 1993).

Costly delays in development of services can be caused by lack of technological coordination between the different independent service technologies (Edvardsson et al. 1995). Delays can also result due to a lack of information at the start of the development process described as undefined specifications, lack of reporting and decision-making based on incomplete documentation (Edvardsson et al. 1995).

In addition to technology concerns, customer-facing staff with insufficient skills could also hamper innovation. This is, however, a barrier that can be overcome by sufficient training (Drew, 1995b). Internal marketing has been deemed essential to obtain the support from front-line staff and provide them with sufficient knowledge to sell the service (Garden-Ellson et al. 1986).

Den Hertog and Bilderbeek (1999) emphasise the importance of treating NSD as a knowledge asset that should lead to competitive advantages for the organisation. He cautions that innovation requires knowledge - 'work rather than genius'. Knowledge management could be considered more important for NSD environments, which are considered more fast-paced and chaotic than NPD organisations. Communication in NPD environments is more structured, as regular meetings take place, while in NSD, communication of information is more free flowing and informal (Den Hertog and Bilderbeek, 1999).

During the NSD process, the primary role of the product manager is to design the product specification. An ineffective product manager or a poor quality functional specification could lead to poor P&S (De Bakker et al. 2010). Berglund (2007) recommends that product managers should be encouraged to experiment with business models to come with up more innovative and flexible options. The function of innovation is then seen as primarily vested in the role of product managers.

Teece (2010) advises that an innovative business model offers an effective method of capturing value by embedding it within NSD. An innovative business model delivers advantages by (1) using differentiated, effective, efficient and hard-to-replace architecture; (2) ensuring that a level of opacity exists which makes it difficult for competitors to establish how the business model is implemented;

and (3) cannibalising existing sales and profit. Competitors are reluctant to adopt a business model when it leads to cannibalisation of existing sales and profits (MacMillian, McCaffery and Van Wijk, 1985; Teece, 2010). It seems that the more complex the business model and technological architecture, and the more innovative the cost structure, the more difficult it will be for competitors to emulate.

Since business model innovation is regarded as one of the new areas of service research (Teece, 2010) it is necessary to expand on the concept of what a business model is. Teece (2010) describes a business model as the concretisation of the organisational and financial architecture of a business with the objective of creating value for customers, assuring payments and transforming payments to profits. The elements of a business model according to Teece (2010) consist of a selection of the technologies and features that should be embedded within the P&S; the benefits to the customer that is consuming the service; the market segments that are targeted; confirmation of the availability of revenue streams and formalisation of design mechanisms to capture value.

2.5.4. Organisational Factors

Organisational cultural factors substantially influence the success of services. More so than NPD processes, NSD processes should be characterised by a supportive environment driven by experts (De Brentani, 1993). Thwaites (1992) states that experts in marketing, risk management and technology could act as champions to drive service innovation. A more favourable work environment supports NSD resources subject to a high level of uncertainty and experts can alleviate doubt. Thus a human resource (HR) strategy, supportive of improving service development and good teamwork, should exist (Atuehene-Gima, 1996). The HR strategy should further focus on ensuring that reward structures are linked to performance and that a dedicated organisation business unit (responsible for service development) exists (Drew, 1995b).

More so than in product development, it was found that a propensity to take risks was considered to be an important indicator of service innovation (Silvestro et al. 1992). A disposition to risk-taking is described as the willingness to confront opportunities, tolerate failure and learn from mistakes (Saleh and Wang, 1993). Organisations with a positive attitude towards risk are more likely to drive proactive innovation (Yen et al. 2012). Risk taking within the context of NSD is not considered to be reckless but rather informed risk decision-making.

Organisational factors that can lead to costly project delays include a lack of communication between line-management and cross-divisional functions, intra-organisation conflicts and power struggles (Edvardsson et al. 1995). The role of management during these conflict situations is described by Scarborough and Lannon (1989. p. 57) as management overcoming ‘structural inertia rooted in internal political forces’ and ‘blinkered perceptions’ due to ‘bounded rationality’. Leadership should, therefore, eradicate silo mentality and push service delivery effectively across functional divisions.

The main barriers that slow down the rate of innovation are the absence of top management support and a lack of focus (De Brentani, 1993). Greater involvement by senior management and staff increases potential success of services (Martin and Horne, 1995). Top management support should be 'energising, enabling and envisioning' but it is noted that only a limited number of senior managers display these characteristics (Johne, 1993). Management can also re-engineer the organisational culture and structure by advocating a greater commitment to teamwork and empowering employees (Drew, 1995b).

Innovation champions are important for NSD (Scarborough et al. 1989). As the characteristics of intangibility, inseparability and heterogeneity of the service increase, the importance of employees acting as customer champions (by identifying customer needs and reducing complexity) increases in parallel (Schneider et al. 1984). It is conducive for NSD when a good mix of specialist functions are involved during the process (Johne and Vermaak, 1993). Again this would facilitate improved management of uncertainty.

Differences exist between the characteristics of active and passive innovators. Active innovators have high 'functional specialisation', 'low centralisation' and a 'tight structure' for NSD, which is lacking in the less active innovators (Johne and Vermaak, 1993, p. 29). Active innovators shift from 'loose control' at initiation phase to 'tight controls' during the implementation stage. Less active innovators are reliant on generalist and top management to close controls through the development cycle (Johne and Vermaak, 1993). Strong centralised control of decision-making would therefore negatively impact on service innovation.

2.5.5. Service Factors Summary

Table 26: Factors that stimulate NSD Innovation, is provided in Appendix 3. Table 28 presents an overview of the research conducted by various authors in NSD and how they relate to the four categories introduced by Montoya-Weiss and Calantone (1994). These success factors will form the basis for the integrated (IRMF).

Fewer researchers have conducted studies on services when compared to products. What is also evident when comparing the product (Table 27) and service table (Table 28) is that researchers who study product development mainly investigate success factors relating to one or two of the dimensions. Service researchers have established a broader range of variables across the four categories during their investigations. It could be the case that due to its complexity, services innovation requires a focus on many more factors than only one or two specific success factors.

However, these variables would still be insufficient to explain why innovations fail. Additional barriers to innovation practices are external factors such as regulatory requirements, poor economic conditions and insufficient funds (Drew, 1995). Researchers did not investigate these types of risks although they have a fundamental influence on innovation.

According to Yen et al. (2012, p. 814) frameworks for managing service innovation are scarce:

> In sum, what has been noticeably missing from the literature is a robust framework and instrument to study the factors that affect readiness for service innovation and firm-level empirical evidence to explicate these factors.

When analysing the definitions as presented in section 3.1.4 in the ‘product factors summary’, the definitions provided for the four categories that relate to ‘strategy, market, process and organisation’ still hold true, except for ‘products’ replacing ‘services’.

Further comparison between NPD and NSD reveals no major differences between the factors that influence innovations. Certain factors are, however, more important in the NSD environment owing to the fast-changing, complex and competitive service environment. Review of these factors takes place in the next section.

2.5.5.1. Uniqueness of Service Factors

The primary objective to launch new products is to ensure continued competitiveness and sustainability of the company. However, the reasons for developing new services do not always conform to these objectives. The motives for developing new services could also relate to reducing obsolescence, responding to the competition, having spare capacity, change of seasonal effects and risk reduction (Cowell, 1988). The reasons for launching services are therefore not only to ensure the financial viability but also for some other reasons, such as responding to competitive actions and retaining customers.

In services, the most important source of new ideas is those of competitors, which explains the prevalence of ‘me-too’ services (Davison et al. 1989). Internal ideas for new services are mostly generated internally via top management and marketing sources (Johne, 1994). However, Drew (1995) finds that less successful firms use the marketing function as the key driver for sources of ideas.

Services are subject to more intense competitive pressures than products. Competitors are more likely to respond with ‘me-too’ services in cases where the service has high visibility in the market, and the competitor is directly attacked (MacMillian et al. 1985). Obstacles preventing fast replication of services from the competition include employing technological barriers such as new operating systems or technologies that require substantial investment, as well as the introduction of more sophisticated services, which require specialised skills (MacMillian et al. 1985). Product development does not have the same challenges because products are patented as unique designs.

For service organisations, not being competitive or innovative could be particularly harmful, as they would be unable to respond quickly to competitors. A lack of resources, due to occupation with other strategic objectives, could also inhibit a fast response (MacMillian and McCafferty, 1984). This could indicate that 'portfolio management' (selection and allocation of resources to projects) could be even more beneficial in an NSD environment than for NPD (Martin and Horne, 1993).

Atuehene-Gima (1995) regarded 'product advantage' as the primary success factor in NPD, but for new services it is rated third. In services, the interaction between customers and skilled contact staff is considered to be more important than the service itself (Easingwood and Storey (1995). Services are harder to evaluate for potential customers. Cowell (1998) explains that due to the intangible nature of services, it is not feasible to test whether service concepts might work in the market. It could additionally alert competitors to new service ideas. As an alternative, increased contact with consumers, or offering the new service to internal employees, is proposed (Bowers, 1989).

During evaluation of a service, customers' attention may shift to peripheral, more tangible aspects of the service that indicate quality, such as the prestige or reputation of the supplier (Frambach et al. 1998). As a result, corporate and brand image are more important for new service introductions (Easingwood, 1986). In the absence of a tangible product, the customers perceive the brand as being the tangible object in which to place their trust (Joubert and Van Belle, 2009). Cowell (1988) explains that branding diverse service offerings could be challenging, which demonstrates the need for the organisation to introduce new services continually (Cowell, 1988). Continuous introduction of new services is a method to stay relevant in the market.

Product research characteristically includes investment in R&D (Papastathopoulou and Hultink, 2012), which is often the source of new ideas for products (Davison et al. 1989). R&D spend is therefore thought to be more important for product development than service development (Hipp and Grupp, 2005; Kleinknecht, 1987; Nijssen et al. 2006). A further reason for the low investment in R&D expenditure on services is that it is harder to patent services, and more incremental type services are introduced compared to products (Cowell, 1988).

It is easier to design new services than products and this explains why low-risk incremental types of services dominate the categories of available services (Johne and Vermaak, 1993). The risk of too many service offerings is that they can cause confusion amongst customers and expose employees to information overload (Johne and Vermaak, 1993). The cost of failure for a service is regarded as lower than that of products (Davison et al. 1989). Consequently, services have a lower risk profile than products in terms of financial investment. Calculating the cost and profitability of new services is challenging, as the cost of shared delivery systems and the cannibalisation impact of new services are hard to assess (Easingwood, 1986).

The process of service innovation is different from the NPD process. The NSD process has been indicated as being less institutionalised (Adams et al. 2006; Leiponen, 2005). It is however significant that researchers have emphasised the benefits of following a rigorous NSD process as being especially conducive to service innovation (De Brentani, 1995; Edgett, 1994; Garden-Ellson, 1986). Once services are launched they are not easily withdrawn, as 'exit barriers' exist and customers could be reliant on the services (Davison et al. 1989). It is therefore likely that unprofitable services will remain in operation for a much longer time than products would.

Homburg and Kuehnl (2013) studied the differences between NSD and NPD organisations regarding the effect of cross-functional integration and inter-organisational collaboration on innovation success. The findings of the research indicate that integration aspects are more important in service firms as the front office is the only visible aspect of a service. If departments and external entities responsible for the service delivery fail to adequately collaborate (due to silo mentality), this would impact on the provision of a seamless service and cause inferior customer experience. Technical synergy is regarded as more important in services than products since a service predominantly consists of interacting technologies and systems, rather than a tangible product (Atuehene-Gima, 1995).

2.5.5.2. Business-to-Business Innovation

Research on innovation primarily focuses on consumers as adopters, and not on adoption in the B2B context. Only limited studies identify factors that influence adoption between businesses. De Brentani and Ragot (1996) conducted one of the few research studies that explicitly investigated B2B services.

Factors important to the service industry are also relevant for B2B services. These factors include: market fit; valuable marketing resources; a superior service; potential of the market; expertise of staff; and an active innovation culture that focuses on service development (De Brentani and Ragot, 1996). De Brentani and Ragot (1996) found customer participation to be especially beneficial for B2B service development. It was established that consumer adoption decisions will be primarily driven to satisfy individual needs while businesses (as consumers) will adopt innovations to sustain competitive advantages (De Brentani and Ragot, 1996).

Business adoption of new services involves a long-term commitment to a higher degree of perceived risk than in the case of consumer services. Marketing strategies will, therefore, differ substantially from consumer markets. In B2B innovations, specifically, it has been found that the marketing effort is shifting from transaction-based activities to relationship-based ones (Frambach et al. 1998). The quality of interaction between buyers and sellers during the adoption stages is particularly critical for B2B innovation.

It cannot be assumed that findings of consumer markets can be applied to business markets (Frambach et al. 1998), despite similar critical success factors (Haverila, 2010).

2.6. Categorisation of Innovation

It is important to classify innovation into typologies as the factors that influence these types of P&S might differ (Song and Parry, 1998; Freeman, 1994). P&S have different characteristics and the critical success factors will vary between the categories due to their dissimilar characteristics. Development of a unifying 'one size fits all' framework for innovation and risk should take into account the context and type of P&S.

Empirical studies often fail to delineate the degree of innovativeness or newness of innovation (McDermott and O'Connor, 2001). The lack of accepted definitions presents challenges to innovation researchers as it limits the comparability of findings (Ernst, 2002).

Innovation is often associated with radical or breakthrough innovations. However, insufficient agreement exists amongst researchers as to what a radical innovation is (Slocum and Rubin, 2008). Radical innovation research distinguishes between radical (really new, discontinuous) versus incremental (routine, continuous) categorisations (Garcia and Calantone, 2002).

Radicalness differs, from the perspective of the firm, according to technological uncertainty, technical inexperience, business ignorance and cost of technology (Green, Gavin and Aiman-Smith, 1995). Radical new products establish landmark new markets and create new industries such as the Internet (Garcia and Calantone, 2002). High innovation can also refer to 'product, process or service with either unique performance features or familiar features that offer potential for significant improvement in performance or cost' (Leifer, 2000, p. 5).

Utterback (1994, p. 200) describes radical innovation as 'change that sweeps away much of a firm's existing investment in technical skills and knowledge, designs, production technique, plant, and equipment', while at the lower spectrum, innovations consist of incremental changes. Radical innovation typically requires long-term investment and development time (often longer than ten years) (McDermott and O'Connor, 2002).

Radical innovations at the highest spectrum might not require the same conformance to best practice criteria as lower-level innovations. Peters (2006, p. 125) observes that rigid processes could 'not only be unhelpful but harm radical innovations (RIs), where risk, ambiguity, and uncertainty are high'. RIs may not require as much customer needs analysis as other types of innovations, since Steve Jobs claimed that customers often do not know what they want until shown (Isaacson, 2011). The criteria for RI projects such as long term, high uncertainty, unpredictability, sporadic, non-linear, stochastic and context-dependent (Notargiacomo, 2006) could make them unsuitable for application to a best practice framework.

For the purposes of this study, innovation is discussed from the perspective of the organisation (Green et al. 1995). This means that even though a product, service, technology or process is known to the market (or changes the industry) if it is new to the organisation, it will be seen as an innovation.

Davis (2002) classifies products according to their risk profile that inspired the method used by this study, with some enhancements. Four product categories exist: (1) New ventures are 'new-to-the-world' products that use new technology applied to new markets with uncertain needs. (2) New categories are 'new-to-the-company' products that use existing technology applied to new markets with new user needs. They can offer innovations that 'open up whole new markets and potential applications' (Henderson and Clark, 1990, p. 9). This category may include copies of competitors' products. (3) New platforms are 'additions to existing product lines' utilising a defined platform and existing technologies applied to markets with common user needs. (4) Derivative products are 'improvements and revisions to existing products' that include cost reductions.

Booz et al. (1982) expanded on the four-category typology by introducing additional innovation categories such as 'repositioning' and 'cost reduction' products. As 'repositioning' products are existing products targeted to new market segments, this can easily be accommodated in Davis's (2002) category two while 'cost reduction' can be seen as an improvement to existing products related to Davis's (2002) category four products. Cost reductions equate to improvements which allow an existing product to be produced at lower cost, and it can therefore not be thought of as a distinct product (Johne and Pavildis, 1996). Customers could deem the cost reduction to be the differentiated advantage that will ensure adoption of the product, which will succeed in turning the product into a successful innovation. Cost reductions could potentially introduce technology risks such as insufficient capacity that could impact on the success of the product and will, therefore, be included in this study.

The types of categories for services do not differ dramatically from those of products. Lovelock (1984) distinguishes between six types of service categories, namely (1) Major innovations: New services for markets; (2) Start-up businesses: New services for a market that is already served by existing services; (3) New services: Services for the currently maintained market offered to existing customers; (4) Service line extensions: Augmentation of existing service lines; (5) Service improvements; and (6) Highly-visible style changes to existing services. These service categories are similar to the product categories. Style changes could be incorporated as part of the service improvement group (Davis's, 2002 category four product) while start-up businesses could be seen as new services for a market that is already served by competitors and, therefore, relates to Lovelock's (1984) 'new services' for the market. 'New services for the market' can refer to Davis's (2002) category three, which are products applied in current markets with apparent user needs. It is further proposed that all product categories and innovation factors should be studied (Ernst, 2002 quoting Hauschildt, 1993).

2.7. Summary Innovation

Innovation management is complex and multi-dimensional. To simplify the study, the following terms will be employed in the remainder of the study to describe the different stages of the NPSD process: idea, concept, design, develop, implement and maintain. An explanation of the stages appears in Table 87, Appendix 8. The terminology aligns to that of systems development lifecycle (SDLC) since Nambisan (2003) argues that the rapid infusion of IT within NPD research, allows information systems (IS) to serve as an appropriate reference discipline for the field of NPD. A P&S follows the same generic NPSD methodology, but different terms are used to describe different phases.

NPD and NSD share common practices and success factors, which allows transfer of knowledge between the two disciplines. The synthesis approach to study P&S is followed, as the preferred method utilised by researchers. Basic to this approach is the assumption that the underlying critical success factors are similar, but the importance of the dimensions might differ (Yen et al. 2012). Various researchers (Evanschitzky et al. 2012; Homburg and Kuehnl, 2013; Menard, 1991; Oehmen et al. 2014; Papastathopoulou and Hultink, 2012; Wolfe, 1994) have pointed out the difficulties experienced with innovation and have conducted risk studies. Neglected research areas such as services and B2B innovations were singled out (Maglio and Spohrer, 2008; Leiponen, 2005). Calls have been made for a more comprehensive model that integrates NPD and NSD research (Ernst, 2002; Avlonitis and Papastathopoulou, 2001). Gaps in the research indicate opportunities for researchers and are specifically addressed in this dissertation, with the development of an IRMF to assist organisations to develop more successful P&S innovations.

2.8. Risk Management

2.8.1. Definition of Risk

RM is a choice between alternative outcomes under conditions of probabilistic uncertainty (Berglund, 2007). Over time, risk has become associated with negative outcomes. The traditional view that only considers the downside of risks is, however, no longer practical. Risks should also consider opportunities and the impact of positive events. When only negative risks are considered the idea that an organisation needs to take on risks in pursuit of its objectives is overlooked. As Marks (2015, p.1) advises: 'Risk management is not about evading failure; it is about achieving success'.

The concept of managing risks is well documented in the software development literature, but researchers do not agree on a risk definition. Risk is defined as uncertainty around whether the project or its parts can be completed (Alter and Ginzberg, 1978); failure to gather correct and complete requirements (Davis, 1982); or the inability to reach the stated objectives of the project (McFarlan, 1982). Barki, Rivard and Talbot (2001) label an unsatisfactory result as a 'risk', while risk exposure links the probability of an undesirable outcome to the potential loss that could result (Boehms, 1991). The risk definition in software literature reflects focus areas as avoiding disappointing results and minimising losses, uncertainties or understanding the tasks. IS traditionally has a narrow view of risk where consideration is primarily given to prevent unsatisfactory outcomes, rather than ensuring positive outcomes. The ITIL Glossary (2011, p. 61) definition of RM focuses on 'A possible event that could cause harm or loss, or affect the ability to achieve objectives'.

NPSD literature also has a negative view of risks, but introduces concepts of ambiguity and uncertainty (Sarbacker and Ishii, 1997). Uncertainty is the absence of information, while ambiguity is mainly caused by a lack of understanding, which results in multiple and conflicting interpretations about an issue (Daft et al. 1986). In the NPSD environment that is full of ambiguity and uncertainty, the product team is obliged to make decisions with less than perfect information. The 'fuzzy front end' of NPD can lead to excessive cost escalations in projects (Brun, 2008). Addressing ambiguity and uncertainty during P&S is therefore fundamentally an exercise in risk reduction (Sarbacker and Ishii, 1997).

Risks can have outcomes (good and bad) that vary from expectations (Thomsett, 2011). This fits well with the ISO 31000 RM standard (2009, p. 9) that defines risk as the 'effect of uncertainty on objectives'. Not only does this include uncertainty caused by ambiguity and lack of information, it also infers that risk can introduce both positive and negative impacts on objectives. Decisions about 'product attributes, technological choices, design issues, pricing and advertising decisions' determine the success or failure of the P&S (McNally and Schmidt, 2011, p. 621).

The goals of NPSD are to ensure delivery of a high quality P&S in a short development time at reduced cost. Since risks reflect 'uncertainty on objectives', not meeting the goals is considered a prime source of risk for P&S (Oehman et al. 2010). Any NPSD activity could be labelled as a risk to the P&S if the likelihood of an unfavourable result is high and the ability to mitigate the risk within the available time and resource limits is low, while the potential consequences of the risk will be ultimately severe (Keizer et al. 2002; 2005). The high failure rate in terms of cancelled projects and cost overruns can be attributed to insufficient RM (Keil, Cule, Lyytinen and Schmidt, 1998).

RM is often defined within the realm of project management as the entire set of activities and measures that are intended to deal with risks in order to maintain control over a project (van Well-Stam et al. 2004). RM is identified as a process that includes concepts of information gathering, organisation and interpretation to simplify complex decisions under conditions of ‘bounded rationality’ (Simon, 1983).

According to the ISO 31000 (2009, p. 2) standard, RM is a 'coordinated set of activities and methods' that are used to direct an organisation and to control the many risks that can affect its ability to achieve objectives. According to this definition, RM includes the RM principles, framework and processes that are utilized to manage risk. This is the definition that will guide this study.

2.8.2. Risk Frameworks

There are six widely-used RM standards. Some standards share a commonality in that they focus on meeting the organisation’s objective (ISO 31000: 2009; BS 31000:2008; FERMA: 2002) while OCEG ‘Red Book’ 2.0:2009 and COSO: 2004 focus on compliance and control objectives. SOLVENCY II and BASEL II focus on regulatory compliance elements (RIMS, 2011). Further RM standards include INCOSE (2007), US Department of Defense (DoD, 2006), the national Australian New Zealand Standard by AS/NZS 4630 (redundant due to ISO 31000) and the Project Management Institute (PMI, 2008).

The International Organisation for Standardisation (ISO) published the ISO 31000 standards consisting of principles and guidelines, risk assessment techniques and RM vocabulary (ISO 2009a, ISO 2009b, ISO 2009c). The framework supporting this study is ISO 31000 since Olechowski et al. (2012) has shown its effective application to the NPSD process. The ISO 31000 process model describes a generic process to ensure that risk is managed effectively, efficiently and coherently across an organisation (ISO 2009). The ISO RM process can, therefore, be applied to all organisations as well as all different functions within the organisation.

A standard that is of particular relevance to South Africa is the ‘The King Report on Corporate Governance’. It has been called the most useful summary of international best corporate governance practices (Banhegyi, 2007). It was of particular significance that the King reports made board members personally accountable in the instance of inadequate RM. The South African law evolved to embody principles of King II (IOD, 2002) in the Companies Act of South Africa (South Africa, 2008a), whereas King III (IOD, 2009) principles form part of the Public Finance Management Act (PFMA) (South Africa, 1999) and the Promotion of Access to Information Act (PROATIA) (South Africa, 2002). This necessitated the implementation of an efficient and on-going process to evaluate and manage risk using formal RM methodologies within South Africa. The seven ISO 31000 elements are discussed within the context of NPSD in the next section.

2.8.2.1. The ISO 31000 Process

The ISO 31000 RM framework allows effective RM at different levels and contexts within the organisation. The framework is not intended to be prescriptive but enables the organisation to adapt components to its particular needs and context. The content of ISO 31000 is summarised in Table 88: ISO Framework, Appendix 8.

The RM principles, framework and process, are interrelated. The principles that benchmark the framework are based on a mandate and commitment (to perform RM). A two-way relationship exists between the framework and RM process via the implementation of the RM process. The practice of managing risks consists of seven distinct processes which are explained in Figure 108, Appendix 8). The seven steps of the ISO process are discussed below.

Step 1: Communication and Consultation

The first step corresponds to consultation with both internal and external stakeholders. Inherent in this requirement is the identification of all the main stakeholders and consideration of possible divergent opinions. The risk process also prescribes that stakeholders should be informed regarding how risk decisions are made and the impact of these decisions. Communication should facilitate 'truthful, relevant, accurate and simple exchanges of information', taking into consideration confidential and personal integrity aspects (ISO 31000, 2009).

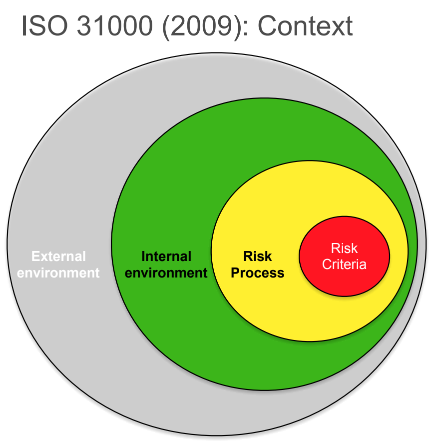

Figure 3: ISO 31000 (2009): Establish the Context

Step 2: Establish the Context

When establishing the context for the P&S, four specific content areas should be considered, namely (1) external environment; (2) internal environment; (3) RM process; and (4) RM criteria as depicted by the researcher in Figure 3. The external environment identifies key trends and risks that could impact on the organisational objectives. These include the social, political, legal, regulatory, financial, technological, economic and competitive environments. Moving from the peripheral layer to the internal environment is where the alignment with organisational objectives is considered to reflect understanding of the opportunities, culture, information systems, standards, resource capabilities, governance roles and structures of the organisation. Moving inward to the risk process area, which is where, the RM activities will be conducted in the business, the establishment of scope, responsibilities, activities and relationships are included. The central area, namely risk criteria, identifies how the risk will be analysed and how alignment will take place to the organisation's risk policy, values and objectives. The risk criteria that will be applied when conducting a risk assessment should also be established during this phase. Consideration should be given to how the risk process will be integrated within the overall NPSD process rather than functioning as a stand-alone method that is applied once off during the NPSD lifecycle (Oehmen et al. 2010).

Step 3: Risk Identification

During risk identification, detailed risk lists are generated that could impact on achieving the objective of the P&S. Risk lists contain prioritised risk items that can assist the product manager to focus on potential sources of risks. NPSD research has developed risk lists from different perspectives. Some researchers focus on prioritising risks that could impact on the success of the product (Berglund, 2007) while others have focused on the objectives of the product, the project itself (Skelton and Thamhain, 2004), services individually (Sarbacker and Ishii, 1997; Yong and Chen, 2011) and project portfolios (Matheson, 1983).

Other methods which may aid the development of risk lists include using published information from commercial databases, and scanning major macroeconomic global risk surveys to identify key trends in the external/macro environment. An example is shown in Table 71 of Appendix 8. A further method is to develop checklists from historical incidences arising from previous projects. Other internal sources of risk lists could include product information, project risk assessments and lessons learnt.

Techniques that have been used by researchers to expand on risk lists include a grouping of risks into certain categories (Sarbacker and Ishii, 1997). Risk categories reflect common sources of risks, which make risk identification easier. Risk lists can indicate the needs of different departments to establish the various priorities per stakeholder (Berglund, 2007).

Techniques which may be used to obtain information for risk identification include brainstorming, Delphi-techniques and interviews, as well as strengths, weaknesses, opportunities and threats (SWOT) analysis (Keizer et al. 2002; Keizer and Vos, 2003). Additional approaches that may facilitate the development of risk lists include Potential Problem Analysis (PPA), Fault Tree Analysis (FTA) and Failure Mode, Effect Analysis (FMEA) (Keizer et al. 2005; 2003), Theory of Scenario Structuring (TSS) and the Hierarchical Holographic Modeling (HHM) technique (Kaplan and Garrick, 1981). These methods are critiqued due to exposure to 'group-think', oversimplifying complex risks or for exclusive focus on technology risks (Keizer et al. 2005; Segismundo and Miguel, 2008; Tang et al. 2011).

Step 4 to 6: Risk Analysis, Evaluation and Treatment

Following risk identification, a deeper understanding of the risk is obtained by quantifying the risk via likelihood and consequence scales to decide which risks need treatment. In classical RM literature, this is referred to as the 'assessment' phase. Qualitative scales are used to assess the probability (likelihood) of the risk occurring as well as the potential impact (the magnitude of the consequences of the outcome) if the risks are realised (Susterova, Lavin and Rives, 2012).

Sarbacker and Ishii (1997) refer to probability as the likelihood of the outcomes deviating from expectations while the impact is the consequences of each potential outcome and how they impact on the overall value of the P&S to the organisation and customer. Some of the approaches which have been used to estimate risks in NPSD are subsequently discussed.

Keizer et al. 2002 developed the Risk Diagnosing Methodology (RDM) to improve the chances of successful products by identifying and managing potential risks. The framework consists of nine steps that are carried out with the assistance of a risk facilitator. The steps include risk identification, risk assessment and risk response development and control actions. The respondents scored risks on 3 by 5-point scales to establish (1) the probability of the risk being realised; (2) the capability of the team to influence risk actions (within time and resource restraints); and (3) the relative importance of the risk statement to obtain project success. Kassarjian, (1977) procedures were used to standardise the outcomes into a reference risk list. Twelve main risks categories and 142 potential critical innovation risks were identified. Keizer et al. (2005) subsequently developed a risk reference framework (RRF) for diagnosing risks in products that consisted of 12 categories and 142 innovation risks.

Sarbacker and Ishii (1997) developed a framework and methodology for identifying and evaluating risk during product innovations by focusing on the objectives of the product. The NPD process is partitioned into three stages that allow for the successful completion of each stage and ensure that the output is robust. The framework identifies NPD risks according to the three major phases of the NPD lifecycle. The dimensions include envisioning risk (initiation phase), design risk (development stage) and execution risk (commercialisation phase).

Davis (2002) developed the Net Present Value Risk (NPVR) framework, in terms of which products are evaluated according to specific characteristics and allocated within one of four categories. Each product is additionally assessed regarding (1) market, (2) technical and (3) user risks. Market risk determines the value chain and target market segment risks. Technical risk considers the innovation capabilities of the organisation and user risks identify associated customer risks.

Subsequently, a scoring of ‘high to low’ is allocated, based on which the NPVR is calculated. The formula quantifies the weighting for each score (per product category). The outcome determines the greatest risk exposure areas.

Nada et al. (2010) promoted an integrated innovation management framework (IIF). The IIF is based on a literature review of seven innovation studies and includes eight dimensions: (1) Strategy/structure; (2) Culture; (3) Knowledge Management; (4) Process; (5) Resources; (6) Intellectual Property Management; (7) Commercialisation; and (8) Innovation. An Innovation Assessment Balanced Scorecard presents a list of capabilities in four categories, namely financial, process, learning and customer.

Mu et al. (2009) designed an RM framework for NPD that was tested using survey data from Chinese firms. The research revealed that the strongest correlations to enhance product performance relate to (1) technology; (2) organisation; (3) marketing; and (4) NPD performance. The study additionally offers indicators for assessing risk performance of these four categories.

Nordin et al. (2011) examined risks in services offerings by developing a conceptual guidance framework for managing risks. Three risk categories are reviewed, namely (1) operation, (2) strategy and (3) financial. Operational risk refers to potential breakdowns in core operating, manufacturing or processing capabilities, as well as human resource problems. Strategic risk refers to those risks that impact on the potential of the business to implement its strategy. Examples are customer or competitive risk, which could damage the achievement of objectives and shareholder value. Financial risk can result due to loss of reputation that erodes the value of a business due to loss of confidence in seven major classes: industry, technology, brand, competitor, customer, project and stagnation. Financial risk impacts on net cash flow and deals with price, credit, inflation, liquidity and financial losses. The study considered the interplay between the three types of risks. If a broad range of service offerings is provided, the operational risk and financial risk increase, while strategic risk decreases.

Barczak and Kahn (2012) derived an NPD audit using a set of 100 questions to ascertain if a particular practice can be described as poor or best practice. A multidisciplinary team assesses the questionnaire. A score of -1 would reflect a poor practice, 0 = average practice and a score of +1 would denote a good practice. The total sum of the questions could be in the range from -100 (which indicates a non-existent NPD process) while +100 would indicate a best-in-class score. A negative score would indicate deficient practices while a positive score would indicate enabling practices. The audit reveals strengths, deficiencies and prioritised risks since the area with the lowest score would require the most attention. Descriptive questions asking ‘why’ are used to examine problem areas, since identification of the root causes allows the proposal of remedies. Insights into the fields of strength can be used for extrapolation across the organisation.

Susterova et al. (2012) use a traditional RM approach to evaluate risks during product development, with a case study approach. Risks are assessed regarding external risk factors, IT, incompetent management, health and safety, quality, staff turnover and insufficient marketing. The risks are identified and evaluated based on the probability and impact and presented in a risk matrix.

A wide variety of techniques have been established for analysing risks. A summary of the techniques, as well as their possible shortcomings (regarding using them for NPSD risk analysis), is presented in section 7.4 of the Appendix. A large percentage of these tools are built on qualitative analysis or narrow contexts, use informal and unsystematic methods and are based largely on management perceptions (Calantone, Benedetto and Schmidt, 1999; Cooper et al. 1999; Griffin, 1997).

The previous section established that a wide variety of different methods can be used to analyse risks and that consensus is limited regarding the best risk strategy or which categories of risks to use in NPSD. While these approaches offer firm guidance to assess risks in NPSD, these studies have certain shortcomings.

NPSD research has preferred to focus on the analysis of risk rather than on risk treatment. The only study that focuses specifically on risk treatment is that of Riek et al. (2001) in terms of which recommendations were developed by studying root causes of risks which materialized in 15 case studies. Lessons-learnt checklists were categorised into project organisation and NPD process issues applied to three phases of the NPSD lifecycle. ISO 31000 (2009) principles and guidelines prescribe risk treatment options as guidelines to balance cost and awards.

Step 7: Monitoring and Review

This phase establishes methods to monitor and review the P&S as well as the effectiveness of the RM strategy when measured against objectives. Furthermore, it required an NPSD process and risk-needs review to establish efficient functioning of controls in practice.

NPSD research predominantly focuses on the development phase of NPSD and seems to neglect steps after P&S launch. No risk procedures monitored the P&S performance after launch, other than post-launch reviews.

Innovation researchers use post-launch reviews primarily to monitor the performance of the P&S against the stated success criteria (Atuahene-Gima, 1995; Cooper, 2008; Edgett, 1996; Shostack, 1984). The objectives of this performance monitoring are the improvement of the efficiency of the P&S and the associated processes.

2.8.3. Risk Management in NPSD

RM phases of risk identification, assessment, treatment and monitoring, are seen as essential to improve NPSD (Oehman et al. 2010; Olechowski et al. 2012; Yong and Chen, 2011). Three standard RM approaches exist, namely (1) Evaluation; (2) Management; and (3) Contingency (De Bakker et al. 2010). The evaluation approach primarily considers RM as an 'ex-post' evaluation process, where failures from previous projects serve as input for current projects. The management approach uses the full RM process of identifying, analysing, controlling and monitoring risks related to a particular project. The third method is called the contingency approach, where RM is not considered as a separate process but embedded within the processes and procedures of the NPSD project.

When evaluating the risk assessment techniques used for NPSD studies, it is clear that Sarbacker and Ishii (1997) followed a contingency approach to analysing risks according to the phases of the NPSD process. The limited use of the method correlates with De Bakker et al. (2010) findings that only a small number of researchers utilise the contingency approach.

Studies that employed the management approach include Susterova et al. (2012). However, no formal framework for analysing risk has been presented, other than applying RM as a method within NPSD. The evaluation approach used by Riek et al. (2001) presents checklists for the treatment of risks based on post-evaluation reviews of project failures. Oehmen et al. (2010) consider risk treatment to be a neglected area in NPSD and suggest that concrete examples of actual risk treatment options could allow a more structured selection process for the treatment of risks.

Risk assessments are often introduced as a separate activity to the NPSD process (Keizer et al. 2002). Integration of the RM within the operations of the business unit (in this case NPSD) is an integral part of ensuring successful RM (Olechowski et al. 2012). The RM phase of 'monitoring and review' has also lacked attention by the research community (Oehman et al. 2010).

Individual studies have only focused on risk assessments that were performed early during the NPSD lifecycle 'idea' phase (Davis, 2002; Keizer et al. 2002, 2005). Once-off early risk identification does not address uncertainty arising during each subsequent phase and activity of the NPSD lifecycle (Mu et al. 2009). Some research studies only focused on the identification of risk and offered limited oversight concerning strategies to follow (Sarbacker and Ishii, 1997). Selected studies only focused on particular types of services such as breakthrough services (Keizer et al. 2005) or products (Davis, 2002; Sarbacker and Ishii, 1997; Nada et al. 2010) and services that originate from products (Nordin et al. 2011).

Further studies only conducted risk assessments based on a limited number of dimensions (Barczak and Kahn, 2012; Nada et al. 2010) and cannot be considered to offer a comprehensive view. The reasoning behind the selection of the dimensions is not always clear, as in the case of Nada et al. (2010) four of the dimensions, (organisational structure, knowledge management, resources and corporate culture) can be combined into the category of organisational factors. It is not clear why an additional product category, namely Intellectual Property Management (IPC) is connected with the commercialisation phase. Specifically, IP risks should be considered earlier in the NPSD process and not only when P&S is being launched, as the organisation it could be exposed to financial liabilities. The framework additionally makes no mention of market or customer risks. A framework should be comprehensive enough to establish an acceptable risk profile ensuring sufficient innovation capabilities.

Another shortcoming of NPSD risk research is that frameworks are built based on a limited number of innovation literature studies (Nada et al. 2010) or a small subset of risks within NPSD (Oehman et al. 2010). A need exists to develop a systematic and efficient method to analyse risks in NPSD, which can assist NPSD resources to assess many kinds of risks associated with the NPD environment and allow risk-based decision making (Tang et al. 2011).

An effective way to consolidate risk factors is by utilising frameworks. An innovation framework describes a systematic process to deliver innovations which add value to customers (O'Sullivan and Dooley, 2008). RM can, therefore, be applied within an innovation framework to assure informed risk decisions by assisting innovation teams to identify risks in NPSD more efficiently (Sarbacker and Ishii, 1997).

Various innovation approaches and frameworks are subject to limitations (Trajtenberg, 1990; Werner et al. 1997). Nada et al. (2010) comments that there is a lack of updated meticulous, comprehensive and integrated frameworks covering the range of all activities required during the NPSD lifecycle. An efficient RM procedure should draw on the knowledge of critical success factors in P&S innovation. Effective RM in NPSD requires venturing beyond generic factors and identifying context-specific risks that apply to the distinctive characteristics of the P&S (Oehman et al. 2010).

This study will use the contingency approach to embedding RM within the NPSD processes. It will additionally address some of the shortcomings of the previous NPSD research by focusing on all NPSD phases, offering a comprehensive set of dimensions, based on a vast number of innovation studies and consolidating the risk information using a framework.

2.9. Risk Management in Information Systems

IS studies seem to be weak on theory and RM approaches since Lyytinen, Mathiassen and Ropponen (1998, p. 234) states that IS:

> [l]acks theories, which help relate RM approaches and explain to what extent, how and why they vary. We also lack systematic frameworks to organise risk assessments and to generate risk resolution

tactics.

Four classical IS risk approaches exist. These are the Alter and Ginzberg (1978) implementation approach, McFarlan (1982) portfolio approach, Davis (1982) contingency approach and Boehm (1991) software risk approach. Lyytinen et al. (1998) finds key differences between these approaches in terms of how they define the concept of risk and focus on risk items and resolution items. Alter and Ginzberg's (1978) and Boehm's (1991) approach concentrate on averting losses while McFarlan et al.'s (1982) method focus on avoiding risk. These and other approaches are subsequently discussed.

For software development, Boehm's (1991) software risk model is regarded as the most influential (Keil et al. 1998). Boehm (1988) created a spiral model that emphasises a 'risk-driven approach' for improving the software process, rather than the traditional 'document-driven' or 'code-driven' approaches. Top ten risks for software development are presented in a prioritised list. Boehm's (1991) risk list mainly focuses on execution risks, of which the top three are established (in priority order) to be (1) personnel shortfalls; (2) unrealistic schedules and budgets; and (3) developing the incorrect software functions. Alter and Ginzberg (1978) utilises similar resolution techniques to resolve many different risk items. Risk practitioners are required to clarify the rationale behind making risk decisions, following a second approach to analyse risk incidents and propose unambiguous resolution strategies.

Risk lists are typically derived from risky incidences and can serve as the source of a risk resolution plan (Lyytinen et al. 1998). An incident is determined by ITIL (2011) as 'an unplanned interruption or reduction in quality of an IT service'. In software risk management, an incident is defined as an event that has potential to cause loss or damage and make the development project fail (Lyytinen et al. 1998).

Davis's (1982) model focuses on the management of risks in requirements specifications by employing a contingency model, providing strategies to address the risks within a given context. Alter and Ginzberg's (1978) implementation risk model focuses on risks associated with organisational acceptance during the implementation of IS and uses risk lists and risk reduction strategies that are classified as inhibiting (avoidance of problem) or compensating (to reduce the impact of the problem). McFarlan's (1982) focus is on managing inherent risk in a portfolio of projects using risk mitigation techniques to ensure better integration within the team and organisation, and improve planning of the project and formal control mechanisms, such as change control.

Keil et al. (1998) expand on Boehm's work by identifying 11 factors (in order of priority) as a universal set of risks which were globally relevant. The three highest risks were (1) a lack of top management commitment; (2) a failure to gain buy-in from the users; and (3) misapprehension of the system requirements. These risks factors are categorised and a framework has been introduced based on the perceived level of control and perceived relative importance of the risk. The different types of risks are mapped into a 2 x 2 grid which presents the dimensions of 'level of control' and 'relative importance'. The four quadrants are renamed to reflect risks related to (1) customer mandate; (2) scope and requirements; (3) execution; and (4) internal or external environment risks impacting on the success of the project.

ISO 31000 (2009) clearly stipulates requirements for an integrated RM approach; therefore, the contingency approach is considered appropriate. Barki et al. (2001) also follow a contingency plan that originates from software project RM as well as Organisational Theory. The model is illustrated in Figure 4 and explained by means of a P&S scenario.

(A) Risk exposure: The risk exposure is dependent on the particular characteristics of the P&S, which could increase the probability of failure. An example is a mobile banking P&S having unique characteristics such as more stringent compliance to financial regulations thus protecting customers from fraud and limiting reputational risk.

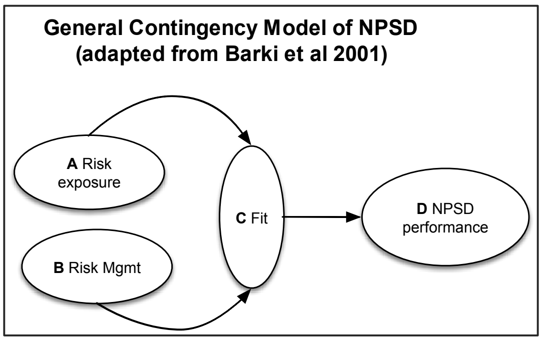

Figure 4: General Contingency Model of NPSD

(B) Risk Management: The RM profile is presented as a multi-dimensional construct that illustrates different contexts. An example of a 'low' RM profile is a mobile banking application utilising existing technology that is well understood and predictable (risk exposure is low). In such a case, the RM pattern may require 'low rule of change' consisting of routine decisions and actions (Altman and Saunders, 1998). In the case of 'high' project uncertainty, where entirely new technology has been implemented the profile could require an increased level of activity, which includes obtaining skilled resources for activities, adding more time to the project development timeline and designing and implementing the required technology security and fraud controls.

(C) Fit: The match between the RM profile and risk exposure is referred to as the 'fit'. Adherence to the ideal pattern (RM profile fit to the risk exposure) will positively impact performance (Barki et al. 2001; Altman and Saunders, 1998). Deviation from the RM profile may imply a moderate degree of fit, possibly resulting in a negative influence on performance.

(D) NPSD Performance: An ideal profile may describe a recommended course of action and demonstrates that such a profile could improve performance.

The development of a risk profile can follow a generic pattern, but it could be operationally difficult to accommodate all the various risk dimensions (Venkatraman, 1989). A generic approach could assist in addressing shortcomings of current research (Sauer, Gemino and Reich, 2007) and is also the approach that is followed by this study.

2.10. Defining Project Success

In the IS community, project success is usually defined by three success factors: cost, schedule and performance targets. Additional criteria include the number of stakeholders seeking success, such as the customer (performance, budget and reputation), the developer (profitability, reputation, client satisfaction) and the public (environment, reliability and cost) (Williams et al. 1995). Further criteria for successful projects include effectiveness, which describes the degree to which the objectives of the project are met as well as the relevance to beneficiaries, impact and sustainability (Ika, Diallo and Thuillier, 2011).

Success factors enabling successful RM have not been well researched. Firstly, it is necessary to determine whether RM can positively contribute to more successful projects and secondly, how to evaluate the impact of RM on NPSD? One of the few empirical studies which examines RM success in projects was conducted by Raz, Shenhar and Dvir (2002) surveying RM practices in 100 projects performed in Israel across various industries. Effective RM was applied to only a small number of these 100 projects and not comprehensively. Albeit, more successful projects resulted where RM was used.

Dvir, Raz and Shenhar (2003) also studied research and development projects in 110 weapons and defense-related projects and found that project success correlates positively with improved planning (which includes RM practices). From a customer perspective, a significant, positive relationship is established between the success of the project and the amount of effort invested in defining the project objectives and technical specifications. When 'uncertainty' is minimised during the specification phase, it may contribute towards successful projects.

It can be difficult to prove the value of RM due to a lack of empirical evidence which supports the practical usefulness of RM (Lyytinnen et al. 1996; Olechowski et al. 2012). Some researchers refer to project management cost and schedule overruns to quantify the cost of poor project RM (Cantarelli, Flyvbjerg, Molin and Van Wee, 2010; Olechowski et al. 2012). The usefulness of following formal RM techniques on the NPSD process improves the success rate of P&S innovation (Keizer et al. 2005). Similarly, Segismundo and Miguel (2008) report that significant reduction in the number of errors and cycle time improves NPSD quality and lowers cost. De Bakker et al. (2010) conducted a meta-analysis of empirical evidence and advise that the application of RM techniques contributes to IT project success.

Since a variety of factors impact on the success of NPSD, it is difficult to identify a single RM practice which positively impacts on the P&S. Therefore, studies predominantly rely on practical approaches to assessing the value of RM, including risk practitioner and innovator feedback. The Keizer et al. (2002) short evaluation questionnaire assesses the usefulness of the RM methodology during NPSD by asking what is the added value of RM, the reference list, the risk session, whether the approach will be used again, the time efficiency and contribution of the risk facilitators. Mu et al. (2009) similarly evaluate the success of P&S by asking respondents whether overall performance of the NPD process and product is successful, if the product reached the market timeously, and if cost management was satisfactory.

General criteria to measure performance in IS projects include efficacy (measuring whether the transformation achieves the intended outcome), efficiency (number of resources) and effectiveness (achieving a strategic objective) as advocated by Checkland (2012). The criteria for effectiveness of an RM process can be obtained from the ISO 31000 principles for achieving effective RM. The operationalizing of the ISO 31000 principles to assess the effectiveness of RM during the NPSD process will be further discussed in Chapter 3, Research Approach, Section 3.5.5.

2.11. Towards Development of a NPSD RM Framework

An efficient RM procedure should consider the critical success factors in P&S innovation (Keizer et al. 2001; Wang, Lin and Huang, 2010). Identified risks are typically grouped into categories, which reflect a common source of risk (PMI, 2004). The four generic risk categories that contribute to P&S success (as discussed in the innovation literature review) are (1) strategy; (2) market; (3) process; and (4) organisation. These categories are retained since failure to perform these factors could contribute towards an unsuccessful P&S.

Skelton and Thamhain (2004) establish that the following risk factors affect overall P&S success. These risks are listed in order of frequency and include (1) changing project requirements; (2) changing market or customer needs; (3) technical difficulties; (4) technology changes; (5) lost or changing team members; (6) changing organisation priorities; (7) conflict; (8) changing management commitment; (9) environmental quality problems; (10) new regulatory requirements; (11) changing contractor relations; (12) intellectual property disputes; and (13) changing social/economic conditions. From Skelton's list, it is clear that technology (item 3 and 4) and regulatory and IP (items 10 and 12) do not correspond to the four innovation dimensions mentioned above and require new dimensions. All the other risk factors can be addressed within the existing dimensions.

NPSD introduces both opportunities and risks into an organisation. The four dimensions that contribute to successful P&S (strategy, market, process and organisation) represent the best use of opportunities. Two additional dimensions are presented as a result of the risk review. These are (1) technology; and (2) risk and compliance. Both innovation and risk researchers mention 'technology' uncertainties as negatively impacting on the NPSD (Davis, 2002; Mu et al. 2009; Wang et al. 2010).

'Risk and Compliance' are introduced as an additional dimension to ensure that risks external to the previous four categories are identified, and appropriate RM procedures exist to address the critical exposures (Leithead, 2000). The dimension risk and compliance denote the extent to which the organisation must comply with external regulatory requirements, internal policies and guidelines, so as to mitigate risks. The six dimensions are discussed concerning the findings of the risk literature.

2.11.1. Strategy and Portfolio Management

An NPSD strategy not aligned to the overall objectives of the organisation may lead to misapplication of company resources and failure to endure in a competitive market (Edgett and Parkinson, 1994; Martin and Horne, 1993). Strategy risks could be introduced by failure to contribute to the brand image, decreased reputation of the organisation and failure to provide a platform and opportunities for launching consecutive products (Keizer et al. 2002). Delayed identification of strategic risks, especially market and technology risks may hamper innovation efforts (Wang et al. 2010).

A failure to orientate the P&S to the strategy of the organisation may lead to misaligned business units materialising as conflicting goals and priorities that can hamper the introduction of P&S (Berglund and Sandström, 2013). Poor practices include pet projects which do not fit the mission, unclear goals or only focusing on short-term tactical strategies (Kahn et al. 2012). The objectives of a new P&S can include reducing risks for the organisation, ensuring competitiveness, timeous responsiveness to competitive actions, reducing technology obsolescence and reducing customer risk (Cowell, 1988).

In cases where P&Ss are losing their market appeal, the organisation may face grave risks of decline and obsolescence (Leithhead, 2000). The profile risk increases when there is an inability to predict P&S obsolescence and ineffective measurement of the market attractiveness of existing P&S. Obsolescence risks refer to failure to timeously replace P&S ranges.

How is the danger of obsolescence identified, measured and monitored within the organisation? It is suggested by Riek (2001) that a financial projection should be included as part of portfolio management to make allowances for obsolescence of existing P&S. Portfolio management should also consider the market appeal and relative maturity of the product line by considering sales or demand trends. When too much of the organisation's revenue is dependent on the continued viability of a mature P&S, future income and market position can be in danger (Riek, 2001).

Poor portfolio management practices can result in the selection of the wrong type of P&S for inclusion in the collection. Portfolio management weaknesses include inadequate understanding of multiple and interrelated projects without considering the overall value contribution and resource utilisation (Riek, 2001). Furthermore, an insufficient understanding of risk and non-financial aspects of the P&S can introduce additional risks (Baker and Freeland, 1975). Other inferior portfolio management practices include a lack of a process for undertaking portfolio management and not using consistent evaluation criteria (Kahn et al. 2012).

The overall perspectives of innovation and risk researchers on strategy criteria are not markedly different. Risk researchers will provide a different perspective regarding the impact of the risks. Obsolescence risk is more prevalent in the risk literature, which may mean that NPD researchers are more concerned about the overall strategic risk introduced by the lack of P&S, regarding not being competitive or sustainable. Risk reduction in strategy is essentially focused on ensuring that the right opportunities are exploited.

2.11.2. Market Orientation

Competitive risk results from ineffective monitoring of competitor actions and not responding timeously with appropriate and suitable products (Leithead, 2000). Not being seen as a market leader could negatively impact on the reputation of the organisation as lagging in innovativeness and leadership (Keizer et al. 2002). Unanticipated competitor reactions to P&S launched could catch teams off-guard (Szymanski and Henard, 2001).

Both familiar and unfamiliar markets introduce risks. Unfamiliar markets introduce risks such as lack of understanding of the market potential and size (Szymanski and Henard, 2001), while familiar markets present risk challenges regarding (1) providing a clear value proposition; (2) managing the threat of cannibalisation; and (3) overcoming market resistance to new technology (McDermott and O'Connor, 2002).

Service innovation is heavily dependent on the existence of an effective marketing strategy that educates users about the value of the services, compared to products. Yong and Chen (2011) explain that customers who experience difficulty in understanding financial services could look for tangible clues of reliability such as the effectiveness of customer-facing interactions. Market communications should, therefore, consider addressing these risks. Risk mitigation should examine the capabilities of the customer facing staff, systems, operations and technology. These interactions should provide clues to the client of a reliable service.

Failure to meet the requirements of customers concerning price, performance, quality and variety may lead to lost opportunities (Chen et al. 2007). Customers are unlikely to support P&S, which do not meet their particular needs (Berglund, 2007). Even a P&S that targets customer needs could fail to meet customers' expectations and quality standards due to the P&S being of inferior quality (Leithead, 2000). In these cases, customers will not be convinced that the P&S adds value for money compared to competitors (Keizer et al. 2002).

Not involving customers during the design of the P&S is a poor practice representative of risks according to Kahn et al. (2012). Customer involvement during the NPSD process, could lead to more efficient targeting and analysis of customer requirements and alleviate the risk of not delivering on customer expectations. A key risk is customer price sensitivity, especially in emerging markets. It is tough to convince customers that the price of services should increase, despite enhancements made to the P&S (Berglund, 2007).

Inferior internal and external relations with stakeholders can introduce risks (Evanschitzky et al. 2012; Montoya-Weiss and Calantone, 1994). Failure to solicit the support of the key opinion-formers for the P&S and not responding effectively to potential negative sentiments can damage reputations (Keizer et al. 2002). The importance of stakeholder engagement is emphasised by Cantarelli et al. (2010) who blame the cost of project overruns on the lack of stakeholder engagement. All the interested parties, including the general public, should be assessed for potential negative responses to a P&S, which could lead to reputational damage.

A common theme hampering P&S is poor commercialisation practices. The inability to effectively market the new P&S to the target consumers is cited as a critical customer risk (Keizer et al. 2005). Risks include poorly-planned and inefficiently executed marketing activities, insufficient product testing, staff training, poor internal marketing, poor planning regarding sales and distribution and inefficient advertising and promotional campaigns supporting the P&S (Riek, 2001). Operational risks that may be present during marketing campaigns include ineffective coordination of publicity, display material, staff training, logistics, distribution and inefficient communication of the P&S to external and internal parties, including sales, resellers, customers and suppliers (Riek, 2001).

There is no substantial difference between risk and innovation researchers concerning market factors. Competitor activity, customer requirements (as well as risk consideration) and marketing activities are the three top sources of risk. Stakeholder concerns are, however, a new area of risk introduced by more recent research. It is perhaps insightful that understanding the market and customers are in effect risk reduction strategies.

2.11.3. Innovation Process

The NPSD process is imbued with great complexity and risk. To ensure successful P&S, risks involved in the development process must be thoroughly analysed and controlled. An absence of formal and proficient NPSD processes is considered a critical risk factor (Yong and Chen, 2011). The requirements for aligning NPSD activities to a robust NPSD process are more of a prerequisite for services (compared to products) due to the intangible nature of services, which could lead to vague and variable specifications during the early development stages.

Skipping development steps to increase the speed of launching a P&S courts disaster, as it leads to ‘launch and fix’ modes, which exponentially increase cost and delivery time frames (Riek, 2001). Adherence to the NPSD process is hindered by the P&S team’s perception that formal processes are too rigid and not supportive of innovative new ideas (Berglund, 2007). McDermott and O’Connor

(2002) support the notion that NPSD processes could inhibit radical innovations and that a different set of rules should be followed which are not incremental in practice. Risk management should both consider risks and improve innovations.

Limited documentation on the NPSD process, lack of a process owner and access to tools for the NPSD teams is deemed to be indicative of poor practice (Kahn et al. 2012). Risks are also introduced when changes are made to the P&S right before launch, or when launch decisions are kept confidential for fear of leaking information to the public (Kahn et al. 2012). Excessive confidentiality leads to poor communication.

Many NPSD functional activities take place within the process dimension, and the next section focuses on the general themes that NPSD risk practitioners reflect as risks about the process dimension activities.

Project Management

Poor quality of project management is regarded as an important risk factor for P&S (Keizer et al. 2002, 2005; Segismundo and Miguel, 2008; Yong and Chen, 2011) and a critical risk factor is a project manager with inadequate skills (Munns and Bjerm, 1996). Sauer et al. (2007) state that experienced project managers deliver close to within 7% of their original budget, schedule and scope on two out of every three projects. For high-risk strategic projects, it would, therefore, be wise to secure the services of an experienced project manager to increase the likelihood of the P&S success.

A project manager is responsible for overseeing the various micro- and macro-projects that result during the NPSD. These multiple projects can introduce additional risks. Inadequate project management methods and techniques may lead to the failure of a project (Munns and Bjerm, 1996). Inefficient or late establishment of the critical success factors of the P&S may lead to compromise and the delivery of inferior products (Riek, 2001). A lack of project metrics to evaluate projects is similarly a poor practice (Kahn et al. 2012).

The effective performance of a product manager is a critical success factor for innovation (Edgett and Jones, 1991). There is a difference between the performance of the project and the resulting P&S. It is possible for a project to be over-budget and exceed target delivery dates but deliver a high-quality P&S, while an on-time an in-budget project might deliver a poor quality P&S (Munns and Bjerm, 1996). Therefore, the success of the project manager and the product manager are not directly correlated. A P&S can be successful despite an unsuccessful project manager and needs to be measured separately (Barki et al. 2001). Inefficient product and project managers could introduce risks to the project.

The effectiveness of project management can be determined by asking questions such as: how are time pressure points or peak loads identified and managed; what compromises have been made for cost, quality, safety and the environment; in what way are variations identified and managed; and how are project activities planned and coordinated (Leithead et al. 2000). These questions can aid the risk assessment efforts to obtain a more detailed understanding of project management activities.

Skelton and Thamhain (2004) rank project management risks in priority order as follows: (1) project work; (2) schedule; (3) budget; (4) scope; (5) project deliverables; and (6) customer satisfaction. The ranking indicates that technical project management attributes are more important than achieving client satisfaction. Project failures result due to the selection of the wrong projects, choice of a project manager with inadequate skills, lack of top management support and commitment, incomplete application of project management techniques and failure to plan for the closedown of the project (Munns and Bjerm, 1996).

Sauer et al. (2007), with particular reference to IT projects highlights project volatility (changes which occur during a project) as having a significant impact on the success of projects. Volatility concerns two aspects, which are governance and target volatility respectively. Governance volatility is defined as the number of changes that takes place to replace project managers or project sponsors. Target volatility is the number of changes to the schedule, budget and project scope. Sauer et al. (2007) found that governance volatility is more harmful since project managers in IT projects tend to change once every two projects while sponsors changed once in four projects. Target volatility changes occurred on average eight times per project. In an NPSD environment, with low maturity processes, the loss of a project manager or sponsor (governance volatility) could be especially harmful. It is also likely that the target volatility changes would exceed the average number quoted by Sauer et al. (2007) since there could be more uncertainty in an overall NPSD development as technical development is just one phase of the NPSD lifecycle.

De Bakker et al. (2010) state that the traditional way of measuring a successful project by assessing compliance with time and cost requirements is no longer useful as these criteria are being established too early in the NPSD lifecycle and could change several times. They recommend that an additional success parameter, such as stakeholder opinion, should be brought in to evaluate the success of the project. The risk practitioners should note the success criteria of the P&S and assess the risk profile accordingly.

When comparing the innovation and risk literature, the importance of retaining knowledge seems to be a prevalent concern for innovation researchers while risk reviews seem to focus predominantly on the technical aspects of project management. Risk practitioners should also consider knowledge management issues that would improve later developments of P&S.

Financial Risk

Financial risk is considered to be a primary concern for NPSD (Nordin et al. 2011) and may result due to services being priced too low. This is indicative of inadequate business model analysis leading to unprofitable services (Leithead, 2000). The business model analysis should consider how the market structure works, alliance partners and how the organisation will participate in the market. The project team often underestimates the importance of analysing the business model as well as understanding the time and investment required to perform an adequate business model analysis (Riek, 2001).

Additional financial risks impacting on NPSD may include insufficient allocation of budget for development of the P&S idea or the inability to justify financial expenditure, which could lead to viable and profitable P&Ss being held back due to financial considerations (Berglund, 2007). Risk practitioners should also consider these risks which result in inhibiting innovation efforts. Risks might also be associated with commercial activities such as incorrect forecasting of the estimated volumes and costs, due to reliance on inadequate assumptions (Leithead, 2000).

One of the risks of an innovative business model is that it often leads to cannibalization of other revenue streams (McDermott and O'Connor, 2002). It therefore, seems relevant that using an informed risk decision-making based process should assess the advantages and disadvantages of cannibalization.

Additional Risk Factors Related to Process

Some of the additional risks that can be presented as a result of the micro-projects occurring during the NPSD lifecycle are subsequently discussed. Collaboration with third parties increases innovativeness but also introduces additional risk (Kerssen-Van Drongelen and Bilderbeek, 1999). If all of the value chain requirements cannot be delivered internally by an organisation or with existing partners, other partners should be sourced as part of the P&S solution (Davis, 2002). Failure of a third party vendor to deliver in agreement with requirements can lead to major project delays (Berglund, 2007).

Risks relating to lack of familiarity with supply chain (Olechowski et al. 2012; Riek 2001) and third party relations (Berglund, 2007) have been specifically identified as grave risks that could arise during NPSD projects. Unsuccessful integration of these functions into the NPSD process is considered as a risk factor (Homburg and Kuehnl, 2013). As some P&S require the sourcing of alliance partners, it is critical to devote adequate time and effort to find partners with the right competencies (McDermott and O'Connor, 2002). Failure to select the appropriate vendors and partners, as well as an inability to assess their service delivery capabilities could result in vendors not delivering per agreements; either not delivering on time or lacking the flexibility to meet evolving business requirements (Berglund, 2007). Failure to achieve quality standards could be addressed by clearer contractual and supplier reassurances. Since vendor contracts are often awarded by tender based on best price, contractors may understate the costs and risks involved to ensure selection of their proposal (Bruzelius et al. 2002). It seems that excessive focus on procuring the lowest price without performing sufficient due diligence to ensure that work can be completed can be a costly mistake. These costs and risks often only surface when the P&S is well into the development stage (Bruzelius et al. 2002).

Supply chain risks are mostly noted by risk researchers, which could relate to the phenomena that NPSD practitioners mostly view these risks as being external to the NPSD process. Business model elements are increasingly being introduced by service innovators, which would create awareness of supply chain factors and facilitate the development of more innovative business models. Supply chain and sourcing risks should be analysed by risk practitioners to ensure that adequate contingency options exist in case of delays, and that the available capacity will meet the demands (Keizer et al. 2002).

2.11.4. Organisational Factors

A major factor that contributes to failed projects is disruptive cultural issues, rather than technical risks (De Bakker et al. 2010). One cultural aspect that can lead to project failure relates to a reluctance to apply risk management practices. Project managers may display behaviour that is described by Kutsch and Hall (2005, p. 591) as a tendency to 'deny, avoid, ignore and delay dealing with risk, with the consequence of those actions having an adverse influence on their perceived effectiveness of risk management and the project outcomes'. A proactive approach is necessary to discourage ‘irrational’ behaviour of project managers to ensure that RM as a discipline is not discredited (Kutsch and Hall, 2005). Risk practitioners, therefore, would require some conflict resolution skills to be able to handle confrontations efficiently and not damage business relationships in the process.

Successful risk-taking is a desirable trait in senior management. However, top management occasionally displays behaviour that can adversely impact on their ability to manage risks. Good performing managers will avoid risks if those could negatively impact on their performance, while underperforming managers are more likely to take chances and make uninformed risk decisions as they have less to lose (Berglund, 2007). Senior managers also tend to inflate the roles they played and their risk-taking capabilities, when reflecting on risk events (Berglund, 2007). Other top managers could be risk-averse as demonstrated by a preference for development of incremental P&S rather than radically new P&S (McDermott and O’Connor, 2002). Obtaining support for radical innovations could be more difficult since more resistance is expected.

Ineffective communication may lead to project failure. The absence of effective practices relating to cross-functional communication, integration, coordination and promotion of teamwork between diverse teams, could inhibit project success (Garden-Ellson et al. 1986; Szymanski and Henard, 2001). The NPSD project team should guard against behaviours that inhibit knowledge sharing and collaboration and where project teams only support ideas that originate from their area (Kahn et al. 2012). Effective communication takes place across two dimensions, namely functional silos and hierarchical levels (Bharadwaj et al. 2013). Bridging of the silos is enabled by collaborating with all functions responsible for delivery of the NPSD in the value chain. Bharadwaj et al. (2013, p. 473) eloquently describe this approach as 'transfunctional' where 'functional and process strategies' are united 'under the umbrella of digital business strategy with digital resources serving as the connective tissue'.

McDermott and O'Connor (2002) point to the importance of championing and leadership roles because radical innovation is often dependent on the persistence of individuals. Lack of top management commitment can be a prime risk factor in projects (De Bakker et al. 2010). The nature of support expected from top management is to enable and empower motivated NPSD employees (De Brentani, 1993; Drew, 1995a; Johne and Vermaark, 1993; Martin and Horne, 1995). Persistence will guide the P&S through the different phases and functional areas of the organisation.

A further risk factor is the absence of a learning environment. A supportive learning environment encourages experimentation efforts, being tolerant of failed ideas, adopting risk-taking norms, employee development and fostering the acceptance of diversity within the group (Crossan and Apaydin, 2010). Team diversity can be both an advantage or disadvantage (Griffin, 1997). If team diversity leads to negative group dynamics, it could increase information uncertainty and ambiguity. In these cases, group decision-making techniques can be implemented, such as consensus decision making, multi-voting nominal group and nominal-interacting group techniques (Keizer et al. 2002).

Bruzelius et al. (2002) caution against a further negative aspect of team culture in that NPSD teams could be over-optimistic about forecasting the project viability to ensure that the project gets approved. Cooper (2003) describes additional team dynamics challenges that could inhibit innovation, such as judgmental biases, being overly ambitious and lacking the ability to deal with complex data.

Yong and Chen, (2011) find that a high correlation exists between skilled technology resources and the most successful P&S in the financial service industry. Losing critical skills (especially technically skilled resources) could cause projects to be abandoned (Berglund, 2007). The loss of human capital risk is especially catastrophic when senior management retires from the project leading to loss of insights and knowledge (Hall and Andriani, 2002). It can be especially detrimental if skilled employees leave and the organisation has inadequate knowledge management procedures in place.

The industry structure also influences innovativeness. The business culture of a monopoly organisation is not likely to be supportive of innovations and customised solutions (Berglund, 2007). Since monopolies do not effectively compete in the marketplace, it follows that innovation would probably not be a large requirement for success. In these cases, RM practitioners should consider the risk of not stifling innovation further with too-stringent RM practices.

Lack of an identifiable organisational structure could inhibit successful NPSD due to a lack of responsibilities being assigned (Kahn et al. 2012). Not having clear responsibilities assigned to specific individuals would mean that risks are not adequately addressed. Kahn et al. (2012) describe an efficient organisational structure as organic, with decentralised authority based on expert knowledge, informal planning and more liaisons between team members to compensate for the lack of formal communication paths. Effective communication is an essential aspect ensuring effective risk management. Good communication and flexibility are especially important for organisations that are highly exposed to uncertainty in addition to insufficient information to address this risk (Barki et al. 2001). A risk introduced by radical innovations is that the business unit would often not fit within the existing organogram. Not finding the right placement for radical innovations within the hierarchy could lead to a lack of support, which would increase the risk of failure (McDermott and O'Connor, 2002).

The size of the product teams corresponds to the level of risks. If product teams are big (more than 50 participants), the likelihood of underperformance increases (Sauer et al. 2007). Tenure within the organisation also presents risks and opportunities. McDermott and O'Connor (2002) identified that the most effective product team members (during radical innovations) are those that have been with the organisation for more than 15 years and have filled many positions during which they developed deep informal networks. It therefore seems that the practice of bringing in external employees to stimulate innovation within the organisation can be overrated.

No marked differences between the risk and innovation researchers could be found with regards to organisational cultural factors. There is general agreement on the significant risks as well as opportunities presented.

2.11.5. Technology Factors

Obsolescence of existing technologies can have grave implications for the P&S regarding an inability to effectively compete within the market (Yong and Chen, 2011). However, implementation of new technologies can introduce risks that are unique to the technology.

Risks can be presented by an inadequate understanding of the technology supporting the P&S, especially if the P&S is principally dependent on this technology (Keizer et al. 2002). The use of unproven technology can introduce considerable risks leading to the cancellation of projects (Segismundo and Miguel, 2008). Inflexible and slow technologies can inhibit innovation (De

Brentani, 1993; Yong and Chen, 2011). The main risk of obsolescent technologies is that they could prevent the delivery of functionality to satisfy the sophisticated demands of customers (Davis, 2002; Yong and Chen, 2011).

Innovative technology requires the technical development team to acquire more knowledge and capabilities to increase their familiarity with the leading technologies to reduce risks (Olechowski et al. 2012). Acquiring knowledge and skills is resource intensive in terms of time and cost; factors that are often not considered by NPSD teams. The technology team can obtain new knowledge by building networks, attending conferences and scheduling corporate visits to suppliers of these technologies (Berglund, 2007).

It is not only novel technologies that introduce risks but also changes to existing technology that supports the P&S since it introduces additional uncertainties (Leithead, 2000). Reliance on a single technology is not considered wise, and Riek (2001) suggests that while the development of alternative technologies would cost more, it could be the best way to manage technical risks. In the current age of cost cutting, preparing two technology versions of a single P&S would potentially only be viable for extremely high-risk technology projects.

Technology resources are severely impacted when multiple simultaneous NPSD projects take place. Multiple developments on top of each other are seen as operating in the 'suicide-square' where high levels of uncertainty exist on multiple fronts (Riek, 2001). Mitigation of the risk can occur by leveraging from known capabilities or outsourcing to fill competency gaps (McDermott and O'Connor, 2002). Another possible solution could be to utilise platform development where assets and system resources are shared across P&S (Meyer and Zach, 1996). The product team should consider delaying the initial NPSD implementation to introduce a more robust platform (Meyer and Zach, 1996). The decision should be taken with consideration of the competitive pressures where a competitor can potentially gain first-mover advantage. Platforms allow improved utilisation of limited resources by reducing the number of development hours (Chen et al. 2007). The disadvantage of platforms is that they may lead to the development of more incremental P&S, which can impact, negatively on the competitive strategy of the organisation (Chen et al. 2007).

Risk researchers often refer to risk mitigation methods as using modular design and digital platforms. The difference between the two is that modular design (through the decomposition of its modules, parts, subsystems and physical interfaces) is P&S specific while digital platforms consider overall design capabilities (Yoo, 2012). Both can be deployed with consideration of the risks involved.

Risks are increased when NPSD development tasks are executed simultaneously. Cooper (2008) provides an example where NPSD cycle time is reduced by purchasing technology early in an NPSD project. However, the project might be cancelled and due to the technology being sourced, the financial cost cannot be recovered. The decision to overlap activities must be understood as a calculated risk. The cost of the risk materialising should be considered against the cost of delaying the P&S until clarity is obtained.

Technical risks are presented when a sizeable technical gap exists, the programme is complex, and a lack of a technological skill base exists concerning people and facilities (Cooper, 1999). Additionally, poorly integrated systems can lead to costly delays during the development of P&S (Edvardsson et al. 1995). Software threats occur when four variables (task, structure, actor and technology) interact in any of three environments (management, project and systems environment) (Lyytinen, Mathiassen and Ropponen, 1996).

Technical solution design risk occurs when the technology department does not know the functionality necessary for the P&S (Keizer et al. 2002; Sarbacker and Ishii, 1997). A lack of information at the start of the development process can lead to costly delays and rework (Edvardsson et al. 1995). Not understanding the P&S ‘in-use conditions’ and specifications could mean the non-fulfilment of the P&S intended functions (Keizer et al. 2005). Any deviations from the required P&S specifications should occur within acceptable organisational tolerance levels (Shostack, 1984).

The technology department is expected to be knowledgeable about the properties, function and behaviour of components of the P&S so that deviations can be timeously reported (Keizer et al. 2002). It is especially relevant to the technology department to communicate during the design of the technical solution any critical incident points and unusual activities that could negatively impact on the performance of the P&S (Edvardsson and Olsson, 1986). The technology department should additionally be capable of communicating any risks that exist due to interdependencies between systems or where the P&S specifications cannot be fulfilled by existing systems (Lovelock, 1984). If the underlying systems are unable to deliver the requested functions, the P&S team should be notified and new technology procured, or the P&S specifications changed to fit the limitations of the existing system.

The technology team should also develop comprehensive testing plans to make sure that all potential risk scenarios are tested for the product (Riek, 2001). Testing should guarantee the existence and functioning of the P&S attributes supported by adequate design documentation that tracks change management during the NPSD lifecycle (Leithead, 2000).

Technology risks are mentioned by innovation researchers but not to the same extent as risk researchers, who appear to have a more detailed understanding of technology risks related to NPSD.

2.11.6. Risk and Compliance

Olechowski's et al. (2012) study indicates a strong relationship between effective RM and overall P&S performance. It is however pointed out that the success of a P&S is dependent on far more factors than was possible to capture in the study. Boyd, Pucciarelli and Webster (2012) finds that 75.9% of companies experience significant business risks and compliance incidents and suffer severe consequences. Effects of these risks (in order of priority) are reported as: failing to meet compliance requirements; losing key employees and customers; experiencing a major IT breach; encountering a significant audit; and suffering a major public relations (PR) crisis.

Berglund (2007) indicates significant innovation risks due to ineffective internal processes and failed relationships with suppliers, partners and customers. Operational risk management is therefore seen as an important part of RM in NPSD. Meulbroek (2002) agrees that wider risks should be considered, including public perception regarding the accepted social values such as health, safety and the environment (Keizer et al. 2005).

The application of the wrong or inadequate RM methods can also introduce risks during NPSD (Yong and Chen, 2011). Inferior RM methods can provide a false sense of security that can be even more harmful than not conducting RM at all.

Characteristics of Successful RM Practices in NPSD

This section starts with an analysis of the characteristics of successful RM in NPSD, followed by a discussion of individual risk factors, which include compliance elements such as regulatory and legal compliance.

Olechowski et al. (2012) indicate that RM is more important in high-performance projects when more resources are required to reduce the risks as early as possible. Olechowski et al. (2012) provide a few guidelines regarding requirements for effective RM. These include the presence of motivated, qualified and skilled resources; customization of the RM process; and integration of RM through all functions, levels and processes of NPSD. RM should also be regularly monitored and reviewed demonstrating that RM is, as Olechowski et al. (2012, p. 10) state, ‘an ongoing journey of tailoring, adaptation, integration and improvement, not a static process state’. Further critical success factors include the existence of organisational design experience; risk-based decision-making; and the application of mitigation activities that are unique to the problem. Olechowski’s et al. (2012) study additionally demonstrates that the ISO 31000 (2009) standard is well suited and applicable to evaluation of risks in NPSD and lists compliance with the ISO RM principles as a critical success factor.

Williams (1995) agrees that RM should not be deemed to be an external add-on function but tailored to the particular environment and stakeholders. RM should be an on-going process during project management and not only a once-off activity. Yong and Chen (2011) find the method of RM utilised during NPSD as significantly more important.

Wang et al. (2010) advocate additional principles for effective RM in NPSD. These include multi-disciplinary teams, an iterative RM approach, good communication between RM teams and the development of a knowledge management system to store and disseminate company-specific knowledge to facilitate learning from past experiences. Olechowski's et al. (2012) principles are more theoretical while Wang et al. (2010) offer actual practices that can be employed for efficient RM.

To ensure the effective implementation of RM during NPSD, Keizer et al. (2002) advocate that the risk team should be familiar with the business and innovation practices and that the RM process should fit within the existing innovation process and offer a cross-functional perspective. The risk process should additionally be supportive of the project team’s work and should not lead to negative group dynamics. It is not deemed advisable to allow the NPSD teams to act as risk managers as the approach often proves to be ineffective (Keizer et al. 2002). The focus is more on team dynamics and ensuring business innovation support by risk practitioners.

Murray-Webster and Simon (2010) identify the use of consistent RM methods and effective stakeholder communications as techniques to embed RM within the operations and to deliver business value. Furthermore, documentation of risks in a risk register or database can assist to retain knowledge for specific domains. Another good RM practices is to find ways to reward the anticipatory behaviour by highlighting when good RM practices took place and exposures are reduced (Williams, 1995). However, Murray-Webster and Simon (2010), caution against the creation of an organisational culture that rewards those who put out fires while they could have prevented the risks in the first place. The Murray-Webster and Simon’s (2010) RM approach is not tailored to the context (of NPSD) within the organisation.

Failure to have an adequate understanding of the risk can inhibit RM practices. Lyytinen et al. (1996) note a failure to understand the complexity of the risk, relying on ‘simplistic contexts.’ The lack of understanding of the nature of the risk can be aggravated by the use of ad-hoc risk lists. NPSD is complex with high uncertainty, and it does not appear probable that a predetermined list of risks will be sufficient as a solution to address them (Segismundo and Miguel, 2008).

RM needs to consider the risk appetite of the organisation. Innovative organisations will have a higher risk appetite than the non-innovators. It is important to establish the limits that organisations place on the amount of risk they will accept (Leithead, 2000). These indicators will form part of a risk framework. It is suggested by Wang et al. (2010) that the risk framework should be integrated into the performance measurement system of the organisation. Some RM studies (Beasley et al. 2006; Scholey, 2006), consulting companies and CMM models advocate for the integration of RM in performance management. The objective is to create increased awareness of risks. However, CIMA

(2011) cautions that it is not possible practically, especially in complex organisations. Incorrect measures could have the opposite result in that they could create a reluctance to take on risks. CIMA suggests that the existence of a company-wide strategy could be more useful as a frame of reference to consider both risk and performance management activities. RM is intrinsically linked to performance management.

Another vital consideration is ensuring proactive RM. Proactive and preventative measures exceed the benefits of treating risk contingencies (Kim and Meiren, 2010; Sudjianto, Nair, Yuan, Zhang, Kem and Dıaz, 2011). To address risk proactively it is necessary that risk managers should understand the organisational dynamic, project management process and risk factors (Skelton and Thamhain, 2004). It is agreed that proactive identification and mitigation of risks should be encouraged before adversely impacting P&S performance. Even though a proactive RM approach is advisable, in the real world RM processes are often displaced by a reactive fix later mentality (Sudjianto et al. 2001).

Product and project management behaviour can also influence the success or failure of RM. Some product managers can be responsible and committed to resolving risks while others can lack accountability, be seen as incompetent, suffer from information overload, stress, opportunism or just laziness (Skelton and Thamhain, 2004).

Only a small number of activities carried out during projects are related to RM (Besner and Hobbs, 2006). While risk identification is almost always conducted, analysis, evaluation and treatment of risks are often missing (Raz et al. 2002). A comprehensive risk assessment approach should evaluate each potential risk regarding the likelihood, controllability and its relative importance as it relates to the performance of the P&S (Keizer et al. 2002).

The type of RM processes, structures and practices applied will provide an indication of the success of RM practices (Riek, 2001) similar to following a robust NPSD process with clear stage/gate criteria. Utilizing unsystematic RM methods that are based on management perceptions rather than facts might expose the organisation as well as the P&S to risk (Griffin, 1997). A systematic and efficient method to analyse risks should exist to allow assesment of various kinds of risks and guide optimal risk decisions (Tang et al. 2011).

Various best practices for RM have been noted, including skilled resources, providing a customised and tailored RM approach that is integrated with the organisational practices and applying the full risk method. The ISO 31000 methods provide a comprehensive summary of useful RM practices, which incorporates all of these elements and adds a few others. These methods are used in this study to evaluate the effectiveness of RM.

Legal Risks

Legal risks include unprofitable contractual agreements or failure to monitor vendors' and contractors' compliance with agreements. When a third party is involved it is especially important to ensure that the liability of risk is legally transferred or outsourced (Williams, 1995). Sales resources and those responsible for monitoring and controlling contracts should be sufficiently trained to understand complex contracts. Elaborate contractual arrangements impede the ability of sales resources to sell to customers (Berglund, 2007).

Intellectual property (IP) risks should be considered especially where third party vendors are employed to develop solutions, and this knowledge is not transferred to the organisation (McDermott and O'Connor, 2002; Riek, 2001). These vendors should be contractually obligated, and relevant resources responsible for their management must be informed of these obligations. Protection of Intellectual Property Rights (IPR) should consider trademarks and patents associated with the P&S (Keizer et al. 2002; Nada et al. 2010; Riek, 2001). The intention is the protection of the organisation's trade name and trademark rights, thereby ensuring customers are neither deceived nor confused. Failure to protect the use of IP (including international IP rights) and infringements held by others could lead to the retraction of a P&S from the market and result in reputation and litigation risk (Keizer et al. 2005; Nada et al. 2010).

Regulations

The regulatory environment could impact on the probability of commercial success within a market (Cooper et al. 1999). NPSD plays a significant role in deciding the future sustainability of an organisation, which makes it crucial to determine the governmental regulations as they pertain to the specific P&S early during the design phase of the P&S (Ali-Qureshi and El Maraghy, 2011).

Failure to comply with regulations may have grave consequences for the organisation (Bruzelius et al. 2002). The traditional view of regulatory compliance is the infliction of additional costs and lower profits, yet benefits do exist. Rennings and Rammer (2011) propose that the organisation could benefit from less uncertainty with regards to what standards to follow as it removes the temptation to adhere to the lowest compliance standards for as long as possible. Nidumolu et al. (2009) argue for more proactive compliance, stating that complying with more stringent rules before regulations are enforced could lead to substantial first-mover advantage.

Privacy

The researcher thought it applicable to consider privacy concerns in this section, despite hardly any NPSD researcher tabling privacy as a risk for P&S. According to the European Commission (Cyberguide, 2012), more than one million individuals daily across the world are victims of cyber crime. Security and privacy consistently featured as one of the top 10 key concerns for IT executives from 2003 to 2009 (Luftman and Ben-Zvi, 2011). Privacy will continue to grow as a primary concern for customers as a result of increased digitization and the three fundamental trends redefining the emerging technological environment, namely mobility, convergence and massive scale digitisation (Yoo, 2012).

Privacy has passed from the realm of voluntary protection to increasingly being mandated via regulation (Spears, Barki and Barton, 2013). Investments in global cyber security are expected to grow 10% yearly and reached $60bn in 2011 (Cyberguide, 2012). The primary driver for IS security investments is regulatory requirements (Spears et al. 2013).

Cyber security has become a constant risk for organisations. The number of security incidences continues to rise and so do the associated financial losses. PWC's Global State of Information Security ® Survey 2016 reports that the number of detected incidents increased by 48% from 2013 to 2014 (PWC, 2016). The PWC (2016) review further advises that information security programmes have weakened due to lack of investment. The annual growth rate of security incidents increased 66% annually while the financial cost of investigating and mitigating incidences and losses increased since 2013.

As consumers become more knowledgeable about information privacy and feel vulnerable to abuse by the organisation or fraudsters, they will expect firms to address their concerns (Schwaig et al. 2013). These privacy concerns include unauthorised access, the collection of personal information, errors and secondary use of their data. New privacy concerns such as voluntary disclosure of personal data via social media and the increasing use of 'big data' by organisations have emerged (Xu and Belanger, 2013). An overview of the particular privacy challenges that are faced within the NPSD environment are presented in Section16.3: Adapted from the Smith, Milberg and Burke (1996) literature review of privacy dimensions, available in Appendix 7.

If consumer perception of privacy risks were too high, it would strongly influence the intention to use P&S (Martins, Oliveira and Popovic, 2014; Wu et al. 2012). Privacy concerns also impact on the validity and completeness of the information provided by customers (Wu et al. 2012). Customers concerned about privacy are more likely to provide inaccurate information, having a negative impact on the organisation. Collecting data which lacks integrity is a futile exercise and may negate the value of information utilised to assess the target market.

Customer privacy risks form part of perceived risk theory (Featherman and Pavlou, 2003). Privacy risks can result due to a lack of technology security controls and provision of an untrusted technical infrastructure. Hence, privacy relates to a wide area and requires a variety of controls to reduce privacy-related incidents, such as reliable internal processes and good corporate governance practices (Da Veiga and Eloff, 2009).

The most frequently-used definition of privacy refers to the customers' ability to control information about them (Smith, Diney and Xu, 2011). This definition, however, excludes consideration of the right of the individual to privacy, as well as privacy concerns from external stakeholders (Smith et al. 2011). To ensure that a P&S meets the privacy needs of the individual, the laws and regulations, as well as the type or category of P&S need to be considered.

The Protection of Personal Information Act (PoPI) now in effect in South Africa forces compliance to data protection by imposing strict penalties and civil remedies such as liability payments which can run up to millions due to public class actions (South Africa, 2013). The consequences of not complying with PoPI are therefore severe, not only from a regulatory perspective but also in terms of reputational damage and a potential loss of customers. More information about data protection laws and regulations governing business in South Africa are presented in Section in Appendix 7.

2.11.7. Consolidation of NPSD Risk Factors

Table 27: Consolidation of Risk Factors that Impact on Innovation of Appendix 7 provides an overview of the research conducted by various authors in studying risks in NPSD. These risks are grouped into six dimensions. Definitions have been provided for four of the dimensions (refer to section 3.1.5) and it has been confirmed that the definitions are equally applicable to services. Due to the risk literature review, two additional dimensions, namely 'technology' and 'risk and compliance' have been introduced. Technology-related risk has been identified as a key reason for P&S failure. Introducing RM, as an additional dimension, will capture any additional risks that do not fit into the other categories, as well as ensuring that best practice for RM is applied.

Technology risk is defined as the adverse impact of 'threats and vulnerabilities' (ISO, 2008) measured by impacts and likelihoods (NIST, 2002). ISACA (2009) in the Risk IT framework broadens consideration of risks to not only potential adverse impacts but also the consideration of 'enabling risk' as a result of missed opportunities to enhance the organisation. Technology risk is defined based on the ISACA (2009, p. 7) definition and adapted for this study as 'the business risk associated with the use, ownership, operation, involvement, influence and adoption of ICT during the NPSD process'. Risk and compliance are defined, based on the GRC Capability Model, (OCEG 'Red Book' 2.0, 2009) definition as the management of activities to maximise NPSD performance against objectives, while managing risks and complying with applicable laws, regulations and obligations.

2.12. Summary Risk Management

The ability to deal effectively with inevitable risks is a common denominator for NPSD success. The reality is that almost any NPSD activity could contain potential risk. A RM framework according to the ISO 31000 (2009) standard consists of components that support and sustain RM practices throughout the organisation. A comprehensive framework to manage risk in NPSD does not currently exist and is introduced in this study. The framework can assist in the identification of both risks and opportunities to support the development of successful P&S. The preliminary framework as it emerges from the literature review in the preceding sections is subsequently discussed.

2.13. Preliminary Framework

2.13.1. Introduction

Efficient management of innovation risks occurs when organisations proactively implement certain practices during the NPSD lifecycle. Best practices are a 'technique, method, process, or activity that is more effective at delivering a particular outcome than any other technique, method, process or activity' (Kahn et al. 2012, p. 182).

NPSD is subject to many risks which can cause the P&S to fail. The organisation must govern NPSD effectively by ensuring that risk applicable to the particular P&S is identified and mitigated in line with the risk appetite of the organisation. Effective innovation RM considers risks that impact negatively on the P&S, but also the opportunities that could lead to more positive outcomes.

In the literature review, practices that lead to successful NPSD were identified, followed by an evaluation of the different risk approaches used, to ensure effective RM. The organisation must ensure that these are implemented to increase the chances of a successful P&S. Research from the literature review is used to design a preliminary Innovation and Risk Framework. The components of the framework and how they were developed will subsequently be discussed.

2.13.2. Literature Review Framework

The NPSD process and activities are complex, and a uniform language does not exist to provide a comprehensive description of the innovation process (Terziovski and Morgan, 2006). A good way to aid understanding is by providing visual representations. Since the area of analysis is so broad and detailed, the process mapping should provide sufficient detail, but not so much that the understanding of the process is obscured (Ham, 2010). Based on the literature review, two conceptual mappings are provided. Firstly a visual map of the risk NPSD process is offered (in the appendix) and secondly the consolidated categories of the framework are presented. These two artefacts are subsequently discussed.

A visual map of the risk NPSD process is provided in Figure 77 in Appendix 3. The high-level process map demonstrates the pertinent variables of the dissertation, including the lifecycle phases, decision-making points, documented sources of input and output and direction of process flows. Even though the process flows are shown as linear, many activities can be performed concurrently.

The process map explains why RM needs to be integrated with NPSD processes. Risk and opportunities indicate how new risks and opportunities can arise during each phase and how ignoring these risks can negatively impact on the P&S. It also indicates where the introduction of new third parties adds risks to the project.

Development of the second artefact is subsequently discussed. Collective dimensions are described by Morgeson and Hoffman (1999, p. 251) as 'interdependent and goal-directed, combination of entities ... and thus, represents a general model for developing multi-level theories'. Six collective dimensions were presented in the previous sections of the study, as it emerged from the innovation research in the preceding chapter. The function of the dimension can be investigated by determining the output, its impact, objective and value that is delivered (Morgeson and Hoffman, 1999). The collective dimensions were clearly defined during the literature review. These definitions provided a clear basis to determine what second-level constructs fit within these high-level constructs. The high-level constructs and possible second-level constructs are subsequently analysed as presented in Figure 5: Literature based IRMF.

Strategic Dimension: When researchers analysed the dimension of strategy they mainly referred to themes as indicated in Table 28 (Appendix 3). Review of Table 28 illustrates that both P&S innovation researchers, as well as risk NPSD researchers, found portfolio management and strategic organisational alignment as important factors. The remaining elements, namely technology synergy, market synergy, company resources and product strategy are all inputs to determine alignment to organisational strategy and portfolio management. The strategic dimension will, therefore, relate to two main second-level constructs, namely (1) strategic alignment and (2) portfolio management.

Market Dimension: The second dimension of 'market' focused on three main elements as indicated in Table 29 in Appendix 3). When analysing Table 29, the elements most consistently mentioned by researchers are 'customer', 'market' and 'marketing activities'. When analysing the market, it is also necessary to examine the competitors that are part of the market. Therefore, the researcher has combined 'competitor and marketplace' in one category. 'Public and trade acceptance' mentioned by risk researchers forms part of 'competitor and marketplace'

Figure 5: IRMF Literature Based

and is therefore also included in the market high-level construct.

Process Dimension: When Table 30 (refer to Appendix 3) is analysed, some dimensions (marked with *) are indicated which contribute to the development of successful P&S. The four key functional activities that determine the success of P&S are: following an NPSD process; project management; product management; and financial activities. These are core activities conducted by the NPSD specialists. All the other factors can be consolidated within these four main dimensions. NPSD process is excluded from the associated activities, and risks are decomposed within the IRMF, and the whole framework is representative of the NPSD process. The second-level constructs informing the process dimension are: (1) project management; (2) product management; and (3) financial management.

Organisation Dimension: Table 31: Organisational (refer to Appendix 3), indicates the major themes relating to the organisation. Important organisational factors, therefore, include top management support, communication and management of relations between functions, ensuring a corporate culture or climate of innovation, validation of the organisational structure in support of NPSD activities and the existence of champions. Organisational factors are manifested as attitudes, which are difficult to measure. Behaviours can indicate support for innovation concerning organisation structure, how management support manifests in resource planning and communication during the NPSD lifecycle. Organisational factors have been treated as three sub-dimensions namely (1) organisational structure (2) management and (3) resources.

Risk and Compliance Dimension: Researchers have identified additional supplementary risks that do not fit within the other NPSD risk categories. These factors are summarised in Table 32 (refer to Appendix 3). Risks external to the other categories can relate to statutory, regulatory, contractual, laws, audits and organisation policy requirements. RM as a second-level construct is excluded from the ramework since the framework represents RM within innovation. The two primary second-level constructs underlying the high-level construct are identified (1) Regulatory and Legal Compliance and (2) Supplementary risks.

Technology Dimension: Table 33 (refer to Appendix 3) indicates the central themes of risks relating to the technology dimension. The high-level consruct of technology consist of two second-level constructs namely (1) technology operations; and (2) technology innovation aspects.

The sub-dimensions are further qualified in Table 34 (refer to Appendix 3). This conceptual framework based on the literature review serves as a foundation for the AR study to develop and evaluate a more comprehensive IRMF.

2.13.3. Conclusion

NPSD is deemed to be the key to unlocking growth and value in the organisation. NPSD is however characterised by fast-changing markets, technology and regulatory requirements. Many NPSD projects are unsuccessful, with the success rate typically reported as below 25% (Evanschitsky et al. 2012). Numerous NPSD projects suffer from delays, failures and cancellations that can be attributed to inefficient RM. It is for this reason that RM has increasingly become more vital in the innovation literature as a universal denominator for successful NPSD.

During the literature review, two streams of academic research were analysed, namely innovation management and RM. Both best and poor practices and risks relating to NPSD were revealed that should be emulated or avoided. The effectiveness of risk studies conducted in NPSD was discussed, and it was recognized that the ISO 31000 (2009) standard could be effectively applied within the context of NPSD. Initial development of the IRMF, based on the innovation literature review, revealed four collective constructs, which were expanded during the risk literature review to six constructs. The constructs were then further analysed to determine the functional sub-constructs aligning to the central constructs, which form the basis for the IRMF.

Crossan and Apaydin (2010) state that innovation research is predominantly based on the theory of practice described as 'macro level' of theorizing while research is needed into the 'managerial reality' at the 'micro-level' as it unfolds on a daily basis. The AR study is designed to address this gap by studying practitioners in praxis (action) based on practice (managerial and academic 'espoused' theories) (Whittington, 2006).

3. Chapter 3 – Research Approach

3.1. Introduction

This chapter explains how the AR study took place, which interventions were introduced and why these can be regarded as trusted artefacts that can assist organisations to improve RM in new P&S. As indicated in Chapter 1, Section 1.6, it is expected that an AR thesis can be longer than a traditional study (Bryman, 2007; Dick, 1993). This particular research is complex, using both quantitative and qualitative data gathered over a period of five years. The artefacts developed from DS and AR require academic grounding and establishment of integrity and rigour of the research. The mixed-methods similarly require proof of robustness. The use of mixed methods and both DS and AR allow a robust and comprehensive representation of 'real-word' NPSD organisation. The researcher acknowledges that this chapter might be longer than expected, but hopes that the justification is sufficient to allow the researcher additional pages to demonstrate depth, integrity and rigour of the research.

This study follows a prescriptive, interventionist approach. The underlying philosophy is pragmatism, which forms the foundation of mixed-method studies (Tashakkori and Teddlie, 2003). A variety of research artefacts have been developed concurrently and sequentially during the duration of the study. The use of mixed methods provides opportunities for improved validation of the research, produces richer data and assists in the generation of new knowledge (Rossman and Wilson, 1985).

The study follows several stages, using mainly four types of methodologies. Each phase provides input into the subsequent stage. The research was not always conducted sequentially and at various stages, the literature was reviewed to make sense of new variables introduced during the AR iterations of the study. The following schematic presentation demonstrates the research instruments utilised by the study. The research instruments referred to are:

- The literature review, which analysed the factors that are important to ensure the launch of optimal new P&S and a second literature review, which examined the risk factors that could inhibit the launch of superior P&S. The results of both these literature reviews were the development of best practices, as well as risk factors for innovation, which were consolidated in a preliminary innovation and risk framework as shown in Chapter 2. The literature review was refined over numerous iterations;

- The AR study, which was carried out to improve the framework over various iterations. DS was undertaken to develop an artefact that operationalized the framework. Interviews and questionnaires were designed to support and validate the framework and the research. Additional literature reviews were performed to support the developing requirements of the study;
- The analysis and interpretation of the action iterations, DS artefact, interviews and questionnaires, as well as additional data collected during the AR cycles;
- The IRMF, which was refined and consolidated into recommendations that can be used by risk and innovation practitioners to ensure more efficient P&S.

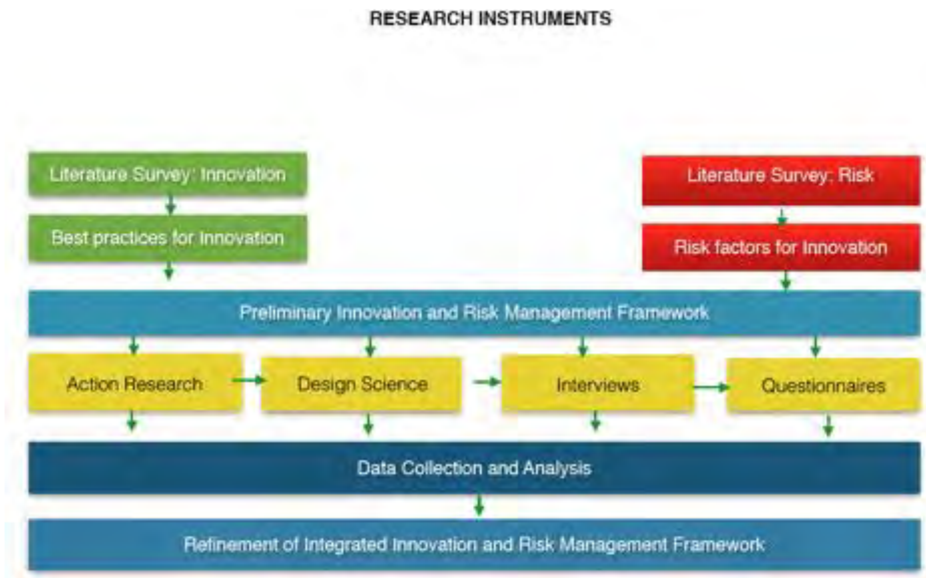

Figure 6: Research Phases and Instruments

These phases were not conducted sequentially, but rather developed during the AR iterations. The next section describes the theory that guides the research and the approach used to do the research.

3.2. Research Paradigm

The research paradigm reflects how the researcher observes the world (Burrell and Morgan, 1979). It provides the foundation according to which shared beliefs, values and techniques were utilised by the study (Kuhn, 1970). The influence of the paradigm is mirrored during the various cycles of research and reflection (Carroll and Swatman, 2000). It is, therefore, important that the researcher chooses a paradigm that reflects their view (De Vries, 2007). Consequently, the discussion considers the epistemological foundation of AR, the core research method of this study.

3.2.1. Foundations

AR builds on realism rather than objectivism. A realist accedes that a unique uniform understanding of the world does not exist and that all knowledge is inherently subjective, interpretative and provisional (Maxwell, 2012).

Social science researchers have debated the epistemological foundations of AR over the years as either interpretative or pragmatic (Lau, 1997). While the result of all research is knowledge (increased understanding of phenomena that are of interest to the world) (Walsham, 1992), there are nonetheless fundamental differences with regards to how the pragmatist and interpretivist view and use knowledge. As these two approaches are related, the differences are subtle in nature. The main characteristics and differences are reviewed in Section 17.9. of Appendix 8. It was important for the researcher to understand the distinctions since the AR approach utilised by this study is based on Iversen et al.'s (2004) AR study, where the underlying epistemological foundation was stated as 'interpretive' while the paradigm underlying this study is 'pragmatism'.

Both stances can provide invaluable insight into the real world phenomena. Since this study focuses on the introduction of change initiatives and focuses on actions rather than merely understanding, the underlying philosophy is one of pragmatism. Pragmatism also serves as the foundation for Design Research (DR) that will additionally be utilised in this study (Baskerville and Myers, 2004).

Goldkuhl (2012b) introduces further distinctions concerning the forms of pragmatism employed by this study. Pragmatism consist of three types, namely: (1) functional; (2) referential; and (3) methodological. Functional pragmatism refers to the creation of practical knowledge that is useful for the organisation being studied but also applied to general practices in a wider field. Referential pragmatism refers to the study of the actions of actors as the primary focus of the study. Methodological pragmatism studies how knowledge is created and emphasises the active role of the researcher where experimentation is conducted by using different research methods. This study mainly follows the functional pragmatism paradigm but some elements of methodological pragmatism are introduced.

Since pragmatism constitutes the theoretical foundation for the research, four distinctive principles drive how AR can be conducted. Baskerville and Myers (2004) list these principles as: (1) human interaction has consequences (Peirce's tenet); (2) truth exists in practical interventions (James' tenet); (3) controlled analysis is logical (Dewey's tenet); and (4) human action takes place in a social milieu (Mead's tenet). The implications are that AR is conducted in complex social settings. Controlled action requires a precise identification of the purpose of the action and the underlying supporting theory. In turn, action should inform and validate the theory with actions that take place in collaboration with actors within a social context, which have certain consequences (Baskerville and Myers, 2004). The next section describes the implications of these principles for designing AR studies.

3.3. Action Research

AR is widely believed to originate from Kurt Lewin (Lewin, 1951), although this is disputed by Altrichter and Gstettner (1993) cited by McTaggart (1997), who claim that Moreno (a physician and social scientist) used the term as early as 1913. Whatever the origins, AR is a research method grounded in participatory actions between researchers and practitioners, facilitating social change by striving to improve results. Lewin's (1951) theory has been widely adapted, of which the work of Enid Mumford is particularly significant (Baskerville and Myers, 2004). She introduced AR to the IS field by presenting a collaborative systems development technique called ETHICS. Wood-Harper, Antill and Avison (1985) later utilised AR elements when he designed a system development methodology called Multiview. The next landmark for AR was achieved when Checkland (1991) used AR to develop the soft systems methodology, combining systems development and AR practices (Baskerville and Wood-Harper, 1996). Since then, AR has been considered to be an acceptable research method for IS research.

3.3.1. AR Background

The central premise of pragmatism is action. Earlier AR studies such as that conducted by Blum (1955) utilised two-stage action processes such as diagnostic and therapeutic stages. It is during the taking of actions that value is added to the research since IS are complex and can be best understood when changes are observed (Baskerville, 1999) How these cycles of actions introduce knowledge are demonstrated in Figure 7 following Goldkuhl (2012) and Mead's (1938) concepts.

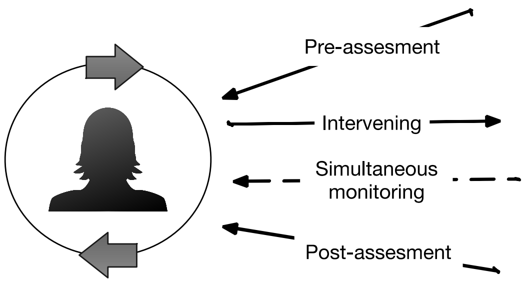

Figure 7: A Cyclic Model of Human Action (Goldkuhl, 2007)

Pre-assessment is an internal action (indicated by an incoming arrow) that takes place when the researcher considers different courses of action based on perceptions of the world. Intervening (indicated by an outgoing arrow) shows the implementation of interventions to influence practices from which knowledge is gained to use for further interventions to be – as Goldkuhl (2012, p.141) describes – 'helpful to the world'. Simultaneous monitoring takes place when the researcher monitors the action, and finally, post-assessment is the phase during which the researcher evaluates the outcome of the intervention. From Figure 7, it is evident that AR is conducted by following an iterative approach, starting with ideas for improvement, which is refined via iteration cycles.

A widely applied AR approach is demonstrated in Figure 8, namely the 5-phase cycle of Susman and Evered (1978). The phased approach starts with the establishment of a client-system infrastructure. This refers to the agreement between the researcher and the organisation regarding how the research will be undertaken and specifies how relationships with practitioners will be governed. Within this context, iterations take place that follows five identifiable phases namely: diagnosing; action planning; action taking; evaluating; and specifying learning. The five stages are briefly described as follows:

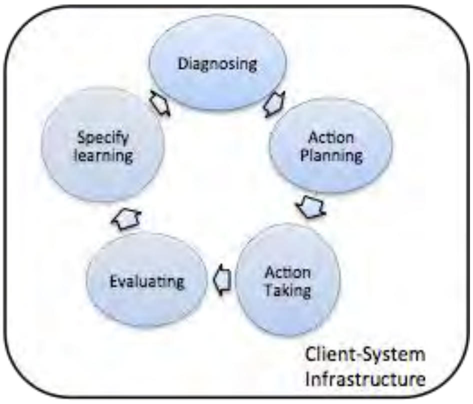

Figure 8: Five-phase Cycle of Action Research (Susman et al. 1978)

- *Diagnosing:* The primary problem is defined and explained as are the underlying causes of the problem.
- *Action planning:* The preliminary steps and means to address the problem situation are selected.
- *Action taking:* The planned intervention is implemented.
- *Evaluating:* The practitioners and researchers assess the outcome to see if the objectives of the intervention were achieved.
- *Specifying learning:* It is established whether learning took place. The evaluation considers whether: (1) the intervention impacted on organisational norms to reflect the new knowledge or 'double-loop' learning (Argyris and Schon, 1978); (2) the intervention was successful and whether the knowledge can be applied in the further interventions; and (3) whether the theoretical framework was a success or failure.

Checkland (1989) later added an explicit 'exit' phase of the AR process, which signals the phase where the researcher explicitly withdraws from the iteration of the AR process.

The researcher can choose to follow one of several types of AR methodologies. A wide range of terms has been applied to describe various types of AR. Baskerville (1999) found 11 AR approaches while Goldkuhl (2012) found 14 different methods. Refer to section 7.13 of the appendix for a listing of these approaches.

Because AR has grown out of different social contexts, AR differences are informed by what Herr et al. (2005, pp. 2-21) describe as 'purposes, positionalities, epistemologies, ideological commitments, and, in many cases, different research traditions'. Since AR has diversified over the years into many variants, Raelin et al. (1999, p. 222) went as far as claiming that AR 'means so many things to so many people that it is methodologically useless to distinguish one strategy from another'. Goldkuhl (2012) responded that far from regarding AR as useless, there is a need for further clarification of the distinctive criteria and boundaries that define AR approaches.

The three most consistently used AR types in mainstream IS research are Collaborative Action Research (CAR), Participatory Action Research (PAR) and Collective Practice Research (CPR) according to De Vries (2007). All three approaches use collaboration to introduce interventions (Hult and Lennung, 1980; Mathiassen and Sandberg, 2012). The research approach followed by this study utilises the Iversen et al. (1999) CPR approach. It was based on the Mathiassen (2002) study that described CPR as balancing relevance and rigor by combining experimental action research and conventional practices. The approach originated during the 1980s (from Scandinavian IS research) to improve systems development practice (Mathiassen, 2002). It has three characteristics, namely: (1) the improvement of professional practices; (2) collaboration; and (3) following a pluralist methodology (Iversen et al. 2004).

How collaboration varies between parties is another distinctive attribute introduced by the type of AR utilised. Participation can range on a continuum from absolute control by the researcher to an entirely democratic process where a community makes decisions. Herr (2005) advise that the 'positionality' of participation can impact on the validity of results, power relations and ethical considerations for the study. The positional influence of the researcher can introduce biases during the interpretation of the study, which can be addressed by clearly describing the role of the researcher (Näslund, Rahul and Paulraj, 2010). The tracking of how collaboration and the influence of the researcher progress during the lifecycle of the study are therefore essential elements of AR.

Huang (2010) describes the degree of collaboration between researcher and practitioners as two opposing poles of 'low-involvement' versus 'high-involvement'. During low-involvement AR, collaboration takes place but practitioners share their perspective on important matters, while during high-involvement situations the practitioners act as co-researchers. Clark (1972) refers to high-involvement researchers as organisational scientists. The participatory method employed by the research can be described as 'cooperative' according to Herr (2005). Cooporative implies that the researcher directs the process but collaborates to plan and implement the interventions. The researcher works as a practitioner-researcher that places the practitioner mostly as an insider within the context of the study.

Chisholm and Elden (1993) advise that role clarification is of particular importance during the following three stages: (1) planning and conducting the research; (2) interpreting and communicating the results; and (3) learning from the process via discussion and writing. The changing roles of the researcher and participants should also be clearly explained as these roles can change during the action iterations (Checkland, 1991). This researcher direct involvement gradually dwindled during AR iterations until the final iterations when direct participation is limited.

Another way to think about how the researcher positions themselves within the research is presented by Herr (2005). The continuum or degree of insider/outsider orientation is presented in Table 3 below as adapted from Herr (2005).

Table 3: Degree of insider/outsider orientation (Herr, 2005)

(1) Researcher studies own self/practice	(2) Insider in collaboration with other insiders	(3) Insider(s) in collaboration with outsider(s)	(4) Reciprocal collaboration (insider/outsider teams)	(5) Outsider(s) in collaboration with insider(s)	(6) Outsider(s) studies insider(s)

On the continuum depicted above, the researcher functioned at a level 2, as an insider who worked in collaboration with other insiders but operated as an outsider to the NPSD department. At the start of the research, the whole team of risk practitioners, who were a newly formed team, initially performed as outsiders to the NPSD teams. The risk practitioner team was required to build insider knowledge of the NPSD process and activities as well as reflect on the leanings that emerged during their work activities (Coughlan and Coghlan, 2002).

The researcher was familiar with the culture of the organisation, as she had been employed there for more than 10 years in a variety of positions. The practice of research basically constituted her everyday working environment. She was not an outside researcher who was totally unfamiliar with the working environment but functioned as what Mathiassen and Sandberg (2012) refer to as an 'inside researcher and practitioner', who was unfamiliar with AR.

The term 'positionality' also refers to position in the organisational hierarchy (Herr, 2005). Since the researcher was in charge of the division, care needed to be exercised regarding managing power relationships, specifically to prevent coercion to follow the 'personal agenda' of the researcher (McPherson, Smith-Lovin and Cook, 2001). The influence of the researcher can be minimised by (1) a clearly defined researcher role; (2) using additional researchers during the different AR phases; and (3) applying triangulation approaches to increase rigor and improve results (Näslund, Kale and Paulraj, 2010). Such methods have been employed in this study.

3.3.2. Motivation for the use of the Action Research Approach Followed

Due to the ‘unique attributes’ of AR, it is necessary to discuss why AR would be considered suitable for the research study (Näslund et al. 2010). The next section will address this requirement, followed by an explanation of the AR approach utilised.

The answer to why AR was adopted for the study is threefold. Firstly, a change was required to solve a real business problem. P&S of the organisation were exposed to risk, leading to the implementation of risk change interventions and risk processes within the NPSD functions. AR is suitable for the study of change processes.

Secondly, the context being studied is complex. NPSD is multi-faceted and influenced by many variables, such as new markets, new ventures, new business models, third parties and technologies, as well as the people, processes and systems applied within these departments. The research consequently required an improved understanding of a social context with multiple variables (Hult and Lennung, 1980). Again, AR was found to be suitable for the study of complex social contexts. The researcher adopted the AR approach because a major strength of AR, according to Levin (2012), is solving pertinent real-world problems via the researcher’s active involvement within the process. The change should be ‘real’ according to Susman and Evered (1978), which (from the perspective of this study) meant that risks should be adequately considered and managed by the NPSD teams.

Thirdly, AR is deemed to be a suitable methodology where the focus is on solving real-world business problems (Näslund et al. 2010). Close collaboration between the researcher and professional practitioners is required to improve professional practices (Iversen et al. 2004). AR is unique regarding what Avison et al. (1999) describe as ‘research informing practice and practice informing research’. This is highly suitable for this type of study.

AR, unlike conventional social science, is not primarily to understand practices but also to transform these practices by empowering stakeholders through the process of expanding knowledge (Huang, 2010). The process of how AR is intellectualized is explained by using Checkland’s (1989) ‘organised use of rational thought’ model.

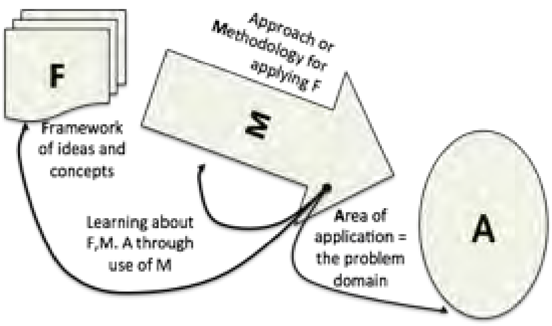

Figure 9: Organised Use of Rational Thought (Checkland, 1985)

The model is illustrated with the assistance of Figure 9. It consists of a framework (F) of linked ideas, methodology (M) for using the framework and an area of application (A). The 'ideal domain' is one where M can produce the most valuable information about F within the context of A. Baskerville and Wood-Harper (1996) explain an 'ideal domain' for AR as a setting that allows the researcher to (1) actively participate; (2) apply knowledge immediately; and (3) link theory and practice via the cyclical iterations.

The 'domain of ideal use' should also analyse a complex problem (Baskerville and Wood-Harper, 1996). As NPSD is progressively being exposed to more technical, economic, political and social risks, NPSD development teams need to manage a broad range of risks to ensure successful P&S (Williams et al. 1995). AR would, therefore, be a good methodology to use for analysing risks in NPSD as it assists with practical problem solving, a deeper understanding of the context and implementation of change (Checkland, 1985).

This study combines the components of Checkland's (1989) 'organised use of rational thought' model using the Iversen et al. (2002) AR cycle approach. The method is explained by using Figure 10:

- *Research themes:* The two primary areas of interest are NPSD and RM. The two fields are combined and serve as the context for examining how risks can be effectively managed within the NPSD environment to ensure more successful P&S.

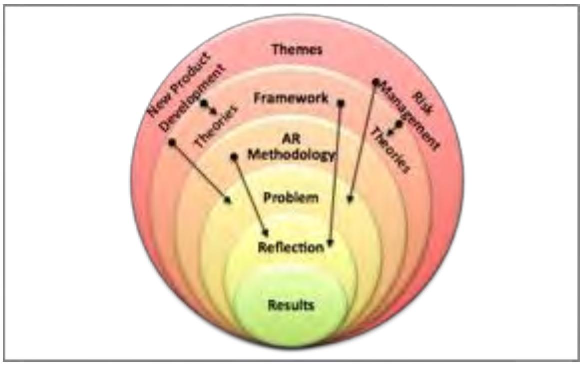

Figure 10: Action Research Method

- *Research framework (F):* The study is based on theories and concepts from NPSD as well as RM. These are indicated by way of arrows flowing into the framework. The foundation for these theories was discussed during the literature review (Chapter 2) and within this Chapter.

- *Research methodology (M):* The study is guided by the AR methodology that was followed as described in Section 3.3.2.1.

- *Real world problem situation (A):* The problem area that was researched is to effectively manage risks in NPSD to improve the organisations RM and NPSD capability.

- *Reflection:* The researcher accumulated experience and reflected on (F) the IRMF, as well as risk processes and (M) the AR methodology.

- *Results:* The findings are critically reviewed to identify and document research contributions.

The research frameworks (F) are introduced in the literature review (Chapter 2) and research approach (Chapter 3). The research methodology (M) is presented in the next section of this Chapter. The real world problem situation (A) is introduced during the AR practice (Chapter 4) in which reflection also takes place, but expanded in the presentation of the research results (Chapter 5).

3.3.2.1. The Design of the AR Study

There are numerous ways to perform AR research (Baskerville and Wood-Harper, 1998). This study is based on the research framework of Iversen et al. (2004) who conducted one of the few IS studies which utilised AR with the objective of managing risk in Software Process Improvement (SPI). There were both similarities and differences between the approaches followed by this study and by the Iversen et al. (2004) study. Both studies explore RM, but in different contexts: The Iversen et al. (2004) study investigates the domain of SPI, while this study focuses on NPSD. Differences exist between the extent of the real world problem situation, the epistemological foundation and the client framework, which is explored in more detail in Appendix 8 (refer to Table 90). The researcher has aligned the structure of the thesis according to the Iversen et al. (2004) study, but due to the larger scope of the study, some variations have resulted.

Iversen's et al. (2004) methodology was developed by combining AR approaches followed by Checkland (1989), McKay and Marshall (2001) and Susman and Evered (1978). Iversen's et al. (2004) AR methodology consists of three main steps and ten sub-steps as indicated in Figure 11.

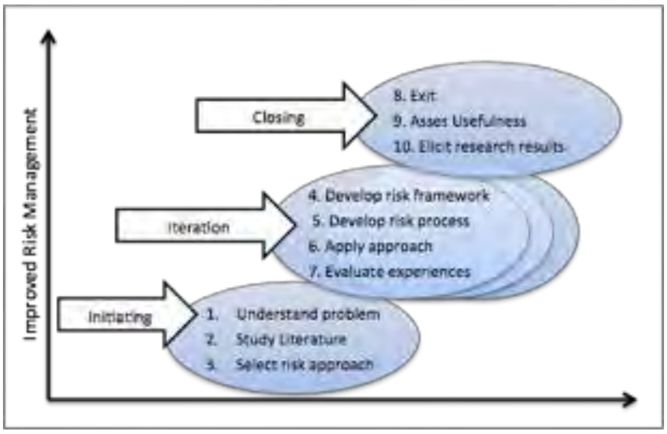

Figure 11: Overview of Iversen et al. (2004) Action Research Process

- *Initiating:* The objective of the initiating phase is to understand the context and purpose of the cycle. It provides the rationale for the development of the action interventions. It involves the identification and interpretation of the complex organisational problem in a holistic fashion (Baskerville, 1999). Iversen et al. (2004) use three steps, namely (1) appreciate the problem situation (2) study literature and (3) select risk approach. The selection of the risk approach is the activity that would improve the situation and the changes that need to be implemented to reach the objectives. The step includes both a target and plan to implement change initiatives guided by a theoretical framework (Baskerville, 1999).

- *Iteration:* During the iteration phase, the planned actions are implemented. The practitioners and researchers interact to deliver the proposed solution. This phase consist of four steps (continuing the numbering of the stages in Figure 11) to: (4) develop a risk framework; (5) design a risk process; (6) apply the approach; and (7) evaluate the experiences. Developing the risk framework and risk process is not a sequential activity and can occur in parallel. Application of the approach takes place when the risk framework and process is implemented in collaboration with the relevant key practitioners to obtain the desired change that is required. Evaluation of the experiences is achieved via reflection on both intended and unintended outcomes of the approaches implemented, including failure, errors and frustrations (Coughlan and Coghlan, 2002). It provides essential learnings regarding the framework and methodology and informs the actions that are required for the next cycle. The iteration process takes place in three cycles.

- *Closing:* During closure, monitoring of what and how actions occur within the iteration takes place, and this is the focus of the academic dissertation (Coughlan and Coghlan, 2002). The closing stage consists of: (8) an exit, (9) an assessment of usefulness; and (10) eliciting of research results phase. Even though this activity is indicated last, it is undertaken as an on-going process during the AR cycles.

The predefined action plan was to develop and implement interventions over a one-year period, where the objective was to deliver an RM framework customised for managing risks within NPSD. The first iteration was predefined, but the rest of the iteration phases were not planned. As Coughlan and Coghlan (2002) explains, action emerges from attempts to meet objectives, which means that cycles following the first iteration can be anticipated but not planned in detail. The second cycle does not proceed until the issues experienced during the first iteration are studied in more detaill.

O'Brian (2001) states that AR is not dependent on a single approach to collect and analyse data, but allows for the use of several different research methods. A more holistic approach to solving the problem can be achieved by using a variety of research methods. Coughlan and Coghlan (2002) advise that data collection should consider five aspects, namely: gathering data; feedback; analysis; planning actions; and monitoring. These activities are reviewed in Table 91 (refer to Appendix 8). The Coughlan and Coghlan (2002) criteria were used to develop a data-gathering plan. Data was gathered from different sources to allow multiple interpretations as explained in Table 4.

Table 4: Data Sources

Data Source	Explanation
Direct involvement	The researcher was directly involved during the development of P&S and had a leading role in all the interventions that were implemented for this study.
Project documentation	Complete documentation regarding the P&S that was launched by the organisation, including functional specifications, technical design specifications, concept development documentation, testing documentation, market research and communication plans, project management minutes, meeting

Data Source	Explanation
	minutes, email communications, presentations, stage/gate meetings presentations and documentation, NPSD process documentation.
Case studies	A number of case studies were conducted to determine lessons learnt.
Minutes of meetings	Minutes of meetings to plan interventions and discuss outcomes of interventions.
Risk practitioner documentation	Risk reviews per P&S, stage/gate deliverables, post-implementation reviews, email communication, meeting minutes, risk database with incidences, risk factors identified, resolution strategies, risk and control database.
Research notes	Design of interviews and surveys, complete interview and survey results, development of processes and framework, training material, development of toolkits, evaluation of results of interventions, retrospective questions asked during evaluation.
Participatory observations	Individual consultations and informal discussions with risk practitioners and NPSD practitioners regarding how problems were perceived and evaluated.

Archived data include the minutes of relevant meetings, primary NPSD documentation and secondary information such as presentations, memos and email correspondence, informal meetings, verbal conservations and extensive time spent (five days a week, often after hours and weekends) working within the organisation. The sequencing of data collection varies on a per project basis. The data gathering strategy was tracked during the various iteration phases. During multiple cycles of the AR iterations, the number of projects and documents were tracked for certain periods to provide estimates of the volumes. It was not an ongoing activity during the AR cycle as the risk team was overloaded with work objectives and strict adherance to time pressures and it was not practically feasible to count every single document.

3.3.3. Criticisms faced by AR Practitioners

Since AR is exposed to various criticisms, it is important to understand these criticisms to ensure that the researcher can address these during the AR study. One of these is that AR frequently needs to be defended against the charge of consulting (Baskerville and Wood-Harper, 1996; Näslund et al. 2010; O'Brien, 2001). Both consulting and AR had the same foundations of Lewin (1951), but Schein (1969) diverged to developing the consulting methodology based on similar cycles and concepts.

Gummesson (2000) presents four ways in which consultancy and AR are different: (1) AR researchers are more rigorous in their inquiry and documentation than consultants; (2) AR researchers justify their findings based on theoretical validations, while consultants require empirical explanations and offer best practices solutions; (3) Consultants are subject to tight deadlines and budget constraints; and (4) Consultation is linear while AR follows a cyclical approach. Consultants engage, analyse, action and disengage while AR researchers gather data, provide feedback, analyse the data, plan action, take action and evaluate the outcomes that lead to further data gathering. The difference is that consultants develop an understanding of the problem situation by being independent while AR researchers improve understanding through iterative experimental engagement.

Baskerville (1999) offers further distinctions between consultancy and AR as follows: (1) consultants are primarily motivated by money, while the motivation for AR researchers is to expand on scientific knowledge; (2) a consultant's commitment is towards meeting the needs of his or her client, while the AR researcher's commitment is towards the scientific community; and (3) a consultant's approach towards the organisation is as an external party to the organisation, offering an objective perspective, while the AR researcher's approach is collaborative. While some similarities might exist, the main difference that distinguishes AR from consulting is that a scientific process and clear criteria are followed (Goldkuhl, 2012).

AR has some disadvantages when compared to other more traditional positivistic research approaches. Firstly, the time commitment is immense, and secondly, collaborative AR has idealistic objectives that are not easily achievable. According to Kindon, Pain and Kesby (2007, p. 24), some of these lofty goals include creating a culture of:

> [m]utual understanding and respect, sensitivity to difference in organisational cultures and goals, networking and sharing information, recognizing and strengthening individual and group capacities, questioning priorities, formulating questions so as to foster change and not simply to 'explain' what is, and, not surprising dealing with diverse personalities.

Some of the challenges in meeting AR objectives are subsequently considered. AR is not always collaborative as the term describes a range of activities that are not all participatory in nature (McTaggart, 1994). Sometimes, organisational priorities could override the research objectives. It is not always possible to strive for consensus. According to Levin (2012), striving for consensus can undermine observations resulting from experience. The research results (Chapter 5) will explain the extent to which the research conformed to ideals.

A further difficulty inherent to AR studies is that it could be difficult to obtain degrees and publish articles in scholarly journals since AR is perceived to lack the required scientific rigor (Baskerville and Wood-Harper, 1996). Scientific rigor is the term that is used to denote that sufficient scientific discipline was applied to the application of the cyclical theoretical infrastructure. As AR follows a qualitative approach, it is necessary to ensure that the findings can be validated via the use of robust control mechanisms. Rigor can be introduced by controls such as the utilisation of multiple research methods.

AR research can additionally be exposed to problems that are typically experienced in social science research. The researcher can be accused of a lack of impartiality due to being actively involved in the AR process (Baskerville and Wood-Harper, 1996). Rapoport (1970) advises that the researcher needs to guard against over involvement in the research and always keep good ethical behaviour in mind. Personal interests should be stated by the researcher upfront (Winter, 1987).

To identify the sources of learning is another challenge presented by AR. Baskerville and Wood-Harper (1996) state it could be difficult to establish if learning occurred as a result of the researcher, methodology or other environmental factors. The origins of knowledge are confirmed by applying cross-method triangulation research.

An additional critique of AR includes the similarity to DR approaches (Cole, Purao, Rossi and Sein, 2005; Järvinen, 2005). A clear conceptual view of AR is required to understand how AR and DR relate (Goldkuhl, 2012). A more rare critique of AR is that it could be seen as 'glorified case study research' (Järvinen, 2005). Biased research findings could result, and ethical conflicts might arise if the research is funded by the organisation (Rapoport, 1970). For this study, no funding was providing by the organisation.

The researcher has considered these important critiques and guarded against potential weaknesses of the study. Some of the critiques are addressed by the use of the AR criteria (described in the next section) but are also attended to during the AR iterations. Since concerns can legitimately be addressed, AR remains a valuable method to be applied in this study.

3.3.4. Research Criteria

Action Research Criteria

AR should be relevant and rigorous. Relevance relates to the development of insights that allow a better understanding of the organisation while rigor focuses on justifying the claims of the research (Näslund et al. 2010). To meet both objectives, it is essential to engage in a rigorous approach while solving the business problem (Vermeulen, 2005). Partanen et al. (1999) state that there is a lack of guidelines for researchers on how to conduct AR as well as a lack of criteria for evaluation. Lau (1999) has produced the most comprehensive list of the assessment criteria for AR, most often cited in IS literature. Lau's evaluation criteria are consolidated from criteria advocated by Baskerville (1993); Baskerville and Wood-Harper (1996); Baskerville and Wood-Harper (1998); Candlin and Wright (1991); Checkland (1991); Chisholm and Elden (1993); Hult et al. (1978); Kock et al. (1997); Lau (1997); and Jonsson (1991).

Lau (1999) divides the research criteria into four major dimensions: (1) the conceptual foundation; (2) study design; (3) the research process; and (4) role expectations. Avison, Baskerville and Myers (2001) offer supplementary criteria to improve rigor, such as initiation control procedures, authority definitions and AR control structures. The criteria for ensuring robustness of Canonical Action Research (CAR) are expanded by Davison, Martinsons and Kock (2004). De Vries (2007), evaluated 30 AR studies published from January 2000 to October 2006 and developed an expanded framework that advocates six principles and criteria for the assessment of AR rigor. The expanded criteria were evaluated and included in the original format of the Lau (1999) framework. Some descriptions were changed by the researcher; for instance 'assumptions, perspectives and traditions' have been renamed 'epistemology' to ensure that a more narrow focus is adopted to increase robustness. Additional criteria, which the researcher has deemed pertinent to the study, have been added, for example the notion of transferability (Mathiassen, 2002; Iversen et al. 2004).

Lau's (1999) expanded framework is both descriptive and prescriptive. The evaluation framework used in the study includes a description of the features of IS AR but also defines criteria on how AR studies should be assessed. Tables and descriptions of research tests are presented in Appendix 8 (refer to Table 92, Table 93, Table 94, Table 95), which were used to evaluate the robustness of the research. The researcher acknowledges that the study is subject to divergent validities.

Action Research Evaluation

The AR contribution has been analysed to determine conformance to the evaluation criteria.

Table 5: The Principle of Researcher-Client Agreement

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based Action Research
Did both the researcher and client agree that the CPR-action based research was appropriate for the organisation that was studied?	The Researcher client agreement clearly outlined the research process and how this would be conducted with a description of the iterative process and the intention to deliver interventions for risk practitioners and NPSD professionals to follow and obtained formal approval from the CRO and executives in HR. The research theme addressed an immediate practical and significant problem in an organisation.
Was the focus of the research project clearly and explicitly identified?	The focus of the study was to ensure that risks in NPSD are adequately managed and both the organisational and research interests were aligned. The research objective was to implement RM within NPSD. How this was achieved was largely left to the discretion of the researcher.
Did the client make an explicit commitment to the project?	The CEO of the company provided additional risk resources and a mandate to the risk team that P&Ss could be stopped before launch if excessive risks remain and it could result in reputational damage to the organisation. The exclusive focus of the risk resources was on managing risks in NPSD.
Were the roles and responsibilities of the researcher and client organisation members specified explicitly?	The roles of the researcher and practitioner were dileniated according to the practitioner's work targets that needed to be achieved while the researcher focused on practices and approaches applied to improve the approaches followed that could be implemented within the working environment.
Were project objectives and evaluation measure specified explicitly?	The project objectives were defined as delivering of an innovation and risk management framework and supporting risk processes to improve RM in NPSD.
Were the data collection and analysis methods explicitly identified?	The researcher-client agreement sanctioned the collection of data to determine risk incidences that informed the framework, but was bound by a confidentiality agreement not to divulge information that could be perceived as harmful to the organisation. Meta-data and strategic themes could, however, be reported.

Section 3.3.4.1 provides a more detailed overview of the researcher-client agreement.

Table 6: The Principle of Cyclic Agreement

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based Action Research
Did the project follow the cyclical process model or justify any deviation from it?	The AR project followed three apparent cycles of iteration during which the primary deliverable was developed and refined. Three cycles in initiating, iterating and closing stages were followed for all of the cycles. Each cycle improved the risk practitioners understanding of the intervention.
Did the researcher conduct an independent analysis of the organisational situation?	Each AR cycle started with an independent diagnosis of the situation and provided an idea of how the organisation expanded during this time and how the research interventions were adapted to fit the context of NPSD.

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based Action Research
Did the planned actions result due to the diagnosis?	The only objective that was defined upfront was to deliver an innovation and risk framework, which remained constant during the other cycles. Input into the risk framework was very much informed on the result of the diagnosis and the changing context of the research. Additional interventions were solely based on the results of the diagnosis.
Were the planned actions implemented and evaluated?	All the interventions were developed and implemented with the assistance of participants and assessed regarding whether the intervention was appropriated to address the future problem and the effectiveness thereof.
Did refection on the outcome of the intervention occur?	During the cycle of iteration and specifically at the end of an iteration the researcher in collaboration with practitioners reflected on the results of each intervention to ensure that learning can be identified and communicated. Reflections included consideration of the context, interventions applied, actions and outcomes of the intervention and what education was obtained regarding knowledge, skills and experience. Double-loop learning concerning new knowledge that is acquired and how the organisational norms changed as a result were also introduced as part of reflection.
Was this reflection followed by an explicit decision on whether or not to proceed through an additional process cycle?	The reflection period was incorporated into stage seven (evaluate experiences) and was explicitly followed by an exit phase where it was decided to exit from the stage based on whether the objectives was reached and if another iterative cycle was required. These decisions were made based on the adequacy of the main deliverables, which were the innovation and risk framework.
What justification is used to exit from the phase?	The rationale for the departure from each iteration was clearly articulated and justified concerning the stated goals to alleviate the problem situation. The decision was a collaborative decision made in conjunction with the risk practitioners and the researchers.

Table 7: The Principle of Theory

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based action research
Are the project activities based on theory?	The set of theories guiding AR included the ISO 31000 international standard for RM, the theories, best practices and critical success factors for NPSD innovation, NPSD process models, product classification models, risk factors and frameworks to manage risks within NPSD, Capability maturity models for NPSD and RM, AR, DS and strategic models.
Was the domain of investigation and the specific problem setting of interests to the research community as well as the client?	The domain of research was focused on managing risks in NPSD, which is of interest to both the research community as well as the organisation as this, would lead to improved quality of P&Ss. Of specific interest is that the domain of study focused on services (which is regarded as an under-researched area) as well as B2B innovation (which is also under-researched).
Was the problem observation based on theory?	To obtain a better understanding of the problem situation, the CPR-based iteration cycle started with an evaluation of the maturity level of both risks and innovation aspects that informed the causes of the problem and the framework was based on theoretical models that studied best practices in risk and innovation.
Were the interventions based on theory?	The interventions followed from this understanding of the problem situation and guided by the best practices interventions from the innovation and risk frameworks. The argument was that improved risk management in new products and services would lead to improved products and services.
Was theory used to evaluate the intervention results?	The effectiveness of each intervention was guided by the theories and the international risk management standard ISO 31000 which postulates that when an RM framework is implemented in accordance to the international standard, it will enable specific characteristics ranging from increasing likelihood of achieving objectives to improved controls and minimising losses.

Table 8: The Principle of Change through Action

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based Action Research
Were both the client and researcher motivations aligned to improve the situation?	The client was exposed to risks that were not sufficiently mitigated during the launch of P&Ss and was motivated to ensure that it does not re-occur. The client provided a mandate and additional resources to manage risks more efficiently in NPSD. The researcher was a practitioner within the organisation who was tasked to prevent reputational risk exposure.

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based Action Research
	Both the client and researcher were motivated to improve the situation.
Did the specification of the problem result due to the analysis?	The diagnosis was that poor risk management is causing reputational risk to the organisation. Therefore, a team of specialist who conducts risk management in new products and services could reduce the risk exposures. It follows that the problems and causes of problems were identified and formulated using collaborative practices between the risk practitioners and the researcher and the client. This was the case during each iteration phase of the action research cycle.
Did the client agree to the planned actions before they were implemented?	The proposed measures were approved and discussed with the participating organisation as well as the risk practitioners during project and team meetings.
Was the organisation situation assessed comprehensively both before and after the intervention?	The organisation situation was assessed before each iteration of the AR cycle. During the end of cycle one and two, a lessons learnt were conducted to obtain a wider assessment of the organizational situation where the NPSD practitioners provided their perspective. Only the risk practitioners assessed the organizational situation after cycle three of the iteration.
Were the timing and context of actions taken documented?	The timing of the AR project was not explicitly documented but estimated as at minimum a 3-year project which was communicated during progress reviews where updates were provided on the status of the research project.

Table 9: The Principle of Learning through Reflection

Criteria (Lindgren et al. 2004)	Evaluation of CPR-based action research
Did the researcher report progress to the client?	The client was aware of the research as the interventions were introduced and communicated to the organisation on a regular basis. Updates regarding the status of deliverables were regularly communicated.
Did reflection take place by the researcher in collaboration with organisation members concerning the outcomes of the project?	Reflective analysis was conducted in collaboration with practitioners but also by the researcher on her own. The group reflection was important to ensure that the researcher's understanding of events were not one-sided. Reflection considered the scope and activities surrounding the intervention to understand what learnings could be communicated. The impact on the organisation itself was also explicitly addressed.
Were the research activities and outcomes reported clearly and completely?	Research papers on innovation and risk factors were published. The risk practitioners won an award at the Institute of Risk Management for the framework. The complete research activities and outcomes are furthermore documented in this thesis.
Were the results considered in terms of implications for further action in the situation?	Further actions was reported as the organisation requested the risk practitioners to roll-out the risk methodology and framework to its international operations in six different countries in Africa and to other projects in the organisation. The initial scope of the study also expanded to include NPSD divisions, such as B2B and Financial Services.
Were the results considered in terms of implication for action to be taken in related research domains?	New business areas in the organisation requested specialised risk frameworks to assist them with establishing and controlling their business areas. The risk practitioners are also involved in large IT/IS and compliance projects within the organisation due to their expertise in risk management and the framework is adapted to this purpose.
Were the results considered in terms of implications for the research community?	The research is relevant for those that research NPSD innovation as well as RM. To the best of the researcher knowledge no comparable studies in this regard have been conducted which allows the successful implementation of RM in NPSD. The research is also relevant to the study of risks in new services and B2B services where research is considered to be scarce.
Were the results considered in terms of the general applicability of collaborative action research?	The iterative nature of the research aided the development of the framework as the framework were made more robust by including risk incidences. As the context of the business change the framework were expanded to include additional concepts and risks. The reflection stages very much aided the risk practitioners to obtain a good understanding of what worked and what is not working. Usually in a very highly charged working environment, reflection is a luxury that is often overlooked. The evaluation of the maturity of the processes and how this needed to be improved in each cycle also greatly aided the risk practitioners in understanding areas of focus, which provided a sound strategic foundation for their efforts.

3.3.4.1. The Researcher-Client Agreement

One of the requirements of a robust AR study is the existence of a researcher-client agreement. The purpose is to ensure that mutual understanding develops between researchers and practitioners regarding the scope, focus and research methods that will facilitate commitment to the research (Lindgren, Henfridsson and Schultze, 2004; Susman and Evered, 1978). According to Baskerville and Wood-Harper (1996), the agreement provides the authority under which the researcher may operate to provide research that is considered to be beneficial to the client. The researcher-client agreement regarding the roles, study participants and the expectations of key stakeholders are subsequently described.

The researcher joined the client's RM department in 2009 to review new P&S to ensure that risks were appropriately managed, but the manner in which to achieve this objective was not clear. As no previous framework existed, the researcher had to develop new frameworks and processes to achieve the requested results. The research idea emerged from this background.

The CRO and senior management in HR sanctioned the research theme and approaches. Some of the data sources utilised by the researcher have a confidential data classification and cannot be divulged to the research community. However, while restrictions on the reporting of confidential information were implemented, the researcher was permitted to gather meta-data that could benefit both the organisation and the research.

One of the key deliverables of the research is the provision of an IRMF. Studying the exposure of new P&S to risks and the impact of these risks was necessary as these incidences informed the framework. The researcher is bound by confidentiality agreements not to divulge specific incident information that could be harmful to the organisation.

Another concern raised by the client-organisation was that the research should not impact on the timely delivery of work deliverables. It was agreed that certain work deliverables from the researcher could, therefore, be utilised as research interventions where applicable to the study. A clear understanding and agreement existed regarding the scope, focus and research methods that would be applied to the study and that the study could cover some of the researcher's work deliverables in conducting RM. This fits with Clark's (1972) view of practitioners as 'organisational scientists' rather than 'academic scientists', as they have subject knowledge and insight on how to address activities within their specific field of knowledge.

A key indicator of rigorous AR design is an adequate description of the unit or group of things that are being analysed (Näslund et al. 2010). Within the organisation, the RM unit was studied as risk practitioners, while the NPSD functional units and all the units that contribute towards the delivery of a P&S were being studied as innovation practitioners. Risk practitioners were those with RM knowledge who had the objective of ensuring that risks were adequately managed on a per-project level. The innovation practitioners were responsible for developing and delivering a new P&S.

The differences and similarities between the focus of the work and research deliverables are demonstrated by using a Venn diagram (refer to Figure 12). The researcher as practitioner ensured that risks were adequately assessed and managed in NPSD. As a researcher, the role was to increase knowledge and understanding of how to improve innovation practices using RM. The overlapping focus was that improvement should occur both in the managing of risks but also lead to improved delivery of P&S. The main difference between the role of practitioner and researcher was that the practitioner focused on delivering work deliverables within target dates while the researcher reflected on the practices and approaches applied. The improvement deliverables mostly flowed from the researcher's focus on constant improvement.

Figure 12: Overlapping Focus of Researcher and Practitioner Roles

Initially, no research infrastructure was established, but during the initiating phase of the AR research risk resources were being appointed. New resources allowed opportunities for developing and testing risk approaches in collaboration with the risk teams and innovation practitioners. The risk group met on a regular basis to discuss improvement opportunities and present ideas for risk approaches, which provided useful critique as the study progressed. The collaboration with work colleagues proved to be invaluable in assisting the researcher to interpret experiences and overcome individual opinions.

Guiding principles of Winter (1987) allowed conformance to ethical research practices, namely: (1) Prior consultation: relevant persons and authorities have been consulted and principles were accepted upfront; (2) Voluntary participation: all participants were allowed to influence the work, and those that did not wish to participate were excluded; (3) Transparency: the work products were transparent and open to suggestions; (4) Authorisation: permission was obtained to make observations or examine documents produced for other purposes; and (5) Confidentiality: permission was obtained to describe the work of practitioners as well as the points of view of NPSD practitioners as presented in Chapter 5 of the research results. The researcher accepted responsibility for maintaining confidentially and no individual persons were identified as a consequence of the study.

The second approach that was utilised by this study, namely DS, is subsequently discussed.

3.4. Design Science

AR is the predominant study method applied by this study. However, DS is a secondary study method that was used since new knowledge can be introduced by using multiple methods that could improve AR studies (Rossman and Wilson, 1985).

The research was not initially concerned with the development of artefacts, even though many risk interventions were produced which could be described as artefacts. When the opportunity surfaced during the third AR cycle to design a work deliverable, the researcher wondered if the DS approach could be applied in a work context and whether it would deliver advantages. The researcher then decided to use DS for the development of the artefact. An additional benefit of using DS was to gain practical experience in applying the approach. The ADR method was not employed for the whole study, but AR and DS were utilised as complementary methods.

Using different methodologies could enhance the learning from the study, both from a research and a practical perspective. DS conforms to the pragmatic research paradigm followed by the study and is therefore considered a suitable inquiry method to be employed. DS is subsequently discussed regarding its foundations and similarities with AR.

3.4.1. Design Science Process

Fuller and McHale (1965) was the first researchers to use the term DS to describe a systematic process of design. A more expanded clarification of DS is offered by Gregory (1996, p. 323) who explains DS as:

> [c]oncerned with the study, investigation and accumulation of knowledge about the design process and its constituent operations. It aims to collect and organise and improve those aspects of thought and information which are available concerning design, and to specify and carry out research in those areas of design which are likely to of value to practical designers and design organisations.

The term ‘science of the artificial’ (to describe DR) was popularised by Simon (1996). He used the lectures of Karl Taylor Compton to convince design disciplines (such as architecture, engineering and computer science) to apply more formalised methodologies. Simon (1996) described knowledge gained by DS as 'a body of intellectually tough, analytic, partly formalisable, partly empirical, teachable doctrine about the design process' (Cross, 2001, p. 1).

Researchers were initially slow in adopting DS as a research method. It is likely that the adoption was hampered by the lack of a uniform method and model for performing DS research. Peffers et al. (2006) were the first to introduce a DS research model, based on research conducted by Nunamaker and Chen (1991) and Walls, Widmeyer and El Sawy (1992) who were regarded as the early pioneers of DS in IS. The model is based on six activities, illustrated in Figure 13, which were influenced by seven (7) DS researchers. The main influences are presented in Table 96 (refer to Appendix 8).

- *(1) Problem identification and motivation:* The research problem and its associated complexity are identified to justify the value of the solution and why the problem is worth solving.
- *(2) Objectives of a solution:* The objectives can be qualitative or quantitative but must be clearly and succinctly identified. The objectives should be measurable, reflect the desired outcome and align with the aims of the key stakeholders.
- *(3) Design and development*: The required functionality is designed and the artefact is developed. The artefact should be useful and original.
- *(4) Demonstration:* The artefact is demonstrated to relevant stakeholders to confirm that it is meeting the objectives and addressing the specified problem.
- *(5) Evaluation:* The artefact is evaluated regarding how well it solves the problem and meets the original objectives. Evaluation criteria could consist of performance measures or client feedback and satisfaction surveys.
- *(6) Communication:* The artefact is communicated concerning its novelty, utility and design rigor grounded in observations from the literature review.

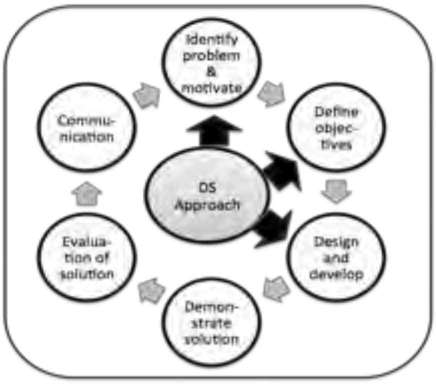

Figure 13: Peffers et al. (2006) Design Science Cycle

Stages can be sequential or entry points can differ depending on the type of problem that needs to be solved. The black arrows in Figure 13 indicate potential entry points depending on whether the artefact development has a problem-centered, objective-centered or design-centered approach.

3.4.2. Combining Design Science and Action Research

AR and DS science may appear similar in nature, but significant differences exist. Table 97 in Appendix 8), provides an overview of the similarities and key differences between DS and AR.

Both approaches solve problems, such as creating a new process or system, and the primary activities of each are comparable. AR ‘action taking’ is similar to DS ‘building’ and both approaches ‘evaluate results’. During both approaches, the researcher collaborates to solve and understand problems. Further similarities are evident when examining the methodologies used by each approach. The researcher compared the AR method used for this study Iversen et al.’s (2004) CPR approach with the ‘design thinking’ DS way of Järvinen, (2007) as indicated in Table 10 below.

Table 10: Similarities between Design Science and Action Research (adapted from Järvinen, 2007)

Criteria	Iversen et al. (2004) CPR based process	Design thinking (Järvinen, 2007)	Outputs
Initiating	(1) Appreciate problem situation (2) Study literature (3) Select risk approach	(1) Awareness of problem (2) Suggestion	Explanation of context Proposal, tentative design
Iterating	(4) Develop risk framework (5) Design risk process (6) Apply approach (7) Evaluate experiences	(3) Development (4) Evaluation	Artefact and performance measures
Closing	(8) Exit (9) Asses usefulness (10) Elicit research results	(5) Conclusion	Results

At first glance, the methodologies appear similar. The differences are that slightly different criteria measure the utility of the studies and the critical learning offers unique knowledge perspectives. Both create knowledge, but for DS, the knowledge is about artefacts while AR uses knowledge to guide additional interventions. The criteria for measuring AR are more often from people's perspective while in DS, rules could consist of measures such as 'completeness, simplicity, elegance, ease of use and easy to understand' (Järvinen, 2007).

Action Design Research (ADR) is a further variation of DS. ADR is a method employed within an organisational context for generating 'prescriptive design knowledge through building and evaluating IT artefacts' (Sein et al. 2011, p. 40). The main similarity between DS and ADR is that both adopt a cyclical approach and the implementation of formalised objectives and demonstration stages at each phase. Sein et al. (2011, p.37) developed the ADR approach precisely because DS values 'technological rigor at the cost of organisational relevance, and fails to recognise that the artefact emerges from interaction with the organisational context'. ADR fulfills properties of: (1) being innovative; (2) the DR contribution should follow design principles; and (3) addressing a class of problems (Sein et al. 2011).

As the study combines principles of AR and DS, a relevant question would be why the ADR method is not employed for the entire study rather than applying AR and DS as two separate methods. The primary objective of the study is not to build an IT artefact but to consider how RM can be implemented within an innovation environment that spans different contexts, methods, technologies, operational practices and organisational conditions. As the situation is complex, an ADR approach would restrict the focus of the research to specific deliverables while the focus of the study is wider, allowing RM practices and deliverables to unfold within an organisational context.

The research leads to the development of an IRMF that has been refined and adapted over a five-year period. The IRMF is, however not the only deliverable, and numerous artefacts are introduced as experiments during the AR cycles, depending on the type of problems faced by the practitioners during this period. Not all of them follow a DS approach and not all of them are innovative. For instance, the practice of compiling risk lists is not new but the expansion of the risk lists over a substantive period would assist risk practitioners to obtain a better understanding of the primary associated risks. The ADR approach is not the primary research framework for the reasons discussed above, but principles of ADR as it relates to the development of IT artefacts within a particular organisational context will be applied.

3.4.3. Design Science Study Approach

Utilising DS as part of the research has two main objectives. Firstly, delivering a DS designed artefact that can be implemented to support the IRMF and processes. Secondly, the aim is to evaluate the usefulness of applying DS to the design of objects in the workplace.

Reich (2013) states that no one DR method is better than the other, and the researcher should adopt the DS that best fits the purpose of the study. When considering the type of DS approach to use, several alternatives are considered. The DS framework has been adapted to follow the requirements of the organisation and the type of artefact to be introduced. The researcher developed a combined approach based on the Peffers et al. (2006; 2007) and Sein et al. (2011) ADR frameworks. The Sein et al. (2011) methodology has four stages, namely: Problem formulation; building intervention and evaluation (BIE); reflection; and learning and formalisation of knowledge. The Peffers et al. (2006; 2007) methodology is explained previously in this chapter (refer to Section 3.4.1).

The approach and phases followed by the study and the major influences that developed the framework are indicated below. Figure 14 below provides a consolidated view of the DS method developed by the study. Deliverables for each phase are shown ias well as examples of criteria that can be used to assess the stages. The arrows from the ‘formalisation of learning phase’ designate that all the previous deliverables need to be evaluated at this point. It is also important to consider that the design and development follow iterative cycles such as in AR where prototypes are developed and improved.

Phase 1: Problem Formulation

Seins et al.’s (2011) ‘problem formulation’ phase includes both ‘problem identification’ and ‘objective’ aspects of Peffers et al. (2006; 2007). The research problem is defined according to the context and scope of the organisation and the value of the solution to the key stakeholders. The criteria to measure the effectiveness of the artefact as it is aligned with the objectives were also developed during this phase.

Phase 2: Design and Development

This phase is based on Peffers et al. (2006; 2007) ‘design and development’ stage and the first two parts of Seins et al.'s (2011) BIE phase. The initial design follows different design cycles according to the requirements of the organisation.

Phase 3: Implementation and Evaluation

This phase involves the demonstration of the problem within the organisational context (according to Peffers et al. (2006) guidelines) as well as the evaluation of the artefact according to Peffers et al. (2006) guideline objectives and benefits. The phase is reflective of the 'evaluation' phase of Seins et al.'s (2011) BIE.

Phase 4: Formalisation of Learning

Seins et al.'s (2011) ADR 'formalisation of learning' principle was selected as the final phase instead of Peffers et al. (2006) 'communication' phase. The researcher was required to demonstrate generalised outcomes which can be in the form of: (1) generalisation of the problem; (2) generalisation of the solution; and (3) development of new design principles. The description of the generalisation can follow five steps: (1) learning can be abstracted into concepts representative of a particular field; (2) sharing of learning with the practitioners; (3) communicating the results as design principles; (4) sharing learning in terms of the theories selected; and (5) formal presentation of the result for diffusion in the relevant contexts (Tate and Furtmueller, 2012).

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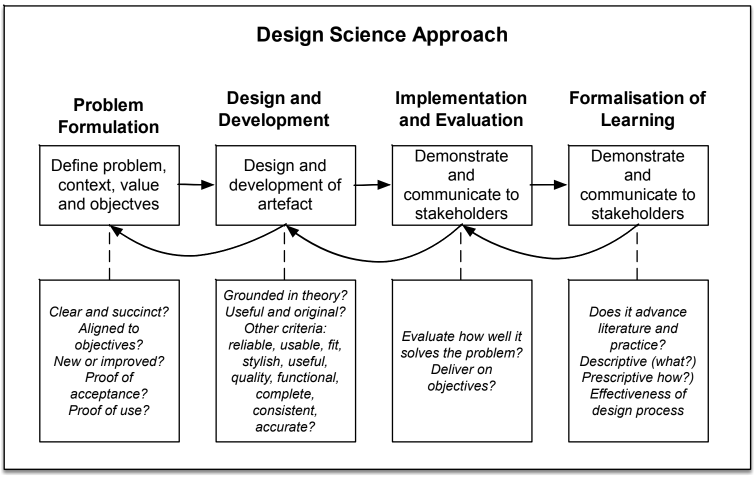


Figure 14: Design Science Approach for this Study

Furthermore, innovative design is a crucial criterion of the Sein et al. (2011) approach. Since DS is a second method applied within the AR lifecycles, the researcher did not deem it necessary that the artefact meets stringent criteria for innovative design. The rigorous standards for innovative design are probably more suited to evaluate artefacts during studies where DS will be the employed as the primary research method. The artefact still, however, needed to conform to properties of being useful and original within the context of where it was delivered.

The artefact as a ‘risk dashboard’ was designed and evaluated using the approaches stated above and introduced during iteration three of the AR cycle. The design of the dashboard is primarily explorative in nature since research on dashboard design was relatively scarce at the time of designing the dashboard. (Yigitbasioglu and Velcu, 2012). A subsequent Google Scholar research revealed a number of dashboards designed for risk management. However the scarcity of risk dashboards in innovations influenced decisions taken at that particular time.

The development of a risk dashboard is subject to many challenges that are inherent to an organisational context. The development of the dashboard will address some of the challenges, indicate what concepts and models were used to guide the implementation of a risk dashboard and how the risk dashboard can facilitate more efficient RM learning within NPSD.

3.4.4. Design Science Evaluation Criteria

Hevner, March and Park (2004) guidelines are used to evaluate the validity and robustness of the artefact. The criteria are subsequently discussed.

Design as an Artefact

The artefact should be practical and can consist of a construct, method, model or instantiation. Davis (2005, p.18) advises that a DS artefact should have characteristics of a ‘new or improved design… (that can be) demonstrated by reasoning, proof of concept, proof of value added, or proof of acceptance and use’.

There were serious initial concerns about the ability to deliver the artefact according to these requirements. Doubts were expressed about the performance of the artefact and whether the function could be considered as necessary for the design community. The artefact was applied in a particular domain, namely RM within NPSD which is deemed to be appropriate for the development of dashboards.

Problem Relevance

The problem can be defined as the difference between a goal state and the current state (Hevner, March, Park and Ram, 2004). The implication is that elements in the environment would pose challenges to deliver the artefact. People, organisational- or technology aspects could present some of these challenges. Hevner et al. (2004) state that the problem should be relevant to practitioners and the artefact should effectively solve the problem. All of these challenges were present during the design and delivery of the risk dashboard.

Design Evaluation

The evaluation methods for the design should be robust and consider the demonstration of the usefulness, quality and value of the artefact. Hevners et al.’s (2004) criteria included functionality, completeness, consistency, accuracy, performance, reliability, usability and fit. Hevner et al. (2004) caution that descriptive evaluation is best suited to original artefacts where no other feasible methods of assessment exist. A good design is furthermore stylish; what Gelernter (1998) describes as ‘machine beauty’, combining simplicity with power. The evaluation should also take into account the effectiveness of the design process.

Research Contributions

The research contributions should reflect on the artefact, foundations and methods used to create the artefact. Methods include methodologies during the creative development as well as methodologies used for evaluation of the artefact. Hevner et al. (2004) refer to two criteria in particular that are of importance. Firstly, ‘representational fidelity’ refers to the representation of the artefact within the business and technology environment to solve a particular business problem. Secondly, ‘implementability’ refers to the instantiation of the object in the environment. DS should produce knowledge, which can be either descriptive (what) or prescriptive (how) (Gregor and Hevner, 2013). The basic premise is therefore that the artefact should be implementable and deliver a contribution to an organisational business environment. All these aspects are addressed during the study.

Research Rigor

Robust methods should be applied to construct and evaluate the artefact. The techniques used (during the development of the artefact) should be appropriate. Hevner et al. (2004, p. 87) provide an explanation of the rigour cycle as consisting of 'grounding theories and methods along with domain experience and expertise from the foundation’s knowledge base into the research'. The design of the artefact should additionally be based on theoretical foundations and research methodologies.

Design as a Search Process

Design as a search process considers Hevners et al.’s (2004) ‘means, ends and laws’. Means represent decisions taken to create the artefact, including actions and resources used. Ends are the objectives that need to be achieved with consideration of the current environmental constraints present and are expressed in terms of the usefulness of the artefact. Laws are the uncontrollable external aspects that impact on the design of the object and the decisions made to consider these influences. The crucial consideration according to Hevner et al. (2004) is to ensure that the artefact works and that the environment in which it functions is clearly specified and appropriate.

Communication of Research

The research should be of relevance to practitioners as well as researchers. Reviewers of research journals will analyse the research contributions in terms of four questions: (1) Will the problem advance knowledge of theory, methods and applications? (2) Does the research make contributions improving upon previous work? (3) Is the artefact new and can it be employed to solve similar problems? And (4) Does the research clarify understanding and does it hold interest? (Wilson, 2002).

Even though the researcher did not use the Peffers et al. (2007) communication phase, the researcher thought it was imperative to research the type of content that would be required for publication purposes. Content specification was derived from Gregor and Hevner's (2013) study to establish to what extent the dashboard would meet the criteria for publication (refer to Section 17.17 of Appendix 6). The criteria are additionally applied during the DS phases to design the risk dashboard.

The Risk Dashboard as a Design Science artefact

The validity of the risk dashboard as a DS artefact is dealt within this section. The concept of an information dashboard is not new. The term 'information dashboard' was popularised as an Executive Information System (EIS) artefact in the 1980s (Few, 2013). The use of dashboards is popular in EIS applications since they use business intelligence to monitor Key Performance Indicators (KPIs) of organisations. A KPI is a quantitative metric that attributes to the measurement of organisational objectives (Vinella and Jin, 2005). Several EIS dashboards or scorecard methods have been developed by researchers, including the Balanced Score Card (Kaplan and Norton, 1992), Performance Measurement Matrix (Keegan, Eiler and Jones, 1989), the Performance Prism (Neely, Adams and Crowe, 2001) and the Performance Pyramid (Lynch and Cross, 1991).

In RM literature, risk dashboards are frequently used to present visual information about Key Risk Indicators (KRIs) rather than KPIs. A KRI is a quantitative metric that represents one or more critical success factors that are required to carry out the organisation's objectives (Vinella and Jin, 2005). The difference between KRIs and KPIs is that KPIs will evaluate historical performance and advise whether goals were achieved, while KRIs act as real-time indicators that track changes in the risk profile, impact and likelihood to achieve the objective (Scarlat, Chirita and Bradea, 2012). During the development of KRIs, it is important to consider the events that have a low probability of occurrence but a significant consequence (Scarlat et al. 2012). Risk indicators, therefore, function as early warning systems, which are often presented via a dashboard interface. However, the risk profile is often difficult to visualise and describe (Horwitz, 2004) which makes it difficult to represent on dashboards. Also, dashboards often fail to communicate the relevant information (Few, 2013).

Risk reports are often lengthy, which complicates effective communication and leads to a vague understanding of the prevalent risks and how to address them. More efficient communication of the risk profile of P&S can be achieved by visualisation techniques, especially if the risks described are complex (Hahn, Shangraw and Mark, 2007). Eppler and Aeschimann (2009, p. 71) describe visualisation within the context of RM as:

> The systemic effort of using (interactive) images to augment the quality of risk analysis and communication along the entire risk management cycle. Risk visualisation employs charts, conceptual diagrams, visual metaphors and mapping techniques to improve the understanding and subsequent management of risks.

The benefits of visualisation are seen as facilitating better engagement, quicker learning, improved clarity, and deeper analysis, as well as better retaining of information than mere text and print communications (Fey and Prakash, 2001; Kontio, Jokinen and Rosendahl, 2004). Visualisation can, however, present risks such as displaying insufficient and misleading information (Bresciani and Eppler, 2008).

While business interest in dashboards as a management tool is growing, the scientific literature is lacking. While plenty of textbooks and journal articles exist, only a handful of academic studies exist and provide limited guidance to practitioners and researchers (Pauwels et al. 2009; Yigitbasioglu et al. 2012). The design of a dashboard can therefore still be considered as a relatively recent area of research (Eppler et al. 2014). While some researchers use DS approaches to design EIS dashboards no risk dashboards could be found specifically developed for use in NPSD (Marx, Mayer and Winter, 2011). Silveira et al. (2010) developed a risk dashboard that specifically deals with compliance on an organisation-wide basis but did not use DS approaches. To the best of the researcher’s knowledge, no dashboards were specially developed for managing risks in NPSD on a per project basis.

3.5. Mixed-method Research

Pragmatism assumes two extremes of positivism and interpretivism and therefore, Tashakkori and Teddlie (2010) view it as the foundation of mixed-method research. Mixed-method studies collect both quantitative and qualitative data concurrently or sequentially and integrate the data within a single study (Creswell, Plano Clark, Gutmann and Hanson, 2003). The use of mixed methods provides opportunities to validate the research through triangulation, produce richer data and assist with new knowledge by attending to contradictions that might appear between the two data sources (Rossman and Wilson, 1985). A more comprehensive research study can result from the interaction between the problem statement, methods used and results (Burke, Onwuegbuzie and Turner, 2007).

This study uses many methodologies and techniques. It is firstly necessary to confirm the essential differences between a paradigm, methodology and technique. A paradigm is a ‘set of philosophical assumptions’ that defines the nature of research, while a methodology is a ‘structured set of guidelines or activities’ that develop within a particular paradigm to assist researchers to conduct studies (Mingers and Brocklesby, 1997). Within the methodology, certain techniques exist that can be defined as ‘a specific activity that has a clear and well-defined purpose within the context of a methodology' (Mingers and Brocklesby, 1997, p. 491). Using a multi-methodology could be necessary when the real-world problem situation is complex and multi-dimensional (as in NPSD) and when an intervention is developed through several phases. Applying different methodologies can improve research results as it provides support for the various actions and tasks. However, mixing methodologies could present philosophical, theoretical and practical challenges (Mingers and Brocklesby, 1997).

The particular method of combining methods is referred to as 'methodology enhancement', where a single paradigm is used but the process is enhanced with techniques from other methodologies (Mingers and Brocklesby, 1997). Such an approach is utilised for this study, and the major challenge is to efficiently fit methods together to address the practical problems that require a broad range of knowledge and skills.

3.5.1. Literature Review Methods

The initial framework was developed through consulting the literature. The method involved searching electronic databases and the top IS/IT journals for research on innovation and RM. The scope of research mainly focused on factors that deal with P&S innovation. The initial searches explicitly focused on improving the potential success of new P&S and keywords that include 'product innovation' and 'service innovation' and a combination of these in the title. Highly cited papers received preference, as these would meet the Pittaway et al. (2004) criteria that prescribe that papers should include theory robustness, apply a robust methodology, be generalisable and offer practical contributions. If research was published in one of the top innovation and IS/IT journals, it was assumed that most of these criteria would be met. The researcher was specifically interested in research contributions that could be practically applied.

During the AR iterations, it became necessary to conduct additional literature reviews to support the development of dimensions of the IRMF or risk processes. Additional research is a requirement of AR research when compared to conventional research methods. For quantitative studies, the body of literature can, to a large extent, be defined upfront, while in AR, the data is first collected and then the literature is reviewed to support or challenge findings (Dick, 1993).

However, in some instances, there was insufficient research in top journals to cover the additional topics that were raised during the AR iterations. Glaser and Strauss (1967) advise that theoretical saturation can be applied in instances where no further data can be found in the particular category. In these cases, when literature support was not found in the top journals, additional studies were included as specialist research to support certain risk groups. Adams et al. (2006) argue that literature from the business domain provides useful perspectives, as it is recognised by several innovation scholars that innovation research should be expanded.

In addition to those factors that innovators perceive they have direct control over, external influences were also included in the ambit of this research. The reason is that NPSD could be affected by external risks as well as operational requirements of the business. These types of criteria are not included as part of the NPSD research literature. As this is a practical study, which seeks to investigate all factors that could influence the potential success of new P&S, additional risks that the organisation faces, are also included. For instance, it has been demonstrated in the practical environment that a lack of attention to fraud risks could lead to unsuccessful P&S and reputational damage to the organisation. External relationships should also be considered as these could exert a strong influence on the success of P&S (Ernst, 2002).

Studying cross-functional research contributions were an additional requirement of this study (refer to Table 99, Appendix 8). Nambisan (2003) did not consider IT to have made any critical contributions to the field of NPSD. However, IS principles, such as project management, privacy, information security and systems development deliver valuable contributions to the development of the IRMF and offer valuable perspectives for researchers who are interested in developing a comprehensive NPSD framework. IS should, therefore, be regarded as a good reference discipline for NPSD. The IRMF framework draws research from the interdisciplinary fields depicted in Table 99 and updated by the researcher.

The requirement to incorporate research from other disciplines additionally correlates to the first objective of the framework; to ensure that it is comprehensive and includes a wide number of risks and innovation variables. The advantage of borrowing from existing theories includes the benefit of learning from the experience of others by obtaining a quicker and more advanced understanding and knowledge of issues (Stock, 1997).

The Hierarchical Holographic Modeling (HHM) technique was used as a starting point to define the modules and sub-modules of the framework. When risk scenarios are analysed, three characteristics or the ‘set of triplets’ are required, namely: (1) complete; (2) finite; and (3) disjointed (Kaplan and Garrick, 1981). The IRMF was partitioned into subsets, but they are non-disjointed, meaning that overlap is allowed. Kaplan, Haimes and Garrick (2001) argue that disjointed characteristics are only required when a quantitative analysis is used which will cause likelihoods to be counted numerous times. As this is a qualitative risk assessment, some minimal overlap is allowed. For instance, in the dimension of ‘compliance,’ a regulatory requirement can exist to inform the customer when his/her information is transferred to a third party. This provision needed to be built into the design specifications by the product manager as part of the ‘process’ module, but implemented by the technical team in the ‘technology’ module. The researcher has applied the characteristic of disjointed as far as possible.

Three concerns underlie the validity of the dimensions. The first is inclusivity, which refers to whether or not the six dimensions encompass all elements that contribute to NPD best practice.

The arguments for establishing these dimensions are strongly based on the incidences and risks as perceived by the risk practitioners during the NPSD lifecycle. A second concern is equality, which establishes whether the high-level constructs are equally important. It is evident from the literature review that some aspects are more important than others, and this suggests that the high-level constructs are unequal in weight. The third concern relates to the sophistication or maturity of the processes. Kahn et al. (2006) contend that maturity can be defined across four levels of maturity and that perfection is not always required. A maturity level for each of the second-level constructs is provided during the AR research.

The objective of this study was to be comprehensive, which means that a large number of risks and opportunities, which may impact on the success of a P&S have been considered. This study will, therefore, claim to be encompassing and contributing towards the development of a comprehensive innovation and RM model that can be applied in practical environments.

3.5.2. Soft Systems Methodology

The researcher employed an additional AR method during the study, namely Soft Systems Methodology (SSM) from Checkland (1981, 1992) and Checkland and Scholes (1990). SSM was earlier viewed as a modelling tool but has increasingly been used as a learning tool to structure thinking about learning in the real world (Williams, 2005). Three of the seven stages of SSM inquiry are used during different sections of the AR iteration. Stage one and two of SSM are utilised during the initiation phase to express the problem situation and draw rich pictures with special consideration of structures, processes, climate, people and conflicts. SSM stage three components, such as the development of root definitions and the CATWOE model, are utilised to develop a model of purposeful activity that guides the study during the 'initiating' phase. SSM and the CATWOE model are again applied during AR iteration three as part of the problem identification to develop a risk dashboard.

Mingers and White (2010, p. 1151) state that SSM forms part of the family of problem structuring methods (PSM) to solve complex problems, characterised by 'the existence of multiple actors, multiple perspectives, incommensurable and/or conflicting interests, prominent intangibles and key uncertainties'. The most difficult requirement presented by complex situations is to develop a shared understanding and a definition of the issues that constitute the problem situation. It can, therefore, be assumed that applying SSM methods to obtain an improved understanding of the problem is relevant for this study.

SSM was not used as a modelling tool, but applied to understand the extent of the problem situation by using SSM guidelines. The claim of legitimate use of SSM is achieved by applying the criteria of efficacy, efficiency and effectiveness (Checkland and Scholes, 1990). The evaluation questions were therefore articulated as:

- *Efficacy*: Would these activities achieve the stated output? The objective was to increase understanding and an appropriate degree of consensus regarding the problem situation in a structured manner, which was achieved.

- *Efficiency:* Could fewer resources or alternative techniques be used? Yes, alternative techniques could be used but applying SSM methods to obtain a more thorough understanding of the problem is relevant for this study.

- *Effectiveness:* Are we doing the right thing to accomplish long term goals and align with the 'weltanschauung' or worldview of the owner. The owner of the process (CEO of the organisation) provided a mandate to the risk team to stop P&S to limit the risk exposure, so alignment has been established.

The three Es can be expanded into five Es:

- *Ethics:* Is it morally correct to do? Improving RM practices align with increased attention to corporate social responsibility (CSR), which is seen as the process of organisations associating values and behaviour with the expectations of stakeholders (Lee, 2008).

- *Elegance:* Is the process aesthetically pleasing? It is suggested that there is a lack of credibility to using rich pictures in hierarchical organisations (Dallenbach, 1994 quoted by Berg and Pooley, 2013). Information visualisation techniques should capture and communicate perceptions about the real world problem (Mirijamdotter and Bergvall-Kåreborn, 2005). The researcher has included iconography and legends to the initial rich pictures as this allows the interpreter to improve their appreciation of the problem situation.

The CATWOE elements have also been demonstrated in more contemporary terms to the risk practitioners where 'transformation' was more firmly identified as a 'process', and 'owners' were identified as the decision-makers. This aligns to Bergvall-Kåreborn, Mirijamdotter and Baden's (2004) suggestions to replace some of the terms to improve understanding. The original words have, however been retained for the rich pictures.

3.5.3. Delphi Techniques

The Delphi-process was employed during the initiation phase to select the appropriate risk approaches to follow for the first AR iteration that took place in January 2010. At the start of each AR iteration, a full-day workshop was held (off-campus away from the organisation premises) at the private residence of the researcher with whiteboards and other equipment being available in a relaxed, informal atmosphere, allowing improved interaction.

A strategic thinking approach was firstly applied by using the Manning (2001) model of six abilities by consideration of: (1) strategy; (2) possibility thinking; (3) winning stakeholder support; (4)

business model design; (5) implementation: and (6) learning and change requirements. These are presented in Section 7.1.9 of Appendix 6.

The Delphi method was utilised based on the Schmidt (1997) approach in term of which the first phase took the form of a brainstorming session, which focused on specific actions that were required. Brainstorming techniques can facilitate idea generation (Sutton and Hargadon, 1996). The researcher, skilled in brainstorming techniques, took the lead, but the outcome of the sessions was collaborative.

Beckhard and Harris (1987), as quoted in the Coughlan and Coghlan (2002) action planning steps, was used to frame the discussion concerning: (1) what needs to change? (2) in what part of the organisation? (3) what types of change are required? (4) whose support is needed? (5) how is the commitment built? and (6) how is resistance managed? These questions were reframed to fit within the organisational context.

A list of challenges was created and these were subsequently collaboratively classified into three broad categories. During the second round, potential mitigation actions were discussed and during the third round, risks were classified in order of importance. Likert scales response categories ranged from ‘very important’ to ‘unimportant’.

Agreement is defined for the purpose of this study as 'a compatibility of observations reached by a team of individuals acting as a whole', while the opposite side dissention would be characterised as 'difference of opinion such that strife is caused within the team undertaking to make a decision' (Tastle and Wierman, 2005, p. 95).

The technique has some limitations. Kendall’s coefficient of concordance (W) was not utilised to establish the degree of consensus (Nevo and Chan, 2007) due to the small number of participants. The objective was never to reach clear consensus but rather what Mingers and White (2010) describe as ‘accommodation’ between requirements. Since all the risk practitioners were present, it provided a basis for agreement on the way forward.

3.5.4. Capability Maturity Models

A Capability Maturity Model (CMM) was used at the start of each AR iteration phase to determine the extent to which the implemented iteration led to improvements. The framework developed from the innovation literature review highlighted best practices of ‘what can be done’. The more widely and regularly these best practices are applied, according to Dooley et al. (2001), the more mature the NPD process will be leading to more successful P&S. Paulk et al. (1993, p.4) describe maturity as 'the extent to which a specific process is explicitly defined, managed, measured, controlled and effective'.

Dooley et al. (2001, p. 23) state that issues of maturity and diffusion are rarely investigated. He described maturity as 'how well the system does what it does', while diffusion relates to 'how widely and how often the organisation performs the best practice'. CMM is used to predict performance based on the fundamental practices that characterise and differentiate each successive level of process maturity. A positive relationship exists between maturity and the success of NPSD projects (Dooley et al. 2001; Griffin, 1991). The concept of maturity is rooted in the Software Engineering Institute (SEI) process, CMM and Crosby's Quality Management Maturity Grid (Paulk et al. 1993). Many different types of maturity models exist and the advantages and disadvantages of 17 types of models are described in Table 105, Appendix 8.

Although many maturity models exist, Dooley et al. (2001) generalise the concept of maturity beyond the software engineering domain to determine the impact of maturity on project performance in NPD. Since the concepts of capability maturity are increasingly being applied to NPD, and CMMs are regarded as the most popular method to establish the maturity of a process (Fraser, Moultrie and Gregory, 2002), it was appropriate for this study to utilise a CMM to evaluate the maturity of the innovation processes during the AR cycles.

An assessment of maturity considers the five CMM maturity levels that are shown in Figure 110 (refer to Appendix 8). The processes can range from level one where processes are 'undefined' (the lowest level of maturity) to level five (highest level) where the process is continually improved and feedback is used to improve performance. At lower maturity levels, the P&S team is required to make decisions with imperfect information. The more undefined the processes are, the more the P&S can be exposed to ambiguity and uncertainty risk, which can adversely impact on the chances of a successful P&S (Sarbacker and Ishii, 1997).

The more mature processes are, the less the NPSD team is exposed to risk and more certainties exist regarding expectations of a quality P&S. The researcher has demonstrated the trade-off between quality and risk on the right side of Figure 110 (refer to Appendix 8). The more RM processes are entrenched within the NPSD process, the better risks will be managed and certainty will exist about delivering a quality P&S. As the process matures, more performance data is collected and the project activities follow a proactive approach rather than a reactive strategy.

The maturity of the NPSD process was analysed by using the Dooley et al. (2001) CMM process at the beginning of each AR cycle to establish what process improvements had occurred during the period. Dooley et al. (2001) predict that it takes approximately 20 months to move from one level of maturity to the next. All critical practices that are inherent in a level must first be in place before the organisation can mature to the next level. Maturity was measured at a programme level and not on an individual product level as Dooley et al. (2001) reiterate that evaluating maturity at a single project level is not sensible.

The risk framework highlighted the risks that needed to be managed to minimise exposures leading to more successful P&S (Sarbacker and Ishii, 1997). It is assumed that the better RM is integrated within the NPSD lifecycle, the more mature the processes will be. Yeo and Ren (2009, p.5) agree that 'there is logically an intimate link between RM capability maturity and success of projects, since risks are measured by their potential effect on the achievement of project objectives'.

Hillson (1997) provides a Risk Maturity Model (RMM) that can be used to benchmark RM practices. The model consists of four stages and outlines activities that are needed to progress to the next level. An overview is given in Table 101 (refer to Appendix 8). The framework provides a method whereby organisations can benchmark RM approaches against the levels of maturity and outline activities that are required to progress to the next level. Each level is described regarding five dimensions, namely: definition, culture, process, experience and finally the application of RM within the organisation. During the AR iteration, the risk practitioners did not consider the Hillson (1997) RMM to be reflective of the industry as it was found to be static and one-dimensional. During the research, the researcher found another model that was more representative of the risk context of the organisation, namely, the Yeo and Ren (2009) CoPS-RMM-CMM multi-level framework.

Yeo and Ren (2009) criticises Hilson's (1997) model by stating that organisations require an improved framework to benchmark RM practices to cater for large-scale, complex, cross-functional, multidisciplinary, flexible and advanced technological projects. He developed the CoPS-RM-CMM multi-level framework specifically for high-value, information-driven technology projects that are used for the production of consumer goods and services. These projects are called Complex Product Systems (CoPs) projects. Since new P&S could fit into this category, the CoPS-RM-CMM was suggested as a guide to assess maturity levels and identify realistic targets and action plans for improvement in risk capability.

However, the researcher was concerned about continuity of measurements if the criteria used to assess changes between the AR iterations changed. The Hilson (1997) RMM was therefore utilised at the start of the three AR iterations. During the closing phase (signifying the end of the AR iterations), a new evaluation was conducted based largely on the Yeo and Ren (2009) model that was adapted to the context of the organisation. The adapted model was called the Navigator and it was developed based on the combined experience of the risk practitioners within an extremely volatile NPSD environment where individual practices are not applied due to constraints within the organisation. The final model is presented in Table 70: CMM NPSD Navigator Model (refer to Appendix 4).

Assessments used Likert scales where the response of '0' meant that the practice is not used anywhere in the organisation and an answer of '5' meant that the method is widely employed in all NPSD developments. The evaluation process aligns to the Dooely et al. (2001) CMM evaluation criteria. The assessment was conducted collaboratively. Risk practitioners directly identified whether the practice existed or not and if it did exist, documented proof was analysed to determine the extent to which it was present. NPSD practitioners were engaged to assess the CMM NPSD process, since cross-functional teams eliminated single-respondent bias (Fraser et al. 2002).

The objective of the evaluation was not to prescriptively follow CMM, but rather as guidance on improvements that could be needed for subsequent phases. During AR iterations, certain activities were not conducted which, according to Dooley et al. (2001 p. 6), means that an improved maturity cannot be achieved since all the previous level practices are not in place. A common misconception is that all of these activities need to be performed to reach the next level. Wiegers (1996) clarifies this as impractical since the objective is to satisfy the KPAs associated with the level rather than the activities. For instance, if an organisation does not engage in a particular activity, alternative practices might accomplish the goals even if not mentioned in the CMM. For example, the organisation's Project Management Organisation (PMO) did not manage projects according to the Dooley et al. (2001) prescribed criteria of cost and schedule, but used other methods to meet the objectives of the projects. Wiegers (1996) states that CMM key practices are guidelines and not requirements.

3.5.5. Risk Management Evaluation

The effectiveness of the RM practices employed in NPSD should be established by this study as per the primary research question. Keizer et al. (2002) developed a short questionnaire to evaluate the effectiveness of RM asking questions such as: (1) Does RM add value in identifying and evaluating project risks? (2) Is RM useful in making decisions on the management of risks and establishing whether (3) RM is useful for innovation projects. A similar, but much more detailed, evaluation process was followed by this research.

For RM to be effective, the organisation should comply with all of the principles as stated in Table 36, Appendix 2. Since the research question specifically refers to the 'embedding' of RM, it is relevant to determine whether this goal was reached. The Institute of Internal Auditors advocated seven tests to assess the adequacy of whether RM was embedded within an organisation (IIA, 2010). The tests are presented in Table 33: Embedding of Risk Management: Seven tests (Refer to Appendix 2). As ISO 31000 effectiveness principles already consisted of 11 individual questions, it was determined whether these issues could be incorporated into the existing ISO questions. An additional column was added to determine the alignment. It would therefore not be necessary to ask these questions as an additional qualification, but instead, take care to introduce them to the existing ISO principles. Baseline criteria for scoring are presented in Section 13.1 of Appendix 4. The scoring criteria are based on the IIF (2010) report but adapted from the Hindson (2011) Institute of Risk Management (IRMSA) Report, which provides indicators for the different levels of embedding and criteria. The questionnaire consists of 71 questions and is presented in Section 11.3 of Appendix 2.

A further objective of the questionnaire was to establish the degree of consensus and divergence amongst the risk practitioners around whether the RM processes, practices and framework implemented by RM within NPSD were effective. An expert-questionnaire approach was followed to obtain the opinions of a range of experts, the risk practitioners. The expert-questionnaire approach is suited to explore areas which are not well researched. No subsequent rounds of distributing the questionnaire were conducted. The areas of divergence were as interesting as the areas of convergence. The questionnaire was only completed by the RM experts as the content provides an in-depth analysis, using RM terminology that only RM experts would understand, such as risk profile (appetite). It can, however, be considered that NPSD practitioners would potentially have a contrary view to the RM experts about the extent to which RM practices were applied within the organisation.

The questionnaire was emailed to the risk practitioners to be completed independently, in order to avoid group thinking and potential external pressure that could be experienced. The survey was completed by (n= 5) risk professionals (100% of the target population). The researcher entered the responses in an Excel spreadsheet and assigned control criteria to ensure that the validity of the data could be established, such as a check that the number of responses = 5.

Numbers were assigned by choosing a category from one to five. If all participants chose the same category, then the consensus would be complete at a value of 5 (100%). As the balance of the team is unequal (n=5), the number of participants that chose a category had to be greater than three (Tastle and Wierman, 2005). The results are presented in Chapter 5 by explaining the extent of RM conformance to the criteria as well as the degree of consensus and divergence noted in the responses.

3.5.6. Quantitative Research

To minimise potential observer bias (by the researcher and risk practitioners) interviews and questionnaires were distributed to NPSD practitioners at the end of AR cycle one and two. Only AR iteration two questionnaire data is applied as quantitative measures. No hypothesis was developed since the main idea was to 'discover meaningful patterns descriptive of a particular phenomenon' (Auerbach, 2003, p. 6).

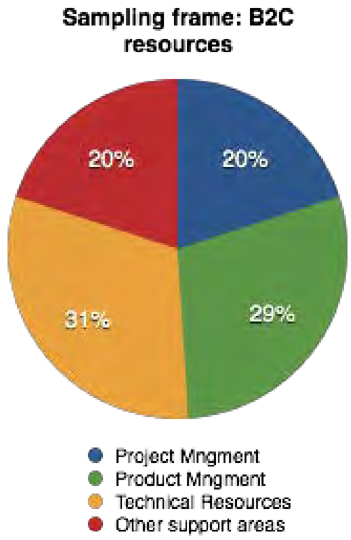


Figure 15: Sampling Frame for Questionnaire AR Iteration One

The size of the organisation and the size of the NPSD development teams made it difficult to gather discrete information on a per-project setting. The two questionnaires distributed to the NPSD teams assisted in determining the significant risks that faced the NPSD teams and offered insights into occurs in the organisation versus perceptions. The two questionnaires are subsequently discussed.

Questionnaire AR Iteration One

The research question for this particular questionnaire focused on identifying the perceived risk exposure by NPSD practitioners to operational risk categories. Since the survey was restricted to operational risks, strategic and reputational risks were excluded. A secondary purpose was to address research gaps, since operational risks have not received attention by NPSD researchers, as explained in the literature review. A third objective was to validate the high-level and second-level constructs of the IRMF.

The sampling frame targeted more than 80% of B2C NPSD practitioners, directly responsible for developing P&S. Functional areas were well represented as indicated in Figure 15. Technical resources (responsible for the technical design and implementation of the P&S) formed the majority of the interviewees (31%). The large number of technical employees reflects the practical nature of the questionnaire. The second-highest category was product managers at 29%, closely followed by project managers (20%) and resources from other support areas at 20%. The resources from other fields included resources from marketing, finance, customer front-line support and CRM.

Only two senior managers (in charge of divisions) were included, so the questionnaire cannot be considered to be representative of top executives. Since senior level executives would focus on tactical or strategic risks, and junior employees would focus on operational risks, exclusion of top executives did not have a significant impact on the integrity of the questionnaire. A total of seventy-seven face-to-face interviews were conducted over a period of one month over geographically dispersed areas. Face-to-face meetings were considered as an opportunity to build further relationships with NPSD teams, as well to obtain a more detailed understanding of risks.

The scope of data collection was restricted to 16 P&S, prioritised for delivery on the 2010 roadmap, rather than 100 or more projects that were ongoing during the year. This facilitated more focused discussions with the NPSD practitioners. There were, however, disadvantages since risks in other projects could be missed. NPSD practitioners (interviewees) were given the opportunity to add any additional comments for consideration as lessons learnt. The questionnaire was predominantly reflective of the 16 projects and seven risk categories chosen.

The scope of the questionnaire was restricted to operational risk categories since these were not well presented in innovation research. The process of determining the operational risk categories is explained in Figure 16 below.

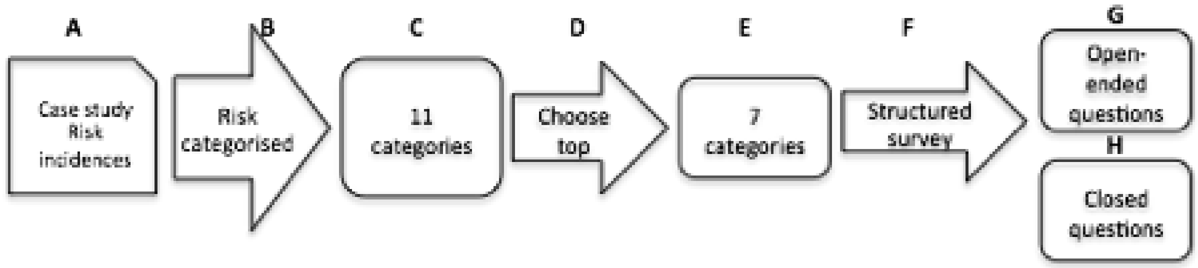


Figure 16: Questionnaire: Operational Risk Categories, AR iteration One

(A) The 10 PIRs were analysed to determine risk incidences; (B) The risk incidences were categorised according to the IRMF second-level constructs; (C) The risk occurrences reflected 11 risk categories; (D) Strategy high-level dimensions were excluded as they were considered to be well represented in the innovation literature and did not fit the definition of operational risk; (E) Seven categories were eventually chosen: project management, third party, technology, product performance, revenue assurance, business rules and customer care. The 'revenue assurance' category was previously excluded from the IRMF; (F) The risk team conducted face-to-face interviews following a structured survey approach using closed and open-ended questions; (G) The structured interview was closed with open-ended questions of: 'What went well?' and 'What could be improved?' These formed the basis to recommend certain practices that could be encouraged for future NPSD projects.

Risk practitioners were seeking to substantiate the interviewees' perceptions with factual information. Data that was based on facts could not easily be disputed by senior executives and would enhance the validity of findings. Three questions were asked per factor. For instance, technology questions were asked as (Q5) Has the product/service/campaign experienced technical defects since launch? The rating scale varied from excellent (5) to (1) poor. The respondent was also requested to refer to the actual source of where details of the incident could be found, such as the 'technical defects log which would document the nature and criticality of the issues' which enabled the risk practitioners to develop a deeper understanding of the nature of the incident.

A comments field was added for each question, which allowed a respondent to provide an explanation for the rating assigned. An example of a comment from an NPSD practitioner was, 'There have been a few complaints about customers not getting 100% discount, due to lack of product understanding which relate to inadequate customer education'. Following the interview, the risk practitioner (interviewer) investigated the incident and referred it to sources that established the impact and cause of the incident, which was cross-referenced and updated in the questionnaire.

The questionnaire was trialled with a few selected NPSD practitioners, and some questions were rephrased to reduce ambiguities. The risk practitioners scheduled hour-long appointments with the

NPSD practitioners to administer the questionnaire. The meeting request contained the objective of the interview and assurances of confidentiality. Before the interviews, questionnaires were forwarded to NPSD practitioners to be completed. In many cases, these were only completed during the appointment due to the workload of NPSD practitioners. The interviewer (risk practitioner) reviewed the questionnaire in collaboration with the interviewee to add missing information that aided understanding of the incidents.

The data was entered into an Excel spreadsheet, and no statistical analysis was conducted other than developing descriptive statistics. The researcher consolidated poor and below-average responses to obtain a 'below average' response. 'Average' responses were retained, and 'good' and 'excellent' responses were consolidated into an 'above average' rating. Risk practitioners verified the calculations, and the final results were combined in a report and distributed to senior executives. The report was well received by the organisation and improvements to the NPSD process resulted.

Questionnaire AR Iteration Two

During the exit phase of AR Iteration two, another risk questionnaire was administered. The scope of the survey expanded to include the B2B division. Socio-demographic attributes were collected, such as gender and role within the organisation. The percentages are presented in Figure 17 below.

The Governance, Risk and Compliance (GRC) resources including Legal, Regulatory and BCM resources, but the risk practitioners themselves were excluded. The ICT group is the technology resource responsible for P&S development. Marketing resources included those responsible for traditional marketing activities as well as PR, while NPSD practitioners included all the product managers and project managers, as well as those that were directly responsible for delivering a project, including the Financial resources.

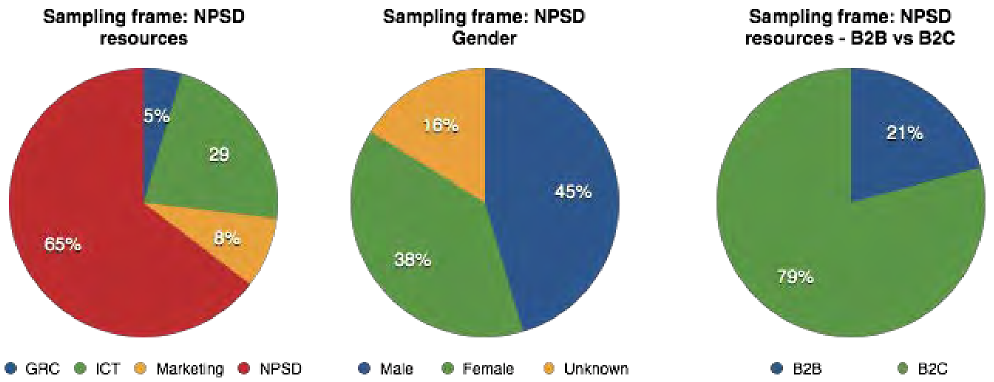


Figure 17: Sampling Frame for Questionnaire, AR iteration Two

All resources that were involved during NPSD (the target population) were represented. A proper distribution of male and female respondents existed with 16% failing to identify gender. The majority of responses (79%) was from B2C, which was much bigger in size than B2B, since the latter could essentially still be considered in the start-up phase. The sample was homogenous regarding organisation and involvement in NPSD, but heterogenous regarding age, gender, qualification, responsibility, the extent of participation within NPSD and duties. A wide variety of NPSD resources from all geographic locations were included to get a good representation of the total population.

The questions posed were based on previous RM studies conducted in NPSD, as these questions should have been raised from a risk perspective. The questions were predominately from Keizer et al. (2002), identifying potential risk issues in the innovation process. The risk questions were modified slightly to conform to Kahneman and Tversky's prospect theory (1981). A risk was formulated as a positive statement, since the negative framing of risks introduces more positive perceptions than positive framing. The risk questionnaire was designed using these principles. The researcher developed additional questions to include operational risk factors that would not normally feature in NPSD studies to address the research gap. The questionnaire consisted of 73 questions and was exclusively based on the IRMF and risk categories as it reflected the status of AR iteration two. Responses were recorded on a Likert-scale ranging from 1 = Fully agree, 2 = Agree, 3 = Uncertain, 4 = Disagree and 5 = Strongly disagree.

Written permission was obtained from the executive officer in charge of the NPSD divisions and an email was circulated stating the objective of the risk questionnaire and assurance of confidentiality. The questionnaire was quite a lengthy document as the IRMF contained many categories and one of the aims was to reduce the IRMF to more manageable components. Since the risk of boredom and fatigue markedly increases with the length of the questionnaire (Adigüzel et al. 2008 cited by Bergkvist, 2014), appropriate buy-in was obtained from the respondents, the executives and through memos distributed to NPSD practitioners by senior managers.

The instruments were administered by the risk practitioners who had a detailed understanding of the high-level and second-level risk constructs. The questionnaire was collected during a follow-up interview session where missing answers were detected and the respondents were requested to complete the missing values.

The data was consolidated in an Excel spreadsheet and cleaned. Some questions were removed to reduce the number of variables for risk and technology factors. In other cases, the items were found to be too specific, such as two of the strategy questions were removed that reflected specific policies of the organisation which led to only single-item scales to test some constructs.

Using multi-items is considered to be more reliable than single-item measures (Henard and Szymanski, 2001) since they are purported to describe the context of the construct insufficiently (Fuchs and Diamantopoulos, 2009). The notion that single-item measures are unsuitable for construct development has been challenged by several authors (Bergkvist and Rossiter, 2007; Drolet and Morrison, 2001; Fuchs and Diamantopoulos, 2009) stating that there are acceptable conditions under which single-item measures might be appropriate. Following the guidance of these studies, one variable question was retained to obtain a general view of the nature of the construct and not to validate constructs (Fuchs and Diamantopoulos, 2009).

An example of a case where a single-item was recorded as a construct is strategic alignment. Single-item measures are considered appropriate for concrete rather than abstract constructs since measurements errors are more prevalent in abstract concepts (Rossiter, 2002; Sackett et al. 1990; Bergkvist, 2014). Bergkvist (2014) refers to the appropriate use of single-item measures when applied to 'double concrete constructs'. These constructs have two characteristics, namely: a clear objective (e.g. brand) and a single-meaning attribute (e.g. liking).

Strategic alignment used a single-item construct of: 'products help to achieve the organisation's five business strategies'. While strategy could be seen as an abstract concept, the five business plans of the organisation were documented, distributed and communicated across the organisation. These strategic objectives are embedded in the key performance areas of all employees and adherence to these strategies primarily determines annual bonuses. Additionally, all P&S are required to align to one or more of the five pillars of the strategy. Since all respondents would have a similar perception regarding what the organisation's strategies are (Fuchs and Diamantopoulos, 2009) and a holistic understanding of the attributes of the approach as one overall quality exist (Rossiter, 2002), respondents would be able to articulate clearly the degree to which P&S help to achieve the strategy. For these reasons, within the context of the study and the organisation, strategic alignment can be viewed as a single-item construct. However, the second-order construct analysis is not heavily reliant on the interpretation of single-item constructs and only sparingly applied. In cases where single-item constructs are used, it is indicated in the research.

The data was analysed using the statistical software SPSS. The results are reported in Section 13.4 of Appendix 4. A summary of missing values, frequency analysis, measures of central tendencies and dispersion are provided. Responses seem to be consistent based on standard deviation values of +1/-1 since no significant differences in how the respondents answered the questions could be detected. The bivariate correlation table indicates weak but statistically significant relationships which indicate an absence of multicollinearity (Yong and Pearce, 2013). Moderate to weak communalities loading between .3 and .5 were found to occur frequently in behavioural data (Lingard et al. 2006 cited by Yong and Pearce, 2013). Important conclusions can still be drawn from statistically significant relations despite the low R-squared value (Yong and Pearce, 2013). The central premise of the study is to conduct effective RM in NPSD; cognisance of a wide variety of risks should be taken. Only correlations significant at 0.05 (2-tailed) were reported in the study.

Factor analysis is applied to reduce the latent variables into hypothetical factors. It is, therefore, necessary to address the sample size as a potential weakness of the mixed-method study. The study focused on the context of the organisation and over 80% of the organisation's NPSD resources were interviewed. Due to the number of risks that an organisation can be exposed to, 73 variables resulted, which tested 33 categories of risks.

A sample size of 100 is regarded as poor and 200 fair, while the variables should have at minimum five to ten observations each (Comrey and Lee, 1992 cited by Yong and Pearce, 2013, p. 80). Since 73 risk variables exist, it would necessitate a minimum of 365 respondents. The sample of the NPSD organisation is comprehensive and fully inclusive. Three hundred and sixty-five (365) respondents did not exist at that time within the NPSD group. De Winter, Dodou and Wieringa (2009) notes that when the nature of the sample is highly representative of the population, it provides support for using factor analysis in smaller samples.

Other studies also suggested that smaller sample sizes can effectively be used for factor analysis with good results (Bandalos and Boehm-Kaufman, 2009; Mundfrom, Shaw and Ke, 2005; Preacher and MacCallum, 2002). The number of factors and variables and how well the variance is explained by the factors are considered to be important factors supporting smaller sampling sizes. Factor recovery with sample sizes <50 were found to be reliable when factor loadings were high, the number of variables high and the number of factors small (De Winter et al. 2009).

To determine if the dataset is suitable for factor analysis the correlation matrix is reviewed to check for relationships. Reasonable factorability can be assumed when all variables correlate at minimum 0.3 with one or more variables as confirmed by the results (Neil, 1994). Bartlett's test of sphericity should indicate a significance level of $p < .05$ to establish patterned relationships (Yong et al. 2013). It is confirmed that patterned relationships significant at $p < 0.001$ exist. A further test to determine factor analysis suitability is the Kaizer-Meyer-Olkin Measure (KMO) of Sampling Adequacy where a figure of above .50 (Yong and Pearce, 2013) or .60 (Neill, 1994) is considered adequate. The KMO was found suitable at .79.

Principle component analysis was used to identify composite factors underlying the IRMF. The large dataset can be reduced by grouping common variables into factors to establish the smallest number of common factors that will explain the correlations (Yong and Pearce, 2013). The rotated eigenvalues and scree plot (refer to Section 13.7 of Appendix 4) are used to determine the number of significant factors. According to Kaiser's criterion, all factors above eigenvalue of 1 are retained (Yong and Pearce, 2013) which means that 20 factors (conforming to Kaiser's criterion) were kept. This explains 75% of the total variance.

The varimax rotation method was used to improve interpretation, to produce distinct clusters of interrelated variables (Cattel, 1973 cited by Yong and Pearce, 2013, p. 84). Rotation converged within 47 iterations reflective of the large dataset (Yong and Pearce, 2013). Factor loadings above .32 are described as reasonably desirable (Yong et al. 2013). This was confirmed. The dataset has several high factor loadings of >.80 which indicates that a smaller dataset ($n > 150$) should be sufficient (Guadagnoli et al. 1988, cited by Yong and Pearce, 2013).

Factor loadings of less than three variables were excluded, as were two factors that did not contribute meaningful interpretation of factors. For example, 'effective leadership' is not readily explainable as fitting within the process category; internal policies and procedures adherence does not fit with product development, and effective anticipation of risks does not fit with 'data integrity'.

A few classloadings at .32 were recorded such as 'clear competitive advantages' loading .553 within customer and .359 within finance. Similarly, the business model generating profitable revenue loaded .470 in finance and .423 in customer. These two instances reflect complex variables that tend to crossload (Yong and Pearce, 2013). Since the business model and competetive advantage are closely related to profitable revenue streams that correlate with effective financial management, the crossloadings are explained. In these cases, the highest factor loadings were retained.

Internal consistency for each factor was examined using Cronbach's alpha. Overall reliability was at .883, while the individual reliability of factors ranged from .883 to lowest .685 that indicates moderate reliability. Meaningful names for the factors were assigned and in cases different names were applied (than in the IRMF) to provide a more accurate and useful description of the underlying construct. The latent factors as presented by the factor analysis is discussed in Chapter 5 of research findings as they were presented by the population of NPSD practitioners of the organisation.

Interviews

Structured interviews were introduced as a further analysis method with members of NPSD teams, as well as supporting resources. Interviews had 'open ended' questions to allow respondents to state 'main areas of concern?'; 'what went well?' and 'what could be improved?' The respondents were additionally requested to state any recommendations they might have to improve NPSD.

The use of open-ended questions allowed the participants to provide more comprehensive answers. Risk practitioners were the interviewers. Each interviewer was comprehensively trained and a full record of the interview, which lasted approximately an hour, was created at the time. The interviews took place face-to-face across multiple sites in South Africa. Participants were ensured of their anonymity and confidentiality and were not obligated to answer the questions. Formal risk and NPSD committees and management in the organisation sanctioned the reviews and survey. The interviews assisted in delivering objectives, which are in line with the research study, namely to: (1) capture key learning points for future improvement of NPSD; and (2) review the performance of NPSD activities.

Coding of Interviews

The process of identifying, coding and categorising patterns in data is called categorical analysis or thematic coding (Gibbs, 2007; Lyytinnen et al. 1998). The coding of themes is a form of qualitative analysis that allows the researcher to link common themes into categories and establish a 'framework of thematic ideas' (Gibbs, 2007).

Pre-existing frameworks (such as the IRMF) guided the researcher when coding was conducted (Gibbs, 2007). Coding was also applied during the literature review to develop a framework and deduce potential categories that could inform the IRMF. During the AR iterations and analysis of the interviews, coding was used as a means to verify whether the observations recorded by the risk practitioners were correct.

The sources of information during the AR iterations consisted of written notes taken by the risk professionals and documented on the questionnaires. Three practices were applied which aided the analysis as prescribed by Ritchie and Lewis (2004 p. 201), namely: (1) condensing the meaning and understanding of the participants words; (2) applying common sense understanding aided by an understanding of the organisational environment; and (3) having a theoretical understanding of how the statement fits within the broader literature on innovation and RM.

The researcher transcribed the data verbatim from the documented interview forms, with some grammar mistakes being corrected and acronyms being included. Since the main purpose was to categorise the data, a 'less detailed rendering' was considered sufficient (Gibbs, 2007). The researcher was responsible for all coding of the data since coding is subjective and consistency and reliability are maintained when one person performs the classification (Bailey, Gurak and Konstan, 2002). To protect the confidentiality of respondents, measures were applied not to identify the person and the organisation.

The data analysis comprised of several steps. The first step was labelling, which allowed the researcher to switch between the original transcript and the transcribed version. The questionnaire data was categorised according to broad categories of the IRMF, which allowed the researcher to organise the data according to these key themes. The data was subsequently summarised into a statement that reduced the volume of data to manageable sizes to enable more efficient pattern recognition. For example, where the 'end-to-end integration testing of the P&S need to be more stringent', the data related to the category in the IRMF of 'testing'.

Since organisational problems can cover one or more categories, double coding resulted (Leavitt, 1964). For instance 'resource capacity issues that prevent products from being released' can relate to 'technology, project management and organisational cultural issues of management (providing insufficient support)'. Another key concern was to distinguish between the categories, which was overcome by careful analysis of the definition of each second-level construct. A detailed practical understanding of the IRMF aided the analysis.

The results are transcribed in Chapter 5 and selected quotations from the respondents are used to elucidate certain concepts. The data was mostly analysed to determine if it supports the development of the framework and the propositions from the literature review regarding the significant risk concerns for NPSD.

3.5.7. Mixed-method Research Guidelines

Both qualitative and quantitative research methods are utilised in mixed-method studies. Venkatesh, Brown and Bala (2013) developed a set of guidelines for conducting and assessing the quality of mixed method research, as well as the quality of inferences drawn from IS research. Inferences are the researcher's conclusions drawn based on analysis of multiple data sources that include, according to Tashakkori and Teddlie (2003, p. 692):

> [r]elationships among people, events, and variables as well as his or her construction of respondents' perceptions, behavior, and feeling and how these relate to each other in coherent and systematic manner.

Venkatesh et al.'s 2013 criteria for conducting mixed method research are subsequently discussed. The researcher rephrased the guidelines as questions and combined and condensed the author and reviewer considerations and expanded the integrative framework from Venkatesh et al.'s (2013) study in 'author and reviewer considerations'. The criteria is presented in Table 102, Section 17.23 of Appendix 8. The guidelines as relate to the study is subsequently discussed.

Appropriateness of Mixed Method Approach

Ventakesh et al. (2013) prescribe that mixed-method approaches should be appropriate to the study. The objectives and research question of the study seek to implement risk and innovation framework and processes to support more effective risk mitigation within NPSD. Mixed-method research is applied within the study to obtain corresponding or opposing views about the factors and the variables that present risks and opportunities for NPSD.

The context of the study is complex due to the multitude of role players, P&S, technology and risks. Mixed-method research allows a more comprehensive view of the NPSD practitioners perceptions. Combining qualitative and quantitative data allowed increased understanding by offering richer explanations for findings and increasing the credibility of inferences deducted from this approach as divergent views could be incorporated. Five of the seven purposes of using mixed method research is met by the study namely complementary, completeness, expansion, corroboration and diversity Ventakesh et al. (2013).

Strategy for Design and Analysis of Mixed Method Research

The objective of AR is to understand what is currently occurring. At the end of the first two AR cycles, questionnaires were distributed to validate the findings. A sequential design approach is followed since the quantitative component follows qualitative data gathered at the end of an AR cycle (Morgan, 1998).

The difficulty with a sequential approach is to validate that the changes occurred due to the timing or method of data collection (Venkatesh et al. 2013). However, the objective of the qualitative analysis was to obtain a snapshot of the perceived risks and opportunities in that particular timeframe from a larger sample to validate the input for the next cycle. Venkatesh et al. (2013) recommend that in the absence of firm theoretical foundations, firstly a qualitative study is conducted, followed by a quantitative study of validation. The strategy for analysing both the qualitative and quantitative data was presented in previous sections in a manner that ensures that useful and credible inferences can be made to support valid inferences.

Second Level Construct Analysis and Validation

The overarching goal of mixed methods is to go beyond the independent analysis of qualitative and quantitative data and 'genuinely integrate' to offer 'mutually illuminating' theory of phenomenon of interest (Bryman, 2007, p.1). This study does not meet these lofty goals, but offer 'holistic explanations' to support the development of guiding principles. Venkatesh et al. (p. 38, 2013) describe meta-inferences as 'theoretical statements, narratives, or a story inferred from an integration of findings from quantitative and qualitative strands of mixed-method research'. While this study do not provide meta-inferences it does provide generic guiding principles therefore the principles for developing meta-inferences were used as guidance.

The process of developing meta-inferences (or guiding principles as applicable to this study) follows Locke's (2007, pp. 880 - 885) inductive theory development advocating: (1) the use of an appropriate philosophical truism; (2) cultivated from an extensive body of knowledge; (3) the formulation of valid conceptions; (4) identification and validation of causal elements; (5) incorporation of ideas from other sources and theories; (5) integration of the findings into a noncontradictory whole; (6) contextualisation of the domain and boundary conditions and; (7) the process of developing theory should be a 'careful, pain staking and gradual process'. Locke (2007) states that theory development is largely an inductive process starting from particular observations that can be more broadly generalised on which theory development can be based. The guidelines as applied to the study are subsequently discussed.

The epistemological foundation of the research is pragmatism, which is also viewed as the best paradigm for use in mixed-method research (Teddlie and Tashakkori, 2003). The study utilises pragmatism as abductive reasoning that iterates between induction (quantitative approach) and deduction (qualitative approach). This study is based on a comprehensive body of knowledge and incorporates ideas from many cross-functional sources and theories.

Researchers should first draw valid inferences from the qualitative and quantitative data separately and then develop a mixed-method approach that can either move from quantitative to qualitative (or the other way round) (Venkatesh et al. 2013). The approach that is followed by this study merges the qualitative and quantitative findings to validate the second order constructs. Additional methods of bracketing and bridging are applied to analyse and validate the second-level constructs. Bracketing analyses contradictory data and investigates the nature of the inconsistencies (Venkatesh et al. 2013). A pluralist analysis would indicate that different actors will have different perceptions according to their interests (Pettigrew, 1990). Bridging does the reverse and establishes consensus opinions from which theory is built (Bryman, 2007). Bridging is suitable to sequential mixed-method research (as in the case of this study) where an expanded view of the research problem is provided (Venkatesh et al. 2013).

Validation Criteria

Validation criteria for quantitative and qualitative research are discussed in previous sections. Additionally, the quality of the mixed-method research inferences needs to be validated. Issues surrounding validity include: (1) how to conceptualise validity in mixed-method research; (2) how and when to report validity for qualitative and quantitative strands of mixed-method research; (3) the extent to which the traditional validity guidelines should be followed; and (4) the minimisation of threats to the validity of data collection and analysis issues (Creswell et al. 2003).

Data quality refers to the degree to which the collected observations meet the standards of quality and can be trusted. The term 'inference quality' is used to describe validation for mixed method research and refers to the quality of the research design to derive accurate, logical conclusions and analytical rigor (Teddlie and Tashakkori, 2003; 2009 from Venkatesh et al. 2013). Three validation criteria for mixed-method inferences exist, namely: (1) Integrative efficacy: Robust processes were used to obtain understanding; (2) Integrative correspondence: The mixed-method research adheres to the specific research goals; and (3) Inference transferability: Establishing the boundary conditions or applicable contexts. These guidelines are carefully considered by this study.

Potential Threats

Bryman (2007) identifies nine barriers to developing inferences from mixed-method research, which are subsequently discussed:

- *Different audiences:* The first barrier reflects the difficulty of condensing quantitative and qualitative findings for different audiences which could entail that preference is given to a particular audience. (Potential audience interest is explained in Chapter 1).
- *Methodological choices:* One set of findings is emphasised by researchers in line with their dominant skillset which can inhibit the researcher's inclination to combine findings from

qualitative and quantitative research. For this study, the research literature provides the body of knowledge on which the IRMF is based while other sources of data are used to integrate and contextualise findings. The predominant method of study is AR, which does not reflect a particular dominant skillset.

- *The structure of research projects:* The design of the research project could inhibit integration if either the quantitative or qualitative component are the primary emphasis of the research and the structure does not allow sufficient integration during reporting of the study. During the writing of this thesis, it took several months for the researcher to obtain a suitable structure to report the vast sources of data collected.

- *Timelines:* The quantitative analysis requires a shorter timeframe than the quantitative due to the amount of reflection involved, which means that due to time pressures, the findings of one set can be inhibited to publish as soon as possible. This is not applicable to this study, since the thesis spans four years.

- *Skills specialism:* Teams can be used to overcome skills lacking in a particular discipline. When research activities take place in project teams that function in silos, it can hinder the integration of findings. The researcher was privy to all the main research interventions conducted and due to the small number of risk practitioners; silo mentality could not be reported as a risk for this study.

- *Nature of the data:* One set of data might produce more interesting findings, which may lead to the prioritisation of these findings. The study carefully followed ethical guidelines to ensure the robustness of results.

- *Bridging philosophical divides:* This refers to a potential conflict between epistemological and ontological positions creating difficulty in bridging the gaps. However, when pragmatism is applied as the philosophical foundation (as is in the case of this study), the conflict is significantly reduced.

- *Publication issues:* Some journals might have a methodological bias and restrictions regarding page size might favour quantitative data. Mixed-method research requires additional pages since two sets of data and the method of integration additionally need to be discussed (addressed in Chapter 1).

- *The problem of exemplars:* Due to a perceived lack of mixed-method exemplars, the researcher is not able to draw upon ‘best practices’ that might be associated with mixed-method research. It is suggested that the research objectives should form the platform to create inferences. The absence of mixed-method exemplars are concerning, but best practice guidelines are consistently followed during the research timeframes.

The researcher acknowledges the potential threats to mixed-method research and has applied the guiding principles for mixed-method research to ensure a robust study.

3.5.8. Longitudinal Studies

Longitudinal research studies dynamic change and 'is concerned with the flow of activities, meanings, and the interrelationships among important variables' (Perks and Roberts, 2013. p. 1099). The purpose of utilising a longitudinal study is, therefore, to describe how changes occurred over time and to provide reasons for the changes that occurred. Robust longitudinal research considers context, content and process of change (Pettigrew, 1990). Context has two parts, namely an external (economic, social, industry) context and an internal context, referring to the organisation's cultural, structural and political environment. These contextual aspects are all included in the research and explored during the study. Context consists of actors, structures and processes as explained during the AR iterations.

Perks and Roberts (2013) analyse longitudinal data in innovation articles and conclude that longitudinality was weakly presented and failed to capture changes that occurred over time. Pettigrew's (1990) longitudinal research guidelines are subsequently discussed, as is the manner in which these risks are addressed. Pettigrew (1990, p. 8) advises that longitudinal research needs to consider timeframes for change processes to:

> [s]tudy events and the social constructions of those events in the context of the important time cycles which help to provide the implicit rhythm of particular social systems.

The research objectives provide justifications for starting and ending data collection. Clear, 'exit' points are allocated to signify satisfactory resolution of the research questions. Additionally, the research objectives were analysed as part of the cycles of the organisation (such as the NPSD process), to understand why and how patterns occur. The CMMs that initiated each AR sequence provided an improved understanding of changing patterns.

The extended timeframes for the study during which data collection and practitioner involvement are essential presented challenges concerning soft skills required. These skills include listening, probing, flexibility, objectiveness and knowledge about RM and NPSD. A further requirement was that the risk practitioners needed to maintain credibility in the eyes of the NPSD practitioners and all levels in the organisation. The collected data displayed how structures change over time, allow comparison, are pluralist, historical and allow different levels of analysis. Triangulated data is collected to provide opportunities for crosschecks.

Longitudinal research also considers the audience to which the result should be presented. This research process started with a broad definition of the problem, refined via various iterations with additional literature reviews, data collection and internal reflections, which Pettigrew (1990, p. 279) describes as 'at times the untidy character of the research process'. One reason the researcher rewrote the thesis multiple times was to lay the foundations for themes that formulate the framework. The AR study results started with the concerns faced by the organisation followed by an iterative process of refining interventions. In the research chapter, the patterns recognised from the data are presented and merged with the theory to aid generalisation by linking it to research findings.

A further challenge associated with an improved understanding of the real-world complexities is the volumes of data collected, which Pettigrew (1990, p. 281) so eloquently describes as 'death by data asphyxiation'. The route to understanding in longitudinal research is obtained by having clear research objectives, understanding the study questions and time constraints, defining the theory and methods, establishing the analytical framework and themes that cut across the data, applying techniques to reduce and present the data and prescribing generalised actions. It was necessary to reduce the data to simplify it and deduce patterns. Using tables and prioritising findings achieved data reduction. From the theory and results, deductive elements were linked to the framework. The first emerging level of information is ‘what’, which gradually expands to build a picture of ‘why’ and ‘how’ (Pettigrew, 1990).

Since the research objectives were clear, the measurement activities, the actors, context, and theory development contributed to increased understanding of the changing context, history and processes impacted by the interventions. The AR framework succeeds in providing coherence for a longitudinal research study which (Pettigrew, 1990, p. 283) explains as providing an:

> [a]nalytical structure at a broad level but no over-restrictive theoretical web, and plenty of space to adjust research designs and study questions as one moves from one content area of change to another. Furthermore, it provides intellectual space for teams of talented interdisciplinary researchers.

3.5.9. Limitations and Key Assumptions

From the preceding sections, it is clear that AR, mixed-method and longitudinal research presents some challenges. Additional limitations to which the study is exposed are subsequently discussed.

Group Thinking

The researcher allowed the risk practitioners to express their views in group settings rather than one-to-one interactions, except during the DS research and evaluation of the research question. Such an approach can be subject to criticism since social norms could inhibit the free expression of divergent views (Ritchie and Lewis, 2003). Views were challenged by adopting three main approaches to: (1) encourage divergence as an acceptable practice; (2) challenge conformity by presenting alternative points of view; and (3) taking care to obtain responses from introverted individuals. When apparent consensus was reached, the researcher questioned consensus findings. The researcher additionally prescribes to the adversity team leadership style where social codes of practice promote open discussions aligning to Pettigrew’s (1990, p. 278) assessment that such skills should support research:

> [c]onducted by professionals with varying backgrounds and experience and a wise manager seeking commitment respects differences in personal work style and balance in using data sources within a climate where such differences are openly discussable and their consequences revealed.

The study objectives were well integrated as improvement work deliverables since the risk practitioners mostly forgot about the study and 'the Hawthorne effect' of increasing productivity as a result of being observed during the study was not considered a reality. Interviews were also structured in ways that could minimise influence to responses and actions.

Researcher Bias

The researcher functions within the role of practitioner-researcher and should guard against subjective interpretations, which could decrease the value of the research. Preconceptions could prevent exploration of issues. The researcher has 'a scientific and ethical responsibility to present all significant views before offering research objectives' (Pettigrew, 1990, p. 278). Team collaboration and regular meetings assisted in achieving a more balanced objective view and in preventing personal interests from interfering with observations. Using multiple sources of data also helped with maintaining perspective.

There are, however, some advantages to the research being conducted within the researcher's organisation since difficulty in accessing the research population and learning the context of the organisational problems was significantly reduced (Saunders and Lewis, 2003).

Retrospective Analysis

In some cases during the study retrospective analysis was employed primarily at the end of each cycle when practitioners were requested to review individual projects concerning what went well or not. Historical studies are criticised due to potential 'hindsight bias', which can be introduced (Bizzi and Langley, 2012). However, Leonard-Barton (1990) suggests that retrospective perspectives aid longitudinal case studies. The approach is applied to allow retrospective views of NPSD practitioners.

Interviews

In-depth interviews were conducted with NPSD practitioners since they play a leading role during NPSD and are directly impacted by change and risk interventions. While interviews can provide deeper analysis, they present the risk of emotions overshadowing facts (Pettigrew, 1990). Improved factual validity was achieved by requesting interviewees to provide concrete examples of projects that indicated the risks or incidences described. The interviews were developed in discussion with the risk practitioners' teams and first tested on a few professionals and accordingly modified to eliminate potential biases.

Documents

Documents provide factual information but can be subject to selective information retrieval (Pettigrew, 1990). In cases where documentation was counted, standardised decision rules were employed, and types of data were clearly identified. Where risks related to second-level constructs were collected, the different interpretations of the risk practitioners concerning the applicability of the risk to the construct were tested during meetings.

Ethics

The anonymity of the organisation is protected as is customary during research. The confidentiality of all participants in the research is guaranteed and pseudonyms are used to prevent individuals from being identified. However, the organisation has only five risk practitioners who are performing this job function. They are, however, proud of their work and have given consent to collaborate and participate in the research.

Even though care has been taken not to present any sensitive information, the study provides an actual account of how decision-making and change occurred within the organisation. Some of the inferences made during the second order construct analysis could be interpreted as sensitive. However, since these deductions were inferred from a multitude of sources, verification of conclusions are provided. In a few cases, actual case studies from NPSD projects have been indicated, but care has been taken to obscure overtly sensitive information by using coding schemes. Documents produced by the organisation are not divulged to the community due to IP protection; however meta-data was, in some instances, collected.

The NPSD practitioners were aware that they were participating in research during questionnaires and interviews for which consent for participation was obtained and all respondents knew that they were not obliged to take part in the research. However, in situations where work deliverables and research deliverables overlapped, NPSD practitioners were aware that the researcher was conducting research on NPSD in the organisation but was not continuously reminded at every meeting that this was the case, as it would simply have not been feasible to do so. The NPSD practitioners also had no option but to continue with the work deliverables. In cases where information was divulged as part of the work deliverables, care was taken to consider the implications and not publicly disclose sensitive information about specific incidences but use it as background information to formulate the framework and establish general trends. An example is the results of AR lessons-learnt 1, where only the general trends were presented rather than listing individual incidents.

Team of Risk Practitioners

In some cases, the risk practitioners were the co-researchers, while in others they were the studied subjects. No additional financial remuneration was received because they participated in the study, however as individual research deliverables exceeded work performance, extrinsic and intrinsic benefits were derived. Additionally, the team also won industry-related awards for some of the risk initiatives that were implemented, which were directly related to the research.

All involved risk practitioners were permanently employed by the organisation and highly qualified by way of honours and MBA degrees. The racially diverse, multi-disciplinary team functioned as a coherent unit. If and when adverse situations arose, this could at most be attributed to inflicted work pressures. Increased work pressure was especially relevant to AR iteration three when some of the deliverables were only delivered during the last part of the iteration.

Guided by a common strategy and framework, the team members were driven to ensuring organisational success. Given the limited size of the team working closely together in an open-plan environment and complemented by interaction during and after working hours, teamwork and consensus were easy to attain. During the five-year AR study, two team members were replaced by a collective recruitment drive as a selection of competent risk practitioners was crucial to the study and the implementation of RM within the organisation.

3.5.10. Population

The South African telecommunication environment consists of five mobile network operators (MNO's): CellC, MTN, 8ta (rebranded to Telkom Mobile in 2013) and a mobile virtual network operator (MVNO) Virgin Mobile, two national fixed-line operators, Telkom and Neotel, as well as hundreds of Internet service providers and value added service providers. A second MVNO was launched in 2016, namely FNB Connect operating on CellC's network. The two biggest MNO's are merging with the two fixed-line operators (Vodacom/Neotel approved and proposed MTN/Telkom network sharing deal). These proposed mergers raise a concern about how competitive the South African market is, especially considering the high cost of communication (especially broadband services) (Hawthorne, 2015). The dominance of Vodacom-MTN had an adverse impact regarding network competition (Gillwald, Moyo and Stork, 2012). Despite severe regulatory constraints, the two leading MNO's succeeded in increasing their market leadership, revenues and subscriber numbers year on year with new revenue stream offerings and growing their data business offerings. The question is to what extent the market can be considered an extremely competitive environment?

However, competition between the operators regarding mobile broadband and search for new revenue streams via offerings such as mobile money, insurance and mobile medical services, is a reality. Additionally, increased competition is allowed by the converged regulatory regime where hundreds of alternative service providers can compete with Internet service offerings. Within this context, it would be appropriate to investigate risks in NPSD in the ICT sector in South Africa due to: (1) the high rate of introduction of new P&S; (2) the environment being characterised by high technology and business model complexity; (3) various domains such as B2B, B2C, online, social media, and external stakeholders being represented where a variety of specialised knowledge is required; (4) high potential for risk existing and the ability of new P&S to utilise new technologies, business models, new business partners and require new technological integration; and (5) the industry being characterised by a high degree of structure due to regulatory requirements.

Sites, which reflect critical incidents, should be chosen because they fit the context of this research, which focuses on a highly complex NPSD organisation exposed to a variety of risk incidences (Pettigrew, 1990). It is also deemed advisable to select sites where the comparison between high and low performance can be noted which apply to the NPSD environment (Pettigrew, 1990). The site should have experience in the phenomena being studied (which is true for the organisation that had extensive experience in NPSD) (Pettigrew, 1990).

The practitioner/researcher has worked for the organisation for 15 years and incepted the risk division, focusing explicitly on P&S innovation risk management. To the best of the researcher's knowledge, there is currently no comparable model elsewhere in the world.

3.5.11. Conclusion

IS research has been accused of lacking relevance (Keen, 1991a). It is believed that AR can improve practical significance for IS research. AR is the predominant model that operationalises this study. It is described as the 'touchstone of most good organisational development practice', and 'remains the primary methodology for the practice of organisational development' (Baskerville, Smithson, Ngwenyama and DeGross, 1994 quoting Van Eynde and Bledsoe, 1990, p. 27).

The type of knowledge gained by this study as a result of applying AR is subsequently discussed. Mathiassen (2002) used Vidgen and Braa's (1997) framework to distinguish between these three different types of knowledge:

(1) *Understand:* The first objective is to understand. Understanding is achieved by collecting data during practice and interpreting the data using different concepts and frameworks. In this study information was collected over four years. The data consists of interviews, questionnaires, incidents and documentary data informing the risk assessments conducted on a broad range of P&S for the B2C and B2B markets. Due to the absence of particular theories and constructs to guide RM in NPSD, additional exploratory research has been introduced, involving questionnaires and qualitative methods (Skelton and Thamhain, 2004).

(2) *Support:* The second objective is to obtain knowledge that can support the practice. The associated activities involve the design of artefacts, which for this study consist of methods, guidelines, or techniques that can be used to improve RM practices. A framework supporting the development and implementation of RM specifically for NPSD is developed and tested using CPR and DS approaches over three AR iterations.

(3) *Improve:* The third objective is to improve practice, which can only be performed with some technical or social intervention. Practices are changed so knowledge can be obtained from new approaches as well as any barriers and enablers that would impact on the improvement efforts. NPSD projects are studied throughout their duration and the development of NPSD processes and RM processes are tracked via the utilisation of CMM frameworks over the three AR cycles.

The three activities support each other to facilitate organisational learning (Mathiassen, 2002). Organisational learning is directed towards: (1) changing corporate norms; (2) preparing for further AR interventions and cycles (based on the knowledge that was gained); and (3) providing knowledge to the scientific community in preparation for future research (Baskerville, 1999).

4. Chapter 4 – Action Research Practice

4.1. Introduction

The primary objective of the research is to embed RM within the domain of NPSD within an ICT organisation. From this broad theme, the main contribution of the AR research is defined as the development of a framework for understanding risks in NPSD and RM processes. A secondary contribution is to enhance the knowledge regarding what risks exist within NPSD and how these risks are managed within an NPSD environment. A third contribution is to increase information about what happens inside the RM process as De Bakker et al. (2010) state that insufficient research has been conducted on the behaviour of stakeholders and the activities that take place within the RM process.

4.2. Organisational Context

The following section is divided into two parts. Firstly, the organisational context is discussed, followed by the RM context. An explanation of the research site and formal structures that govern the organisation is necessary to clarify the research focus and whether the involvement of the researcher is adequate (Davison et al. 1980; Lau, 1997, 1999).

Organisational Environment

The research organisation is a mobile communications operator that provides voice, messaging, data and converged solutions to both consumer and business customers in various African countries. The industry sector is IT and Telecommunications with geographic areas of operations that include South Africa, Lesotho, Mozambique, Tanzania, DRC, Nigeria, Zambia and a few other countries in Africa. The total number of permanent employees in South Africa is 5153 and internationally, 2115 according to the organisation's Integrated report for the year ended 31 March 2013. The AR study focuses initially only on South Africa.

The organisation is considered an early adopter of leading-edge technologies and also the innovator of various telecoms P&S that have been adopted worldwide. The NPSD structure initially provided P&S to the customer market, which was later extended to provide mobile and converged P&S solutions to the business market. The organisation thus has two main divisions that are responsible for the launching of new P&S, namely B2C and B2B. The organisation has also expanded to new markets with ventures such as mobile health, insurance, financial services and mobile money.

The telecommunications industry in South Africa is deemed to be competitive and consumers expect prompt reactions to competitor product launches. Due to the competitiveness of the market, NPSD teams operate under intense performance pressures. Under these conditions of extreme competition, a lack of formal NPSD development existed, and this was intensified by high tolerances for risk displayed by senior management within NPSD. A former senior executive describes the status of the organisation during that time as 'sometimes one could not get through all the paperwork on time but the imperative was to be first at any cost'.

In general, the IT & Telecommunications industry is characterised by complexities inherent to the use of innovative technologies, multiple business partners and business models. The organisation is operating within a stringent regulatory environment that governs competition and consumer protection laws. All of these interacting dynamics present challenges to the NPSD teams engaged in the development of a vast number of P&S on an annual basis.

NPSD teams are primarily located at the head office in Gauteng, but some system development activities take place in other locations. Figure 97 in Appendix 8 describes the complexity of the work site. The NPSD division is structured in many functional units that concentrate on specific markets and customer segments. The product managers, supported by project managers, are responsible for NPSD. The project managers belong to a distinct functional unit, namely the Project Management Office (and assemble NPSD teams to ensure that all relevant parties who can contribute towards development and commercialisation form part of the NPSD group.

NPSD teams can comprise of seven people, ranging to project teams with 50 or more participants (dependent on the complexity of the P&S). Support resources include members from different functional areas, such as technology, finance, legal, regulatory, risk and marketing. In some cases, these teams can also include external parties such as vendors and suppliers of the P&S. The wavy red line on top of Figure 97 designates the external environment, namely customers, businesses and external stakeholders such as government. NPSD teams will intermittently interact with customers while executive management will manage stakeholders like government.

NPSD teams, as well as technology teams, are functioning within an environment that can be characterised as pressurised and target-driven. Structural reorganisations take place on an annual basis. Restructuring also applies to top management, where a major overhaul can be expected every few months.

The cumulative number of NPSD projects that NPSD practitioners engage in on an annual basis is approximately 160 projects. Functional units report to their particular line management team. Executive management involvement in NPSD takes place on a higher level with a more strategic orientation towards selecting suitable P&S for development. As the red arrows indicate in Figure 97 the risk practitioners interact directly with the product teams and different individuals on the teams. These interactions include senior management, and to a lesser extent, executive management.

NPSD and support teams consist of multi-cultural, multi-racial individuals with an average age of 45, which is gradually increasing due to the low employee turnover rate of 7%. Black representation at senior management level is 49%, while female representation lags at 29%. A good indicator of productivity and engagement levels is that the absenteeism rates are 1.4% below the industry average of between 2.6% and 3.0% for South Africa. More than 60% of resources have obtained a college or advanced degree. This information is contained within the organisation's annual integrated report presented for shareholder and published online.

The Risk Management Context

The organisation is listed on the Johannesburg Stock Exchange (JSE), which means that the Companies Act 71 of 2008 binds the organisation (South Africa. 2008a). The Companies Act makes RM mandatory through advocating compliance with the King III Report on Corporate Governance for South Africa (2009), emphasising the importance of reviewing Enterprise Risk Management (ERM) practices to safeguard continuity, sustainability and continued success of the organisation. Failure to comply with the Companies Act may result in penalties.

The overall obligation for management of strategic, tactical and operational risk was the responsibility of the ERM function as indicated in Figure 18. ERM, according to the Committee of Sponsoring Organisations (COSO) is an on-going process of planning, organising, leading and controlling the activities of an organisation to minimise the impact of risk that organisations undertake (COSO, 2010). The Internal Audit function investigates process risk while project risk is the responsibility of the project owners. Before this study, the focus of the ERM function was restricted to operational, tactical and strategic risk. No formalised RM processes for NPSD were implemented. The Australian and New Zealand Standard (AS/NZS, 2004) governed the overall management of risks within the organisation.

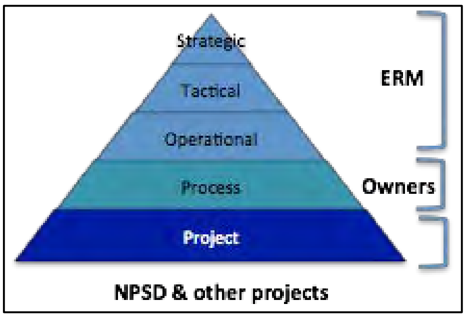


Figure 18: Pre-study Context Of Risk Management

The researcher relocated to head office to take up the position of Principal Specialist in April 2007, to manage risks within NPSD. The expectations of the RM leadership were that the researcher should act in an advisory capacity, by proposing risks and controls. No obligation rested on the NPSD teams to consider or implement any of the risk recommendations. Initial risk assessments consisted of a list of risks unique to the P&S. Each product was analysed from a zero basis as no risk lists or structured methodology existed. The workload was excessive, due to the sheer number of P&S that were being developed.

Six months later, the researcher made a breakthrough. The organisation was forced to abandon a P&S launch that was deemed a 'harmful business practice' by the National Consumer Forum and consequently declared illegal by the National Lotteries Board (Mail & Guardian, 2007). These risks were previously predicted and escalated to executive management. Subsequently, the CEO provided the RM department with a mandate to prevent P&S from launching that failed to implement sufficient controls. Furthermore, four risk positions were granted specifically to manage risks in NPSD. The significant difference between the pre-mandate and the mandate stage was that hitherto the practitioner operated as a consultant to the NPSD team. With the mandate provided by the CEO, the risk department had to ensure that risks were efficiently mitigated and critical risk exposures prevented.

The researcher/practitioner was responsible for the selection of risk professionals, engaging candidates passionate about RM and ensuring that the best P&S were launched. RM experience was considered as advantageous but not necessary. The final risk practitioner team consisted of a team leader with a strong practical and theoretical background in IS and specifically information security. The team also included a business analyst, a product manager with solid project management skills and an IS auditor. The researcher/practitioner had a strong practical background in IS development, business analysis and various specialist RM functions. The risk team was multi-cultural and championed protecting the organisation.

During this time, the researcher enrolled at the University of Cape Town for a Ph.D. study and laboured to find a suitable research topic. The two opposing poles of innovation and RM were of interest to the researcher, mainly due to her working environment. The researcher’s professor advised an AR approach and introduced the researcher to the seminal study of Iversen et al. (2004) that focused on improving RM practices in SPI. The research idea was born.

4.3. Initiating

The objective of the initiating phase is to establish the context of the initial AR cycle. It provides the rationale as to why the interventions were chosen to address the complex organisation problem. Following Iversen et al.’s (2004) AR methodology, three steps were used during initiation, namely: (1) appreciate the problem situation; (2) study the literature; and (3) select risk approaches. Phase 2, namely the literature review, was discussed during the literature review in Chapter 2 and is not repeated in this section. The interventions and selection of the risk approaches are discussed in Section 1.3.2.1 under the heading ‘framing the deliverables’.

4.3.1. Appreciate the Problem Situation

Several P&S were launched without adequate risk consideration. P&S were vulnerable to a wide variety of risks ranging from lack of market appeal to technology inadequacies. Due to insufficient consideration of unintended scenarios, the transversal impact meant that other risks were being realised. These ranged from a loss of trust, exposure to reputational risk, financial losses and poor quality of P&S that did not support the strategic direction of the organisation. The extent of the problem was real, on-going and had a significant influence on the quality of P&S launched by the group. If problems continued within the NPSD division, it would have a significant impact on the ongoing sustainability of the organisation, which is largely dependent on the development of NPSD to remain competitive.

A rich picture capturing a snapshot of the complexity of the problem situation and the multiple relationships that needed to be managed is presented in Figure 98, Appendix 5. Following on Checkland's SSM (2012), the roles of clients, practitioners and issue owners were identified (as indicated in Figure 103). The primary client was the CEO of the organisation who provided the resources and mandate. The owners of the major risk issues are those who are 'concerned about or impacted by the situation and the outcome of the effort to improve it' (Checkland et al. 2012, p. 211). Many risk issue owners existed, ranging from the actual customers of the P&S to the shareholders. The researcher had to fulfil several roles, those of researcher and while functioning in the role of risk practitioner, also as issue owner.

The formal and informal roles (social positions), norms (expected behaviours) and values (criteria to judge behaviour within the role) provide a good indication of the ‘social texture’ of the context (Checkland et al. 2012, p. 215). NPSD teams (indicated as running figures) in Figure 103 are constantly under time pressure to launch P&S speedily due to competitive and shareholder demands to be the first to market (innovator in the industry). As a result, the goals of the NPSD practitioners and those of the risk practitioners were considered to be in conflict.

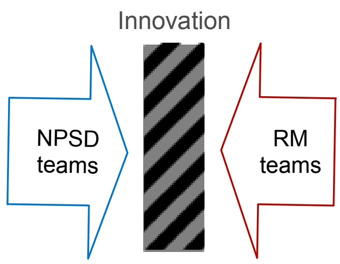


Figure 19: Paradox between Risk and Innovation

NPSD teams intended to bring P&S to the market as quickly as possible. Risk practitioners, on the other hand, appeared to inhibit innovation (as illustrated in Figure 19). Considering risks required extra focus, time and effort. This dilemma reflects a 'real-world problem' that risk practitioners all over the world face (Leonard, 1992, p. 111). It would be challenging to embed RM in such an environment.

Furthermore, conflicting viewpoints existed with regards to what types of risks the risk practitioners could raise. Product managers considered some risks to be in their jurisdiction of management and therefore not a risk to be reported by the risk team. An example was if a risk practitioner requested clarity regarding a proposed business model which could impact on the financial viability of the P&S, a typical response would be: 'what does this have to do with risk?' The sentiment was that the risk practitioners should stick to what they know and leave the product managers to attend to their business. NPSD practitioners did not have a clear understanding of the role that risk professionals would play during NPSD. It was also not yet clear to the risk practitioners.

The culture of the NPSD organisation, in particular, the product managers – who had primary responsibility for launching P&S – could mostly be described as a ‘yes-man culture’ (Khurana, 2002). NPSD practitioners were uneasy communicating ‘bad news’ to executive management. This behaviour culminates in risk avoidance, which adversely impacts on the effectiveness of RM (Kutsch and Hall, 2005). In some cases, NPSD practitioners did not inform the risk practitioners of risks. It was essential to address risk avoidance behaviours to ensure effective RM.

An essential aspect of analysing the problem situation is to consider the politics as they determine 'what does or does not get done' (Checkland et al. 2012, p. 216). The 'local private language' used in the organisation can reveal an example of the powerful political influence played by the CEO (Checkland et al. 2012, p. 218). When questioned why certain P&S were prioritised for implementation with gratuitous haste, the answer was simply, ‘because the CEO said so’. Senior executives displayed a similar autocratic leadership style of 'just do it'. During the implementation of these types of executive fast-tracked P&S, there was limited consideration of risks. All power in the organisation was concentrated in the top executive structures.

The power base of RM was initially weak. Traditionally, a lower status has been associated with non-dominant disciplines (such as RM) while NPSD was considered to be more prestigious. Leonard (1992, p. 120) adds that a 'minor but significant indication of status is that a lower-status individual usually travels to the physical location of the higher'. This state manifested in that the RM team was required to travel to reach the innovation sites.

Another compounding challenge for RM was that regarding size. The risk team was small compared to the size of the NPSD innovation teams and numerous P&S were being developed per year. A faster and more productive method of analysis and risk mitigation within NPSD was required.

Despite these challenges, a written mandate authorised risk practitioners to stage problem interventions and prevent the launch of a P&S. The mandate was essential and served as an expansion of the researcher-client agreement. The researcher had a clear mandate to intervene immediately in problem situations, which is considered a fundamental criterion to support effective AR (Hult and Lennung, 1980). Risk practitioners had the mandate to ensure that risks were efficiently managed and to implement risk initiatives that would guide the NPSD teams and create a risk-aware culture.

4.3.2. Select the Risk Approaches

The principal activities of this iteration took place from January 2010 until March 2011. The manner in which the risk approaches were framed and selected is now discussed.

4.3.2.1. Frame the Deliverables

The initial full-day session, which included all the risk practitioners, was held off-campus. Brainstorming and Delphi techniques were employed to facilitate a collaborative process and outcome by all parties. The researcher most skilled in brainstorming techniques led the session. The manner in which the workshop was conducted and the principles that were applied to guarantee robustness are explained in Section 3.5.3 of Chapter 3: The Research Approach.

Beckhard and Harris (1987) action planning questions were used as guidance to develop an action strategy. The questions that were adapted to the context of the study, for instance 'What needs to change?' were restated as, 'What significant challenges face the risk team to embed RM within the NPSD organisation?' A list of challenges resulted from the brainstorming session. The challenges were classified into three categories, namely 'NPSD, RM and culture'. The first two classes identified the parts of the organisation and the third class, 'culture', related to the support that is required and how commitment can be built. During the second round, the risks were discussed and potential mitigation actions assigned. Refer to Table 16 in Appendix 5 for the second round results. The third round risks were defined and classified in order of importance to improve consensus regarding the highest priority actions.

High consensus was attained for the ranking of the challenges as such: (1) the efficient and effective management of risks in NPSD; (2) lack of a formal and structured RM framework and process; (3) lack of knowledge regarding best practices in innovation; (4) resistance and lack of support for risk management in NPSD; and (5) structure and organisation of the RM team. The literature review also validated these challenges.

The initial challenge was to manage risks efficiently. Risk assessments were carried out on an ad-hoc basis and information was not combined with frameworks, supplemented by risk and controls. To improve efficiency, a consistent manner to gather, organise and analyse risks was required to simplify complex decision-making (Simon, 1983). Secondly, an RM process, iterative and aligned to the NPSD process, was essential (Wang and Huang, 2010; Olechowski et al. 2012). Thirdly, contemplation of best practices in innovation was a critical success factor for an efficient RM strategy (Keizer and Vos, 2003). The absence of best practices could be viewed as a potential risk to the P&S (Nada et al. 2010). Fourthly, cultural aspects, perceived misalignment between the strategies of the risk and the NPSD teams needed attention (Martin and Horne, 1993). Lastly, it was necessary to allocate responsibilities within the risk team to improve support of the risk framework and processes (ISO 31000, 2009). These five objectives were the broad themes that would be refined during the research iterations.

4.3.2.2. Model of Purposeful Activity

The practitioner utilised SSM as an alternate approach to refine the deliverables. The Root Definition (RD) was described by employing the PQR formula of doing P, by Q to achieve R, answering the questions 'What?' 'How?' and 'Why?' (Checkland et al. 2010, p. 219). The RD was described as follows: Embed RM within NPSD by developing an IRMF and supporting processes, for efficient RM. The model of purposeful activity was derived from the RD as illustrated in Figure 20 adapted from Iversen et al.'s (2004) study based on SSM CATWOE elements (Checkland et al. 2010). CATWOE elements are explained in Table 103 in Appendix 5).

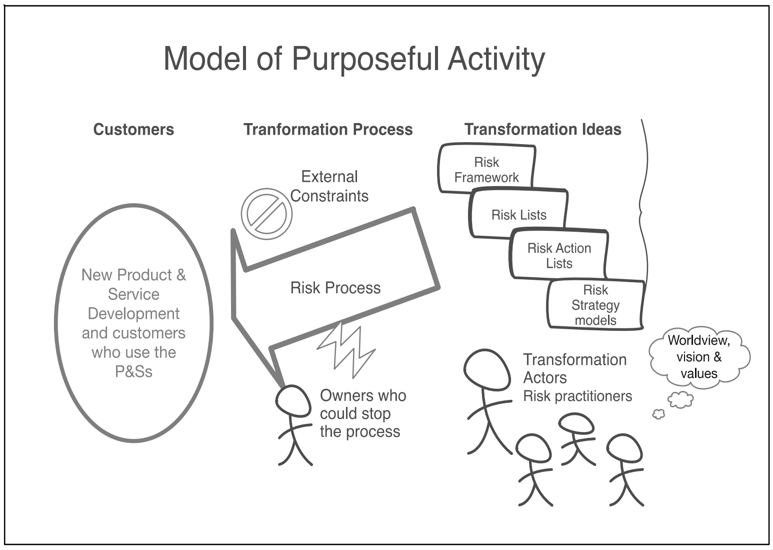


Figure 20: Risk Improvement Areas, AR Iteration One

The objective of the transformation process is to seek improvement in the NPSD organisation, which is responsible for launching consumer products to the market. NPSD are the customer; however, secondary customers such as the actual end-users of P&S can be impacted as either 'victims' or 'beneficiaries'. The transformation processes consist of improvement ideas and methods that are being developed in collaboration with the risk practitioners. Improvement processes are the techniques used to organise, implement and embed RM within the NPSD organisation. Owners of the transformation processes include executives in charge of the NPSD group or those that could stop or change the process. Constraints in the external environment are those elements external to the transformation process such as stakeholders of the organisation. Actors responsible for the transformation process are the risk practitioners in collaboration with the researcher. The worldview is the internalised assumptions whereby actions are interpreted.

The risk specialists collaborated on the development of an RM plan for NPSD. An RM plan specifies the approach, management components and resources to be applied to the management of risk (ISO 31000, 2009). The primary objective would be the development of a risk framework and supporting processes. Three AR cycles took place in an iterative manner, through the stages of development of the risk framework and risk process, applying the approach and evaluating the experiences.

4.4. First Iteration

The iteration stage consists of four steps, to: (1) develop a risk framework; (2) design a risk process; (3) apply the approach; and (4) evaluate the experiences. The development and design of the risk framework and risk process are combined in Section 4.4.2, while the application and the key learning's are explained in Section 4.4.3. Each AR iteration commenced with establishing baseline performance standards as presented in Section 4.4.1. While the CMM evaluation occurred as a sequential activity at the inception of each AR iteration, development of the remaining interventions occurred in parallel from January 2010 until February 2011.

4.4.1. Establish Baseline Performance Standards

To measure improvement, it is essential to establish baseline criteria. The researcher introduced the risk practitioners to the CMM as a particular method to measure improvement in processes. Firstly the maturity of the NPSD process was analysed followed by the maturity of the RM processes.

NPSD (Capability Maturity Model)

In collaboration with the risk practitioners and resources from NPSD, the team analysed the CMM for NPSD. The objective was to ascertain the extent to which the NPSD process is 'explicitly defined, managed, measured and continuously improved', as improvements in the NPSD process could lead to more efficient projects (Dooley et al. 2001). The discussion was structured around Dooley et al.'s (2001) questions to determine the maturity rating of the overall NPSD effort. The outcome of the analysis is presented in Appendix 5, Table 53: NPSD CMM - AR iteration 1. Only examples of level one and two elements existed and no proof of level three to five activities could be established. The NPSD process was not clearly documented or standardised and existing processes were often bypassed.

As all of the elements were intended to be consistently present during each stage, the maturity rating could not be considered a level - 2. Risk practitioners debated that while good NPSD projects occurred – where massive amounts of work were performed in short time frames to deliver quality P&S – these projects were not the norm and could be ascribed to the efforts of individual product managers. Overall agreement existed that the NPSD process should be more disciplined and key project management activities should be more adequately performed. Consensus about the maturity rating being reflected at level 1- Initial was achieved. Maturity levels are verifiable by reviewing existing P&S, process and project management documentation or lack thereof to validate the existence of the CMM elements.

Risk Management CMM

A baseline performance standard was also established for RM processes. It was anticipated that the RM process would have a low level of maturity as the risk team had not embarked on the formal development of risk approaches and frameworks. The researcher used Hilson's (1997) attributes of RMM levels as a baseline to identify the characteristics of the different levels of RM capability maturity. The risk team performed this task, without the involvement of the NPSD group. The conclusion of the analysis is available in the Appendix 5: Table 56: RM CMM AR - Iteration 1.

While some elements of level-2 existed (such as dedicated resources), not all of the elements were found. Since there was a lack of structured, formal risk processes, tools and methodology and some product managers were still unaware of the need for managing risk, the CMM risk rating was rated as 1-Naïve.

4.4.2. Development of Risk Framework and Processes

The design and development of the risk framework and processes were delivered in parallel. Some deliverables were not envisaged in the initiating stages but became necessary during the AR iteration.

4.4.2.1. The Risk Framework

The primary challenge was to combine risks into a simplified framework that would assist the risk practitioners to deal more efficiently with complex decision-making. Six high-level constructs were developed during the literature review, namely: strategy, market, process, culture, compliance and technology risk. These high-level constructs consist of some second-level constructs.

Three second-level constructs of the IRMF, as developed in the literature review, were excluded during the first AR iteration, namely 'portfolio management' (as a second-level construct of strategy), 'product management' and 'process management' (as second-level constructs of the high-level construct of process). Since the risk practitioners and the largest majority of the NPSD practitioners did not participate or were not aware of official 'portfolio selection' processes, they would be of limited value to the IRMF. 'Process management' was excluded since the AR iterations commenced with an evaluation of both the CMM of the NPSD and RM processes. 'Product Management' was omitted since the risk practitioners observed that the significant risks that form part of the product management category were included in other second-level constructs such as financial management. However, several new second-level constructs were added, indicated as the grey coloured categories in Figure 21 below.

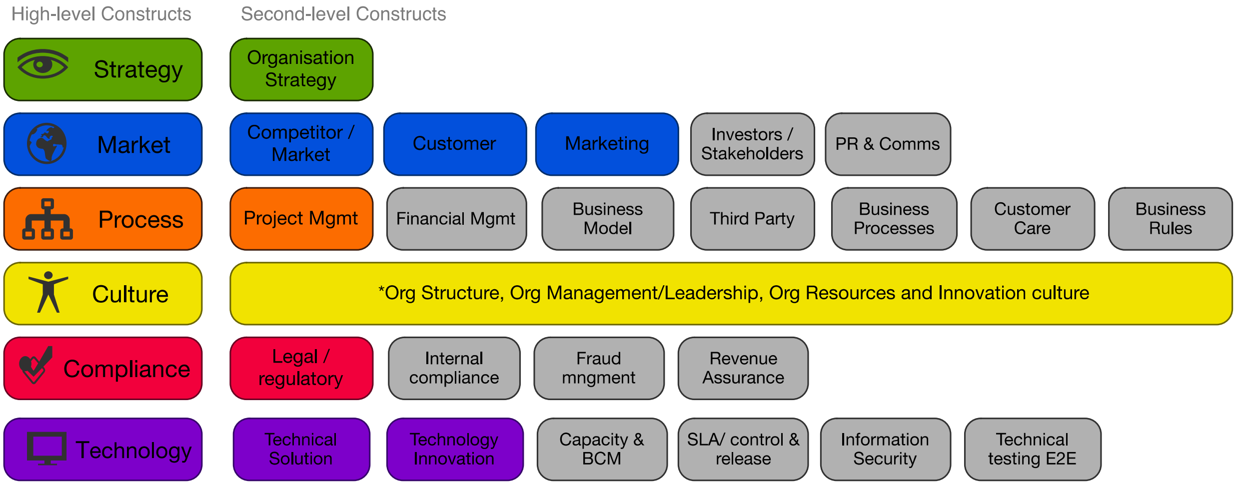


Figure 21: IRMF, AR Iteration One

Both the literature review and risk incidences gave rise to these categories as demonstrated in Table 66: Sources of the IRMF Second-Level Constructs, Appendix 5. Table 66 additionally provides definitions for each of the second-level constructs.

4.4.2.2. Risk Lists

The risk team then needed to expand on the risk and control lists. Risk lists are items that can be used by the risk practitioner to focus attention on possible sources of risk (Rapoport et al. 2000), as explained during the literature review. Sources from the literature review (products, services and risk) were analysed to provide risk lists per a particular second-level construct, but adapted to make it more relevant to the delivery of services and the context of the organisation. A generic example of the second-level construct Competitor and Marketplace is offered in Appendix 5, Table 60. The sources of risk are shown as either from the literature review or information added by the risk practitioners and NPSD resources. The term 'incidents', is used to describe risks that were added from the incident register. The risk lists were raised as questions.

The risk practitioners were firstly required to develop an understanding of the P&S context as a rationale to support the risk decisions made. To use an example, when an absence of competitive analysis was raised as a risk, the risk practitioner considered the context of the specific P&S. If the organisation was regarded as the market leader in the particular target market, the requirement to conduct a competitive analysis was not considered as a high risk. However, if the target market was new and the organisation had not launched previous P&S to the target market, it would be regarded as a high risk not to have a good understanding of the competitive landscape. Risk and mitigation lists should be able to distinguish between different contexts of P&S since generic risk lists are insufficient to address complex P&S (Lyytinen et al. 1996; Segismundo and Miguel, 2008).

Once risks are identified, an analysis is conducted to determine the highest potential risks. Several methods for analysing risks were debated amongst the risk practitioners but the method most aligned to the ERM risk analysis technique used within the organisation was selected. The approach combined estimates of impact and severity of the risks according to generic ERM matrices. The impact models reflected an overall organisational level assessment instead of an individual project. For instance, it would be rare that a specific P&S would negatively affect more than 50% of customers (catastrophic risk), which means that the risk related to a P&S project would probably mostly be rated as insignificant. In these cases, the risk would be seen as a low priority.

The impact ratings were adapted according to the individual P&S objectives. For instance, if an objective is to reach the target market estimated at 10 000 subscribers and 50% of the customers were impacted; it could be seen as a potentially catastrophic risk to the project. The context of managing risks within NPSD occurred by analysing the risks to the objectives. However, in some cases, the objectives were not clearly defined and a product manager would, on a generic level, describe the overall intention of the project concerning the functionality that will be presented. Vague specifications introduced additional risk to the project.

4.4.2.3. Risk Action Lists

Risk action lists contain prioritised risk items accompanied by risk resolution actions (Iversen et al. (2004). Following on the risk action list approach, the risk practitioners collaboratively proceeded with compiling risk resolution items.

The relation between the risk lists and mitigation action lists are demonstrated in Figure 22 below. The risks lists and mitigation action lists were generic and used as guidelines. The risk practitioners

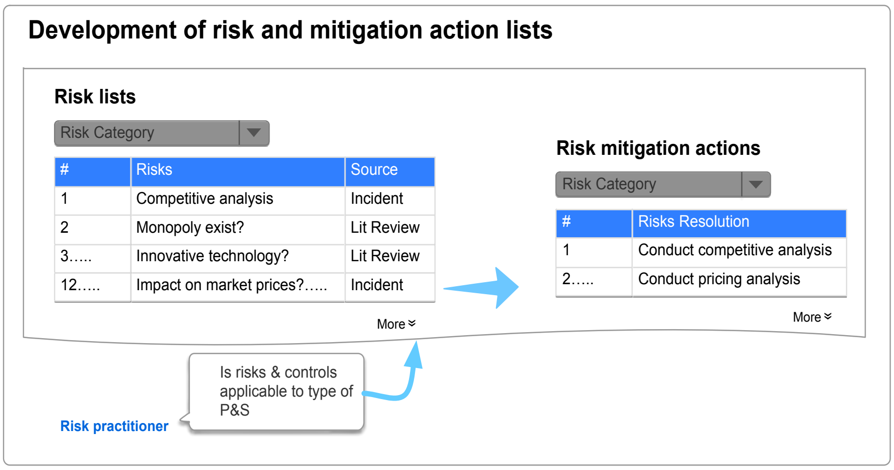


Figure 22: Application of Risk lists and Risk Action Lists

could freely combine and adapt the risk lists and resolution items according to the context of the P&S. An example of the risk mitigation actions developed for the second-level construct of

'Competitor and Marketplace' is provided in Appendix 5, Table 61. The end result of the risk analysis was a risk profile that could be used for prioritisation of risk strategies.

4.4.2.4. Risk Strategy

Tailoring the RM process to the context of NPSD was a key requirement to ensure effective RM. The risk analysis itself needed to be delivered in a standardised framework that would be easy for the NPSD practitioners to understand. The design of a comprehensive strategy and scoring mechanisms was the next challenge that needed to be addressed.

Two problems informed the development of the risk strategy. Firstly, a lack of information presented by the NPSD teams impacted on the quality of risk assessments. The NPSD CMM level-1 implies that P&S documentation was often incomplete. An absence of information creates uncertainty regarding achieving goals. In cases where the risk practitioner tried to quantify the missing information regarding possible consequences and likelihood of occurrence, it was purely a theoretical exercise with limited value. Not having sufficient information led the risk analysis process to be largely subjective and inaccurate. Further, rather than reflecting on the NPSD practitioner (for providing insufficient information), it reflected on the risk practitioners, who had to defend risk assessments as being too conceptual. If the risk practitioner merely stated that insufficient information existed to perform a comprehensive risk assessment, product managers mostly ignored it. The second identified problem was that NPSD practitioners would falsely claim to have certain controls in place. A mechanism needed to be established to determine whether the control was implemented.

In addition to the risk assessments ratings, another compliance scale was developed, based on audit guidelines. The difference between a risk assessment and audit is that a risk assessment provides a high-level overview to analyse gaps and risks, while an audit would verify that the specific controls have been implemented. The risk assessment investigates and suggests what should be in place while Audit tests whether it is actually in place. A compliance scale is applied before the P&S is launched to verify that controls are implemented.

The risk ratings were colour coded as indicated in Figure 23.

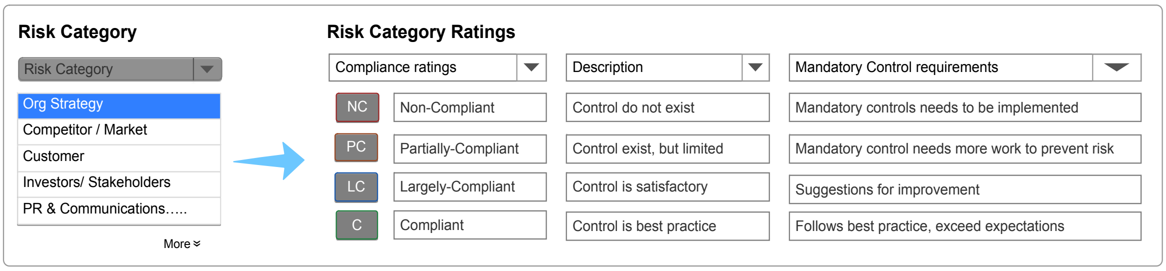


Figure 23: Risk Second-Level Construct Ratings

Non-compliant (NC) and partially compliant (PC) are displayed as red and orange, while largely compliant (LC) and compliant (C) are indicated as green and blue respectively. NC and PC signify that knowledge gaps exist where controls need to be implemented. LC and C mean that no essential work is required, but suggestions, as defined in LC, can be applied to improve the P&S.

Figure 23 shows a generic risk rating. The compliance ratings were customised for each category and based on CMM maturity ratings. Level 1 and 2 scores would indicate that the control does not exist or is insufficiently robust to prevent the risk from occurring, which correlates to CMM level 1 - initial and level 2 - repeatable. Only four categories of ratings were used as it was thought that very few organisations have achieved a level 5 - optimising rating.

Specialised risk ratings were created for each category as indicated in Table 62 (Appendix 5) as an example. The compliance rating was associated with a risk description and mandatory control requirements, which were adapted to the context of the risk category. When the category ratings are applied during the early phases of the NPSD, it indicates to the product manager the extent of which the knowledge gap is to be bridged. The approach proactively reduces risk exposure due to ambiguity and uncertainty. Another advantage of the approach is that it encourages the NPSD teams to achieve compliant ratings that are indicative of best practice evaluations.

The term ‘compliance’ generated many deliberations amongst the risk practitioners as some expressed discomfort about using the word ‘as they were not auditors’. Regardless, some considered that stricter measures were needed to increase the maturity of the NPSD process. The term ‘compliant’, or ‘non-compliant’ for that matter, could indicate to the product managers that they are not meeting best practice guidelines and could ultimately result in their striving to improve. These discussions took the risk practitioners many meetings to resolve. What swayed the debate in favour of utilising the term was that some product managers were still ignoring the risk feedback. Eventually, risk professionals agreed to trial the term ‘compliance’ in the risk assessments.

4.4.2.5. Risk Incidences

Risk incidences were gathered from three different sources: (1) PIRs; (2) incidents gathered during NPSD; and (3) incidents from lessons learnt (surveys and interviews conducted with NPSD practitioners. The process for each is explained with the assistance of Figure 24.

Post Implementation Reviews

Early in the iteration, the risk team was restructured to concentrate on certain P&S categories. Responsibilities were assigned according to knowledge and experience. One of the team members was assigned to perform post-implementation reviews on selected P&S. This approach relates to evaluation, where failures from previous P&S are gathered as generic risks to be added to risk lists (De Bakker et al. 2010). The risk practitioners collaboratively decide which projects require a more detailed PIR. The sources for the PIR were always projects already implemented in the marketplace for three and six months. The PIR practitioners also interviewed the project team members to evaluate their experiences of the project.

Referring to Figure 24 the PIR was divided into four sections: (1) a control analysis to determine what went wrong during the compliance analysis; (2) a detailed findings analysis that focused on the incidences specific to the project; (3) an analysis of the success of the project in terms of its original stated objectives; and (4) a general-lessons-learnt which consolidated information sourced from project team members. The criteria used to analyse these sections are provided in Appendix 5: Section 14.9: Post-Implementation Reviews.

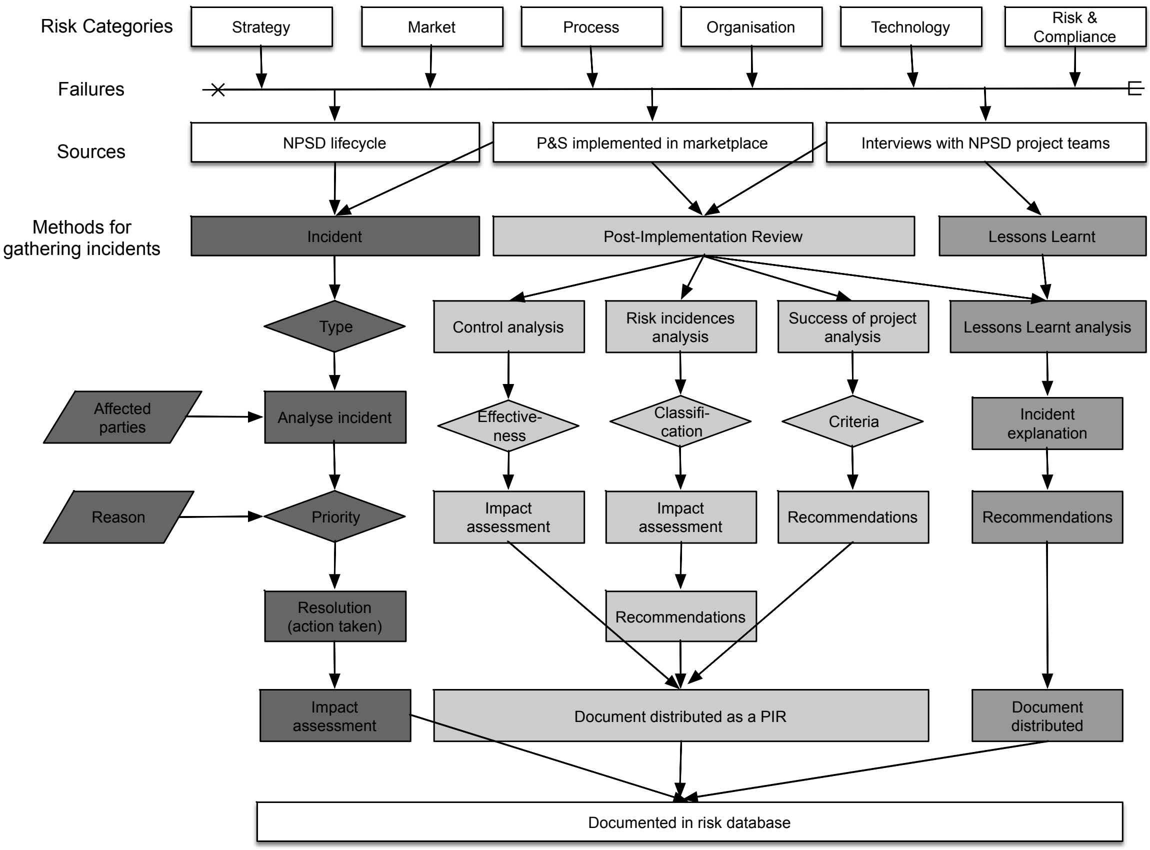


Figure 24: NPSD Incidence Register

The PIRs were conducted in collaboration with the NPSD team (who were directly responsible for the project). The results were documented and distributed to the executives and project team members for the purpose of implementing recommendations. The PIR evaluation offered four knowledge contributions to the project in terms of meeting its objectives, control effectiveness, incidence management and lessons that can be learned to improve further projects.

Incident Database

An incident record documents the details of an incident from registration to resolution. Patterson and Neailey (2002) advise that maintaining a risk register improves project RM as the information can be used as a platform to develop mitigation strategies for high-level risks. A risk register typically identifies and assesses risks and provides mitigation actions to address those risks.

During the NPSD lifecycle and post-implementation monitoring phase, P&S incidents were analysed in terms of the type, affected parties, impact and resolution action taken. In most cases, the risk practitioner responsible for the specific P&S would update the risk register, but high-risk incidences were discussed at weekly RM meetings to learn from the incidences. Additional reports were requested to track occurrences from Customer Care as well as technology incidents. An example of a risk register (as completed for a specific service) is provided in Appendix 5, Table 68: Incident Register.

Lessons Learnt Reviews

At the end of AR iteration one, a lessons-learnt review was conducted on 16 NPSD (including promotions, campaigns and competitions) launched during the previous year. The risk practitioners developed and conducted a total of 77 interviews during which 11 risk categories were assessed. Best practices were discussed and included for each of the 11 categories of risks that were evaluated by the report.

The questions related to incidents. An example is provided in Appendix 2: Table 24: Operational Risk Survey, AR iteration 1. The incidents from the lessons learnt were consolidated in a documented lessons-learnt review that was distributed to all the NPSD practitioners as well as executives of the organisation. The broad objective was to facilitate learning from NPSD that can be used as input to improve the successful delivery of future P&S.

4.4.2.6. Rating of Overall Project

During the AR iteration, additional requirements arose. Compliance ratings provided valuable indications of particular risks requiring attention, especially where mandatory controls were to be implemented. However, the product manager was still required to rely on the

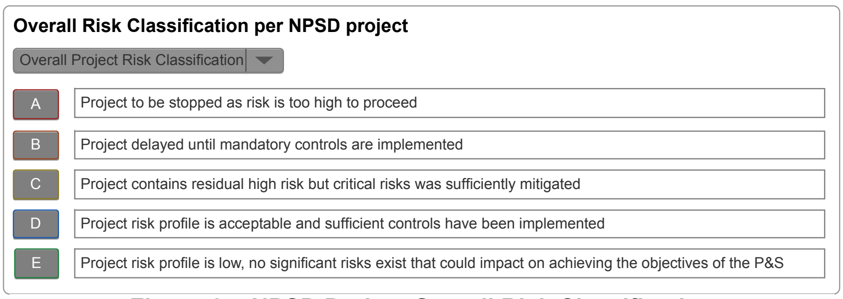


Figure 25: NPSD Project Overall Risk Classification

ratings of the individual risk second-level constructs. A single qualification of the overall risk exposure of the particular P&S project did not exist.

The risk practitioners, in collaboration with senior leadership of RM, designed an overall rating scheme fulfilling two purposes: (1) provide quick guidance to senior leadership of the overall P&S risk, as well as (2) a way for the risk practitioners to reinforce their CEO-granted mandate to prevent P&S from exposing the organisation to excessive risk.

The risk classification is indicated in Figure 25. The risk rating was classified from A to E, where an A risk meant that the risk was too high for the P&S to proceed, while E indicated the lowest risk level. An A rating meant that the risk practitioners were using their mandate to stop the project.

4.4.2.7. Toolkit

One of the requirements of collaborative AR is that the researcher must follow a flexible approach since conditions change during the AR cycle as new priorities emerge. The risk framework, risk lists, risk action lists and rating methods were too complicated for the NPSD practitioners to understand. The risk process needed to be explained in a manner that could assist the NPSD practitioners to make more informed risk decisions.

Development of a guideline for NPSD practitioners was necessary to obtain a thorough understanding of the risk process at a glance. The objective was to clarify the risk process and necessarily lead risk practitioners to be more aware of the risks associated with NPSD. Following on Boehm’s (1991) IS risk management approach, an additional tool needed to be developed for NPSD practitioners.

Under the guidance of the researcher, the risk practitioners designed a toolkit. It was not planned as a DS artefact but an organisational intervention to assist the NPSD practitioners in making sounder risk decisions. It took several iterations to design, since the researcher remained adamant on the concept that the toolkit should conform to DS criteria of completeness, simplicity, elegance, ease-of-use and easy to understand. An overview of the basic premise of the toolkit is provided in Figure 99, Appendix 5.

A second-level risk construct was presented on each page and discussed ‘what’ and ‘why’ questions. Top risks pertinent to the category as applicable to the organisational context were demonstrated, as were mitigation controls, with an overview on the left of how the risks would be analysed and rated by risk practitioners.

To address the perception of cultural misalignment between the objectives of the risk teams and the NPSD strategy, a strategic vision was conceived by the risk practitioners, described as ‘building the organisation's reputation as a company that launches the best products, services, promotions and campaigns’. This vision statement (that was communicated to the NPSD teams during iterations) suggested a mutual interest in growth in NPSD with aligned and affiliated goals (Berglund and Sandström, 2013). All communication to the NPSD team reflected the vision, and it was prominently presented in the toolkit.

4.4.2.8. Risk Process

One of the deliverables of the iteration was to develop a risk process that is iterative and aligned to the NPSD lifecycle. Risk practitioners collaboratively explored several possible options and settled on the process explained in Figure 26 (adapted from Cooper, 2008).

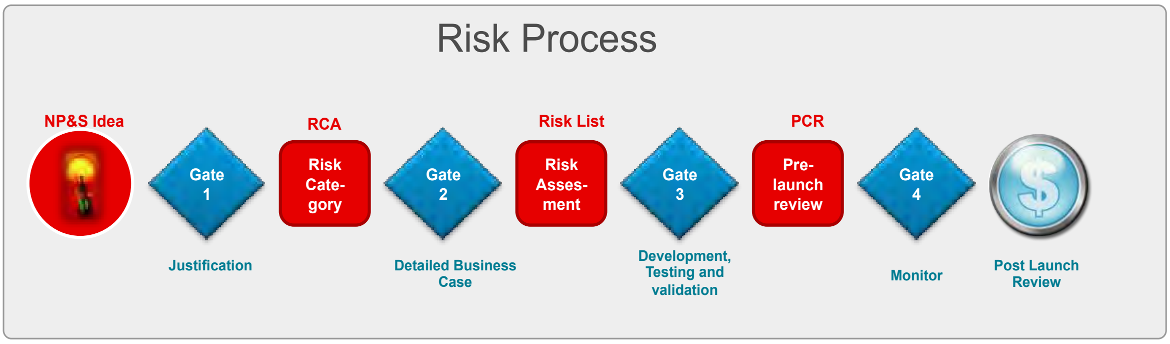


Figure 26: Risk Process, AR Iteration One

As indicated in Figure 26, risk assessments were conducted during all of the lifecycle phases of the NPSD project. Before the P&S launched, a pre-launch review was conducted to determine if the requested controls were implemented. Insufficient controls meant the risk team would not recommend launching the P&S. The final phase encompassed performance monitoring of the P&S once implemented and if several high risks remained, a PIR was conducted.

From a practitioner viewpoint, it was important to reduce the number of reviews conducted, as not all P&S could be considered to qualify as high-risk. In order to decrease the number of risk assessments, the product manager was requested to complete a spreadsheet tabulated with several risks questions. The document was called a Risk Categorisation Assessment (RCA) and is included in Appendix 5, Figure 100. The objective was to determine the risk profile of a P&S after the concept stage/gate. Depending on the outcome of the qualifying questions, if a project was considered high risk, a full risk assessment would be conducted. Conversely, a low-risk categorised project would require a limited risk assessment.

4.4.3. Application and Evaluation of Experiences

This section focuses on the implementation of the intervention and the intended and unintended results. It provides fundamental learnings as reflected upon in collaboration with mainly the risk practitioners but also the NPSD practitioners. Reflection is outlined concerning the applied interventions, their outcomes and identification of new knowledge acquired. Lastly, it considers how the organisation's norms changed as a result of the interventions. Argyris and Schon's (1978) single-, double- and triple-loop learning concepts are utilised to frame the discussion.

4.4.3.1. Interventions

The subsequent section discusses the applied interventions and evaluates the collaborative experiences.

NPSD CMM

Risk practitioners agreed that the CMM evaluation was easy to use and formed a sound basis for evaluating the processes. The risk professionals found that the CMM rating could easily be validated since various examples existed where processes were ignored, bypassed or stage/gate procedures were not followed. The CRO discussed the maturity rating with the executive in charge of the NPSD organisation with the objective of ensuring the implementation of more robust NPSD processes. The risk maturity rating of level 1 was received with considerable opposition and vehemently denied by the executive.

Upon reflection, a lack of resistance would constitute acceptance of certain NPSD work activities not being performed adequately. The challenge was for the risk practitioners to counter such resistance by implementing effective communication methods to ensure that risks were managed, rather than ignored. The risk practitioners learned from the experience that more could be achieved by phrasing risks in other ways so as to achieve greater buy-in. During the iteration, more robust NPSD processes were deployed in collaboration with the principal stakeholders, including the risk team.

Risk Management CMM

Risk practitioners considered Hilson's (1997) RMM framework for evaluating the maturity of the RM process as insufficient to address complex projects reflective of the NPSD group. They also believed that it inadequately covers the elements of an RM process and should be customised to meet these requirements. The researcher was called upon to investigate and develop a maturity framework that could be more applicable to the high technology NPSD ICT environment, rather than a generic ERM context.

The CMM evaluation, however, succeeded in strengthening the risk practitioner's team's determination to implement the risk approaches as previously highlighted, since these were the major shortcomings that would prevent them from reaching an improved maturity rating in the next AR cycle.

Framework

Defining the second-level constructs of the framework was challenging, as risks and resolution items tended to overlap. Risk practitioners additionally had different interpretations of the constructs. Several workshops were conducted to ensure that the risk practitioners had a similar understanding of what each second-level construct meant. However, due to the interrelated nature of risks, it remained difficult to define disjointed constructs.

A risk definition was provided and agreed upon for each second-level construct, which assisted the risk practitioners to obtain an improved understanding of the characteristics of each. There were still some risks, which were overlapping in constructs, which were allowed. Non-disjointed second-level constructs were allowed to meet the objective of comprehensiveness, and since characteristics of disjointed are not strictly required for qualitative risk assessment (Kaplan and Norton, 1992). To verify mutual understanding, several examples of current P&S were used, and walk-throughs were conducted to validate the risk practitioners' understanding of the different risk constructs.

A distinct advantage of the framework was the fact that it reduced time to perform risk assessments and provided a common structure for the risk practitioners to work from. It also ensured that all risk constructs were considered and a wider range of risks were evaluated which improved the quality of risk assessments. However, risk practitioners deemed the high-level construct of culture as 'fuzzy'. They expressed discomfort around reporting insufficient executive buy-in or that the NPSD resources were inadequately skilled in delivering the P&S. Risks related to culture were often just phrased as questions, or ignored. Additionally, the application of the complete risk framework for smaller projects (with less associated risk) was considered inefficient.

Risk Lists

The compilation of risk lists was performed in collaboration with resources from the NPSD teams. The risk lists were extensive; on average the risk team would deliver between 30 and 50 risk items per risk category. The use of IT research on risk sources was especially useful for the technology categories since Nambisan (2003) suggested that using IT research within NPSD could increase research contributions.

The risks were overlapping in some instances as different aspects of the risks were phrased as separate questions. The number of risks supported Lyytinen et al.'s (1998) argument that the more items exist in the risk lists, the more fine-grained the 'vocabulary and classification scheme' for risk should be. More specific risk identification was achieved by concentrating on the top risks per category where the risk practitioners often combined several sources of risks to explain the risk in more concrete business terms.

For instance Haverila's (2010) question: 'Do competitors frequently introduce new projects?' can be rephrased as, 'a risk exists that the frequent introduction of new P&S by competitors could stimulate demand for competitor P&S and lead to perceptions that the organisation is lagging in terms of innovation'. Another manner in which risk was phrased was by using if/then questions and formulating the risk as an event and the impact thereof, such as: 'If competitors frequently outpace the rate of innovation in our organisation, customers (especially those that are not locked into contracts) would likely abandon the company in favour of the competition'.

The latter option also assisted the risk practitioners to not phrase risks as overtly negative. Following Kahneman and Tversky (1979) Prospect Theory, an example of positive framing would be: 'If a P&S does not have clear competitive advantages the P&S is less likely to be successful'. Negative framing would be: 'A lack of competitive advantages would likely lead to an unsuccessful product'. Framing risks as losses have a stronger impact on decision-making as these risks are underestimated and overestimation occurs if risks are framed positively (McClure and Sibley, 2011). A more neutral specification could avoid under- and overestimation according to Keizer et al. (2005) where phrasing could simply be: 'Competitive advantages are clearly specified'. This approach was followed by the risk practitioners.

At the start of the iteration, resistance was experienced from the NPSD practitioners. However, astute product managers recognised that these risks would impact on the success of their project and worked closely with the RM team to address the risks. Other product managers ignored the risk feedback or did the bare minimum. It was the perception of the risk practitioners that skilled product managers were most likely to work with risk professionals. The root cause of the unwillingness to engage with RM could relate to avoidance of the bearer of bad news being the object of scrutiny (Raftery, 1994). It could also be attributed to avoidance of doing additional work when the product or project manager was already overloaded.

Risk Action Lists

Compiling risk lists and mitigation actions took several months to arrive at a satisfactory level owing to the excessive workload of the risk practitioners. Early during the iteration, risk practitioners neglected to specify mitigation actions, as the P&S functional specifications were too vague. Vague P&S functional specifications hampered risk qualification and stipulating approaches to transfer, avoid, reduce, control or alleviate these risks. It became easier to specify risk mitigation actions once more robust NPSD processes were applied.

Risk action lists allowed explicit specification of responsibilities and identification of which person or department had responsibility for the implementation of the control. It was, however not always clear who was responsible and it often took some time to establish the identity of the responsible party and convince them that the control was a necessity.

A further problem was that target dates for implementation of the controls were hardly ever specified as the project time schedule was never that fine-grained. At best, risk practitioners would request that a control be implemented before proceeding to the next stage/gate. For instance, customer requirements analysis should be a compulsory control input prior to proceeding with the development of a P&S, whilst a technology security control could be implemented during the NPSD development lifecycle.

Once the risk practitioners employed their veto right to stop the launch of P&S, compliance with mitigation controls improved significantly. However, there were certain instances where the product manager specified the deployment of a control, only for the risk practitioner to determine, post-launch, that this was not always the case. Often, the underlying problem was that the product manager did not fully understand the required control or assumed deferred responsibility for implementation of the control. As a result, risk practitioners verified, via testing procedures, that critical controls were implemented prior to launch.

Risk practitioners also learned to strengthen their communication skills in order to ensure that the product manager had a good understanding of the requirements of the control. The requested controls had to be updated in the functional and development specification. Risk practitioners requested that testing plans were updated in order to reflect which controls needed to be tested. Since the product managers of development teams often neglected to do so, risk practitioners had to review these documents several times to ensure that the required controls had been specified.

Risk Register

In an attempt to benefit from learning, records were kept of NPSD risk incidences. One of the risk practitioners also conducted PIRs on 10 projects, which suffered from some anticipated and unanticipated risks. The PIRs reviewed approaches that worked and those that did not work and submitted suggestions for further improvements. It was also evident that some of these risks could have been avoided with the application of RM approaches. The risks and controls were added to the growing risk and control lists. The risk lists and learnings were utilised to design the risk framework and the risk process.

The key strategy behind the risk register was to learn and understand root causes. Single-loop learning occurred when the product manager corrected the errors. Double-loop learning occurred when permanent technological controls and changed business rules were implemented. It can be argued that triple-loop learning occurred when the project managers instituted a lessons-learnt-review process after the launch of P&S. This meant that knowledge management could be thoroughly entrenched with NPSD lifecycles and the whole process could be reviewed for improvement opportunities. It also meant that the risk practitioners no longer had to conduct PIRs and could provide their perspectives at the PIR meetings held by the project managers.

Strategy for Assessing Risks

A sizable percentage of the risks raised by the risk practitioners related to uncertainties caused by ambiguity and lack of information in the NPSD specification. In some cases, the risk team developed risk assessments of up to 40 pages in length to conduct comprehensive risk analysis and reflect all the incidences of lack of information that could impact on the P&S. When designing the risk strategy and process it was additionally important to prevent NPSD practitioners from bypassing the RM processes as Kutch, Denyer and Hall (2013) and Nelson (2007) state, often occurs. It was also essential to find a strategy to deal effectively with incomplete documentation.

Implementation of the risk strategy for evaluation of the risks assisted in achieving both objectives. First ratings were inspired by fact. If no tangible evidence of the control existed or it was not documented, it was not available. As an example, product managers stated that a market study would be conducted in future, but since it did not exist presently, risk practitioners evaluated the control as not current and non-compliant. This approach is reflective of audit approaches to ascertain detailed inquiry and observation whether a control procedure is adequately performed (Libby, Artman and Willingham, 1985).

The risk assessment strategy supported notions of single, double and triple-loop learning (Argyris and Schon, 1978). Risk practitioners, attempted to include all learnings (single and double-loop) from previous P&S into the risk and control lists and utilise these as mandatory compliance elements (where applicable to the P&S). Triple-loop leanings were included as guidelines and suggestions for change but were not considered necessary requirements. It was left to the discretion of the product manager to implement these recommendations. However, it was seldom that NPSD practitioners performed best practices voluntary which meant that a C-compliant rating was scarce during the iteration. Being an exception rather than a rule could have been attributed to the highly-pressurised NPSD environment where a large number of projects needed to be completed within a limited time and with reduced resources.

Strategy for Overall Project Rating

The objective of providing a consolidated rating for NPSD projects was primarily to provide improved guidance to senior management. It reduced the impediment of analysing the detail within the risk assessments to achieve an overall indication of the risk status of the P&S. The single rating reduced uncertainty and assisted with balanced decision-making (Festinger, 1957). Kahneman and Tversky (1979) suggest that senior managers are naturally risk averse. While there were a few instances of executives attempting to circumvent high risks, overall managers were knowledgeable of the serious risks and agreed with the necessity of implementing mitigation controls.

With the initial introduction of the overall risk classification, it was unclear what the impact of the risk classification meant. For instance, if a P&S received an overall 'A' rating, meaning the risk was too high for the P&S to proceed, the NPSD practitioners did not understand that the project was, in effect, being discontinued. During the first iteration, there were approximately six projects that received this rating. In most cases the projects were abandoned but in two of these cases, the P&S could be redesigned to ensure more effective risk mitigation. It was, therefore, necessary to specify the impact of the risk classification and update the overall project risk rating accordingly.

Toolkit

Several iterations were needed before the toolkit was deemed by the risk practitioners to conform to criteria of completeness, simplicity, elegance, ease-of-use and easy to understand. The toolkit had to strike the correct balance between ensuring responsible RM and not providing too much information to cause rigidity (Schultze and Leidner, 2002). Although risk practitioners reflected that a sufficient amount of information was produced per risk category, they were also of the opinion that there were already too many second-level risk constructs in addition to the necessity of expanding the IRMF even more.

The risk toolkit was demonstrated to the project managers (PMO office) and then to the NPSD teams. Various workshops were conducted with different groups of NPSD practitioners to explain the framework and risks assessments. The risk team was also given the opportunity to expand on the importance of RM and how risk groups could assist so as to ensure better P&S. During these sessions, numerous recommendations were received from the NPSD practitioners, which were added to the toolkit.

The objective of the collaboration was to overcome potential resistance to the new RM approach. However, little opposition to the new approach was communicated. Product managers advised that they had a better understanding of risk practitioners' evaluation and what NPSD practitioners needed to provide. The biggest advantage for the NPSD practitioners was that they were aware of which risks required priority attention. The new risk approaches were more structured than risk lists and the NPSD practitioners considered the toolkit as a valuable source of information.

The risk practitioner's apprehension to use the term 'compliance' was unfounded. NPSD practitioners seemed to consider risks more acutely since they were required to comply with mandatory controls that needed to be implemented before the P&S could launch. Risk professionals also believed the toolkit sessions to be successful at communicating the RM processes and concluded that the correct target audience was addressed. It was established that regular sessions would need to be held with the NPSD practitioners to further embed the risk processes.

Risk Process

RM practices were embedded during the lifecycle of the NPSD project evidenced by risk assessments being conducted at each phase of the NPSD lifecycle. Before commencement of the

AR iteration, involvement by the risk practitioner was limited to the NPSD planning stage, where the risk practitioners performed risk identification and not full risk assessments. However, as more robust NPSD processes were applied, greater involvement gradually increased during the AR iteration covering the entire lifecycle.

The risk prioritisation strategy ultimately failed due to the requirement that the product manager complete the assessment. Some product managers had an insufficient understanding of their P&S and were unable to complete the prioritization spreadsheet correctly. For instance, they would neglect to state the involvement of a third party (despite it being a straightforward question). In such a case, and as new third party systems were introduced, the risk prioritisation assessment reflected a low-risk project instead of a high-risk one. A subsequent investigation into omission would reveal a response of factual ignorance as the risk was deemed to fall outside the realm of the product manager's responsibility.

As a solution to this issue, consideration was given to the training of the product managers in applying the correct techniques to complete the risk prioritisation. Risk practitioners were of the opinion that the product managers possessed insufficient knowledge to complete the risk prioritisation. Additionally, risk professionals reflected that the qualifying questions of the risk prioritisation were inadequate to capture the complexity of NPSD. An example of a risk that would not be featured in the risk prioritisation was 'insufficient system capacity to accommodate the high-volume of real-time operations'. Such an incident could cause a high volume of customer complaints about a particular P&S and would not be detected if the project was characterised as a low-risk priority by the RCA.

Risk practitioners requested that the risk prioritisation strategy be abandoned as it could negatively impact on their ability to ensure sufficiently mitigated risks within NPSD. Despite the risk practitioners being able to blame the product manager for providing incorrect information, the team expressed reluctance to expose the organisation and its customers to adverse risk. Additionally, not managing risks effectively could negatively affect the reputation of the RM team.

The RM team demonstrated a detail-orientated approach and worried about not understanding the P&S detail. The risk practitioners were wary of 'the devil is in the details' conundrum. Risks in complex P&S are often hidden until a more thorough understanding develops. Upon reflection, the RM team agreed that they could be described as 'control freaks'. They felt vulnerable abdicating responsibility when wanting to review each P&S, even if it meant more work. Use of the particular prioritisation framework was abandoned, as it required further work to provide more accurate risk priority assessments. At the same time, the risk practitioners needed to recognize that they were unable to control everything.

4.4.4. Closing of Iteration

The overall research results will be discussed in Chapters 5 and 6. AR and CPR often follow a pluralist approach where the researcher may validate or improve understanding by applying other research methods such as interviews and questionnaires. The researcher suggested more focused data collection and analysis based on a large number of P&S, also displaying the perceptions of the NPSD teams. Risk practitioners insisted the exercise be conducted as face-to-face interviews, where they could use the opportunity for relationship building with the NPSD teams.

The approaches used to design the interviews and questionnaires are explained in Section 3.5.6, Chapter 3. In collaboration with the risk practitioners, interviews were scheduled with individual NPSD practitioners based on their perceptions of the risks inherent in P&S that were launched during the previous AR iteration.

The information was combined in a lessons-learnt report, which investigated the critical areas where controls were found to be lacking and correlated to actual examples of P&S. The lessons-learnt were communicated to all the NPSD teams as well as executive leadership where they were well received. A contributing reason was that the executive and senior leadership in NPSD were dramatically restructured, and more robust NPSD processes were implemented during the latter half of the AR iteration. Therefore, the current top management attributed the lessons learnt to the previous structures and did not feel personally affronted. An ideal time to exit the iteration was presented as this lessons-learnt could serve as input for AR iteration two.

4.5. Second Iteration

4.5.1. Initiating

During the first AR iteration, the risk practitioners implemented the risk framework and processes. Some improvements were however required which would be addressed in the second AR iteration. The second iteration, took place from April 2011 to March 2012. Understanding the problem situation and the selection of the risk approach are discussed in this section.

4.5.1.1. Understanding the Context

A more robust NPSD process was formalised with clear stage/gate procedures. New executive management responsible for B2C innovation was appointed and perceived to be more favourable towards implementation of RM than the former executive structure. The project management organisation was restructured and served both business and consumer NPSD projects. A new CEO was appointed, and the organisation rebranded to align with the primary shareholder. The B2B P&S division (which previously functioned as a separate group), was now more formally integrated into the processes of the NPSD organisation. The B2B executive management requested risk practitioners to assist B2B professionals with risk assessments.

Determining the deliverables for the subsequent AR iteration occurred during a full day collaborative workshop. Beckhard and Harris (1987) action planning steps were used as guidelines to discuss the required changes and support required. Consensus existed that further work was needed on IRMF and risk processes.

The main point for consideration was whether to take on RM for the B2B organisation. Risk practitioners perceived themselves as overloaded. In some cases, they were unable to provide timely responses, and the B2C practitioners would caution against proceeding with NPSD without risk assessments. The executive leadership of the risk professionals was reluctant, due to insufficient resources. Furthermore, B2B P&S have different characteristics (from B2C services) and were typically more technology intensive, which required better technical knowledge. The B2B division was utilising dissimilar systems and methodologies, which would be a steep learning curve for the risk practitioner team.

The team debated the nature of the constraints as well as the consequences. Taking on the B2B division would require a steep learning curve and additional workload with no additional resources or support provided by the risk executives. The risk team reached consensus that the B2B division was to be included in the portfolio. Despite the conditions, the team was eager to take on new challenges and confirm the value they could add to the B2B environment. The decision was guided by the team values and attitudes that shape their decision-making, in particular, efficacy that explains the resilience to adversity (O'Reilly and Chatman, 1996; Salanova and Llorens, 2011).

The interventions for AR iteration cycle two were: (1) update of the IRMF and risk processes from the lessons learnt from the previous period; (2) update of the risk framework and risk processes to cater for B2B P&S; and (3) establishing an improved risk prioritisation strategy so risk practitioners can focus on high-risk P&S.

4.5.2. Iteration

During the iteration, the risk framework and processes were updated and applied and experiences evaluated. Similar to iteration one, the risk team initiated another assessment of the maturity level of the NPSD processes, in collaboration with all of the risk practitioners and resources from the NPSD teams.

4.5.2.1. Establish Baseline Performance Standards

The assessment was performed on the changed and more formal NPSD processes with clearly defined stage/gates. In addition, the RM processes were now well entrenched.

CMM NPSD

At the time of the assessment, the restructured and improved risk and NPSD processes provided a stable environment for the development of new P&S, which followed formal processes. The stage/gate methods facilitated improved planning activities while the entrenched RM processes ensured more proactive RM. All the key disciplines were consulted during the NPSD lifecycle, and the focus was on improving the P&S. The risk practitioners, therefore, assessed that the maturity level had increased to a level 2 – repeatable level. The results of the evaluation are provided in Appendix 5, Table 54. The rationalization for excluding certain level 1 indicators is explained in Section 1.1.1.1.

Level 2 – repeatable is determined by the existence of documented policies that were enforced, measured and improved. Basic management controls were put in place, and the project management team was more efficient in tracking schedules and requirements of the P&S. Clear change management procedures were implemented, and third party vendor management followed formal organisational procurement processes.

CMM Risk Management Process

Because formal risk approaches had been implemented, the risk team expected the maturity of the RM processes to have increased. The risk practitioners, without involvement from the NPSD team, conducted the risk evaluation. The risk professionals considered the maturity level to be a level 2-initial although level 3 elements were present. The outcome of the analysis is set out in Appendix 5, Table 57.

4.5.2.2. Develop Risk Framework and Processes

Firstly the IRMF was expanded based on the lessons learnt. The expanded IRMF framework is set out in Appendix 5, Figure 104. The second-level constructs, enhanced as a result of the previous AR iterations, are marked with an asterisk. Secondly, 10 additional categories were added to the IRMF, predominately based on risk NPSD incidences. The sources which informed these constructs are presented in Appendix 5: Table 66: Sources of the IRMF Second-Level Constructs. Thirdly the IRMF needed to expand to include B2B (and not only B2C) best practices and risk scenarios. The process that was utilised to extend the IRMF to include B2B factors is shown in Figure 27.

The process started with a review of the academic literature related to B2B P&S and it identified factors that would impact on the performance of these P&S. The impacts and proposed changes to the framework were analysed by the researcher and two risk practitioners who had previous experience of analysing risks in a B2B NPSD organisation.

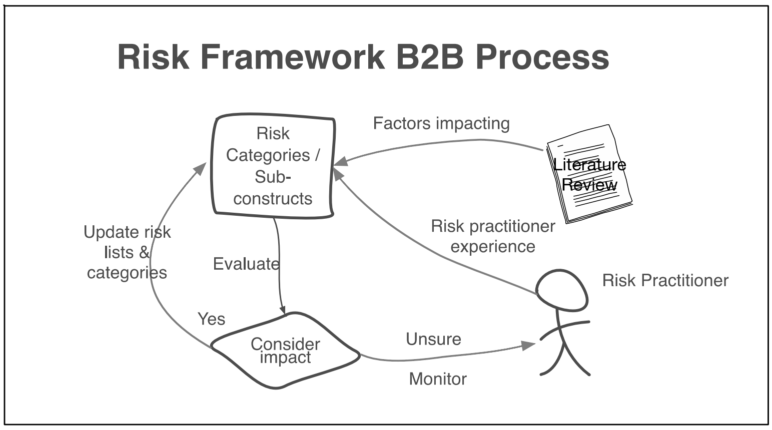


Figure 27: Update of IRMF with B2B Criteria

The sources to determine the impact originated from the literature review and the risk practitioners. When the literature review informed the influence, the particular researcher was referenced. When the source originated from the risk practitioners, they were shown as the source. Risk professionals were not always sure of what the impact of the dimension would be, and this was therefore indicated as being 'unsure'. The variables and decision-making employed to inform the risk categories are available in Appendix 5, Table 67: B2B factors that stimulates innovation.

In some instances, the risk framework and risk lists already contained the indicators, and no explicit reference was made to B2B. However, the risk practitioners deliberated whether differences in the importance of these indicators could exist (when comparing B2B with B2C services), which was indicated by '+ monitor' in the right-hand column. In cases where the risk lists had to be updated with additional information, this was shown by '+ risk lists'.

Two further categories were updated as a result of the B2B investigation, namely, 'technology' and 'marketing'. More focus on the technology high-level construct was necessary due to B2B being more technology driven. Of particular importance, was consideration of the innovativeness of the technology required for B2B P&S since they are technology intensive, and the technology is often the source of new ideas (De Brentani and Ragot, 1996). The category of 'marketing' was updated to 'marketing and sales'. In B2C P&S, the NPSD teams only concentrated on marketing, while in the B2B function, adoption of the P&S is very much driven by dedicated sales teams responsible for particular target markets.

4.5.2.3. Develop Risk Process

Development of Risk Categorisation Assessment

One of the focus areas was to design a more efficient prioritisation methodology. This would allow the risk team to focus on the P&S with the highest probability of being exposed to risks with potentially severe impact. The methodology had three objectives: (1) It should be easy to calculate and replicate; (2) It should apply to a broad range of P&S, from simple to complex: and (3) It should be reliable.

The design of the RCA was informed by the risk literature and incident register. It was not feasible to include all of the second-level constructs since the RCA functioned as a mini-risk assessment. Only the most relevant second-level constructs would be considered. To establish which risk indicators to use, quantitative estimates were applied, rather than qualitative ones. Qualitative risk assessments do not permit identification of risk categories that require particular attention since the human capacity for pattern recognition is limited (Hilson, 2007). Risk practitioners experimented with a variety of quantitative methods including risk Work Breakdown Structures (WBS) and Organisational Breakdown Structures (OBS) and combining the two. While these approaches were not considered to be conclusive, they did provide a clearer idea of the risk categories that would be important for effective risk prioritisation per project.

The prioritisation was called the RCA) and is shown in Figure 29 of Appendix 5. The major differences between the RCA of AR Iteration one and AR Iteration two are that: (1) Different second-level constructs were used and risk questions were changed as a result; (2) The risk prioritisation would be completed by the risk practitioners; and (3) No cost estimation was included. Cost estimation was identified as a constraint within the organisation where these estimates were not freely available.

Some of the risk practitioners were reluctant to rely on a standardised risk prioritisation methodology due to the multifaceted nature of risks and the threat that significant risks could be overlooked. The updated RCA allowed the risk practitioners to override the calculation of the initial assessment by using their experience to update the RCA (as indicated in Section 1 of Figure 29). The advantage was that the risk practitioners were not solely reliant on the accuracy of the tool as they could override the calculation if valid reasons existed. Risk practitioners were at liberty to add any reason the P&S could be considered at a different rating.

Update of Risk Process

Following on development of the RCA a more formal risk process was required to take into account the RCA rating. It follows that high-risk projects should follow different risk processes from low-risk projects. It took many iterations and several months to develop and complete the updated risk process.. The risk process is shown in Figure 28 below.

The risk process was aligned with both the ISO 31000 processes and the NPSD process as shown respectively to the left and right of Figure 28. The first step in the risk process was to determine if the project should be considered a High, Medium or Low risk. This was done by means of the RCA. The remainder of the process depended on the risk category. If the project were deemed a low risk, its assessment would be formatted to email, stating risks and controls to be implemented. The product manager was still required to notify the risk practitioners if any high risks were to arise during the NPSD lifecycle. Formal involvement of risk practitioners during the NPSD lifecycle would be limited, with the exception of the pre-launch phase. During this phase, the risk practitioners would consult with the NPSD team, to determine the readiness of the P&S for launch.

For medium-risk projects, only the top priority risks were considered. The risk practitioners were involved in key meetings, and the risk cycle concluded with a formal review before NPSD launch phase. During the launch phase, the risk practitioners authenticated the implementation of the requested mandatory controls.

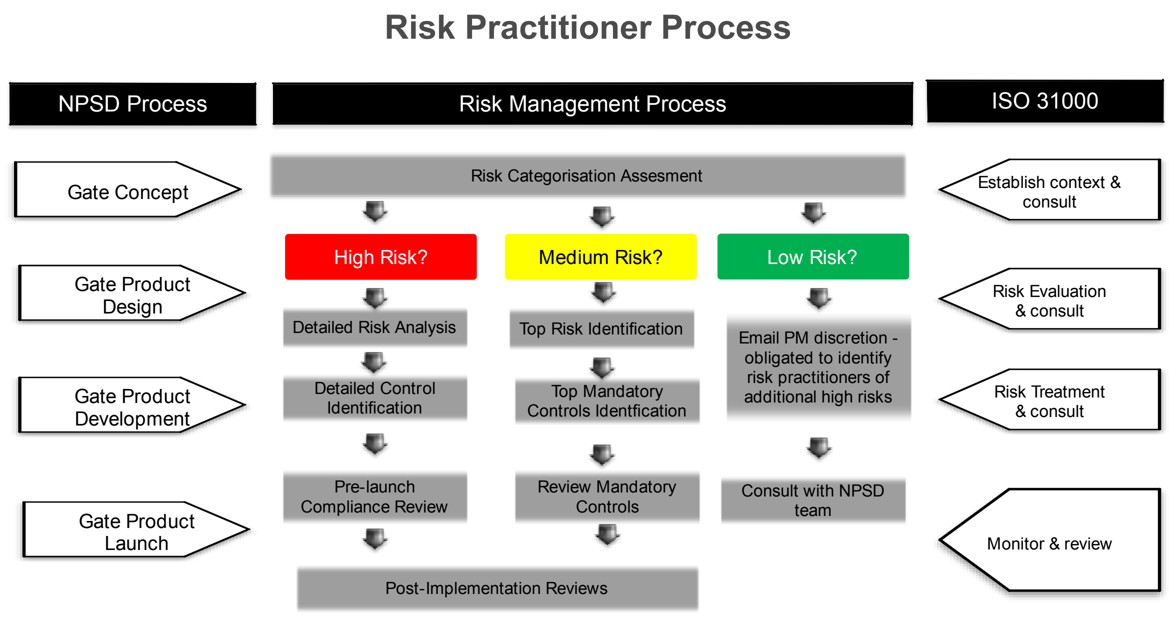


Figure 28: Risk Practitioner Process

A high-risk project followed the comprehensive risk assessment process, and a pre-launch compliance review was conducted where all the second-level constructs of the IRMF were assessed for compliance. Following the launch of the project, risk practitioners would select the projects for monitoring based on the number of incidences raised when the P&S was implemented in the marketplace. Despite the implementation of the NPSD's formal lessons learnt review, this was not completed on all projects and the risk practitioners expressed the desire to conduct a risk-based, post-implementation review at their discretion.

The condensed risk process was presented to the NPSD practitioners and raised awareness that risk practitioners were understaffed and found it challenging to manage the current workload. However, they would utilise the prioritisation methodology to concentrate on the P&S with the highest risk impact.

4.5.2.4. Apply Approaches

CMM NPSD

The NPSD CMM revealed an external organisational constraint since projects were not managed in terms of time and cost. Even during the PIRs, the risk practitioners placed a strong emphasis on evaluating the success of projects according to project management success criteria. This criteria was, however, not adequately applied by the organisation and the absence of its elements (cost, schedule and scope) was attributed to the difficulty of cost development assessment and the fast-changing environment of the NPSD group. Later research indicates that measuring projects according to cost and time was no longer relevant (De Bakker et al. 2010). The reality of the NPSD environment is that many unexpected risks could cause projects delays and cost overruns (Raz et al. 2002).

Time and cost were excluded from the CMM as environmental constraints but retained as a risk in the second-level construct of project management. The main reason was that progress could not be determined if one environmental constraint preserves the CMM rating at a level 1, while much progress has been noted in other areas.

According to Dooley et al. (2001) it takes approximately 20 months to move from maturity level 1 to level 2 and after that, it gets progressively faster to move to subsequent levels. The NPSD group took 16 months to move to maturity level 2. The key factor for its achievement could be attributed to new executive leadership, which implemented formal processes. The lessons-learnt indicated the areas where problems were experienced in the NPSD project, but with the implementation of the RM processes and the NPSD stage/gate processes, which were well managed and controlled, the risk team was satisfied that a new level of maturity was reached.

CMM Risk Management

During the previous iteration, risk practitioners did not consider Hillson's (1997) RMM model to be reflective of the fast changing, technology-intensive environment reflective of the organisational context. However, for continuity purposes and establishing baseline performance areas, it was decided to continue with Hillson (1997) CMM and adapt it to the situation of the organisation.

The risk team disagreed with the validity of the criteria of 'experiencing resistance from new employees'. NPSD employees often originated from marketing backgrounds and were not previously exposed to RM. It was probable that some level of resistance can be experienced when new employees are exposed to RM for the first time. The risk practitioners thought that the initial resistance stemmed mostly from a lack of understanding of the complexity of the organisation and its systems architecture. Once the new NPSD practitioners grasped the complexity, they had a better understanding of the need for RM. Risk professionals proactively trained new NPSD employees in RM, which were found to be successful in reducing resistance.

Risk Framework

Risk practitioners considered the IRMF to be useful and appreciated the shared perspective it created with the NPSD practitioners. The criterion of comprehensiveness was met, but concerns were raised about the vast number of risk constructs. Some second-level constructs could be consolidated. Examples include ‘product management reporting’ as part of ‘product management’, and ‘value chain’ as part of ‘business model’. Some of the compliance constructs could also be consolidated where ‘IPR/Trademarks’ formed part of the ‘legal/regulatory compliance'. ‘Fraud management’ combined with ‘money laundering’ and ‘security’ consolidated with ‘health, safety and social responsibility’. These categories were created from sources that included lessons-learnt, risk frameworks (such as King III) or risk incidences, which occurred during the iteration. In some cases a limited number of risk occurrences did not justify a full category and the second-level constructs were combined.

The second-level construct of ‘risk management’ added limited value and the risk practitioners suggested that it should be removed. The RM category aligned to the high-level construct ‘compliance’ and evaluated the extent to which the P&S adhered with the RM process and reporting requirements. The reasoning behind the implementation of the RM category was due to instances where the NPSD teams would either circumvent RM or not follow the process comprehensively. However, by the end of this AR iteration, RM was well entrenched and the whole IRMF was representative of the RM second-level construct. Compliance with the RM policy was not entirely discarded, but evaluated as part of the second-level construct ‘internal compliance’, which essentially was the extent to which the NPSD practitioners complied with internal governance procedures.

Revenue Assurance (RA) was retained due to the potential for massive financial losses. However, challenges were experienced with the operationalisation of the second-level construct. The category was specified with the intent that the RA functional department could assist with evaluation of potential revenue leakages and implement monitoring tools to detect revenue leakages related to the P&S. The NPSD teams could benefit from regular reporting that would identify discrepancies and allow for quicker detection and subsequent implementation of corrective measures. However, the RA division was understaffed, and it was costly and timely to implement specialised monitoring of the RA system. There were also too many P&S which meant that the NPSD team rarely received adequate responses from the RA group. As a result, the risk practitioners assumed RA specialist roles and listed RA risks without input from the RA teams.

A further category that remained problematic from the first iteration was the evaluation of the high-level construct of ‘organisation culture’. The construct primarily evaluates the extent to which the organisational structure, management support and resources are sufficiently allocated during the NPSD lifecycle. From the literature review, it was evident that a favourable work environment with minimal dysfunctional conflict and efficient communication improved the probability of P&S success. Risk practitioners would make recommendations to address organisational culture risks, such as that the project requires sufficient allocation of skilled resources to support the NPSD. However, it was a rare occurrence that a non-compliance rating was given. The culture of the organisation presented environmental constraints for RM practices since NPSD teams were expected to manage the workload and conflicting priorities. Checkland et al. (1989, p. 214) reflect, 'changes involved in the “improvement” have to be not only arguably desirable but also culturally feasible'. While the ‘organisation’ high-level construct was theoretically desirable in agreement with the innovation literature, it was difficult to operationalise within an organisational context. The ‘culture’ category was retained but only tangible risk aspects were considered, such as pointing out that new business and technologies might require new expertise, competencies and skills. A high-risk rating was almost never assigned to cultural, organisational aspects.

A new second-level construct was proposed for ‘privacy’, previously included as part of the ‘technology security’ category. Privacy would consider customers’ rights and confidentiality of communications, as well as address customer concerns of unsolicited communications and spam. The proposed changes are addressed as part of AR iteration three.

Risk Processes

The new risk process was fully operational and the NPSD teams understood RM activities, roles and responsibilities. However, product managers did not act as ‘risk managers’ and remained reliant on risk practitioners to conduct risk assessments. NPSD teams were responsive to suggestions made by the risk professionals and proactively requested early involvement, often before the project formally commenced. Limited incidences of selective compliance with the risk methodology persisted.

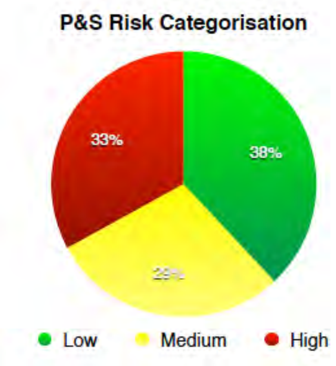


Figure 29: Risk Prioritisation, AR Iteration Two

RM was integrated and risk deliverables flowed into outputs for the next NPSD cycle. Incidences existed where the NPSD team did not respond to feedback from the risk team within agreed timelines (rather than the risk practitioners delaying the project). When oversights occurred, the risk practitioners could adequately address them.

The risk prioritisation strategy was performed on all P&S since the implementation of the RCA. Approximately 33% of projects were considered high risk (indicated in Figure 29). For delivery of the

RCA, the risk practitioners were still required to review NPSD functional specifications, which meant that the workload was not significantly reduced during the planning NPSD phase.

The overall workload increased since the organisation ventured into new markets, including finance and insurance. Due to successes in reducing risk exposures, the B2B division requested assistance with development of customised solutions for corporate customers (over and above normal NPSD project deliverables). Most of the B2B and financial services P&S were rated as high risk due to the introduction of new technologies, new partners and new markets. As can be seen from Figure 30, risk assessments were conducted on 150 P&S and an additional 18 promotions that are not shown below. On average, 12.5 new risk assessments were carried out per month.

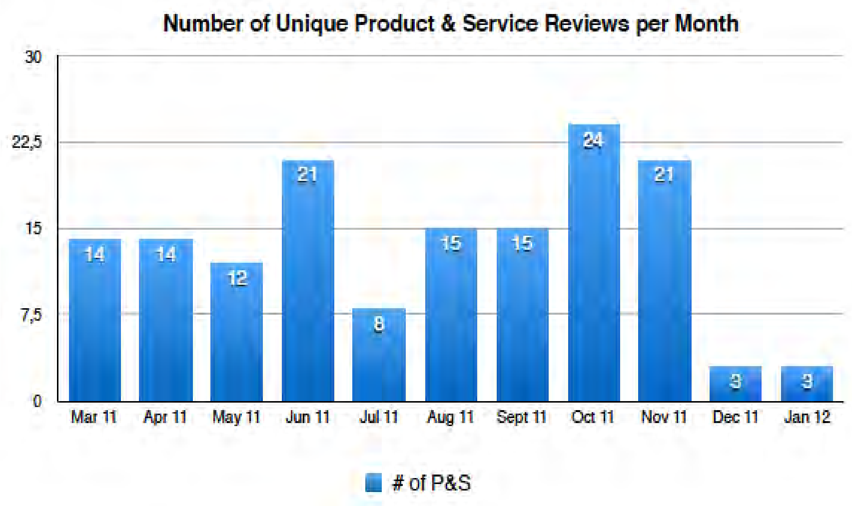


Figure 30: Number of P&S Reviewed during AR Iteration Two

Competitive pressures resulted in an increase in the number of P&S during the months of October to November 2011 (Refer to Figure 30). To enhance speedy delivery, product managers utilised short versions of NPSD functional specifications, referred to as 'memos'. These notices allowed shorter feedback cycles (between one and three days), which increased pressure on risk practitioners to produce risk assessments.

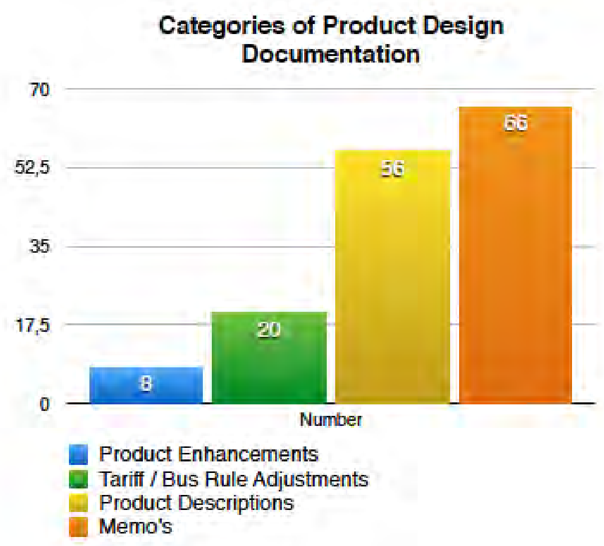


Figure 31: Categories of Product Design Documentation

Types of P&S documentation are indicated in Figure 31. Memos were predominantly used, since less information was required as P&S functional specifications were condensed into fewer pages. Less information increased the risk exposure and added to the workload of risk practitioners and other NPSD teams.

As competitive pressures increased, more variants of P&S functional specifications appeared, such as financial documents (to describe tariff and business rule adjustments), as well as P&S enhancements that were distributed as change requests to existing P&S. These variants were only applicable to the B2C division as the B2B division predominantly utilised detailed P&S functional specifications. These fast-tracked processes prompted the release of another survey and questionnaire as an exit to the cycle.

4.5.3. Closing

The exit phase was marked by a lessons-learnt session being conducted. Main concerns and suggestions from NPSD practitioners were established during interviews,and detailed results are described in Chapter 5.

4.6. Third Iteration

4.6.1. Initiating

IRMF and risk processes were developed in AR iteration one and updated during AR iteration two. The IRMF was updated and a DS artefact in the form of a risk dashboard was introduced during AR iteration three, which took place from April 2012 to January 2014. Instead of allocating an additional iteration, an extended closing period for AR iteration three was allowed in order to obtain a thorough validation of the deliverables introduced. The subsequent section focuses on understanding the problem situation and the selection of the risk approach.

4.6.1.1. Understanding the Context

Organisational changes shaped the deliverables. As previously explained, condensed functional specifications (called memos) were introduced. The PMO added further to the P&S specifications. ‘Highly confidential projects’ were initiated, since P&S launches were prematurely leaked to competitors and the press. These specifications lacked sufficient information to perform adequate risk assessments, which added to the workload of risk practitioners to request and follow-up on missing information.

In addition to the workload, new divisions, such as the Financial Services Division (tasked with the delivery of financial service solutions), introduced new high-risk priority P&S. The organisation expanded into new areas such as mobile health and Machine-to-Machine (M2M) P&S. These P&S were innovative and required specialised knowledge regarding resources, systems, business models, contracts, processes, techniques and unique risks presented by these areas. Furthermore, the risk practitioners were requested to assist with additional projects by the B2B organisation, which focused on the development of consumer specific solutions as well as the implementation of the IRMF in other African countries in which the group operates. Risk practitioners were disheartened as resource constraints prevented them from assisting with these requirements.

Changes also occurred within the RM department. The researcher was promoted to a senior position, with the responsibility to oversee RM in all countries. The researcher would have oversight, but would not be operationally involved in NPSD risk assessments. Two risk practitioners left the organisation and new risk resources were trained.

As in the case of previous iterations, a full-day strategy session was held off-premises using Beckhard and Harris (1987) action planning steps. One of the improvement areas was to develop specialised frameworks and toolkits to support B2B and the financial services division. This was deemed necessary due to the different laws and regulations that applied, disparate systems and internal processes, as well as and vastly different business models. It was however decided that this requirement would be parked due to the workload. The IRMF still required work, since some second-level constructs could be consolidated and a more succinct delineation achieved.

The importance of considering privacy risk was increased with the introduction of a new South African law called the Protection of Personal Information Act (PoPI) (South Africa. 2013). PoPI is considered a stringent data protection law that regulates how personal information should be processed, retained and secured. Any PoPI contraventions would lead to substantial penalties, which could expose the organisation to financial losses and reputational damage. Updating the framework with PoPI provisions was vital. Even though the Act had not been signed into law, the CRO requested that P&S should proactively comply with PoPI provisions. The IRMF, therefore, needed to be updated to accommodate privacy, and PoPI in particular.

There were several difficulties associated with the implementation of the privacy second-level construct. Privacy traversed several IRMF risk constructs. Furthermore, an inadequate understanding existed of PoPI requirements. The privacy officer, regulatory and legal departments were best suited to advise the risk practitioner teams about privacy but did not have a clear framework or guidelines that could be shared. The regulatory department acted as consultant and in some cases did not enforce compliance with laws and regulations. Lack of clear guidance was provided to the NPSD teams, which stemmed from an inability to translate Acts into practical IT/IS and process solutions that NPSD could understand. The risk, regulatory and legal teams held conflicting viewpoints about privacy. In some cases, NPSD teams circumvented the risk practitioners, by only consulting with legal and regulatory, who were less strict on compliance requirements.

Some new P&S could be exposed to PoPI due to practices such as utilisation of third parties, cross-border transport of information and profiling of customers to understand the target markets. All of these aspects had to be considered when designing the privacy second-level construct. The PMO of NPSD requested a third document, namely a summarised executive overview of the risk assessment that should be presented during NPSD stage/gate meetings. Risk reviews were often quite lengthy and top management was not inclined to labour through volumes of data. It was therefore necessary to ensure that an intervention was delivered to facilitate risk communication at NPSD stage/gate meetings.

Three deliverables were therefore planned for AR cycle three: (1) streamlining the IRMF; (2) integration of privacy and PoPI compliance within the IRMF and risk processes; and (3) delivery of a risk intervention during NPSD stage/gate meetings.

4.6.2. Iteration

During this iteration the IRMF and processes are updated, processes are applied and experiences evaluated. But firstly the maturity levels of NPSD and RM were investigated.

4.6.2.1. Establish Baseline Performance Standards

CMM NPSD

An evaluation of CMM for NPSD was performed. Risk practitioners raised concerns regarding the impact of the 'fast-track' and 'confidential' project documentation on the CMM level. These documents followed a process but the documentation was not as comprehensive as NPSD specifications. It was suggested that use of these methods, would justify retaining a level 2 maturity. The NPSD process also produced some level 4 – managed elements, which allowed the quality of the process to be assessed and controlled as indicated in Appendix 5*,* Table 55*.* However, all the practices at the previous levels needed to be in place to progress to the next level.

The difference between level 2 and 3 is that level 2 processes are disciplined and repeatedly applied on a macro-level. At level 3, the internal mechanisms of the stages become visible as activities and are documented and integrated into the overall NPSD process. Certain activities can follow approved tailored versions of the standard process (Dooley et al. 2001). The risk specialists considered the use of these tailored P&S functional specifications inappropriate. However, since the P&S still followed an approved process and the overall NPSD process was well documented, standardised and integrated, consensus was reached that the maturity rating could be established at a level 3 – defined.

CMM Risk Management

During the previous iteration the RM CMM framework was adapted to fit the organisational context by removing project management success criteria (identified as an organisational constraint). The subsequent CMM results are available in Appendix 5: Table 57.

To progress from level 2 to 3, a formal RM framework and standards should be in place. To proceed to level 4, an enabled networked predictable process was necessary. More level 4 – managed processes activities started to be evident. Despite the presence of these elements, the full process was not controlled to the extent that a certain result can be expected and therefore the maturity level of the risk process was evaluated at a level 3 – defined.

4.6.2.2. Develop Risk Framework

The IRMF was updated (as prescribed by requirements from the previous AR iterations) as indicated in Figure 104, Appendix 5.

The second-level construct of ‘risk management’ was excluded, as the risk practitioners did not feel that it added value as a separate construct of the framework. The whole IRMF and process was essentially RM, and since it was well integrated into the overall NPSD process, a separate second-level construct was not justified. However, key risk aspects were incorporated into the internal compliance category.

The second-level construct of ‘product management reporting’ was updated to ‘product management’, which was permanently reinstated following the literature review. Distinct product management activities existed, such as the development of the P&S functional specification and reporting requirements.

The second-level construct of ‘KM’ was integrated as part of ‘project management’ as the risk practitioners concurred that the project managers were in the best position to capture knowledge obtained during the NPSD process, as they were involved in all NPSD projects end-to-end. KM was viewed as a sub-component of project management. Removing KM as a separate category did not demean its importance. Project managers mostly performed KM as a deliberate process to gather, utilise and retain best practices and knowledge to improve P&S.

The second-level constructs of ‘IPR & trademarks’ and ‘financial and regulatory reporting’ were consolidated as part of ‘legal/regulatory’. The ‘fraud management’ second-level construct was extended to include ‘AML’ and ‘security’. ‘Capacity, BCM, SLA/control and release processes’ were combined into one second-level construct. ‘Business rules’ was combined with ‘pricing and revenue assurance’. These second-level constructs were all naturally closely related.

Privacy

It was essential to add a separate IRMF second-level construct for ‘privacy’. In previous AR iterations, privacy was analysed as part of ‘technology security’, ‘customer’ and ‘regulatory and legal compliance’. A coherent privacy dimension did not exist to reflect the variety of controls needed to reduce privacy-related incidences. The establishment of proper corporate governance processes supplemented by reliable internal processes is required to adequately address privacy (Da Veiga and Eloff, 2007). Therefore, additional supporting frameworks and risk strategies were needed to support privacy and PoPI compliance. An overall structure was required to facilitate privacy risk decision-making. To address these and additional challenges (stated in section 6.1.1) the risk practitioners needed to drive the process.

The first step was to ascertain what PoPI is and gain an understanding of the practical implications of PoPI. The findings are addressed in three Tables presented in Appendix 7: namely Table 75 (describes Personal Information); Table 76 lists the major principles of PoPI; and Table 77 list the requirements of PoPI. The principles and elements of PoPI were translated into implementation requirements presented as a generic implementation checklist for PoPI (Table 78, Appendix 7). While requirement were sourced from other generic sources, it was expanded to meet the needs of the organisation. PoPI prescribes *what* should be provided but not *how* it should be provided, so the purpose was to map PoPI requirements into an implementation checklist. Table 78 consolidates the legal PoPI requirements into 15 broad themes. Upon analysis of these items, it was evident that a large portion of PoPI application requirements related to information management policies and procedures.

The IRMF second-level construct of ‘internal compliance’ needed to be updated to accommodate PoPI. Information security policies are those processes and procedures that provide guidelines to employees around adherence in order to protect the confidentiality, integrity and availability of information (BS 7799, 1999). For instance, processes to collect, record, store and destroy personal information (PI) are governed by a records management policy. PoPI also requires a privacy policy to be in place.

Table 79 provides a generic completed analysis. The eight principles of privacy (as related to PoPI) mapped to the existing policies and compliance elements within the organisation are provided. These should be evaluated and updated to accommodate PoPI. The researcher collaborated with risk experts who had a good understanding of the policies. The cross mapping of PoPI principles and policies is provided in Table 79.

An additional principle of accountability was added since it was often unclear who was responsible for individual actions. Two other elements required review, namely ‘employee awareness’ and ‘technology and policy audits’. ‘Employee awareness’ was added since employees were regarded as the weakest link due to the vital role they play in ensuring successful adherence to policies

(Vroom and Von Solms, 2004). Technology and policy audits were added since regulator inspections are required to ensure that information maintains integrity (COBIT. 2000). PoPI refers to a comprehensive governance framework to protect personal information and, therefore, adherence to the prescribed security policies were included as part of PoPI compliance.

Following the identification of the policies, processes and procedures to be updated the type of information utilised by P&S were established, as well as how this information should be treated according to PoPI. A permission matrix was compiled based on existing organisational privacy models that could be utilised on a per P&S basis. The privacy matrix is provided in Appendix 7, Table 80 as a generic matrix that can be used to evaluate the risk profile of PI. At the top of the model, PI processing activities are divided into collection and processing of data. The further to the right, the more privacy-invasive activities are, as information is collected and processed internally within the organisation until transported across borders to third parties.

The types of PI (sourced from Smith et al. 2011) are indicated on the left. Data types are shown from being minimally invasive, such as online social networks (Web 2.0) where information is voluntarily supplied by customers, to eventually the most invasive type of data, namely ‘sensitive PI’ (which is not recommended for collection). The context of the P&S is mapped to the matrix. For instance, if social media platforms are offered as a P&S, certain privacy protection principles are functional requirements.

Figure 32 provides the matrix that was used to determine PoPI compliance. The labels demonstrate the type of permission required, colour-coded to illustrate that non-intrusive information requires a lower permission scenario (indicated in green) and then increasing in strictness to black.

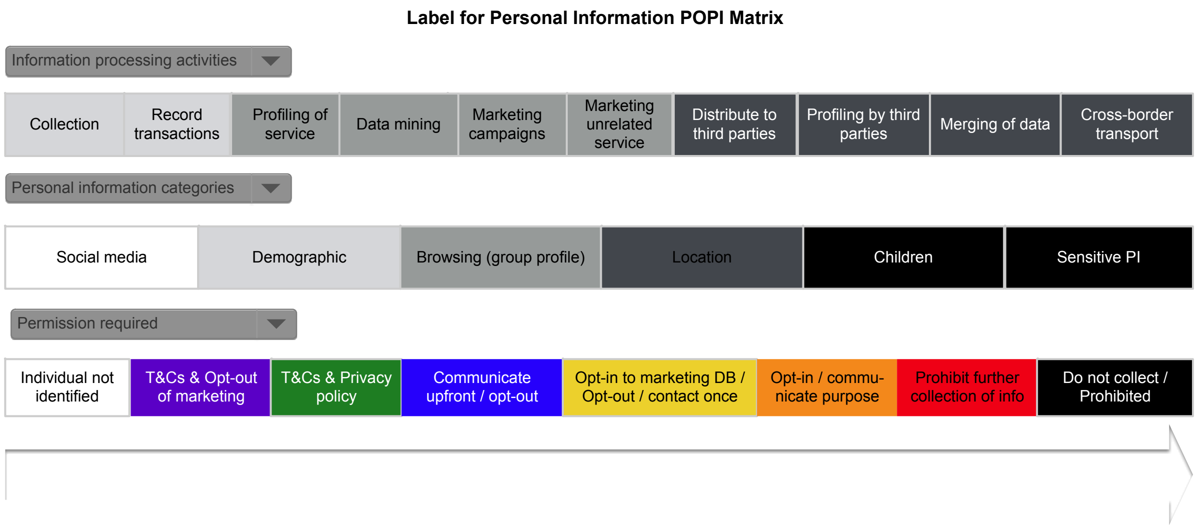


Figure 32: Label for use with Table 65 PoPI Matrix

The permission matrix assists the risk practitioner in three ways: (1) to establish the information processing activities that would be undertaken (during the NPSD lifecycle); (2) to determine the category of PI that will be collected and processed; and (3) to consult with the permission matrix to identify the permission required. Both identification and mitigation strategies for assessing the risks were developed. The privacy second-level construct was created and the regulatory/legal and policy compliance second-level constructs were updated as part of the IRMF.

4.6.2.3. Develop Risk Processes

Additional adaptations to the risk processes evolved as a result of the DS artefact development. The dashboard required a more strategic focus related to the identification of a portfolio of P&S. These were utilised during the development stage/gate to advise the NPSD executives of the portfolio risk.

No procedure or matrix was in place to aid the classification of P&S into categories. The researcher consulted the literature and investigated P&S classification models from Booz et al. 1982; Davis, 2002; Johne and Pavildis, 1996 and Lovelock, 1984. The portfolio classification model was inspired by Davis's (2002) categories of products. However, fundamental changes were required to accommodate the organisational context and make the categories more applicable to services (rather than products). The researcher renamed three of the groups and changed the description and intention of Davis's new platform category. The four updated P&S categories as depicted in Figure 36 below are subsequently discussed.

P&S Enhancement: Davis (2002) refers to the category as a 'derivative product' to describe enhancements to existing P&S that use existing technology applied to current markets with known customer needs. An example of such a P&S would be tariff changes or changing a business rule relating to the existing P&S, as well as adding more functionality to the NP&S. The terminology that was applied to describe such a P&S was simply 'enhancement' and the category was updated accordingly.

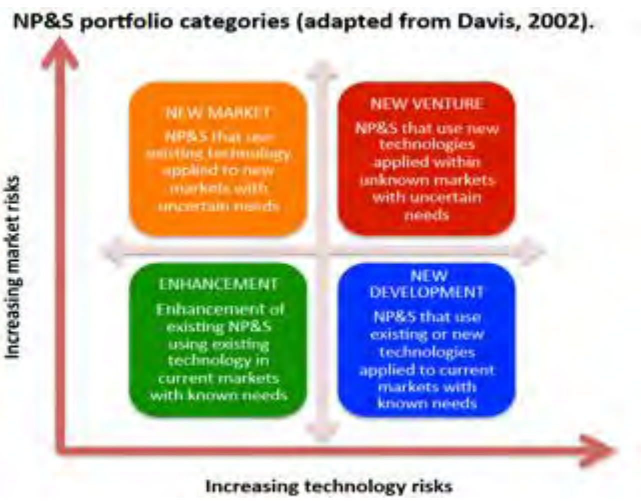


Figure 36: P&S Portfolios (Adapted from Davis, 2002)

New Market P&S: Davis's 'new category' was renamed to 'new market' as the term was more prescriptive of an NPSD that used existing technology but was applied to new markets with uncertain needs. The focus of the category is the increased market risk. An example is when a new

P&S is targeted for a new market segment such as insurance, m-health or m-money.

New Venture: The classification is retained as it refers to new technology that is applied to new markets with existing needs. If the m-money P&S utilises new (innovative) technology, it should move to the new venture category as the P&S is new, technology is new and the market is new. This class of P&S has both high technology as well as market risk associated.

New Development: Davis (2002) refers to this category as 'new platform'. It is described as using existing technology with a defined product platform, applied to known markets. The category was a more advanced version of 'derivative' product and not reflective of the situation within the organisation, as few NPSD projects were utilising a defined platform. Therefore, both new and existing technologies were included in new platform risk as these could introduce new technology risk. The category could not be considered a new venture as the P&S was utilised in existing markets with known needs

The new categories were aligned to the context of services. The method of rating and the rating criteria were additionally changed from Davis's (2002) classes to fit the context of the NPSD group. The criteria as adapted to the changed definitions are indicated in Figure 102, Appendix 5.

A significant departure from the measurement of risk was introduced. Davis (2002) estimated risk according to 'increasing market risk' on the left and 'increasing product risk' at the bottom of Figure 33. 'Product Risk' was eventually changed to 'increasing technology risk'. It is more relevant to organisations that predominantly launch services to measure the risks according to 'market' and 'technology' risk, especially in B2B, which operates in a highly technical environment. The majority of the B2B P&S could be categorised as fitting within the 'new development' and 'new venture' portfolio.

4.6.2.4. Development of Risk Dashboard

This section concentrates on the development of a deliverable at the stage/gate meetings. The deliverable will hereafter to be referred to as the 'risk dashboard'.

The researcher developed the risk dashboards but collaborated with risk and NPSD practitioners during the design and evaluation phases. Appendix 6, Section 15.2, DS Literature Review: Dashboard, provides arguments to support the validity of the risk dashboard as a DS artefact, the research approach followed and the criteria developed to determine the performance of the dashboard.

4.6.2.4.1. Problem Identification

The PMO office requested the risk practitioners to present a risk deliverable at the end of planning and testing NPSD stage/gate lifecycle phases. A snapshot of top risks should be submitted as a single-screen, decision-making tool to assess whether the P&S can proceed to the next stage/gate. NPSD required a concise dashboard that would facilitate proactive risk communication, be easy to understand and allow identification of major risks at a glance. Risk practitioners required the risk dashboard to be easy to use and automate.

The literature was assessed, but NPSD risk dashboards were not available. As an AR deliverable, the dashboard should have transformative powers. Upon investigation of DS design principles, the researcher deliberated whether the application of DS (as a complementary method within AR) could successfully be applied within a fast-moving, complex organisational setting.

The researcher conducted the design and development of the dashboard using the DS process as explained in Section 3.4.3 of Chapter 3: Research Approach. The DS approach was tailored to fit with the AR study and the organisation context. Aligned to AR, the dashboard should enable organisational change. Additionally, the dashboard should promote the research objectives of improving RM within NPSD and reflect the IRMF and processes introduced during previous AR iterations.

A dashboard is simply 'a visual display of the most important information required to achieve one or more objectives, consolidated, and arranged on a single screen so the information can be monitored at a glance' (Few, 2013, p. 26). The main challenge to developing dashboards is conceptual, rather than technological (Silveira et al. 2010). Peffers et al. (2006) argue that working backwards facilitates the solving of unexpected problems, which entailed that the objective (goal state) to be achieved should be articulated.

Using SSM, the root definition was articulated as: Develop a risk dashboard as a business management decision-making tool for use at NPSD stage/gate meetings, provide key risk metrics in a stylish, reliable, usable and customizable interface and improve understanding and subsequent management of risks and RM processes within NPSD.

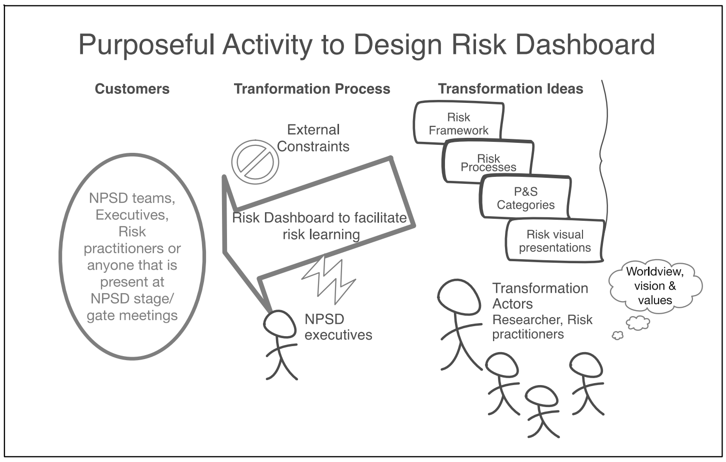


Figure 34: Risk Dashboard Purposeful Activity

Purposeful activities were analysed by using the CATWOE mnemonic of SSM as demonstrated in Figure 23. The customers were the NPSD practitioner teams, the executives that attended stage/gate meetings and who ultimately had the decision-making powers. The risk practitioners were the ultimate users responsible for compiling and presenting the risk dashboards. NPSD practitioner teams could consist of technology, regulatory, legal, marketing and risk specialists.

The transformation actors was the researcher who designed the intervention that the risk practitioners (as secondary transformation agents) applied to meet the RD objectives. The owners of the process were the NPSD executives who could halt the use of the dashboard and request changes. The transformation ideas were based on the concepts of visualisation as well as the existing IRMF and processes.

Several external constraints existed, such as predicting who would attend the meetings and how they would deliberate using the risk dashboard. A detailed requirements analysis was not possible, as stage/gate attendees had different risk interests and needs and without prototyping, it would not have been viable to assess how the different users would interact with and navigate through the risk dashboard.

The risk dashboard presented a snapshot of the status of the P&S at a particular time. Three days were allowed for preparation of the dashboard but would typically be condensed to a few hours before the meeting. Information was difficult to obtain since it was distributed across various NPSD practitioner teams, which often worked in silos. Information/data was consistently evolving. As a result, the risk dashboard could be incomplete and inaccurate and not be reflective of the latest developments. There were no structured process, data or IS that could support the development of an automated risk dashboard. Furthermore, the risk supporting processes and expert knowledge needed to be condensed as a one-screen display but still be understandable. In addition, the RM process was complex and covered a wide area of risks and compliance elements. If the risks were too broad and presented at too high a generic level, the dashboard could lose its impact and limited value would be derived. On the other hand, too many risks would have made the dashboard seem too complex and the NPSD practitioners would not use it either.

The worldview also required consideration. If senior executives dominated the meeting, junior employees would be reluctant to raise risks. In these cases, risk practitioners needed to be aware of new risks for inclusion in the risk dashboard to aid informed decision-making. Executives could resist the dashboard if it were unsuitable to their working styles. It was unclear what resistance could be expected from other NPSD practitioners.

More succinct problem identification was initiated by using Eppler and Aeschimann's (2009) systematic framework for risk visualisation. The risk dashboard conformed to the RM framework that was used for NPSD as well as the overall RM framework of the organisation based on the ISO 31000 (2009) framework. Analysis of the ISO 31000 compliance requirements was conducted and presented in Table 72, Appendix 5. Additional requirements emerged as a result of the analysis: (1) the dashboard should facilitate consultation with various stakeholders; (2) enable informed risk-decision-making; (3) present the context of the organisation, RM and NPSD and (4) be representative of the complete RM process. Presenting all these requirements in a limited space for a sophisticated, high technology, fast-changing P&S was challenging. Silveira et al. (2010) experienced similar difficulties during the design of compliance governance dashboards as: (1) identifying the right level of information abstraction; (2) visual presentation of the diverse elements of the risk analysis cycle; and (3) managing various concepts, instruments and data.

Two different dashboards were required at two stage/gates: (1) at the end of the planning stage (Gate 2) and (2) testing phase (Gate 4). More executives would attend the development stage/gate, which therefore required more high-level content. The size of the knowledge gap (meaning the uncertainty aspect of risk) was higher at Gate 2 than Gate 4, since the P&S was already designed and tested during the latter. The closing of the knowledge gap is indicated by the variances between the two dashboards and potentially could demonstrate the value added by RM.

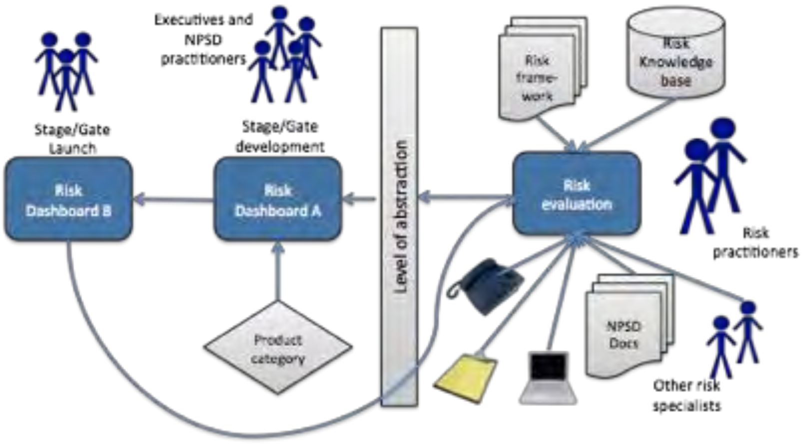


Figure 35: Conceptual Model of the NPSD Risk Dashboard Design

The risk dashboard was required as a business management tool that could clearly indicate risk statuses by using key project metrics for the primary audience, senior management, to facilitate their functioning in an oversight role within the NPSD organisation. The main risks associated with the P&S should be indicated as well as the required risk strategies as a demonstration of risk versus reward. Additionally, the dashboard should improve risk decision-making and focus on best practices to achieve the key objectives of the P&S. This risk dashboard furthermore was to provide visibility into the RM process and present the users of the dashboard with the ability to understand the key risk metrics.

4.6.2.4.2. DS Design and Development

It was first necessary to assess the complexity of the problem as recommended by Peffers et al. (2006). NPSD practitioners were consulted to derive content requirements, but their input was of limited value, due to their lack of exposure to risk dashboards. The researcher developed basic prototypes as a baseline from which feedback could be obtained. Markus, Majchrzak and Gasser's (2002). EKP principles were subsequently used to fill the gaps with regards to what content needed to be displayed.

Markus et al.'s (2002) first principle - to seek naïve users to assist with the design – was followed. The risk practitioners, as the primary users were consulted in what Markus et al. (2002) refer to as an 'onion layering' approach. Five layers of 'naïve users' were consulted, which assisted in obtaining their buy-in and commitment. These sessions lead to the development of a conceptual model of the dashboard requirements, which is presented in Figure 35.

A KPI identified by the risk practitioners (aligned to Marx, Mayer and Winter's, 2011) principles for EIS development) was the availability of accurate (and latest) information. Information was dispersed, and consultations via email, phone calls, reliance on written notes or conversations in some instances would be required to present the latest risk status. Further requirements were that Dashboard B (launch stage/gate) could be more operational, whilst dashboard A, needed to be more strategic. Dashboard A should present risks according to a specific P&S portfolio and the impact of those risks should be set out. Such a method was not available, which led to the development of the portfolio classification model (as adapted from Davis, 2002) as discussed previously (refer to Section 4.6.2.3 of this Chapter).

The abstraction layer indicated the process of choosing display data from the available volumes to reduce information overload (Marx et al. 2011). The IRMF featured a large number of risk categories, which could not all be presented. A Risk Breakdown Structure (RBS) determined the top risk categories consolidated (as indicated in the design of the risk framework). These were adopted to fit the context of the P&S as well as B2B and B2C contexts. New methods were required to produce additional abstraction layers for representing P&S portfolio category risks.

Markus et al.'s (2002) second principle related to the design for knowledge translation through radical iteration with functional prototypes. Various prototype iterations were tested with different interface designs and alternative risk presentation methods, using different charts and styles of presentation and using information varieties from the knowledge base. During prototyping, the general attitude was that the dashboard appeared appealing and provided a good risk snapshot of the P&S. The abstraction layer rules were to be updated, as they did not achieve the desired level of abstraction. By using risk indicator values (e.g. low, medium, high) and colours (e.g. red, orange, green and blue) more suitable abstraction layers could be designed.

Markus et al.'s (2002) third principle was to design for offline action and proposed that offline behaviour should include an understanding of prioritisation activities. The risk methodology already provided an efficient means to prioritise risks by evaluating the impact and probability. The highest priority risks were indicated in the colour red, which means that they required prioritised action. Another method used to inspire action was to demonstrate the size of the performance gap related to ambiguity and uncertainty risks. These risks originated from uncompleted activities that could directly influence the success or failure of the P&S. The executives could focus on non-compliant aspects that would impact on the quality of the P&S.

Markus et al.'s (2002) fourth principle was to integrate expert knowledge with local knowledge sharing which meant that NPSD expert knowledge should be accessible on the dashboard. The dashboard was to promote knowledge sharing and integration of unstructured communication from experts. The objective was to obtain last minute changes to provide an accurate reflection of the project status.

Markus et al.'s (2002) fifth principle was to design for practical guidance through a rational development process. As the risk practitioners presented the dashboard at the stage/gate meetings, they would guide NPSD practitioners through the different information sections of the risk dashboards. The risk professionals could explain the results of the risk assessment and how it was established and offer advice on alternative options that could be explored (Markus et al. 2002).

Further guidelines such as Gestalt principles were applied (refer to Table 73: Risk Dashboard Guidelines, in Appendix 6). A prototype of the risk dashboard is provided in Figure 36. From the various prototypes presented, the risk practitioners preferred the 'look and feel' of the dashboard presented below.

The risk dashboard was automated as far as possible. Last minute information was updated in the knowledge base. All the graphs, heat maps and risk evaluations were automated based on the underlying risk knowledge base. The different sections of the dashboard are subsequently explained.

Section 1 – Overall risk rating for the P&S is provided, with an explanation of why this is the case. Refer to Section 4.4.2.6 of this chapter for an explanation of the overall risk rating.

Section 2 – The P&S portfolio category risk is determined from the framework that was designed for services. Refer to Section 4.6.2.3.

Section 3 – A pie chart indicates the overall percentages for non-compliant, partially compliant, largely compliant and compliant. It makes visible the overall extent of the work that still needs to be performed. The pie chart delivers a consolidated rating as described in Section 4.4.2.4 of this Chapter.

Section 4 – The radar chart indicates the knowledge gap and makes visible the top categories of non-compliance. The development is described in Section 4.4.2.4.

Section 5 – The 5x5 risk heat map provides a visual presentation of the top individual risks (shown in Section 6) along with a qualitative scale of probability and impact.

Section 6 – The principal risks associated with the P&S are aligned with the ISO 31000 (2009) framework that allows for the display of residual risks. Residual risks consider the extent to which risks are mitigated by risk controls. The risks are indicated by considering impact that is multiplied by probability on a 5-point scale. The effectiveness of the control is deducted, and this provides an indication of the residual risks. The risks and controls are based on the risk lists and control action lists developed in Section 4.4.3.1.

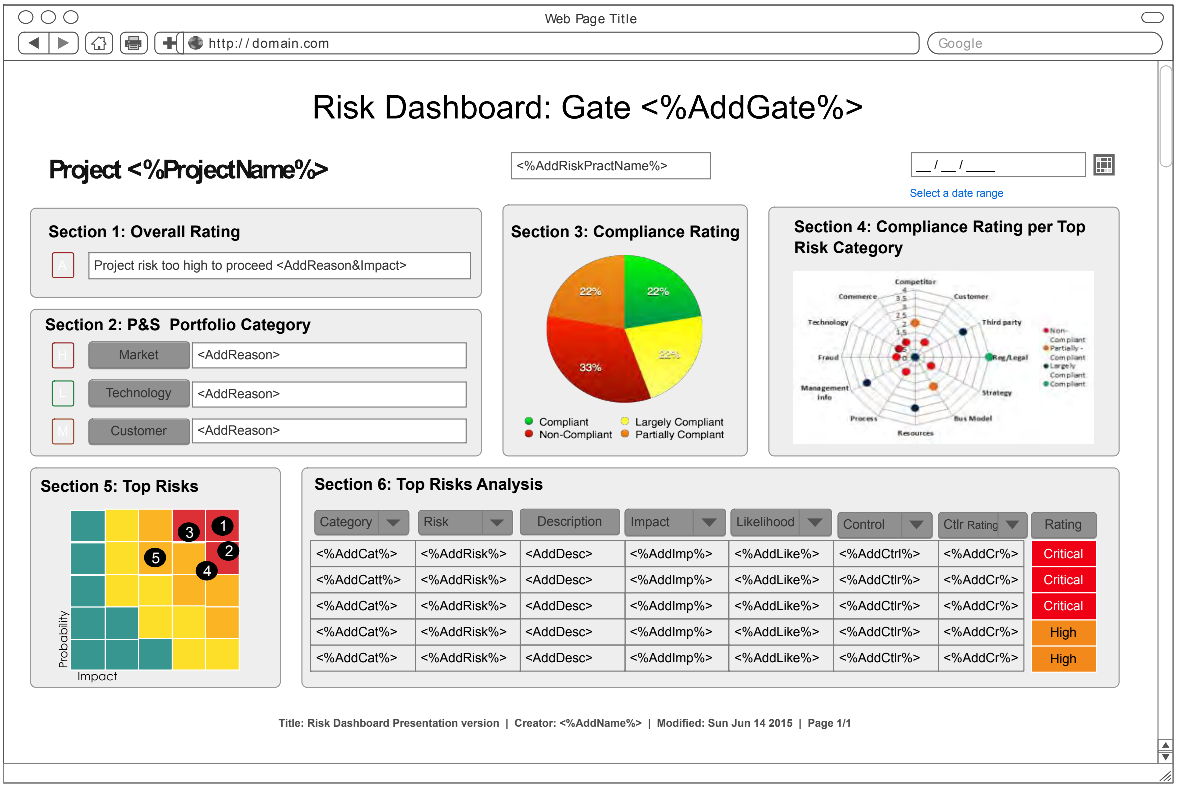


Figure 36: Conceptual Presentation of Risk Innovation Dashboard for Development Stage/Gate

A similar approach was followed for the development of the Gate 5 dashboard. The stage/gate focus was to determine the remaining residual risks and impact on the launched P&S. The movement or improvement of the risk is indicated on the radar diagram and compared with the original compliance ratings, which showed improvement and value-add by the risk department. The P&S portfolio category risk was excluded since the residual risk assessment would indicate any remaining risks in this regard.

4.6.2.4.3. Implementation and Evaluation

The deliverables of AR iteration three are subsequently discussed.

Risk Framework

The IRMF was updated in two ways: (1) the risk categories were updated and consolidated following from the AR iteration; and (2) privacy was introduced as an additional second-level construct. Other risk processes and frameworks were developed to accommodate PoPI provisions, which were integrated into the risk framework and processes. Since the number of categories in the

IRMF was reduced, the risk practitioners remarked that they found it easier to identify and provide mitigation actions. The full framework implementation is discussed in Chapter 5: Research Results.

An implementation checklist for PoPI was provided, as was an internal governance compliance checklist and a PoPI matrix for the collection and processing of PI as applied to the context of a P&S. However, in some cases, application of the generic PoPI principles and matrix required a more detailed understanding of the technology components of P&S. Generic cloud computing solutions are used as an example to demonstrate the additional technology complexities that needed to be accommodated (refer to Appendix 7, Section 16.7 and Section 16.8). Privacy guidelines for cloud computing environments are provided in Section 16.8. The prevailing risk process and framework provided a good baseline for understanding privacy risks, but for certain projects, additional instructions were required to ensure that privacy risks were reasonably mitigated.

Organisational constraints hindered the implementation of privacy and PoPI. Upon the appointment of a dedicated privacy officer, all related matters were initially referred to them. Not accommodating privacy concerns would have reduced the workload of the risk practitioners. However, the privacy officer was unable to process the number of privacy related requests, which delayed P&S development. NPSD practitioners bypassed risk practitioners to consult directly with the privacy officer. Furthermore, risk professionals in some cases disagreed with the recommendations of the privacy officer. The privacy officer did not review the functional specification and failed to comprehend the full scope of the P&S. Under these circumstances, the risk practitioners intervened by way of their mandate. NPSD teams argued that formal approval was obtained from the relevant authority vested in the privacy officer. In these cases, risk practitioners were accused of delaying P&S. RM executives were not supportive of risk practitioners ‘performing privacy work’. Risk practitioners could not exclude privacy risk, and following the privacy officer route delayed risk assessments, which negatively reflected on risk practitioners.

The risk practitioners addressed these challenges by considering privacy risks one P&S at a time. For each P&S, the risk professionals produced a documented privacy recommendation obtained via consultation with the privacy officer, legal, regulatory, NPSD, technology security and technology practitioners. On receiving these recommendations, the privacy matter was generalised to apply to a wider scope of P&S. The recommendations were also documented and presented in support for future P&S, without the need for further consultations with the relevant stakeholders. Initially, the process to ensure uniform privacy opinions was laborious.

The risk practitioners, through the development of these documented white papers, provided double-loop learning as the knowledge was applied to future similar P&S. The risk specialists succeeded to manage privacy risks, within the existing organisational constraints, which required additional effort but ensured that no privacy risks came to be realised during the AR iteration.

Risk Process

Risk practitioners were initially concerned that the P&S portfolio categorisation framework would be confusing for executives, which stemmed from their uncertainties about applying the framework in practice. A subsequent exercise alleviated the concerns. An improved understanding of portfolio category risks resulted from analysing NPSD projects that were under development at that time. Risk practitioners expressed more confidence using the method.

The P&S portfolio category risk section in the dashboard for gate 2 added an abstraction layer that meant that information was easier to view. Furthermore, a common risk vocabulary was introduced and allowed senior executives to assess portfolio risks. Top executives readily grasped that both new technology and new market risks would classify a 'new venture' as a high-risk project. This facilitated increased understanding that technology and market risks should be mitigated and that a higher risk profile deferred target dates.

Risk Dashboard

The implementation process was inspired by Markus et al.'s (2002) EKP principle of design for customer engagement by consulting with the individual risk practitioners to obtain buy-in and collaborate on the development of the dashboard. The personal approach, rather than a group approach, worked well. By the time the dashboard was introduced in a group setting the risk practitioners had bought into the concept. The supply side of the dashboard was evaluated following dashboard criteria regarding presentation, function and content, design concept, structure and interaction (Gannholm, 2013). RM measures were adequately organized into groups of related information and colour was effectively used to highlight areas where attention was required. The visual design was thought to be pleasing. Risk practitioners, however, had reservations around whether the NPSD practitioners would approve of the dashboards since the dashboard style did not align with the prevailing predominantly text-based NPSD dashboards. Executive approval was initially tested when the dashboard was presented to the executive in charge of RM in a group setting. The opinion was that the executive approved of the dashboard but lacked an intuitive understanding of it. It followed that the dashboard was required to be demonstrated with some training to the NPSD teams.

Dashboards were subsequently demonstrated and explained to NPSD teams during special meeting sessions. Five sessions with respondents from B2B and B2C took place. All prospective dashboard users were present, and attendees ranged from eight to 12 at a time. Questions were posed following the demonstration of the dashboard: (1) what they thought about the dashboard; (2) if they believed that it was useful; (3) if the information was relevant; (4) whether there was missing information (anything else they wanted to look at); (5) whether there was too much information; (6)

whether it was easily understandable; (7) whether it was unnecessarily complex; and (8) what they thought about the presentation of the information regarding layout and symbols/icons.

NPSD group consensus was that the dashboard was useful, relevant, not too complicated and understandable and attendees liked the way it was presented. NPSD practitioners remarked, 'that it was definitely useful' and even though they did not have previous exposure to a risk dashboard, they 'thought it was good'. Additional comments were that the dashboard was 'very colourful', 'looks very professional' and 'delivered what was asked'

B2B executives indicated a more favourable disposition to the dashboard than the B2C teams. Top management was attracted to the 'look and feel' of the risk dashboards. The strong selling point was a quick summary and overview of risks instead of detailed documentation that supported the risk assessment of the P&S. The NPSD practitioners mentioned that the dashboard delivered on their purpose of providing an accurate bird's-eye view of the risks, relevant to the specific P&S, as well as the stage/gate meeting.

A further test came when the dashboard was implemented and demonstrated at a stage/gate meeting where some high-level executives were present. These executives were not previously exposed to the risk dashboard. The researcher was meant to introduce the dashboard, but instead, the product manager talked the executives through the dashboard with a complete understanding of what each of the elements meant. One of the senior executives expressed unexpected delight by remarking how much he liked the risk dashboard.

The risk dashboard was subsequently implemented at various stage/gate meetings and integrated as a key deliverable of the stage/gate processes. An unintended consequence of the risk dashboard was that other risk specialist functions felt pressurised to deliver similar dashboards, stating that they needed to compete to provide 'fancy dashboards like risk'.

Five months after the dashboard was implemented, risk practitioners convened to conduct a final evaluation of the dashboard. Risk practitioners were confident that the risk dashboard delivered on its objectives. The success of the dashboard was assigned to the provision of consolidated risk information at the stage/gate meetings, which facilitated an improved understanding of the risk processes. Acceptance of the dashboard was also attributed to the organisational culture, since NPSD practitioners could establish that the dashboard was designed based on robust processes and research, as they would typically suggest changes.

Risk practitioners perceived the fundamental advantage of the risk dashboard to be the process implemented to obtain the latest information from NPSD project stakeholders. NPSD practitioners were not exposed to surprises due to having full knowledge of what would be presented by risk practitioners at the stage/gate meetings. Formerly, stage/gate meetings could be contentious, as some P&S would not pass through to the next gate due to risks that were highlighted which reflected negatively on the responsible NPSD practitioner. The dashboard was reckoned as a tool for building trust and consensus during the stage/gate meetings rather than merely an information device.

Following a formal DS approach was time and resource intensive. The researcher would reflect on the outcomes and whether an organisational artefact could benefit from using a formal DS approach during the formalisation of the learning phase in Chapter 6: Conclusion.

4.7. Closing

The latest statuses of the AR interventions delivered during the AR iterations were reviewed at a session where all the risk practitioners were present. All of the risk deliverables were examined and assessed by the risk professionals. Risk practitioners felt that the IRMF, risk lists and risk processes were well entrenched and stable.

Furthermore, the IRMF was implemented within the B2C, B2B and the financial services division, and expanded into areas such as general IT/IS projects, competitions and promotional activities. Customised IRMF frameworks were developed for the B2B division, financial services division and competitions and promotions. The overall risk categories of the IRMF were applied, but the risk lists and risk action lists were more reflective of the specialised context of these services, reflecting the unique technology, regulatory environment and processes followed by this division. The overall IRMF and risk process remained stable.

The IRMF, risk processes and risk dashboards were also implemented at the organisation's international operations. The risk processes were entrenched at two of the operations that had sufficient resources to implement the processes, however at the end of this iteration, they was still lagging at three of the operations mainly due to resourcing constraints and lack of will to follow systematic risk and NPSD processes.

One of the categories of IRMF was still considered problematic. Portfolio management was introduced as a result of the literature review but omitted since the risk practitioners were not directly involved with portfolio management. However, it was regarded as an important indicator of the overall success of P&S and validated as one of the top concerns of NPSD practitioners during interview sessions held during AR iteration two. Portfolio management concerns reflected shortcomings concerning ensuring a mix of different types of P&S and where certain types of P&S could be implemented faster while others would follow a more robust process. Additional concerns were expressed about whether an optimal mix of P&S exists, and whether both long-term and short-term goals were being addressed. The context at that time was that the number of fast-track projects increased which pressurised resources to deliver inferior quality P&S. Ensuring sufficient allocation of resources to address the number of P&S remained problematic during the AR iterations. The portfolio management risk categorisation was widely used during the stage/gate meetings and updated in the IRMF as portfolio management.

Some naming conventions of IRMF risk categories were not theoretically accurate. For instance, the collective construct of ‘compliance’ was insufficient to describe the second-level constructs of legal, regulatory, internal compliance, fraud, AML, health, safety, social responsibility and privacy. The umbrella term of GRC was found to represent more accurately the high-level construct. While the naming of some high-level and second-level constructs changed, the internal validity of the risk lists, risk action lists and strategies remained constant. The second-level constructs of technology and innovation were included as part of strategy to reflect the importance of procuring innovative technology as a strategy. The updated naming conventions are provided in Chapter 5: Research results, Section 5.3 when the final IRMF are presented.

The small team of five risk practitioners tracked an average of 126 projects annually. The workload was significant. It was therefore not surprising that the update of the risk register was not well maintained. Risk practitioners recognised the value of keeping risk incidence records and undertook to increase their performance. The process of conducting post-implementation reviews was discarded after the initial AR iteration, due to the project management organisation agreeing to take over this process. However, the PMO only intermittently performed post-implementation reviews. The risk practitioners were inundated with work, and insufficient capacity was in place to conduct lessons learnt. Supplementary resources were requested on an annual basis to assist with the expanding risk requirements from business, but not approved. Shareholder employment constraints were listed as the reason.

The risk prioritisation framework was discarded and replaced by the P&S portfolio category risk, which was easier and more intuitive in determining project priorities. The qualifying questions remained consistent. The risk process, with the inclusion of the P&S portfolio risk, was updated in the ERM policy of the organisation as a mandated process to be followed in NPSD.

The CMM provides a way to measure improvement by analysing the maturity level of overall NPSD processes. It did not, however, fit the constructs of the IRMF. Kahn et al. (2006, p. 107) produced a best practice framework for NPD comprising of six dimensions described ‘across four levels of sophistication to describe states of poor, better, good, and best practice pertaining to new product management’. A similar framework was developed based on the AR iterations, which were called the IRMF maturity framework. The maturity framework was based on the risk strategy developed in Section 4.4.2.4, but was generalised to be transferable to meet the needs of a variety of service organisations.

The IRMF maturity framework provided four levels of sophistication but 24 second-level constructs aligned to five high-level constructs. A generic NPSD best practice framework is suggested in Table

35, Appendix 3. The IRMF maturity framework presented in this thesis was used for evaluation of the organisation’s maturity.

It was mentioned earlier that risk practitioners did not consider Hillson’s (1997) RMM model to reflect the fast changing, technology-intensive environment of the organisation. A new CMM rating was delivered using Yeo and Ren’s (2009) CoPS-RM-CMM model. Risk practitioners referred to the model as the 'navigator', since it guided the risk team to increase performances. The ‘navigator’ CMM model is provided in Table 70, Appendix 5. Whilst it had been specifically developed for the purpose of the organisation a more generic version is presented.

Risk practitioners evaluated the maturity of the RM function according to the new navigator CMM model, and RM remained at level 3, largely due to the technology system that was not fully operational. Previously, the NPSD RM activities were conducted in an access database supported by reporting tools, which was replaced by an RM system that could be customised to meet the needs of the risk practitioners, and in which all the risk tools and processes, including risk dashboards, would be fully operationalised. Attainment of level 4 and 5 elements of the navigator CMM was constrained by organisational budget cuts. By the end of the closing phase, ‘navigator’ was well entrenched as a performance tool for the risk practitioners to guide strategic improvement actions required on an annual basis. It was also shared with the global shareholder.

Overall, risk professionals believed that embedding RM within the processes of NPSD was successful. Even though P&S innovations were highly complex and challenging, the organisation was not exposed to any significant reputational risks as a result of any of the P&S that followed the risk methodology. The mandate for risk practitioners to stop P&S where risks had not been sufficiently mitigated was maintained on an annual basis. The CRO confirmed the CEO mandate annually, and it was stated to be operational until 2015. This was the ideal time to exit the iterations as experience suggested that both the IRMF and supporting risk processes were stable and useful, and no substantial additional requirements could be identified.

4.8. Conclusion

CPR based AR was used to combine knowledge from NPSD and RM to implement practical interventions to embed RM within NPSD by developing an IRMF and supporting risk processes, for efficient RM. The interventions implemented during the different cycles are explained with the assistance of Figure 37. Each AR cycle started with an evaluation of the maturity level of the RM and NPSD processes with the objective of establishing benchmark performance measures against which improvement of processes between AR cycles could be assessed.

During the first AR cycle, the IRMF was developed, based on the literature review, and expanded with risk incidences reported during the AR cycle. The IRMF was enhanced with each subsequent cycle. Also, the risk lists, risk action lists and risk strategies were prepared and updated at each consecutive cycle. New knowledge was continually introduced as new risk strategies, such as methods to prioritise P&S, emerged. Previous methods for prioritisation of projects were discarded, and the P&S portfolio category risk method was utilised instead.

Supporting tools and processes were additionally developed during the AR iterations, such as a risk toolkit in AR iteration one and development of a particular methodology to support the RM category of privacy as incorporated from the generic IRMF in AR iteration three. During AR iteration three, a DS artefact, the risk dashboard, was developed, based on the underlying RM body of knowledge developed in the previous iterations.

The first two iterations closed with interviews and questionnaires with NPSD practitioners, while the final iteration closed with an evaluation of the RM CMM that was amended to fit the context of the organisation. The organisational context expanded during the iterations, where the RM framework and processes were initially only applied to the B2C organisation. The context of NPSD increased to encompass B2C during AR iteration two and ultimately during iteration three, to financial services and general IT/IS projects as well.

Interventions designed and implemented during AR cycles

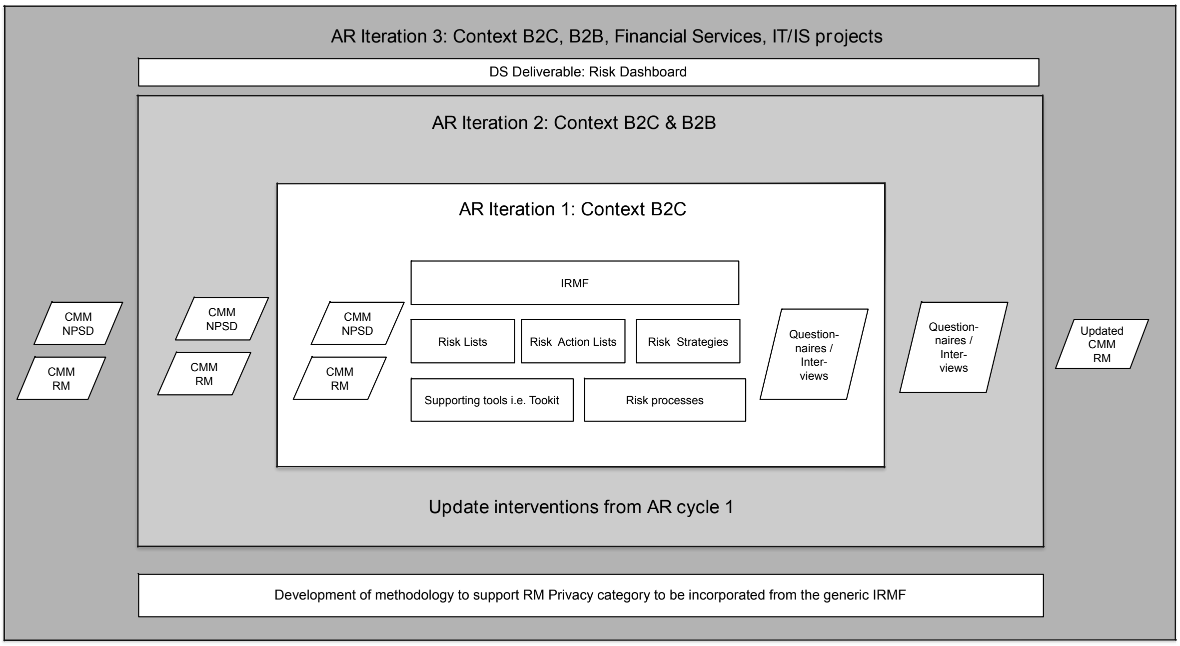


Figure 37: Interventions delivered during the AR Cycles

The researcher directed the process but collaborated with the risk practitioners to decide what interventions to deliver, develop and implement. During the first two AR cycles, the researcher was actively involved as a practitioner, but during the last period, the researcher's involvement was reduced to monitoring the interventions and providing guidance. The risk professionals were responsible for maintaining the IRMF, risk lists, action lists and risk strategies. The researcher delivered the DS artefact in collaboration with the risk practitioners. The final collaborative activity was to elicit lessons learnt that are reviewed in Chapter 5: Research Results.

5. Chapter 5 – Research Results

5.1. Introduction

The study aimed to embed RM within NPSD by developing an IRMF and supporting risk processes for efficient risk mitigation. This chapter presents the final framework, as well as findings from the qualitative and quantitative analysis.

5.2. Structure of Chapter

The structure of this chapter needs to be explained, since final frameworks, as well as the results of the qualitative and quantitative analysis, are presented. Section 5.3 presents the final Integrated IRMF and supporting risk processes. The IRMF is shown in two ways. Firstly, an overview of the high-level constructs of the framework is provided in Section 5.3.1. The detailed framework is provided in Appendix 1: Table 23: Integrated Innovation and Risk Management Framework. Secondly, the supporting risk processes as they evolved during the AR iterations are consolidated in a risk methodology that can be applied in NPSD (refer to Section 5.3.2).

Data analysis commences in Section 1.1.1 with the answering of the research question. Firstly, the effectiveness of the RM practices, as applied within the different NPSD contexts of B2C and B2B, as well as other areas, are analysed (Section 5.4.1.1). Secondly, the effectiveness of the RM practices implemented in NPSD is established (Section 5.4.1.2).

Thereafter, overviews of the quantitative analysis are provided in Section 5.4.2, followed by the operational risk review conducted in AR iteration one (Section 5.4.3) and the content analysis conducted during AR iteration two (Section 5.4.4).

Section 5.4.5 consolidates findings from the qualitative and quantitative analysis into a second order construct analysis and validation. The objective is to understand the actual practices of the organisation in terms of NPSD and to highlight distinguishing features between B2B and B2C. The quantitative analysis is expanded with quantitative analysis to provide ‘how’ and ‘why’ answers for the purpose of enrichment, and to enhance the validity of the findings. This chapter concludes with a summary of the major findings of the research.

5.3. NPSD Risk Management Framework

The risk framework is presented in two parts. An overview of the final IRMF and high-level constructs is presented in Section 5.3.1 followed by presentation of the RM methodology as it evolved during the AR iterations.

5.3.1. Innovation and Risk Management Framework

The framework is a functional, flexible and consolidated reference framework categorised according to business activities that produce P&S. The IRMF serves as a guiding reference for RM in NPSD and follows standard naming conventions for functional concepts. Efficient management of risk via application of the components of the framework will positively influence the quality of the P&S.

The objectives of the IRMF are threefold. Firstly, the IRMF seeks to be as comprehensive as possible, meaning that it includes numerous risk variables. The central premise of the framework is that many diverse risks and opportunities need to be considered to ensure successful P&S implementation.

The second objective is the design of a flexible framework. Flexibility is presented in three ways: (1) the framework is adaptable to meet the needs of unique P&S attributes. If the P&S introduces new technology developments, the ICT and GRC components would be more important; (2) the framework is furthermore customisable according to the requirements of the NPSD lifecycle phases. The risk profiles and individual elements of the framework will be more relevant during certain stages of the NPSD lifecycle than others; and (3) the framework groups the business activities associated with NPSD into functional organisational groups that can be combined in several ways. If for instance, the organisation does not have a privacy officer, privacy and technology security second-level constructs can be combined.

The third objective is to ensure that the components of the framework are actionable, efficiently implemented and used as the basis for learning within an organisation. The IRMF, risk processes and maturity framework can be used by organisations to benchmark current performance against effective practices that are presented within the framework.

The framework is explained with the assistance of Figure 38. The framework has eight elements presented in a cohesive, supported structure where insufficient attention to any one of the components may impact on the structural integrity and lead to risks being realised or opportunities not exploited. The high-level constructs are subsequently discussed. The second-level constructs are discussed in Section 5.4.5.

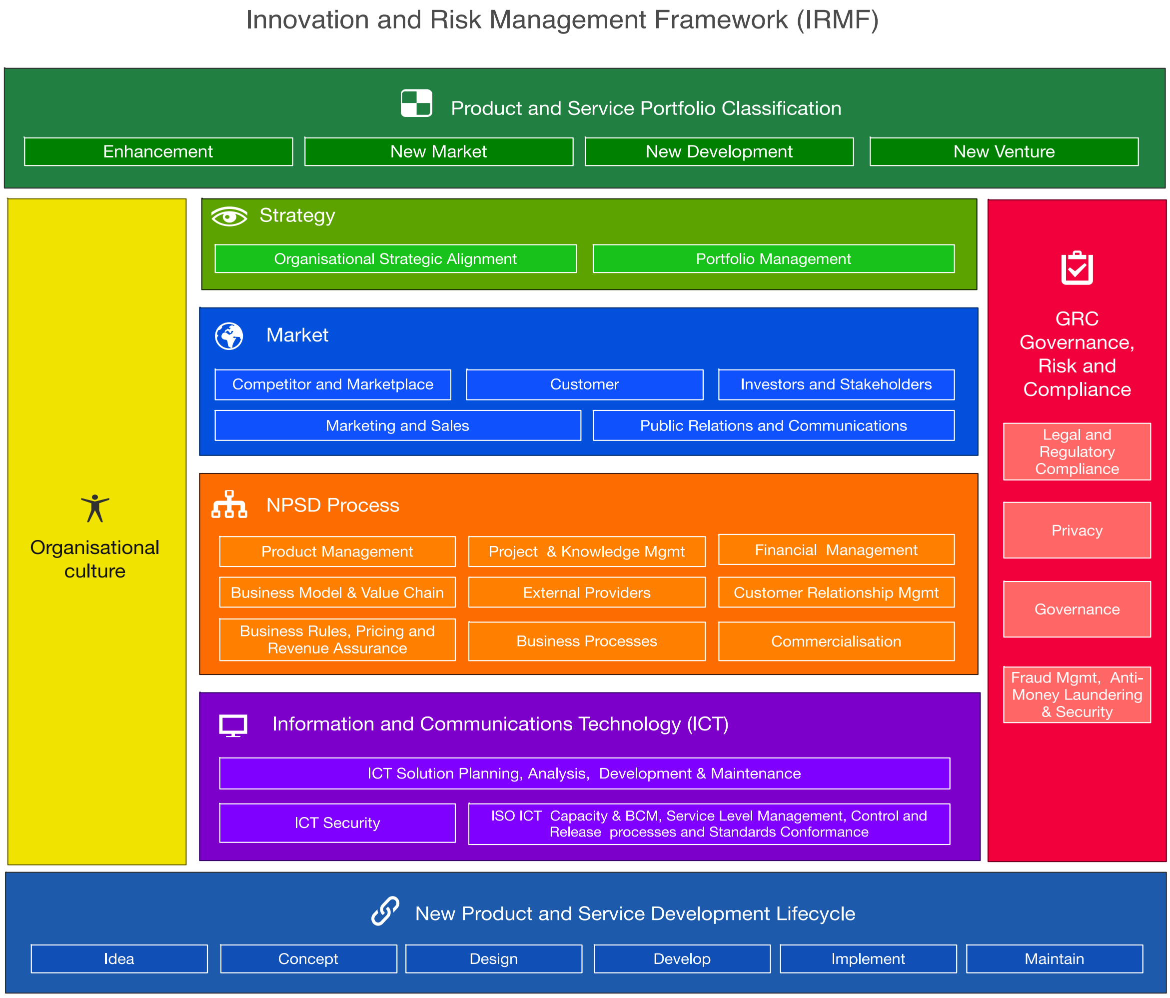


Figure 38: Innovation and Risk Management Framework Final

Product and Service Portfolio Classification: During the AR practice, a P&S portfolio classification was designed (refer to Section 6.2.3 of Chapter 4). Four main classifications for P&S were identified as 'new market, new venture, enhancement and new development'. This categorisation determines the type of risk assessment strategy that would be applied, as well as the significant risk factors.

Strategy, Market, NPSD functions and ICT: These four high-level constructs are the main operational constructs of NPSD. Each high-level construct has associated second-level constructs, which can be flexibly combined according to the requirements of the NPSD lifecycle as well as the unique characteristics of the P&S.

Organisational Culture: Culture was validated as an important component of NPSD during the literature review. It is indicated as a high-level construct that permeates the whole IRMF and influences all NPSD activities.

Governance, Risk Management and Compliance (GRC): GRC informs all NPSD deliverables and was predominantly based on incidences arising from the AR cycles, but in some cases was also validated by the risk literature.

New Product and Service Development Lifecycle: New risks and opportunities could materialise during subsequent phases of the NPSD lifecycle. Some second-level constructs of the IRMF would be more relevant during certain phases of the NPSD.

Each of the above-mentioned high-level constructs consists of some second-level constructs. Risk and opportunities are consolidated into distinct functional risk categories. Research from the literature review, as well as information gathered during the AR cycles were used to develop the IRMF. The generic IRMF is presented in Appendix 1, Section 1: Table 23. A description of the contents of the IRMF is provided in Table 11.

Table 11: IRMF explained

#	Headings	Explanation	Application
(A)	**Risk second-level constructs**	The second-level construct as aligned to the high-level constructs as indicated in IRMF	Second-level constructs can be combined or separated according to requirements of organisation
(B)	**Definition and objective**	Definition and objective of second-level constructs	A clear definition is provided to articulate shared understanding of the construct.
(C)	**Risks**	Generic risks related to the second-level construct.	The generic risks can be used as a basis to develop risk and mitigation lists
(D)	**Products**	Particular risks that is more relevant to the development of physical products rather than services.	During the design of products, these criteria can be considered.
(E)	**Service**	Recommendations about risks that are more relevant for services	When services are designed, these criteria could receive priority attention.
(F)	**B2B services**	Recommendations about risks that that are potentially more applicable to the design of B2B services	When services are designed where the customer is an organisation as in B2B, these risks could be regarded as particularly important
(G)	**P&S portfolio categories**	The four P&S portfolio categories are an enhancement, new market, new development and new venture. The association between the second-level constructs and the four types of portfolio categories are explained.	For certain classes of P&S, individual risk high-level constructs could be considered more relevant and the IRMF and supporting risk processes can be adapted to focus on these high-level constructs.
(H)	**Where?**	The sources from which risks will be analysed as well as where the risk second-level constructs, assessments and controls will likely be documented, is provided.	Practical examples are provided of what documentation can be examined to conduct a risk assessment.
(I)	**Who?**	RACI diagram is provided stating Responsible, Accountable, Consulted and Informed resources. It assists with the establishment of clear responsibilities and accountabilities.	When an organisation is small and do not have all the resources and department of large conglomorates, the RACI diagram can assist when second-level constructs are combined to establish responsibilities fitting the context of the organisation.
(J)	**When?**	Explain the activities that will be performed during each of the NPSD lifecycle phases. Recommendations are made regarding when the particular activities are regarded as more important during the NPSD lifecycle stages.	Discuss when the risk category will be applied during the NPSD lifecycle and when it is of particular significance. When a shorter development process is followed, the recommendations can aid the development of customised processes.
(K)	**Why?**	Describe the reasons and related risk impacts associated with the second-level constructs.	The second-level constructs can be used to provide motivations for the inclusion of the particular risk aspects and can be used to expand the risk strategies.

The IRMF can be utilised in several ways. Since the IRMF is a functional framework, the risk second-level constructs (A) can be combined according to the unique needs of the organisation.

Clear delineated definitions (B) are provided to articulate the risk categories. Objectives of the risk second-level constructs are aligned to the P&S objectives (C).

The primary risk strategy applied by the IRMF and methodology is to reduce ambiguity and uncertainty. A list of risk elements that could introduce risks for the P&S (C), phrased as questions, are provided which can be used as a basis for developing risks and controls.

The different qualities as perceived to be important for products (D), services (E) and B2B (F) services are articulated. The criteria emanate from the literature, the AR cycles and the results section. From these principles, particular risks were found to be more relevant to the quality of the product (NPD) or consumer service (B2C) or business service (B2B). The relative importance of these risks, as applicable to the different contexts, should be considered during the design of a customised risk framework for an organisation.

The P&S portfolio categories (G) form an integral part of the IRMF. A particular risk sub-dimension (A) is not always relevant as it relates to the P&S portfolio categories. How the risk second-level construct refers to the class of P&S is indicated in (G).

The sources of documentation, which can be analysed for risks, are presented in (H) and NPSD functional responsibilities (related to the risk category) are articulated in (I). These can be combined according to the needs of the organisation. For instance, if the NPSD team is small and a separate marketing department does not exist, the product manager may assume the role of the marketing specialist.

The importance of risk activities fluctuates according to the NPSD lifecycle. The relation and significance of the risk activity to the NPSD lifecycle (J) are presented. For instance, an accurate understanding of customer requirements serves as input during the concept phase, but is of primary importance during the design stage of the NPSD lifecycle. If a thorough understanding of customer requirements does not exist by the time the P&S functional specification is complete, this could lead to the development of P&S that does not fulfil customers' needs. While the design stage is of primary importance to ensure that the P&S is designed to meet customer specifications, customer research is also revisited during the commercialisation phase to develop the testing criteria or marketing strategy. If the quality of the client needs analysis is sufficient (as developed during the NPSD planning stage), it will facilitate quality of marketing, sales and commercialisation activities.

Finally, motivation is provided on why the risk category is regarded as important and examples are provided of risk impacts if risks or opportunities are neglected.

The IRMF provides a comprehensive, flexible guide to organisations to ensure that practical risk interventions can be applied and to ensure that risks that may impede the obtainment of P&S objectives are minimised to an acceptable level. It also forms the basis for the development of the risk methodology and supporting processes, which is discussed next.

5.3.2. NPSD Risk Management Methodology

The development of the Integrated Innovation and RM methodology is subsequently discussed (refer to Figure 38).

(A) Mandate and commitment: To ensure that RM in NPSD is effectively implemented, a documented mandate and commitment from the organisation's CEO should exist, be documented and approved for the purpose of distribution to NPSD practitioners. This mandate should clearly explain the role and authority of risk practitioners to perform RM in line with the objectives of the NPSD organisation and to intervene if the risk exposure exceeds the risk appetite of the organisation. It should be reviewed and renewed on an annual basis.

(B) Categorisation: Categorisation consists of a high-level risk assessment to establish the context of the P&S. The project is categorised in two ways: (1) the overall risk classification of the project is determined; as well as (2) the NPSD portfolio classification.

The overall project risk classification is rated from high to low risk (refer to Figure 23: Risk Second-Level Construct Ratings, p. 151. Projects rated as B to E proceed to the next phase, while projects deemed to be an A-rating are regarded as too risky to continue in their current format. After consultation with the NPSD team, the project is assessed to determine if changes can be made to the P&S specification to lower the risk rating and the P&S is accordingly updated and resubmitted. If not, the project is discontinued as per the mandate.

B to E projects is additionally assessed according to the portfolio category as indicated in Figure 33. The NPSD portfolio categories are used to classify the project as one of four categories: (1) new market; (2) new venture; (3) enhancement; and (4) new development. The assessment process is indicated in Table 12 below.

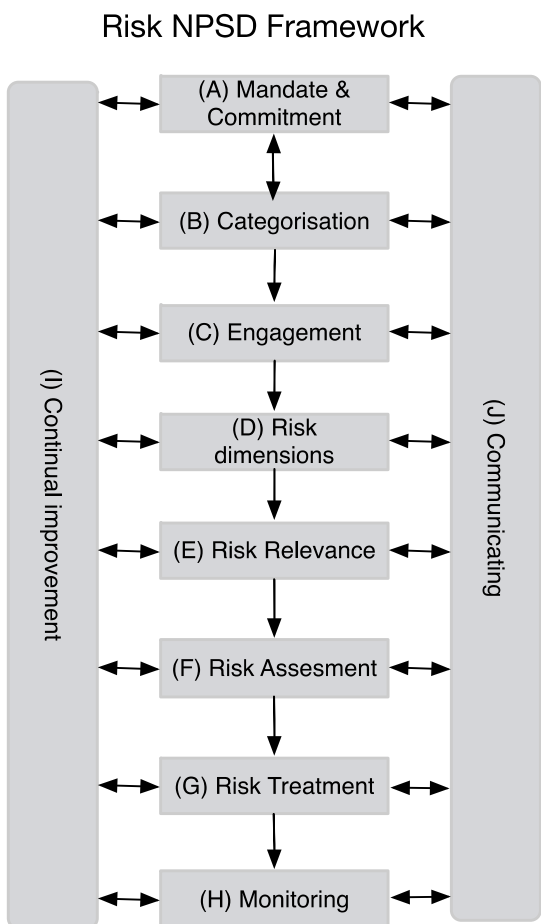


Figure 33: Risk NPSD Methodology

Table 12: P&S Portfolio Category Risk Profile

Market risk					
Value chain			Market segment		
High risk - Value chain requirements do not currently exist within the organisation or with partners	Medium risk - Value chain requirements exist but some are outsourced to partners	Low risk - All value chain requirements exist within the organisation and the organisation has full control over the elements	High risk - Target market segment is new and limited and no presence exist of the organisation within the target market	Medium risk - Organisation currently produce P&S for the target market	Low risk - Organisation is seen as market leader in target market
Technology risk					
Innovation			Technology Capabilities		
High risk - New technology will be used as proof of concept and feasibility within org. context has not been proven	Medium risk - New technology will be used but working prototypes have been produced and tested	Low risk - Technology is incrementally used and understood in the organisation	High risk - Dedicated technology teams do not exist and limited experience of similar projects exist	Medium risk - New team but experienced developers exist that developed similar projects	Low risk - Established development team with experience in similar projects
Customer risk					
Customer research			Functional Specification Assessment		
High risk - No or limited customer research has been conducted. The functionality of the P&S is determined by the NPSD teams	Medium risk - No or limited direct customer research has been done but secondary customer research has been performed	Low risk - Primary customer research has been performed and a good understanding of customer functional requirements exist	High risk - The P&S design is new and innovative for the organisation and the functional requirements are not clearly defined	Medium risk - The P&S design is new, but the performance specifications are clear and all business rules have been adequately defined	Low risk - Similar P&S functional specification exist and performance criteria are clear

NPSD portfolio categories are assessed concerning these three dimensions. A scoring tool is presented in Appendix 5, Section 14.16, p. 561 to assist in the determination of the P&S portfolio category as indicated in Table 69. Once the risk practitioners are familiar with the classification, the scoring tool becomes superfluous and classification becomes intuitive.

(C) Engagement Process: The outcome of the categorisation process (B) determines the type of RM engagement process that will be followed. The engagement process (C) is explained with the assistance of Table 13.

Table 13: Determining the Risk Engagement process

	Overall Project Risk Classification				
NP&S portfolio categories	A	B	C	D	E
Enhancement	Project cannot proceed in current form (usually due to regulatory risks)	Risk engagement process = 3 (Restricted)			
New Market		Risk engagement process = 1 (Detailed)	Risk engagement process = 2 (Top risks)	Risk engagement process = 3 (Restricted)	
New Development		Risk engagement process = 1 (Detailed)		Risk engagement process =	

NP&S portfolio categories	Overall Project Risk Classification				
	A	B	C	D	E
				2 (Top risks)	
New Venture		Risk engagement process = 1 (Detailed)			

An ‘enhancement’ would likely follow the shortest route (C – restricted process) with limited risk practitioner involvement. However, this does not necessarily mean that the overall project risk is low. An ‘enhancement’ portfolio P&S, can be exposed to high risks concerning business rules and pricing especially considering customer price sensitivity in developing markets.

If the project is classified as a ‘new market’ portfolio category, the risk engagement process will depend on the overall project risk classification. If the overall project risk is low (either a D or E) the C risk engagement process will be followed. In the case of the project being considered as a C overall project risk rating, risk engagement process = 2 (top risks) will be followed. Engagement process 1 = detailed risk analysis is supported if the overall project risk is considered to be high-risk (B category).

A ‘new development’ portfolio category would seldom follow the low-risk engagement process due to mandatory technology controls. The risk engagement process will either be a 2 (where only the top necessary risks and controls will be evaluated) or a 1 – detailed risk assessment.

For a ‘new venture’ where both high market and technology risks are presented, the overall risk rating will never be below B or C and the risk engagement process that will be followed will be 1-detailed risk assessments.

(D) Risk Dimensions: Deciding which risk categories of the IRMF to use, is dependent on the outcome of (C). A ‘new venture’ would entail that all of the IRMF risk categories will be analysed. If a project is classified as a ‘new development’ and it is decided to use risk engagement process = 2, where only the top risks will be analysed, particular second-level constructs of the IRMF will be considered more relevant. These are indicated in the IRMF presented in the IRMF Appendix 1, Section 1: Table 23. If, however the risk analysis determines that the risk engagement process should be a 1, all of the categories will be analysed.

For a P&S that is classified as ‘new market’ and ‘enhancement’ the ‘market’ risk categories will be more important. A ‘new market’ category could present technical risks, but the major cause of failure for this type of P&S is often the lack of market or customer understanding, which is why these categories would be considered a priority to ensure that the new market opportunities are adequately exploited.

(E) Risk Relevance: Risk relevance is determined in the following six ways: (1) the objective of the P&S is analysed to identify opportunities being pursued; (2) the criteria utilised to determine success or failure of the project is examined; (3) the unique characteristics of the P&S are investigated; (4) the NPSD lifecycle stage is considered. For instance, if the NPSD lifecycle is in ‘concept’ phase, it is irrelevant to list commercialisation risks; (5) risk lists are consulted to ensure a comprehensive risk assessment; and (6) risk incidence registers are consulted to allow a more formal quantification of the risk or missed opportunity.

(F) Risk Assessment: Risks are identified within a second-level construct with a risk explanation and impact. Potential knock-on effects of risks are also considered. To obtain a more detailed understanding of the risks, other risk experts can be consulted. Only the top risks are individually rated in terms of impact, probability, control effectiveness and residual ratings. These top risks are rated and presented in the risk dashboard during stage/gate meetings.

(G) Risk Treatment: Reducing ambiguity and uncertainty is the overall risk treatment strategy that is employed. The central premise of the IRMF is based on the provision of a comprehensive framework that consolidates NPSD best practices (that should be encouraged) and risks to be mitigated to increase the chances of successful P&S development. If a particular IRMF category is not adequately addressed it would decrease the chances of a successful P&S.

The presence or absence of the risk or best practice is rated according to a unique compliance rating designed for each risk category as explained in Section 4.4.2.4 p.171. Four possible compliance levels exist: Level 4: Compliant (C); Level 3: Largely Compliant (LC); Level 2: Partially Compliant (PC); and Level 1: Non-compliant (NC). If a particular risk was rated at Level 1 NC or Level 2 PC, it was specified as a mandatory requirement. A Level 3 LC rating required suggestions for improvement and Level 4 C rating indicated conformance to best practices.

The risk treatment strategy fulfils the function of a risk treatment plan and includes responsibilities and timeframes. Timeframes are allocated based on the SDLC. NPSD practitioners were encouraged to reduce ambiguity and uncertainty by complying with the mandatory control elements. Essential control requirements are updated in the testing plans.

(H) Risk Monitoring: All three engagement processes specified in (C) merged at the commercialisation P&S launch phase where evidence of mandatory controls elements should be produced. In cases where further risk monitoring actions are required, monitoring responsibilities must be assigned. If residual risks were too high, the risk practitioner could use the mandate to postpone the launch of the P&S.

(I) Continual improvement: P&S incidences are maintained in the incidence register and in cases where a post-launch, lessons-learnt review are conducted, the risk practitioners would update risk and control lists accordingly. These practices are continuously applied during the project lifecycle.

The risk treatment strategy (G) focuses on continual improvement, used on a per-project basis, as explained in Section 4.4.2.4 p.171 by providing stretch targets to improve performance on individual projects. The IRMF maturity framework assists in establishing maturity levels per risk category, as presented in Table 35 in Appendix 3, Section 12.7.

(J) Communication: As old risks are mitigated and new risks appear, the risk profile (B) is continuously updated during the project lifecycle and changes are communicated to NPSD stakeholders. The risk dashboard also functions as a communication tool allowing informed decision-making at stage/gate meetings, so that the project to proceed to the next stage/gate.

Continual improvement (I) and communication expanding on the IRMF and risk methodology is required. To elaborate on high-risk areas, additional templates and tools can be provided such as the privacy tools created during AR iteration three.

A detailed risk engagement process (Level 1) will deliver a risk assessment, which consists of the sections indicated in Table 14.

Table 14: Risk Assessment Sections

Section	Description	Requirements
A	Overall description of project	Objectives of P&S, context of P&S, technology development requirement
B	Overall project risk classification	Classification rating, description of risk and action required (including timeframes and identification primary responsibility
C	Risks associated with the P&S portfolio category	Identification of the appropriate P&S portfolio category, with an explanation of why the specific P&S is considered to be part of this class. The individual elements that make up the P&S portfolio category are discussed regarding the risk ratings, and an explanation of the risk scores is provided.
D	Major risks for the P&S	Reference to risk category, risk explanation, impact, probability, control, control effectiveness and residual rating
E	Compliance review overall ratings	Summary of the total percentage of uncompleted activities and knowledge gap risks due to ambiguity and uncertainty explained according to the compliance ratings (PC, LC, NC, C) with recommendations made.
F	Individual compliance ratings per risk second-level construct	Category name and reference, with detailed risks relating to second-level construct. Rating based on evidence presented by the NPSD project teams regarding Compliant (C), Largely Compliant (LC), Partially Compliant (PC) and Non-compliant (NC) ratings. The summary of findings is presented, and the mandatory control specification is advised. In cases where no necessary control is required, recommendations are made.

The risk assessment is updated several times during the NPSD lifecycle, depending on the engagement process (C) followed.

5.4. Data Analysis

The following section discusses the qualitative and quantitative data independently, before proceeding to integrate the findings in Section 5.4.5.

5.4.1. Evaluation of Risk Management Effectiveness

The central research question focused on whether RM was successfully embedded within NPSD and an expert questionnaire was developed to answer this question (refer to Section 3.5.5, p. 138 of Chapter 3). The results are available in Section 13.2, Appendix 4. The evaluation criteria are explained with the assistance of Table 15 below.

Table 15: Criteria for Expert Analysis

Level	Criteria applied for evaluation
5	Risk approaches are fully embedded within the day-to-day business processes and strategies of new product development
4	Risk approaches are adopted and improved but not fully embedded
3	Risk approaches have been implemented in key areas
2	Risk approaches have been planned but is not delivered
1	A level of awareness exist of risk approaches, but no actions has been taken
0	No consensus could be reached between risk practitioners

Levels 4 and 5 indicate the highest level of conformance and are considered as RM being embedded with NPSD. Level 3 indicates that RM has been implemented in key areas only and is not deemed to be fully integrated. Levels 2 to 0 mean that RM practices were not embedded.

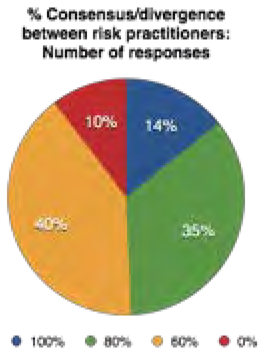


Figure 40: Agreement Responses

Level 0 indicates areas where no consensus could be reached amongst risk practitioners. The researcher regarded these divergent responses to show that RM was not fully embedded within this area since RM should be a structured, systematic, consistent and comparable approach (ISO 31000, 2009a). Lack of consensus indicates inefficient application of RM processes.

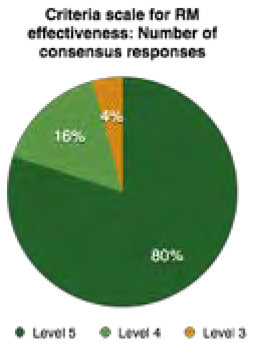


Figure 41: Consensus Responses

No Level 1 and 2 consensus responses were received as indicated in Figure 41. Risk practitioner responses indicated that 96% of RM practices were implemented at the highest possible levels of embeddedness. Four percent of conformance responses signify that risk approaches have been applied in critical areas only. Figure 40 provides a percentage breakdown of conformance, with 14% of responses showing 100% compliance and 35% of the answers reflecting 80% conformance (meaning one risk practitioner had a difference of opinion). Only 10% of responses signified divergent opinions.

The results of the questionnaire are subsequently discussed. Firstly, consideration is given to whether RM was embedded effectively within NPSD, as well as to the specific areas addressed within the AR iterations and externally. Secondly, compliance with the ISO 31000 principles is assessed.

5.4.1.1. Research Question Evaluation

Risk practitioners were unanimous that the risk approaches adopted during the AR iterations were thoroughly embedded within the day-to-day business processes and strategies of NPSD (refer to Table 16 below). RM within NPSD succeeded in reducing risk and ensuring effective risk mitigation in NPSD. The IRMF and supporting risk processes were effective at Level 5 (100% concurrences) in ensuring risk mitigation in NPSD. Risk practitioners perceived that the RM framework and processes were successfully embedded and succeeded in reducing risks effectively.

Table 16: Scores for Expert Questionnaire

Q	AR iteration	Questions	Level 5	Level 4	Level 3
22	AR 1 to 3	RM in NPSD succeeded in reducing risk	100%		
23	AR 1 to 3	RM in NPSD succeeded in effective risk mitigation	100%		
24	AR 1 to 3	The RM framework was effective in risk mitigation	100%		
25	AR 1 to 3	The risk supporting processes was effective	100%		
26	AR 1 to 3	RM was embedded within B2C	100%		
27	AR 2 to 3	RM was embedded within B2B	60%		
28	AR 2 to 3	RM embedded within Financial services	60%		
29	AR 3 exit phase	RM embedded within other operations in Africa			60%
30	AR iteration 2	RM embedded within other IT/IS projects within organisation		60%	

Subsequently, the successful embedding of RM within specific functional areas of the organisation was evaluated (refer to Q26 to Q30). RM approaches were considered to be fully and successfully embedded within B2C. B2B P&S were only introduced during AR iteration two and financial services during AR iteration three, where RM practices were also considered to be implemented at Level 1, however concurrence was lower at 60%. It could be that the greater amount of time spent on B2C could account for the 100% concurrence at Level 1.

During AR iteration two, risk practitioners extended the application of the IRMF and risk processes to other projects (external to NPSD) in the organisation. RM within other projects achieved a consensus rating of 60% for Level 4 that indicates embedment. During the exit phase of AR iteration three, the IRMF was introduced to other African operations of the organisation. The majority opinion (60%) at Level 3 indicated RM was implemented in critical areas..

It can, therefore, be stated that the RM framework and processes were successfully performed (at a Level 5) within the application areas of B2C, B2B, financial services and within other IS projects (at a Level 4). However, RM was not fully embedded in African operations. This indicates the time frames required to ensure that RM embedded. Since the inception of the RM process, a minimum of 3-5 years is needed to obtain a Level 1 embedment. The improvements occurred at a faster pace than suggested by Dooley et al. (2001).

5.4.1.2. Compliance with ISO 31000 Principles

Table 17 indicates the effectiveness of RM implemented within NPSD according to the 11 principles for effective RM (ISO 31000).

Table 17: Expert Questionnaire Compliance with ISO 31000 Effectiveness Principles

Q	ISO Principle	Explanation	Rating & Consensus level
Q1	Principle 1	RM create and protect value	Level 1 (60%)
Q5a	Principle 2	RM is an integral part of all organisational processes	Level 1 (80%)
Q6a	Principle 3	RM is part of decision-making	Level 1 (80%)
Q7a	Principle 4	RM explicitly addresses uncertainty	Level 1 (80%)
Q8a	Principle 5	RM is systematic, structured and timely	Level 1 (80%)
Q9a	Principle 6	RM is based on the best available information	Level 1 (60%)
Q10a	Principle 7	RM is tailored	Level 1 (80%)
11a	Principle 8	RM takes human and cultural factors into account	Level 3 (60%)
Q12	Principle 9	RM is transparent and inclusive	Level 1 (100%)
Q16	Principle 10	RM is dynamic, iterative and responsible to change	Level 1 (80%)
Q19	Principle 11	RM facilitates continual improvement of the organisation	Level 1 (80%)

Consensus opinion indicates that RM conforms to all the requirements of ISO 31000 at Level 1 (fully embedded). Agreement exists that human and cultural factors were at Level 3 – implemented in key areas. Principal 8 advocates that RM should recognise the capabilities, perceptions and intentions of external and internal resources that can facilitate or disrupt the achievement of the organisation's objectives. These skills are reflective of the organisational culture dimension. During the AR iterations, the organisation culture high-level construct was designated as an area of improvement. RM was effectively embedded according to all the ISO principles, excluding organisational culture that was embedded in critical areas.

5.4.2. Quantitative Analysis

During AR iteration two, a questionnaire was completed by 80% or more of NPSD practitioners actively involved during NPSD. A five-point scale was applied to measure perceptions regarding the extent to which the practice was applied within the organisation, ranked from (1) fully agree to (5) strongly disagree. Questions with an answer below 3 were characterised as positive (conforming to good practices) while the median value is ‘uncertain’ and anything higher than 3 relates to poor practices.

The researcher investigated the mean score averages across all variables. The average mean score was 2,75, which falls between uncertain and agree (average <3). The mean score for five variables were above 3, representative of uncertain and disagree (average >3) responses. These variables are shown in Table 18 below.

Table 18: Mean Scores Signifying Disagreement

#	Variable	Mean	SD	Frequency				
				Fully Agree	Agree	Uncertain	Disagree	Strongly Disagree
a	Delays in launching P&Ss did not impact upon the commerciality viability of P&Ss	3,47	1,028	3	22	37	47	21
b	Only the most financially viable P&Ss were implemented	3,16	1,070	7	31	39	40	13
c	New P&Ss were launched before competitors could launch comparable P&Ss	3,11	1,129	10	37	21	53	9
d	Sales projections uptake figures for the P&S were realistic	3,07	.942	2	39	45	36	8
e	Customer support in distribution channels were of high quality	3,03	.988	6	35	46	35	8

These areas reflected concerns regarding implementation delays impacting on commercial viability (a); the financial viability of P&S (b); the perceived innovativeness of the organisation compared to competitors (c); unrealistic sales projections (d); and insufficient support of the customers in the distribution channels (e). These areas will be explored in more detail during the second-level construct analysis and validation section of this chapter.

Half of ordinal data has a Mdn=3, with 50% of the values above and below the median, which indicates that divided opinions exist with regards to the extent to which good or poor practices are applied. Differences could potentially be attributed to different perceptions of the various functional groups, leading to an investigation of whether statistically significant differences could be detected. The Kruskal-Wallis Test indicated statistically significant differences between the perceptions of groups for the variables presented in Table 19. The groups consisted of: (1) product management; (2) technology; (3) GRC; and (4) marketing.

Table 19: Statistically Significant Differences Between Groups

#	Variable	Chi-Square	Asymp. Sig.	Mean rank for Groups			
				GRC	Technology	Marketing	NPSD
a	P&Ss conform to industry best practices in terms of information security	14,695	.002	69,17	86,69	60,73	58,55
b	P&Ss provided clear competitive advantages	14,621	.002	65,25	82,45	84,82	57,14
c	Risk issues were adequately anticipated and mitigated	13,572	.004	79,58	84,74	61,64	58,36
d	Customer privacy issues were adequately anticipated	13,112	.004	77,83	83,67	67,00	58,15
e	Accountabilities for risks were clearly defined between different parties	13,001	.005	96,17	80,53	51,68	59,93
f	The overall impact of business rules were assessed	11,435	.010	69,17	84,76	55,18	59,94
g	Third party suppliers were reliable in delivering according to requirements	10,341	.016	51,33	82,66	73,41	59,55
h	A good awareness exist of the regulations that impact on P&Ss	10,206	.017	85,25	80,95	54,64	60,18
i	Project teams learn from past experiences	9,362	.025	73,00	80,41	75,77	58,47
j	The business models were generally clearly defined	8,473	.037	63,67	81,43	63,73	60,36
k	All business rules applicable to the P&S were known and easy to find	8,286	.040	61,50	80,36	75,09	59,40
l	Customer Care requirements are sufficiently addressed	8,062	.045	53,58	81,91	62,00	61,14
m	Legal and regulatory restrictions were adequately anticipated	7,939	.047	73,33	80,64	59,32	60,52
n	Interactions of products with other systems were well understood	7,959	.047	75,00	80,41	67,86	59,36
o	Formal processes were followed in terms of change control and release management	7,907	.048	73,92	64,24	92,64	61,78

When analysing the mean ranking, it appears that the NPSD group has different views to the technology, GRC (risk) and marketing groups. The technology group has dissimilar perceptions about information security (a); privacy (d); risk anticipation (c) and risk accountabilities (e). The GRC (risk) group variances indicate distinctive views about privacy (d) and regulatory (h). A potential inference is that marketing and NPSD groups have a more detailed understanding of the complexity of addressing privacy and regulatory risk compared to GRC and technology groups.

Comparing the marketing and NPSD groups reveals distinctive mean rankings regarding whether P&S provide distinct competitive advantages (b) and whether business rules are known (f). Knowledge of business rules and competition is required by the marketing group to guarantee that a robust marketing campaign is designed. A likely interpretation is that the marketing group, as well as the technology group, could regard the information as being inadequate for their purposes.

Marketing group perception about the existence of formal change control processes (o) was dissimilar from other groups. Formal change control processes are not typically associated with marketing, which would be indicative of an uncertain response. The NPSD group displays a singular opinion regarding whether teams learn from past experiences (i), noticeable in the mean rankings of the different groups. These and other differences will be explored in more detail in Section 5.4.5 of this chapter.

Examination of the correlation matrix showed weak to moderate associations but significant relationships. This result was expected, since the IRMF implies that effective RM in NPSD requires management of a vast number of risks per risk second-level construct. Testing of the predictive capability of the complete IRMF would require a minimum of 10 questions per risk category, meaning 240 variables for a population of 160 practitioners; nearly impossible task to test in this study. Additional predictors could potentially increase the explanatory power of the model. Alternatively, the data could be inherently exposed to high, inexplicable variability, as people are somewhat unpredictable. However, small P values indicated real relationships between significant predictors and the response variable.

The researcher was subsequently interested in establishing three main interests: (1) whether the number of risk variables could be reduced into subsets or factors; (2) what the underlying concepts and meaningful categories of risks are; and (3) if any latent factors emerge. The intention of the factor analysis was not to change the IRMF, since the objective of the IRMF is to be as comprehensive as possible. Even if these risks are not loaded into the factor analysis, they will still be retained in the IRMF.

Since the requirements for factor analysis have been met, a principal components factor analysis with varimax rotation was performed. The results are indicated in Table 20 below.

Table 20: Principle Component Factor Analysis with Varimax Rotation

#	Factors	Variables	Factor Loadings
F1	Product performance	Remedial actions were applied to underperforming P&Ss	0.813
		New P&S performance targets were adequately measured	0,751
	Cronbach's Alpha: 0.883	P&S performance in the market was adequately tracked	0.718
		The P&Ss are monitored and enhanced to ensure that it continues to function effectively	0.584
F2	Marketing & support	Advertising of P&Ss were effective	0.802
		P&Ss were communicated successfully to target customers	0.759
	Cronbach's Alpha: 0.844	Marketing communications clearly convey the benefits and advantages of P&Ss	0.663
		Customer support in the delivery channel were adequately tested and measured	0.562
		Customer support in the distribution channel were of high quality	0.506
		New P&Ss were effectively communicated to trade partners	0.435
F3	Customer	The P&S specifications met customer standards and demands	0.777
		Customers were convinced that they receive value for money	0.623
	Cronbach's Alpha: 0.802	P&Ss helped to achieve the organisations business strategies	0.595
		P&Ss provided clear competitive advantages	0.553
		The target market were clearly defined using convincing research data	0.372
F4	Financial	Estimated profit margins were based on convincing research data	0.712
		Only the most financially viable P&Ss were implemented	0.692
	Cronbach's Alpha: 0.778	Sales projections and uptake figures for the P&Ss were realistic	0.683
		The business model would succeed in generating profitable revenue	0.470
F5	Legal & regulatory	Legal and regulatory restrictions were adequately anticipated	0.758
		A good awareness exist of legislation and regulations that impact the P&S	0.685
	Cronbach's Alpha: 0.824	Appropriate contract arrangements with suppliers were settled	0.676
		Accountabilities for risks were clearly defined between different parties	0.550
F6	Customer Care	Customer Care have sufficient access to information to sufficiently serve customers	0.794
		Customer care requirements were sufficiently addressed	0.734
	Cronbach's Alpha: 0.846	Agents are well-trained to support P&Ss	0.691
F7	Processes	Existing business processes performed optimally	0.714
		Processes that did not function as intended were redesigned	0.702
	Cronbach's Alpha: 0.851	Processes were monitored to ensure that they work effectively	0.648
F8	Privacy	Confidential information was adequately secured	0.829
		Customer privacy issues were adequately anticipated	0.794
	Cronbach's Alpha: 0.849	P&Ss conform to industry best practices in terms of information security	0.742
F9	Product technology development	P&Ss met the functional requirements	0.721
		P&Ss intended functionality were well known and specified	0.717
	Cronbach's Alpha: 0.775	Interactions of P&Ss with other systems were well understood	0.676
F10	Reputational risk	Public relations for P&Ss were effective	0.710

#	Factors	Variables	Factor Loadings
	Cronbach's Alpha: 0.845	Possible negative external reactions were effectively anticipated	0.691
		P&Ss succeed in enhancing and supporting the organisations reputation	0.664
F11	Information integrity	Financial documentation provide clear pictures of the commercial viability of P&Ss	0.814
		Lodgements complied to regulatory requirements	0.599
	Cronbach's Alpha: 0.712	Volume estimates were based on clear and reliable data	0.500
F12	Technology performance	P&Ss were designed with sufficient capacity and scalability	0.752
		Disaster recovery and or BCM were adequately ensured	0.532
	Cronbach's Alpha: 0.757	Adverse performances consequences of technology script changes were adequately considered	0.508
		Reliable end-to-end testing were conducted before P&Ss launch	0.479
F13	Service levels quality	SLA's and OLA's relevant to the P&S were well documented	0.702
		Service levels were monitored for adherence to timelines, quality and xxx	0.686
	Cronbach's Alpha: 0.732	Past experiences with third party suppliers were positive	0.507
F14	Fraud, corruption and security	P&Ss were adequately assessed for fraud exposures	0.713
		P&Ss were adequately assessed to determines exposures for corruption	0.679
	Cronbach's Alpha: 0.732	P&Ss were adequately assessed to determine physical security requirements	0.498
F15	Project Management	Best practices were followed in terms of scope management delivering on time	0.696
		Delays in launching products impacted on commercial viability	0.637
	Cronbach's Alpha: 0.753	Plans for service recovery of P&Ss were documented, tested and available	0.472
		Project teams learns from past experiences	0.389
F16	Competitive actions	New P&Ss were launched before competitors could launch comparable P&Ss	0.681
		The organisation launched innovative P&Ss	0.554
	Cronbach's Alpha: 0.685	Competitor actions were adequately monitored and responded to	0.488
F17	Business rules and pricing	Knowledge of customer price sensitivity existed	0.707
		The overall impact of business rules were assessed	0.459
	Cronbach's Alpha: 0.756	Consumer appreciation of the P&S was adequately measured	0.416
		All business rules applicable to the P&S were known and easy to find	0.361
Cumulative percent of variance explained = 75.100, Kaiser-Meyer-Olkin measure of sampling adequacy = 0.787; Bartlett's test of sphericity = 6525.261; Significance: 0.000. The Cronbach Alpha score explains the internal validity score for each factor.			

Seventeen independent factors were identified explaining 75% of the variance. The objective of the quantitative analysis was not to provide a predictive model, considering that many risks can impact on NPSD. The findings of the factor analysis are presented in Table 21.

Table 21: Findings of Factor Analysis

#	Factors	Loadings compared to IRMF	Implications for Study
F1	Product performance risks	All the product management variables and the single-item second-level construct for ICT maintenance loaded together.	The objective is to ensure that product continues to perform, and it fits within the metrics and performance evaluation factors proposed by Kahn et al. (2006).
F2	Marketing & support risks	Marketing factors and value chain elements loaded together.	Provides support for service literature that marketing should consider aspects of tangibility when services are marketed. Risk researchers validated the presence of value chain elements.
F3	Customer risks	Customer, competition and single-item second-level construct strategy loaded together	In the innovation literature, strategy is a separate construct while customer and market competition aligns to the market dimension. The factor loadings do not conform to the findings of the literature review.
F4	Financial risks	Financial and business model loaded together	Innovation researchers did not refer to business model aspects, but financial analysis. As these are closely related, it makes sense it would load together.
F5	Legal & Regulatory risks	Legal, Regulatory & single-item risk construct loaded together	Legal ensures that clear risk accountabilities between different parties are contractually established in contract agreements and SLAs, which explains the inclusion of the question whether risk responsibilities are clearly defined. Innovation researchers did not consider legal and regulatory risks during NPSD.
F6	Customer Care risks	Customer Care elements loaded together	Supported by the innovation literature.
F7	Process risks	Process elements all loaded together	Most NPSD research only focuses on NPSD process risks, but neglect the general impact of other business processes that do not perform optimally. However NPSD process risk is validated by Innovation and risk research.
F8	Privacy risks	Technology security elements loaded together but was renamed to privacy	Privacy was not included as an innovation risk, nor did risk researchers raised concerns about privacy risks.

#	Factors	Loadings compared to IRMF	Implications for Study
F9	Technology development risks	Technology development components loaded together	Confirmed by Risk literature.
F10	Reputational risk	The PR & Communications factors loaded together and was renamed to reputational risk	Validated by Risk literature.
F11	Information integrity risks	Financial and regulatory compliance questions that focus on information integrity loaded together. The function was renamed to data integrity risk	The question is whether a separate risk factor regarding information integrity should be introduced. However risks relating to information integrity are included in many second-level constructs and the requirements are so diverse, that consolidating information integrity risks into a separate second-level construct would not be sensible.
F12	Technology availability risks	BCM and one end-to-end testing element loaded together which was renamed to technology availability	Risk literature validated some risks included in the second-level constructs.
F13	Quality of service levels risks	Service levels and third party risks loaded together which were renamed to quality of service levels	External providers are under the process function but closely correlate with ICT SLA's that raises the question whether it should not be rather included under the technology construct. However many external providers is also appointed by NPSD and marketing.
F14	Fraud, Corruption and security risks	The second-level construct of fraud, corruption and security loaded together.	Not addressed by Innovation researcher, or Risk researchers.
F15	Project management risks	Project management and a single BCM component loaded together	Project management risks were validated by the Innovation and risk literature.
F16	Competitor innovation risks	Competitive actions and a single item of innovation loaded together	Validated by innovation literature due to similarity to marketplace characteristics.
F17	Business rules and pricing	Business rules and pricing loaded together with one financial element	Business rules and pricing are closely related to Finance, so it is expected. While Finance has been validated by the Innovation literature as well as customer price sensitivity, the innovation researchers did not go to the detail of business rules and pricing.

Overall, the components of the framework loaded well into the different factors with a few items overlapping. Of interest is that marketing and value chain elements loaded together. The literature review indicated that market commercialisation of services requires the conveyance of physical elements. Tangibility is expressed by the presence of value chain elements, which supports the merging of the second-level constructs.

'P&S performance' was analysed to determine whether associations exist between P&S performance and the other second-level risk constructs. Weak to moderate positive correlations were shown, but significant relationships at p-value < 0.005. An increase of P&S performance requires efficient management of a broad range of risks and opportunities, which support the expectation that the quality of RM activities could positively or negatively influence product performance. Refer to Table 43 in Appendix 4 for the full list. The innovation literature has not validated many of these factors as significant associations to P&S performance. These include the entire high-level construct of GRC and the second-level construct of business rules and pricing.

Only the correlations where $r > 0.32$ and $p < 0.005$ are highlighted in this section. The correlation between P&S 'performance' and 'process' validates the notion that an effective or ineffective P&S process associates to successful or unsuccessful P&S, $r(130) = .41$, $p < 0.0001$. The literature review substantiated 'marketing' $r(130) = .37$, $p < 0.001$, 'customer' $r(130) = .32$, $p < 0.005$ and 'competitor' $r(130) = .32$, $p < 0.005$ as influenceing P&S 'performance'. The quality of 'project management' also correlated to P&S performance $r(130) = .35$, $p < 0.0001$, a factor that has not been studied in great detail in empirical innovations studies. ‘Reputational risk’ has not been studied as a predictor of P&S performance by innovation studies, however risk studies included reputational risk relating to the management of brand associated risks, $r(130) = .33$, $p < 0.001$.

A new potential second-level construct of ‘information integrity’ emerged, which refers to the accuracy and reliability of financial and regulatory information. Information integrity risk is logical as a risk construct since it reduces information ambiguity and uncertainty. Information integrity correlated to financial related second-level constructs at $P < 0.05$, but the most significant relationship was indicated with project management $r(130) = .35$, $p < 0.05$. Good project management could reduce ambiguity and uncertainty.

The quantitative analysis revealed that additional predictor variables are required which support the notion that current NPSD researchers fail to describe the real-world complexity of NPSD. However, strong evidence of relationships between IRMF high-level constructs of risk, technology, process and market were shown, revealing that changes in one influence the other. Information Integrity is a new factor discovered relating to the P&S performance.

5.4.3. Operational Risk Review

A survey aimed at operational risks was conducted during AR iteration one. Using a 5-point Likert scale, respondents were requested to indicate their perceptions regarding the application of operational controls ranging from poor (1), to less than average (2), average (3), good (4) and excellent (5). The operational risks in priority order indicating poor performance were: project management (mean = 1.97), external providers (mean 2.38), technology development (mean = 2.51), product performance (mean = 2.79), fraud/RA (mean = 3.25), business rules (mean = 3.27) and customer care (mean = 3.44). A key finding was that the operational area of project management received the lowest rating. Interviewees strongly felt that a more structured best practice project management approach was required. The full results of the operational risk assessment are presented. The full results of the operational risk assessment are presented in Appendix 3, Section 13.3. Table 22 provides project management results as an example. Table 22 further indicates that the operational risks were additionally analysed in terms of the key areas of risks, what went well, what could be improved and improvement recommendations that were used to update the risk framework.

Table 22: Operational Risk Assessment

Key areas of risk	What went well?	What could be improved?	Recommendations
Project Management			
NPSD processes are not adhered with or bypassed Project managers do not	There were several very good project managers that correlated directly to more successful products Several examples of good project	No structured formal project management approach is followed Insufficient scope management	Implementation of a formal project management framework

Key areas of risk	What went well?	What could be improved?	Recommendations
have required skills Lack of best practice project management methodology are being followed Project manager lacks authority to execute their roles	management activities were listed such as scope management New project management tools has been implemented that should result in improvements	Project performance indicators do not exist Quality assurance is not implemented Insufficient acceptance of accountability and responsibility for their projects by Project Managers	Risk management should be part of project Implementation and adherence to a best practice NPSD process

The researcher, in collaboration with the risk practitioners, identified overall practices, which improved during the start of AR iteration one as validated by the improvement of the NPSD CMM from Level 1 to 2. These advances could be identified as quick-wins to be repeated by other organisations to enhance their NPSD practices. First noticeable enhancements for AR iteration one related to improved adherence to NPSD processes, as well as technical business processes (such as change and release management). The key driver that ensured conformance to these processes was cited as the assignment of technical project managers and indicated that NPSD improvement would result if more of these technologically skilled resources were utilised.

Another advancement was that the call centre organisation improved training and support. Agents were better equipped to address customer queries. The third area of improvement was innovative P&S launched in new market areas, where traditional competitors were not present. Despite the initial adoption and revenue figures being regarded as disappointing, the interviewees perceived the advantages as the organisation’s willingness to take risks, being versatile and developing innovative P&S. An added advantage was that these innovations offered technology development platform capabilities from which subsequent P&S could be developed.

Improvements were also seen regarding team synergy and the ability of the various NPSD stakeholders to continue to pursue efforts aligned to a common goal. This was despite challenges related to processes, resources and technology – which may ultimately inhibit the delivery of on-time P&S. Despite time pressures on NPSD teams, the synergy between the NPSD functional units and the NPSD supporting units (including the technology development teams) was characterised as generally positive.

Despite advances made to improve adherence to NPSD processes and up-skilling of technology and customer-care resources, the operational risk review indicated that project management risk categories, external providers (vendors) and technology still required significant improvements. New market and technology innovations and a positive organisational culture reflected as team synergies were indicated as positively influencing NPSD.

5.4.4. Content Analysis for Risk Concerns

This section provides an overview of the content analysis conducted during AR iteration two. Responses were grouped into the applicable IRMF second-level constructs (as relevant for AR iteration two) and the number of replies per construct was counted. The respondents listed their top three concerns in priority order. These results are subsequently presented.

The top concerns (indicated by the number of concerns raised per risk category) for the B2C organisation are shown in Figure 42. The top concerns in order of priority were (1) NPSD process (15%); (2) culture and leadership (14%) and (3) project management (9%). The other most prevalently mentioned concerns related to strategy and portfolio management (4th), customer (5th), product management (6th) and competition (7th). Technology is only indicated in the 8th position for B2C. The content analysis reveals further concerns related to other IRMF risk second-level constructs (33%), which validates the notion that RM in NPSD is complex and cannot be compressed to a few predictor risk factors and categories.

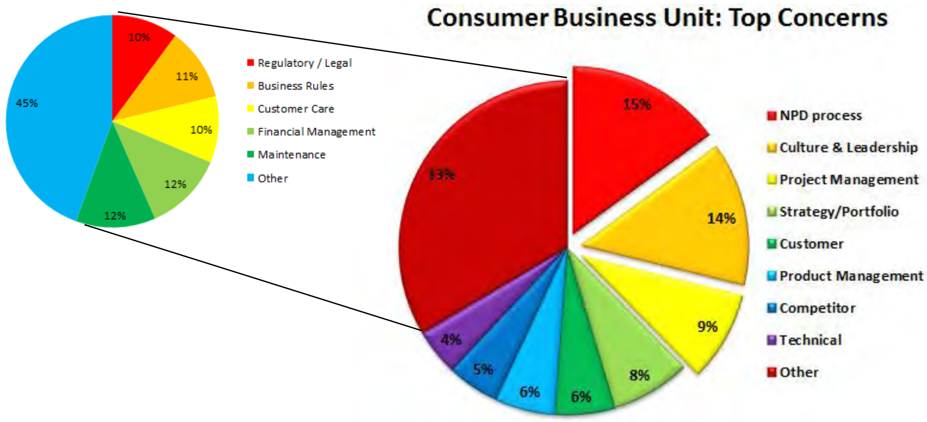


Figure 42: Content analysis B2C

The results for B2B are indicated in Figure 43. The highest number of concerns per risk category in order of priority were (1) NPSD process (29%); (2) culture and leadership (15%) and (3) marketing and sales (10%).

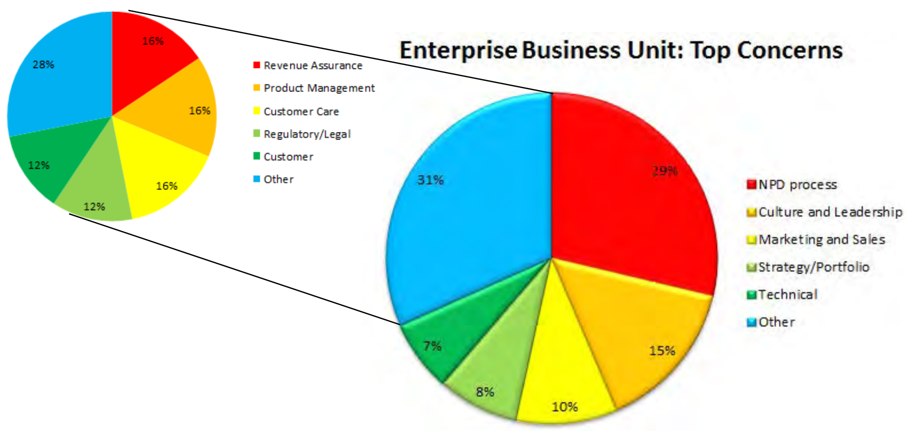


Figure 43: Content analysis B2B

Comparisons between the highest categories of the consumer business unit (CBU) and enterprise business unit (EBU) reveal that the first two concerns are similar and unexpectedly, marketing and sales feature as number three for B2B. Project management, the third highest concern of B2C, was not considered a top concern for B2B. Additional top concerns were strategy/portfolio management (8%) and technical concerns (7%).

The top concerns of NPSD practitioners validate innovation research. Process concerns, identified as the top concern (both B2B and B2C) related to a lack of robust NPSD processes to increase customer quality; reduce the cost of technology development; and lead to more innovative services. An efficient NPSD process delivers further non-direct benefits such as enhanced reputation, increased adoption of existing P&S, improved NPSD capability and enhanced customer loyalty.

The second-highest concern reflected the IRMF 'organisation culture' risk category, which included elements of senior management commitment and accountability, provision of adequate resources and an entrepreneurial climate, as well as high quality and cross-functional development teams (Cooper and Kleinschmidt, 1995). The content analysis reflected concerns regarding the creation of a favourable work environment, where conflicts between teams are minimised with effective communication and prioritisation.

The third concern (only applicable to B2C) considers the effectiveness of the PMO office in using best practice project management principles and ensuring that these are implemented and enforced. The third concern for B2B only focused on the extent to which the marketing and sales strategy succeeded in promoting the P&S. An effective sales strategy was regarded as a primary indicator of successful B2B P&S.

The fourth-highest concern for both B2B and B2C related to strategy and ineffective portfolio management processes, which are discussed under the respective risk categories in Section 5.4.5. The fifth-highest B2B concern related to technical issues, which reflected the lack of established systems and processes due to the relative newness of the B2B division.

5.4.5. Second-Level Construct Analysis and Validation

The second-level constructs of the IRMF are subsequently discussed to reflect the actual situation within the organisation. Each section starts with an explanation of the construct, followed by the expert questionnaire results, a quantitative analysis and descriptive statistics expanded with explanation comments from the content analysis. Each section concludes with an evaluation of where the organisation was placed at the end of AR iteration three regarding the IRMF maturity framework.

5.4.5.1. High-level Construct: Strategy

Strategy consists of organisation strategic alignment and portfolio management. The high-level construct of strategy relates to the selection of a portfolio of P&S that is prioritised for development based on how well these P&S would contribute to the achievement of long term business goals and strategic objectives of the organisation, with consideration of technology, market, financial, innovation and resources capabilities. The two second-level constructs of strategy: (1) organisational strategic alignment; and (2) portfolio management, are subsequently discussed.

Second-level Construct: Organisational Strategic Alignment

Strategic risks consider those risks that could impact on the potential of the organisation to deliver on its business strategy and could impair the achievement of these objectives and decrease shareholder value (Nordin et al. 2011).

The expert analysis perceived RM to be fully embedded and integrated within NPSD strategy at Level 5 (80% agreement).

Strategy as a single-item risk construct correlated ($p < 0.01$) with 56 variables. Expected correlations were: (1) Customer: meeting customer standards, $r(130) = .55$, $p < .001$ and customers being convinced that they receive value for money, $r(130) = .52$, $p < 0.01$; as well as (2) Business Model: succeeding in generating profitable revenue, $r(130) = .52$, $p < 0.01$. As can be expected from the definition of strategy (as articulated at the start of this section) a moderate association but significant relationship existed with reputation, $r(130) = .52$, $p < 0.01$. Managing risks in NPSD, especially those that could damage the reputation of the organisation, should be of strategic significance.

The actual situation in the organisation (refer to Figure 44) indicated that both B2B (Agree and fully agree = 70%) and B2C (67%) were convinced that P&S assisted in achieving the organisation's business strategies. Risk practitioners perceived B2B to be better at planning since alignment to organisational strategy was documented in a consistent and comprehensive manner while B2C followed a more ad-hoc approach. It was acknowledged that strategic alignment could be perceived as more formalised at B2B. The reason was that B2C was subject to higher pressure and volatility regarding price wars, market share and bigger subscriber numbers and mostly exposed to higher risks than the B2B division.

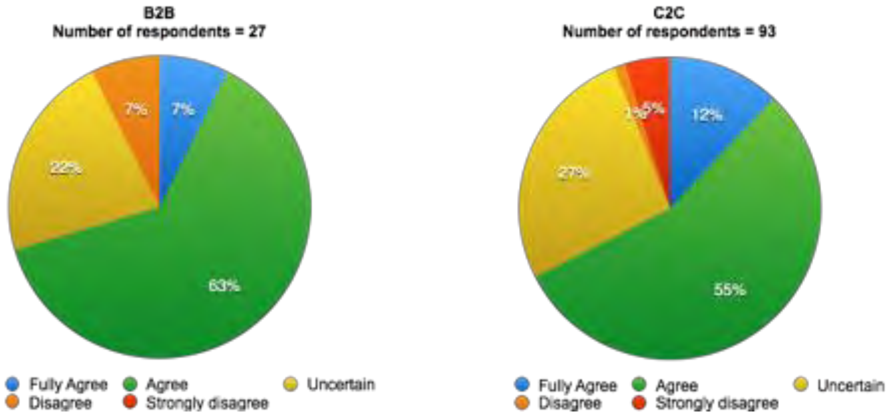


Figure 44: Alignment to Organisational Strategy: Comparison between B2B and B2C

At face value, a clear NPSD strategy existed. However, the content analysis revealed ‘strategy and portfolio management’ as the fourth-biggest concern for both B2C and B2B. NPSD respondents explained 'all towers of (a) service should be clearly aligned with the overall strategy of <the organisation>. This would eliminate any ambiguities and motivate us towards (achieving) common objectives'. When strategy does not ensure alignment between business units (even though it exists), it fails to accomplish its intentions.

NPSD practitioners did not perceive top management to be strategically oriented due to failure in providing a 'mutually supporting vision and strategy to support technology investment'. A definite plan existed, but when analysed concerning how it was operationalised, the organisation seemed to fall short. The organisation, however, launched many successful P&S and was considered the market leader in South Africa. It therefore seems that continuously introducing new P&S to the market is a strategy in itself. An NPSD respondent explained, 'we must be doing something right as we are still making a lot of money'.

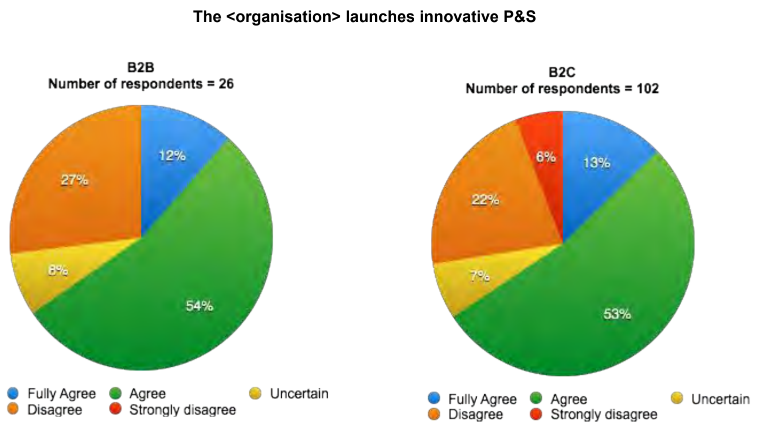


Figure 45: Innovativeness of Organisation: Comparison between B2B and B2C

Innovation is an integral part of the overall organisational strategy. B2B (66%) and B2C (66%) respondents agreed and strongly agreed that the organisation is launching innovative P&S (Figure 45). No differences between the responses of B2B and B2B could be detected despite the perception that B2B were better at strategic alignment.

The organisation was the first to market with some new technologies and P&S. However, concerns existed about the lack of technology innovation related to ‘converged billing of fixed/mobile products’, lack of customisation of systems and legacy systems described as ‘old technology’. It appears that the acquisition of new or improved technology was lacking. A respondent also perceived shareholder influence to impact on the innovativeness of the organisation:

> When we were totally in touch with local customers and context and were agile and not stifled by global best practice. They <shareholder> were too worried about standardising, that the very process of just getting these systems operational meant months of product inertia, often missing opportunities entirely.

Responsiveness to new technologies and market forces indicated a high level of maturity (Kahn et al. 2006). According to the IRMF maturity framework, organisational strategic alignment was on Level 3.

Second-level Construct: Portfolio Management

Organisation strategy focuses on organisation-wide selections to compete in a market while portfolio management has a narrower scope, restricted to the range of strategically aligned projects within the NPSD organisation (Meskendahl, 2010). The objective of portfolio management is to ensure that the best P&S were launched in alignment with the best opportunities.

The results of the expert questionnaire indicate the lack of consensus between risk practitioners regarding the extent to which RM was integrated within the portfolio management processes. The late introduction of portfolio management to the IRMF indicates insufficient time allowed for full integration. Since portfolio management was only introduced during AR iteration three, no quantitative analysis was carried out.

Content analysis revealed portfolio management as a high concern since NPSD practitioners considered it, together with roadmap planning, to be insufficient. Respondents complained about a lack of ‘product management strategy to be defined and communicated’ with targets ‘agreed annually or every two to six months’, which indicates a lack of formally documented roadmaps. The selection criteria to choose between P&S were not clear and definite evidence of best practices in NPSD research, such as applying consistent evaluation criteria and financial aspects, could not be verified. Furthermore, 'prioritisation of products is not based on market needs that are adequately documented', indicating that target markets are

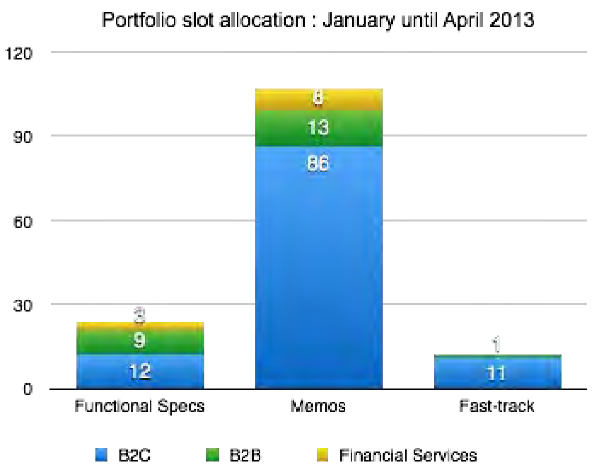


Figure 46: Portfolio Slot Allocation: Comparison between B2B and B2C

not clearly articulated. It seems that the roadmap was not based on validated research and understanding of market needs.

An NPSD respondent suggested that targets for P&S selection should be based on operating profit and not revenue since the organisation launched some 'loss-making' P&S. Additional criteria for portfolio goals were expressed as, 'include customer adoption and quality of products'. B2B practitioners thought roadmaps were too restrictive and complained about the small limits on the number of P&S that can be launched. The portfolio management process allowed the B2B division two slots compared to B2C's three slots. The B2C organisation, however, exercised a variety of ways to bypass these restricted allocations by using fast-track memos and other variations.

A snapshot view of the number of overall projects originated from B2C versus B2B over a two-month period revealed the scenario shown in Figure 46. The largest allocation of the portfolio timeslots was to B2C, where 50% of functional specifications, 80% of memos and 92% of fast-track projects originated. An attributing factor would be the larger customer base of B2C but also the focus of the executives in charge of the organisation. B2B was primarily still considered a start-up business during AR iteration two. Figure 46 also indicates that the balance of the P&S portfolio was skewed to short-term P&S derivatives (indicated by the memos) rather than large-scale, long-term projects (functional specs). Longer-term projects with platform capabilities were mostly restricted to the B2B division.

Respondents list too many P&S and promotions in the market as a risk. Promotions were predominantly launched by the B2C function and focused on the prepaid market. There were many complaints about promotions and it was suggested that the organisation, 'cut back on promotions. There are too many of them'. Risk practitioners also did not deem promotions as actually contributing to the long-term sustainability of the organisation. However some NPSD practitioners regarded promotions as 'resonating well with customers…giving the impressions that the <organisation> cares about customers and rewards them for their behaviour'.

Portfolio management also failed to 'evaluate human resource needs or impact of the new product to available resources', and ensure that 'adequate resources are available (personnel, money, time, equipment, etc.)'. The P&S strategy was judged as too reactive, which could explain the sheer number of 'fast-track' P&S allocated to B2C. A vast number of fast- track projects were reactions to competitor offerings.

The impact of multiple interrelated projects introduced resource utilisation risks and inhibited the ability to determine the overall value contribution. NPSD practitioners noted that short-term incentives P&S seemed to have a cannibalisation impact on other P&S that were not adequately assessed. In some cases, the impacted divisions were not aware of these, which indicated a lack of communication and executive oversight.

Further portfolio risks related to disagreements about priorities between business and technology divisions. The suggestion was to 'focus on fewer products that have bigger impacts. This way technology partners are focused, resources can be freed up and we can all work together to deliver quality products instead of always being pushed for a timeline on when we can deliver’. The technology teams were under constant pressure to design and implement P&S within 'unreasonable timeframes'. Portfolio management should aid in ensuring that sufficient resources exist to implement projects since resources are 'spread too thin – too much on the roadmap'.

The risk of obsolescence (Riek, 2001) could be articulated in the fact that that there was a lack of retiring older P&S that no longer met market needs. Retiring P&S form part of portfolio management, since obsolete P&S consume cost and resources. Only a few P&S were retired that prompted NPSD practitioners to recommend ‘complete analysis of existing products’, to ‘remove current services that do not add value to the business’.

Risk professionals viewed the lack of robust scoring models, tools, techniques and criteria to select a portfolio of balanced projects as a risk factor. The organisation did not employ basic portfolio management principles such as considering the cost versus profit or long term sustainability. Upon further investigation of why high-level executives did not apply formal techniques, a perspective was offered that there was a lack of respect for proper NPSD discipline, which was displayed by both B2B and B2C executive management. The process of portfolio management was described as 'by the seat of pants stuff'. Innovation researchers agreed that culture had an enormous influence on portfolio management. A reluctance to conform to portfolio management techniques introduced risks of insufficient allocation of resources indirectly leading to poor quality projects.

Effective portfolio management practices were lacking in almost 80% of NPD companies (Cooper and Kleinschmidt, 1995). It could be worse for NSD, despite effective portfolio management being even more of a requirement for NSD, due to the vast number of services being launched, which rapidly consume resources.

According to the IRMF maturity framework, portfolio management was considered at Level 2 due to lack of standardised criteria to select projects.

5.4.5.2. High-level Construct: Market

Market refers to competitor and target market opportunities (and risks) as well as key stakeholder and customer needs to enable effective design, communication, marketing, promotion and sales of the P&S. The various second-level constructs consisting of: competetitor and marketplace; customer; investors and stakeholders; marketing and sales; and public relations and communications are subsequently discussed.

Second-level Construct: Competitor and Marketplace

The second-level construct is defined as the anticipation and effective response to competitor activity by understanding market potential, market attractiveness and identification of the particular market segment that would be targeted by the P&S. The results of the expert questionnaire indicated 100% agreement at Level 5 – fully embedded that RM effectively considered the external context of competitors.

The sub-construct of 'competitor' were subsequently analysed to determine correlations. As expected, since a vast number of factors predict competitive action, weak positive correlations were found with significant relationships at p-value < 0.05. Significant associations with 10 of the other second-level constructs existed (refer to Table 43 in Appendix 4). As expected, correlations could not be established with technology and any of the technology related second-level constructs. Additionally, no relationships existed with any of the GRC elements. The results largely suggest conformance to the innovation literature since 'competitor' correlated to P&S performance, $r(130) = .32$, $p < 0.001$ and 'customer', $r(130) = .34$, $p < 0.001$. An understanding of the market should, therefore, include an understanding of customer needs, having a clear business model and rules supported by financial analysis that correlates with product performance.

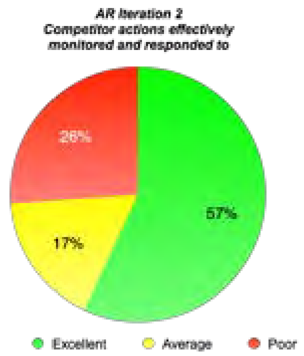


Figure 47: Competitor Monitoring

When analysing what the perception of the actual occurrences was in the organisation, NPSD practitioners validated the risk expert opinion that competitor actions were adequately monitored and responded to (refer to Figure 47). The content analysis raised concerns that the target market or market segmentation strategy was not clear and that a lack of resources and tools existed in the department that was responsible for market analysis. An NPSD respondent stated, 'products are launched that have to be pulled later due to lack of market understanding'.

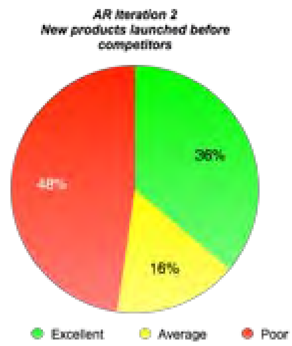


Figure 48: Competitive Innovativeness

Figure 48 implies that NPSD practitioners found the organisation tended to lag behind competitors, described, as 'all products seem to be responses to competitors'. A lack of innovation was indicated as:

> I feel <that> our product team has not delivered anything significant in the last two years … it is as if we try and churn out products just for the sake of launching something. (We) need to be more proactive - less reactive.

Content analysis revealed competitor and marketplace as the seventh-biggest concern for the B2C organisation. An improved market understanding was proposed as, 'avoid launching products just because they were successful in other markets', also indicating the need for additional market research.

Perceptions regarding whether P&S provided clear competitive advantages were subsequently tested. Statistically significant differences between the perceptions of B2B and B2C were detected: (H(2) + 6.351, with a mean rank of 50.22 for B2B and 69.50 for B2C. Figure 49 indicates that 78%

of B2B practitioners were convinced that P&S provided clear, competitive advantages, compared to 44% of B2C professionals. The B2C organisation (44%) was lagging behind B2B in terms of perceived competitiveness (refer to Figure 49). This could be attributed to B2C launching a number of promotions that were not considered competitive.

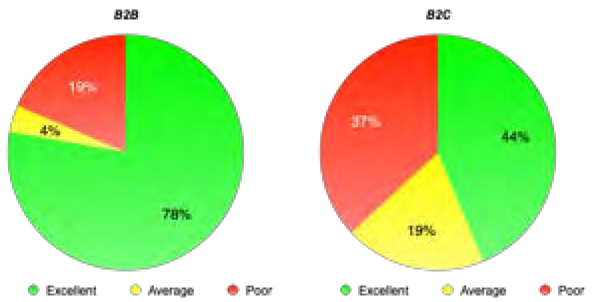


Figure 49: Competitive Service Advantage

While B2B practitioners considered P&S to be competitive, concerns were noted regarding execution and lack of data availability, such as 'systems were not in place to sufficiently support the products', and 'market impact is a thumb suck. We need real detail stats from a marketing department'. Another concern expressed by B2B practitioners was that 'ISPs typically do not publish pricing and monitoring the competition is often not easily achievable', which indicates a lack of access to formal research.

Testing of the market (as recommended by innovation researchers) was rarely conducted which prompted an NPSD practitioner to suggest that 'sampling gets done in certain market segments to test market uptake before a product gets launched nationwide'. The reason market testing was not performed could be attributed to ensuring confidentiality. A quote from an NPSD practitioner summarises this section well as:

> [rediscover] the passion for being the best and innovating. Work towards a long-term goal and do not be distracted from this path by competitor activity that ties up resources looking for a quick reaction.

At the end of AR iteration three, competitor and marketplace were considered to be Level 3 according to the IRMF maturity framework as secondary sources of market research were used for P&S prepared for new markets.

Second-level Construct: Customer

Customer risk analysis provides a good understanding of customer needs within the market segment and translates customer requirements into functionality that provides superior customer value while considering potential risks impacting the customer. The expert risk questionnaire indicated a 60% consensus at Level 5 – fully embedded, that RM in NPSD contributed towards an improved customer experience.

Customer was subsequently analysed to determine correlations with other factors. Weak positive correlations, but significant at p-value < 0.05 with 11 second-level constructs were detected (Refer to Table 45, Appendix 4). Significant correlations could not be identified with technology factors, but with the high-level construct of GRC, especially the second-level constructs of 'legal and regulatory', 'privacy' and 'fraud, corruption and security', which is not substantiated by innovation literature. An effective understanding of 'customer' increased 'product performance', $r(130) = .34$, $p < 0.005$

combined with a detailed understanding of ‘financial risks’, $r(130) = .33$, $p < 0.001$, as well as ‘business rules and pricing’, $r(130) = .33$, $p < 0.005$. Customer price sensitivity was indicated as a key concern by risk researchers (Berglund, 2007; Keizer et al. 2002) who explain the correlation between customer and business rules and pricing.

The actual situation reflected that less than half (45%) of NPSD practitioners were convinced that customer target markets were clearly defined (Figure 81 in Appendix 4). Concerns raised by NPSD practitioners referred to the fact that 'market segmentation can be improved'. Perceptions were, 'we still launch too many products because Exco thinks it might work – no focus on customer needs’, which indicates that P&S are initiated based on what executives think the market need is, without verifying their understanding of customer target market requirements.

Regarding whether the product specification meets customer needs, statistically significant differences between the perceptions of B2B and B2C were detected: (H(2) + 6.818, with a mean rank of 49.50 for B2B and 69.69 for B2C. Referring to Figure 51, 74% of B2B practitioners were convinced, as opposed to 30% of the B2C group being unsure or unconvinced (31%), which explains the different perceptions.

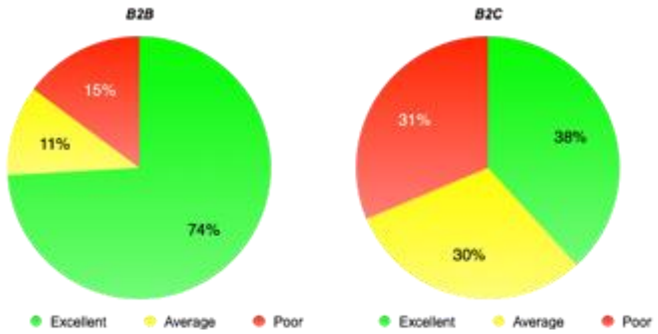


Figure 50: Product Functionality address Customer Needs: Comparison between B2B and B2C

When compared with AR iteration one, (refer to Figure 83 in Appendix 4) there seems to have been a reduction in the quality of P&S functional specifications between AR iterations. 47% of B2C practitioners during AR iteration one regarded the functionality specification (reflective of a detailed understanding of customer needs) to be adequate compared to only 38% of B2C professionals in AR iteration two. The introduction of shorter versions of the P&S specification listed as memos and fast-track projects could account for the decrease in comprehensiveness.

The content analysis was reviewed to determine further reasons for reduced satisfaction. Concerns were listed such as, ‘products are not specified to know full functionality/business rules’. Business rules, which formed an integral part of how the P&S would function, were perceived as ‘not always clear and specific’, or ‘business rules and Terms & Conditions (T&Cs) need

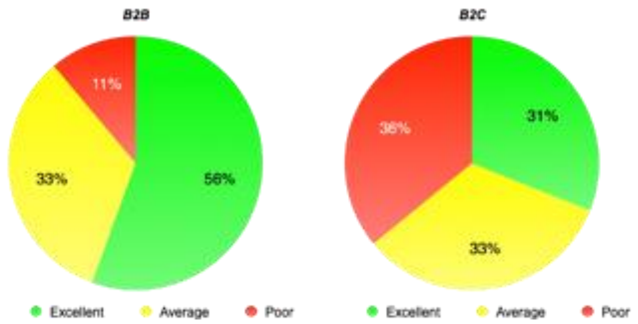


Figure 51: Customer Value Proposition: Comparison between B2B and B2C

fine tuning', and 'incomplete and incorrect'. Under these conditions, it would indeed be difficult to ensure that the product specification addressed the needs of the customers.

Regarding whether customers were convinced that they received value for money, statistically significant differences between B2B and B2C were indicated: (H(2) + 6.286, with a mean rank of 50.06 for B2B and 69.55 for B2C. Referring to Figure 50, 56% of B2B practitioners were convinced compared to only 31% of B2C professionals. Insufficient flexibility was indicated as a concern: 'The lack of ability for customers to select/customise any of the <organisation's> P&S according to their requirements'. Bundling of options was not considered to be ideal. Another point of concern was that clear competitive advantages and value to customers were not adequately communicated, which indicates marketing oversights.

Customer satisfaction was rated as 34% during AR iteration one (refer to Figure 82 in Appendix 4) compared to AR iteration two's 31%, suggesting its slight decline (as perceived by NPSD practitioners). Perceptions were that increased numbers of P&S were launched with lower quality. A respondent remarked: 'We are willing to sacrifice quality for quantity by rolling out half-baked P&S'. AR iteration one's interviewees equated customer dissatisfaction with P&S to inadequate P&S functionality and unrealistic performance targets, forcing the premature launch of P&S.

Content analysis revealed customers as the fifth-highest concern for B2C, including complex P&S causing poor customer experience. The practice of involving customers during the design of P&S was hardly ever implemented by the organisation (mostly due to stringent delivery target dates) that would have alleviated the risk of not meeting customer requirements. During the analysis of 'what went well', various NPSD respondents highlighted a P&S that extensively used customers during design, as an example of a 'great product' launched summarised as: 'Although it took long, the cautious approach, that included pilot customer testing, has increased the success'.

Despite technology not correlating with customer or market, structural and technology factors impacted on the gathering of customer target market information. NPSD respondents advised that duplication of activities takes place in profiling and marketing research and the 'lack of a central enterprise data warehouse – one stop customer information repository with adequate controls', existed. The value of delivering on customer needs was described as follows: 'At the end of the day, it is the customer who pays our salary'.

The IRMF maturity framework considered the organisation to be at a Level 3 at the conclusion of the AR iterations, mainly because customer participation was restricted to a limited number of projects.

Second-level Construct: Investors and Stakeholders

The second-level construct identifies key stakeholders exhibiting significant influences on the P&S to ensure that positive investor and stakeholder relationships result through proactive partnering and collaboration. If the P&S fail to contribute towards positive investor and stakeholder relationships, the risk is that they will be viewed as a liability that could decrease investment and shareholder value. The expert questionnaire indicated that RM contributed towards improved stakeholder performance by creating value for investors at Level 5 – Fully embedded.

The single-item construct of stakeholder (the support of key opinion formers were assured) correlates with reputation and brand, $r(130) = .34$, $p < .0001$. Correlations with risk dimensions (regulatory, legal, risk, fraud, anti-money laundering (AML) and privacy) were detected, averaged $r(130) = .33$, $p < .001$. No significant associations with technology dimensions could be established. Assuring positive stakeholder opinions related to risk factors, reducing reputational risk and validating research, indicating that inadequate stakeholder relationships could cause reputational damage.

The actual situation reflected that 59% of B2B and 49% of B2C practitioners perceive that the support of key opinion formers was assured (Refer to Figure 84 in Appendix 4). While stakeholder management process and engagement was considered satisfactory, shareholder concerns emerged during the content analysis.

NPSD practitioners mentioned that 'products seem to be forced by <shareholder> which doesn't address our needs (which entails that we) have to customise a lot of the functionality'. Of particular concern was shareholder P&S that failed to cater for local market requirements and 'lacked SA innovation and design'. It was advised, 'emphasis should be placed on drawing up a solid business case for <shareholder> products as opposed to cut and paste business cases'.

A factor that could impact on the perceptions of the NPSD practitioners during AR iteration two were that the strategy of the principal shareholder of the organisation was to be a 'fast follower' rather than a leader. The policy changed when a new CEO was appointed during AR iteration three. The strategy was however not widely communicated and the NPSD practitioners who were used to the organisation being a leading innovator remarked that 'we are too reactive – (we) lost the drive to be the first to market'.

A NPSD respondent explains the impact of the shareholder influence as slowing innovation and compromising market responsiveness and competitive threats since the expectations of the shareholder were that European products could be retrofitted to an African context. He explains:

> A lot of the systems they dictated were too expensive for us, or just really impractical from an integration point of view. So that slowed down time to market. The philosophy of the shareholder was to use 'economies of scale' for centres of excellence. Build once, deploy many. But the essence of innovation is built for purpose.

The risk practitioners perceived shareholder intervention to escalate during the AR iterations, aided by the employment of executive employees originating from the shareholder. A shareholder with a global presence can, however, deliver competitive advantages. Recommendations included, 'get the global shareholder teams to share best practices with bigger groups – not just at the executive level'. There was a perception that the shareholder could facilitate learning.

The organisation also rebranded to the principal shareholder colours but maintained its name. Many of the NPSD practitioners listed the rebranding exercise as an example of 'what went well' during interviews stating 'rebrand was a successful project that pulled everyone together with one strategy'.

The IRMF maturity framework considered investors and stakeholders to be at a level 3 – maturity level upon conclusion of the AR iterations.

Second-level Construct: Public Relations

The second-level construct ensures that PR is adequately prepared to publicise information about P&S effectively and build relationships with the wider public to establish stakeholder loyalty through effective communication to internal and external stakeholders and timeously respond to limit potential reputational risks. The expert RM questionnaire indicated that RM assisted in improving the performance of the PR & Communications functions at a Level 4 – where risk approaches are adopted and enhanced but not fully embedded.

The PR & Communications (reputational risk) factor correlated with second-level constructs of 'marketing', $r(130) = .43$, $p < .001$; (2) 'strategy', $r(130) = .39$, $p < .001$; (3) 'business model', $r(130) = .36$, $p < .001$ and (4) 'business rules, pricing and revenue assurance', $r(130) = .36$, $p < .001$. The significance of changes in predictor values impacting on reputational risk and business model, pricing, rules and revenue assurance are explained by using a practical example.

Executive decree amended the commercial rules for a popular service without following a formal NPSD or RM process. Subsequently, significant negative sentiment was expressed via social media, which resulted in the withdrawal of the amendments. The business rule change caused widespread dissatisfaction since the value proposition for customers was significantly reduced, which reflects customer price sensitivity. Senior executives were indicated as primary sources of reputational risk due to having 'no clear understanding of market and price sensitivity'.

Revenue assurance is closely related to an adequate understanding of business rules and pricing and ensuring that revenue is realised. The reality is that only a small percentage of P&S are potentially exposed to significant reputational risk but when the business model or pricing changes, potential reputational risk should be considered. The actual situation in the organisation reflects that PR was perceived to enhance the organisation's reputation and brand (B2B 67% and B2C 65%) and was considered useful (B2B 48% and B2C 56%). Most participants were, however, unsure (38% of B2C and 41% of B2B) whether possible adverse external reactions were effectively anticipated.

Concerns raised by PR resources were that P&S launches are not communicated in time and that PR is not involved during the NPSD process. It also seemed that NPSD was attempting to use PR as a marketing tool, since it was stated that NPSD 'need to be more understanding when we advise them to explore other forms of media to market a product, other than PR'. A lack of marketing budget contributed to the problem. NPSD practitioners were concerned about ineffective and premature press releases, ‘we need to stop sending out press releases before we are sure that the product actually works’.

Risk professionals suggested that stakeholder analysis and understanding of key stakeholder sentiment assisted with predictions of these risks. Analysis of potential stakeholder opinion allows for the implementation of appropriate controls. The IRMF best practice framework indicated the maturity level of the PR and Communications second-level construct as a Level 3 at the end of AR iteration three.

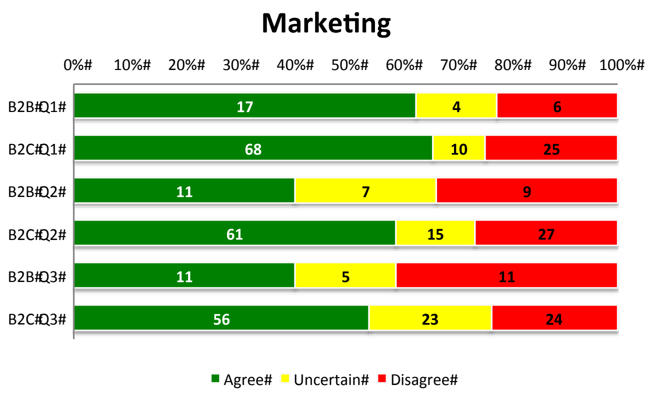
Second-level Construct: Marketing and Sales

Marketing and sales are defined as effective advertising, promotion and selling of a P&S to ensure that it meets its stated objectives, by active targeting of the intended market and utilising appropriate marketing and communication channels. The expert questionnaire confirmed that RM succeeded in improving the performance of the marketing function at a Level 5 – fully embedded. However, divergent opinion existed about the degree of embeddedness within the sales function that indicated that RM attention was required to improve RM within the sales divisions.

The significant factors of the marketing construct were PR & communications, $r(130) = .43$, $p < .001$); strategic alignment, (single-item construct), $r(130) = .67$, $p < .001$); value chain, $r(130) = .39$, $p < .001$); and product management, $r(130) = .33$, $p < .001$). The significance of PR and a trained sales force (value chain) were not considered to have a significant impact on marketing performance (Avlonitis and Papastathopoulou, 2000). However, the researcher qualifies the statement as ‘not yet!’

The marketing strategy often failed to include criteria that would alleviate risks for customers and provide tangible clues of reliability, which seems important considering that value chain elements and customer care indicated strong evidence, despite weak associations.

The actual situation reflected that both B2C (66%) and B2B (63%) are perceived that marketing communication succeeded in clearly conveying the benefits and advantages of P&S (Q1, Figure 52). It was however raised as a concern that following the rebranding exercise the advertising of B2C P&S were focused



Q1: Marketing communications clearly conveyed the benefits and advantages of the P&S
Q2: Advertising of P&S were effective
Q3: P&S were communicated successfully to target customers

Figure 52: Effectiveness of Marketing Activities: Comparison between B2B and B2C

on promoting the brand, rather than advertising the actual value of the P&S to the market.

The advertising of P&S was deemed to be less successful with 41% of B2B and 59% of B2C agreed (Q2, Figure 52). Communicating successfully to targeted customers was considered slightly less successful for B2C (55%). However, for B2B, an equal numbers of respondents (41%) agreed and disagreed with the question (Q3, Figure 52). During the content analysis, ‘sales’ were identified as the third-biggest concern for B2B. During the literature review, the effectiveness of the sales strategy was considered a primary indicator for B2B P&S. A B2B respondent commented that 'a successful launch depends heavily on research and marketing budgets which we do not have'.

Top concerns identified by B2B included insufficient budget and inadequate support of marketing and advertising departments. Marketing communication 'needs to be simple and clear'. It was additionally noted that sales processes were not clearly defined to ensure adequate support. It was suggested that a 'robust understanding of customers/consumer segments help drive innovation and campaigning'. The 'stronger segmentation' requirement could reflect the concern that insufficient information within the NPSD functional specification existed, which inhibits the ability of the sales department to design effective sales strategies. B2B listed further problems that inhibit P&S sales, such as insufficient sales resources, leading to a lack of prospects and low market penetration.

Sales teams were also criticised for being 'overly enthusiastic about products and selling products that are not completely developed or properly launched', or displaying selective enthusiasm for certain products that were perceived as being easier to sell. Perhaps incentive sales targets should consider the complexity of P&S to promote the sales of these P&S categories. The enthusiasm of the B2B sales force was also extended to premature selling, as one respondent described, 'sales run ahead of product and sell things that are not yet complete'. A B2B practitioner summarised the status of sales as:

> [with] regards to <B2B> products, relatively no information is available in the <P&S functional specification> with regards to customer updates. Product managers are not in touch with Sales with regards to customer requirements. The final user uptake and revenues are not contracted with sales to ensure forecasted profitability or revenue of products. Fast changes in technology put us at risk in that infrastructure may go out of life within three years and the cost of equipment may not be recovered due to the low uptake/sales.

The IRMF best practices framework considered marketing and sales to be at a Level 2 due to ineffective engagement of sales staff for B2B; and for B2C, ineffective advertising not conveying the value proposition, only the brand.

5.4.5.3. High-level Construct: NPSD Process Functions

The NPSD process dimension is defined as compliance with a robust NPSD process which allows efficient product, project, financial and other supporting activities to be performed to ensure a quality P&S. The second-level constructs: product management; project and KM; financial management;

business model and value chain; external providers; customer relationship management; business rules, pricing and revenue assurance; business processes; and commercialisation are subsequently discussed.

Second-level Construct: Product Management

The second-level construct is defined as the effective performance of the product manager to ensure that optimal and successful P&S are designed and maintained. Product performance correlations were addressed in Section 5.4.2. The second-level construct was earlier called ‘product management reporting’ and defined as the extent to which the product manager tracked the P&S performance and ensured that remedial actions were implemented. It was updated to reflect product management activities that facilitate the development of superior P&S performance.

The expert questionnaire participants could not reach an agreement with regards to the extent to which RM assisted in achieving the goals of P&S. However, the ratings indicated a Level 5 to 3 ranging from fully embedded to critical area implementation. A more structured RM approach is required to ensure alignment with the P&S objectives.

During AR iteration one, 50% of B2C practitioners regarded the P&S to have reached its stated objectives, compared to 38% that disagreed (refer to Figure 82 in Appendix). Concerns were expressed as a failure of product managers to define, articulate and specify P&S features and specifications that would meet the customers’ needs. It seemed that product specifications lacked customer focus since the value to the client was not clearly documented due to a lack of customer consultation processes. It was recommended that product managers should understand product deficiencies and identify improvement areas. It was proposed that product managers should have access to relevant information and reporting to monitor whether the objective of the P&S was reached. A lack of ownership, coupled with undefined responsibilities by product managers, was identified as contributing to poor performing P&S. Risk practitioners noted that product managers who assumed responsibility were perceived to have better-performing P&S as they were more likely to consider related risks.

During AR iteration two, 57% of NPSD practitioners perceived P&S performance to be adequately tracked in the market (refer to Figure 53). It was questioned 'whether the business case is revisited to check whether the initial projections were met'. It was advised that product manager targets should be updated to consider customer and quality requirements.

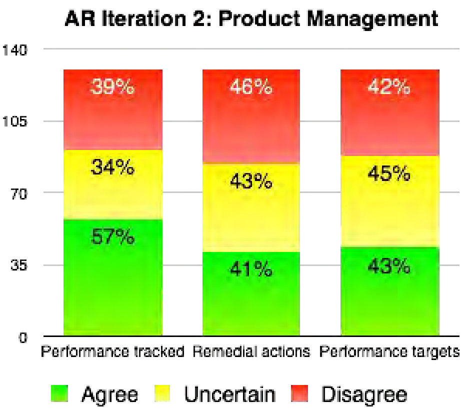


Figure 53: Product Manager Performance

Only 41% of NPSD practitioners perceived that remedial actions are applied to underperforming P&S (Figure 53). There was a lack of focus on the long-term support of P&S

and tracking performance during the lifecycle. It was suggested that product reporting should occur on a monthly basis to monitor performance. The analysis of reports should include an evaluation of P&S successes and considering the impact of 'fixing errors'.

The majority of B2B respondents (45%) were uncertain whether product performance targets were adequately measured while 42% outright disagreed, compared to 26% that were in agreement (Figure 53). NPSD practitioners described the risk as a 'lack of information on product performance'. A lack of accountability existed regarding assumptions provided and business cases supporting P&S were not 'thoroughly researched'.

The sixth-highest concern of B2C during content analysis related to product management. B2C was concerned that some product managers showed insufficient knowledge described as lacking 'insight and understanding of the product', and failed to understand the wider impact of the P&S on the organisation, described as 'product managers do not look at the product and what effect it has on <the organisation> as a whole'. Furthermore 'product managers are not always aware of other products that have been launched or are in the process of being launched, which can assist their product'.

Further concerns were that P&S functional specification was incomplete, lacked quality and changed during the P&S lifecycle. It was stated that 'some product documentation shows a complete lack of knowledge on <the organisation's> products and how they work'. Business requirements were not adequately documented and commercial and functional requirements were not elicited early enough during the NPSD lifecycle. In fact, 'last minute requests to make a change', were the order of the day. Product managers were also criticised for being out of touch with customer requirements or failing to understand the impact of regulations that could expose the organisation to risk. A lack of communication, reporting and access to information from product managers were noted.

Product management achieved a Level 2 rating according to the IRMF maturity framework due to inadequate monitoring of P&S performance compared to the stated objectives.

Second-level Construct: Project and Knowledge Management

The second-level construct is defined as the efficient management of the individual projects that result during the NPSD lifecycle while ensuring knowledge retention regarding practices that could improve future P&S.

The expert questionnaire revealed RM to be embedded within the NPSD project management function at a Level 5 – embedded. The project management second-level construct indicated weak positive correlations but a significant relationship at p-value <0.05 with all the other factors, excluding information integrity and fraud, corruption and security. (Refer to Table 46, in Appendix 4). In particular, project management correlated with 'product performance', $r(130) = .35, p < .005$; 'financial', $r(130) = .33, p < .001$; and 'competitor risks', $r(130) = .34, p < .001$.

Project management was identified as a significant operational risk concern during AR iteration one, scoring the lowest overall results of the survey. Referring to Figure 54, 59% of the participants rated project management as less than average, while only 26% rated project management as above average. Compared to AR iteration two, regarding whether best project management practices are followed, 44% agreed, which indicated an improvement between iterations.

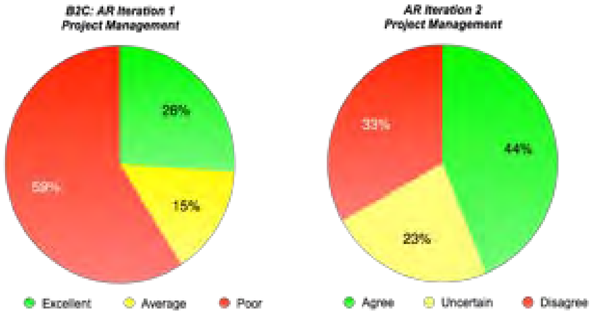


Figure 54: Project Management Performance: Comparison between AR Iteration one and two

During AR iteration two, project management was rated as the third-biggest concern for B2C, while the B2B organisation did not view project management as a primary concern. Concerns included scheduling (which related to an inability to meet the anticipated commercial launch date due to misaligned press releases), vast scope, poor scope creep management and changing requirements. Project managers additionally committed to unrealistic timeframes and launch dates. Improvements were required to update project management documentation with scope changes.

Ineffective prioritisation of projects was noted as a consequence of 'more projects are pushed from other areas'. The results were described as 'being unable to effectively manage the current project and drop the ball while juggling many other projects simultaneously'. Project management was defined as 'under-resourced and largely ineffective, particularly on the technical side. It lacks structure, documentation and planning'.

Project managers did not feel empowered or that they had ownership of the P&S, as they perceived that they had limited capacity to control delivery of a product on time. The impact was described as 'lack of morale and career fulfilment'. One project manager remarked: ‘The rest of business sees us as project management resources for hire', indicating that project managers were viewed as not having a vested interest in the outcomes of their projects, but merely as going through the motions. A similar concern about lacking authority was raised during AR iteration one. Project managers noted a lack of necessary power to execute their roles fully, and stated that they felt disempowered and having little control. Potential reasons can be attributed to the power of executive management exceeding those of project management.

The management area for project managers was defined as ‘too broad’ and it was suggested, 'project managers should be deployed into market segments permanently, to create product professionalism'. The last suggestion was implemented at the end of the AR lifecycle. Before this, project managers were randomly assigned to projects. Some product managers lacked skills, especially technical skills to manage complex P&S. Technical ability related to the understanding of complex technical solutions and, therefore, project managers were unable to manage deliverables efficiently.

Failure of project managers to clearly define roles and responsibilities for project team members contributed towards a 'lack of service from internal departments'. Ineffective communication caused 'late involvement with product launches'. Additional processes were required to govern relationships between functional areas, to ‘bridge the silo gap’ and formalise how teams interact. It was necessary to 'bring different departments and functions together'.

Delays to project timelines were introduced by late documentation approvals. The 'chains of approval are too long', resulting in excessive 'processes and paperwork slowing production'. Paperwork was regarded as 'too much red tape'. Some templates were also not aligned between departments. B2B noted a bias towards B2C projects and remarked that they were not getting proper attention.

KM was necessary to develop know-how and the ability to repeat the process for future P&S (Nada et al. 2010; Pitt and Clarke, 1999). KM was introduced during AR iteration two and placed under project management, since project managers were perceived to be best suited to perform KM due to involvement in all projects during the NPSD lifecycle.

Fifty-two percent of NPSD practitioners perceived that project teams learned from past experiences, compared to 32% that disagreed. However, during the content analysis, concerns were raised about what Pitt and Clarke (1999) refer to as a lack of knowledge repository and information flows. An 'unstructured approach to the dissemination of information to key people in the development lifecycle', existed. It was suggested that investment in a project management tool and an 'electronic portal for dissemination of documents', is required. Despite various practitioners suggesting that there should be a 'lessons learnt workshop after every launch', these were only periodically conducted.

Various incidences pointed to a lack of KM. For instance, similar P&S ideas were reintroduced into the NPSD process during successive AR iterations, without considering the reasons why these projects previously failed. Business rules were not documented in a central repository and were hard to find. In some cases, T&Cs of the P&S were used as business rules. The application of best practices KM techniques to transform information and intellectual assets into value was not implemented by the organisation. As a consequence, the organisation was consistently reinventing the wheel. However, the risk practitioners, by way of their risk assessments and incidence logging, greatly aided the process of KM.

At the end of AR iteration three, the maturity of project management and knowledge management (according to the IRMF best practices framework) were rated as a Level 3, mostly due to additional knowledge management activities and systems being employed.

Second-level Construct: Financial Management

The second-level construct is defined as the efficient management of the individual projects that result during the NPSD lifecycle while ensuring knowledge retention regarding practices that could improve future P&S. The expert assesment revealed divergence amongst the risk practitioners with regards to the extent to which RM improved the performance of the finance function within NPSD. Financial viability concerns and unrealistic sales projections were already pointed out as two of the mean values that indicated disagreement, which to some extent validate the expert questionnaire findings that more sound risk practices are required regarding finance.

The 'financial' second-level construct indicated weak positive correlations but significant at p-value <0.05 with all the other second-level constructs, excluding processes and privacy. The top correlations were customer, $r(130) = .32$, $p < .001$; technology development, $r(130) = .26$, $p < .005$; reputational risk, $r(130) = .31$, $p < .005$; and business rules & pricing, $r(130) = .32$, $p < .005$. From these, 'technology development' is potentially the most surprising. Finance resources remarked that ‘technical implementation is not always in line with the <P&S functional specification> and changes in technology impacted on the financial assessment’. This offers an explanation for the correlation between the second-level constructs of ‘technology’ and ‘finance’.

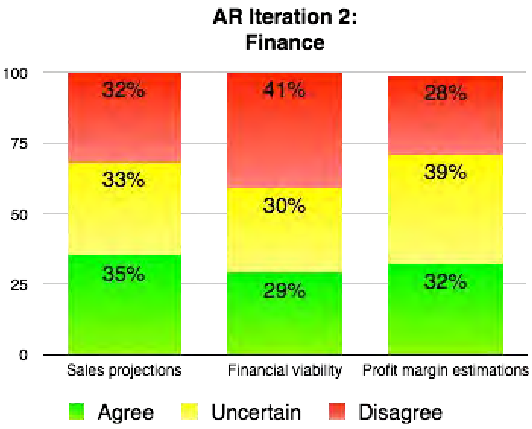


Figure 55: Financial Management Performance

Referring to Figure 55, 35% of NPSD practitioners regarded sales projections to be realistic. It was previously mentioned that product managers did not confirm sales projections with sales staff. The majority of NPSD practitioners (41%) disagreed that only the most financially viable P&S were implemented. The literature survey noted reasons for launching services, other than mere profitability. In particular, promotions were seen 'eroding <the organisation’s> profits and lowering the price points’. Also as shown in Figure 55, 32% of NPSD practitioners agreed that estimated profit margins are based on convincing research data, while 39% were uncertain and 28% disagreed. The integrity of information provided to the finance division was indicated as 'lack of accountability of product assumptions provided e.g. uptake, market sizing, usage information'. A lack of 'clear understanding of market and price sensitivity', were also mentioned.

Finance resources protested: 'Products are rushed through. Some products get approved by CEO and implementation dates committed before scoping'. This signified work pressures. Finance resources echoed complaints regarding the quality and completeness of P&S functional specifications and business rules that provided information to finalise commercials.

Difficulties in obtaining costing information were noted during the AR iterations. Costing requirements were removed from the CMM model as an organisational constraint during AR iteration two. Financial resources complained about ‘no formal costing process’, and advised that credible costing information will reduce time to deliver the financial documentation. The actual cost of providing services was unknown, and it was time-consuming to calculate cost that would defer P&S delivery dates.

NPSD practitioners perceived finance resources as being too risk averse, indicating the financial impact analysis and business case calculation considered the ‘worst case scenario’ instead of a ‘probable scenario’. Budget constraints were noted as impacting on the ability to market the P&S appropriately.

Financial management was rated at Level 2 per the IRMF maturity framework. The Level 2 rating was mostly due to a lack of cost estimates and the inability to base assumptions on reliable data sources.

Second-level Construct: Business Model and Value Chain

The business model should be holistically understood concerning the value chain competencies and elements to maximise support for the P&S and generate profitably and sustainable revenue streams. Business model and value chain elements were consolidated during AR iteration three. The consolidation was validated by the factor analysis. Business model elements were loaded with second-level constructs of ‘finance’, risk accountabilities in ‘legal and regulatory risk’. The actual situation in the organisation will be subsequently discussed.

Overall 59% of NPSD practitioners perceived the business models to be clearly defined compared to 16% that disagreed and 25% that were unaware (Figure 89 in Appendix 4). Statistically significant differences were reported between groups regarding whether the business model was clearly defined and able to generate profitable revenue (Refer to Table 9). The technology group displayed a markedly dissimilar mean ranking to the other groups, perhaps revealing a more detailed understanding of the complexity of business models.

When considering whether the business model will succeed in generating profitable revenue, statistically significant differences between B2B and B2C were detected: (H(2) + 5.409, with a mean rank of 51.50 for B2B and 69.17 for B2C. From Figure 56, it can be attested that the majority of B2B practitioners (48%) disagreed that the business model will be successful in generating profitable revenue, compared to 23% disagreement from B2C. B2B disagreement that

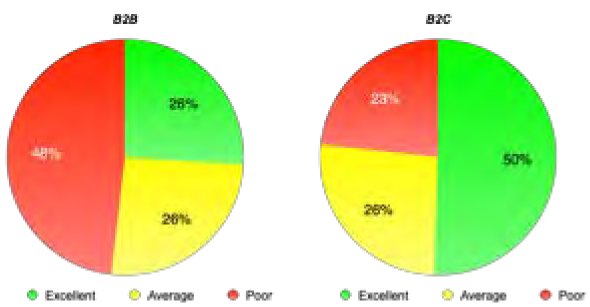


Figure 56: Profitability of Business model: Comparison between B2B and B2C

the business model will generate profitable revenue could be reflective of the fact that B2B was still a start-up company during AR iteration two and needed to grow through a period where pay-back periods on business models took a while, before a profitable result was generated.

Complex business models introduce risks due to multiple partners (Teece, 2010). A lack of understanding of party acceptance of risk accountability could present a major risk, especially if the legal contracts were insufficient to protect the organisation. Generally, 40% of NPSD risk practitioners considered risk accountabilities to be clearly defined compared to 36% that disagreed (refer to Figure 95 in Appendix 4).

Analysing risks in business models requires awareness of supply chain elements and sourcing risks (Keizer et al. 2002). When the value chain aspects were examined, statistically significant differences were detected between the perceptions of B2B and B2C: (H(2) + 4.018, with a mean rank of 77.56 for B2B and 62.34 for B2C. When comparing the B2B and B2C responses (refer to Figure 58) B2B was less confident, which could also indicate the relative newness of the organisation where the value chain elements were not considered to be sufficiently robust. Less than 46% of NPSD practitioners agreed that trade customer appreciation will be tested (refer to Figure 93 in Appendix 4). Regarding if customer support in the distribution channels was of sufficiently high quality, the majority (35%) was uncertain while 33% disagreed and 32% agreed (Figure 93 in Appendix 4).

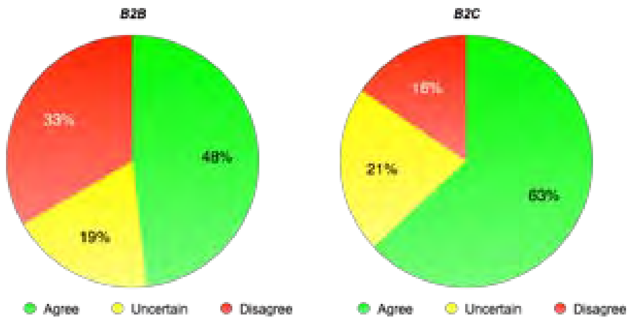


Figure 57: Value Chain Communication: Comparison between B2B and B2C

Statistically significant differences existed between the perceptions of B2B and B2C regarding the quality of support in distribution channels: (H(2) + 9,130, with a mean rank of 84.15 for B2B and 60.61 for B2C. When Figure 57 is analysed, 41% of B2B practitioners disagreed, compared to 31% of B2C practitioners. B2B's lower level of agreement indicates that the company could still be considered new and that the supply chain elements had not been well established. For B2C, the supply chain was relatively mature, but issues regarding the quality of customer support in distribution channels persisted.

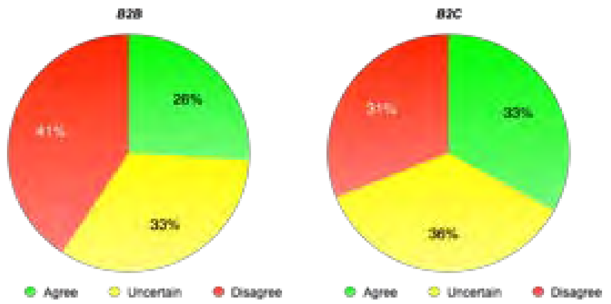


Figure 58: Quality Support in Distribution Channels: Comparison between B2B and B2C

South Africa telecommunication operators utilise a service provider model where customer support and face-to-face contact are outsourced to third parties. Poor customer experience in distribution channels was consistently rated as one of the top-ten highest queries from customers. Additional work was performed to ensure that quality could be monitored in the service channels, as well as employing strategies of buying back clients and integration within the organisation to provide more control over customer satisfaction.

It is clear that the higher the innovativeness of the P&S, the more it will be exposed to risks regarding business model and supply chain, and undue attention to these aspects by start-up organisations could introduce significant risks. It can take years to turn around unprofitable business agreements and in some cases, business contracts continued to be unprofitable. An example in the public domain is where the organisation entered into exclusive shareholder agreements with a provider to provide communication technology infrastructure. The arrangement proved to be severely limiting regarding pursuing further strategic P&S opportunities for the organisation. The organisation paid R18 million to the partner over five years without generating any net profits in return (NewsCentral Media, 2013 a and b). The communication technology provider sued the organisation for a breach of contract, where the matter was settled out of court, with the supplier being reaffirmed as the exclusive provider of this communication technology to the organisation. The example illustrates the importance of robust legal contracts and the necessity to have a strategic view regarding technology supporting the underlying business model.

It was the perception of risk practitioners that product managers paid insufficient attention to business model analysis. This is an area that offers great potential for radical innovation. The literature review was re-affirmed insofar as product teams often underestimated the importance of conducting business model analysis (Leithead, 2000; Riek, 2001).

Concerns were stated as follows: 'Although individual products are financially viable, solutions as a whole are not competitive'. This indicates a wider focus than the particular P&S. There was a lack of awareness or a lack of time to pay attention to these essential elements. Insufficient time was allowed to experiment with business models and as one practitioner stated generally, 'innovation is stifled'.

During closing of the AR iterations, the maturity level of business model and value chain was described as a Level 2 by the specifications of the IRMF best practice framework.

Second-level Construct: Business Rules, Pricing and Revenue Assurance

The second-level construct considered risks associated with application and selection of appropriate pricing strategies, with an adequate definition of the associated business rules to ensure accurate billing for transactions in agreement with contracts and tariff plans to prevent revenue leakages.

Business rules and pricing were analysed to determine correlations. The data indicated weak positive correlations but significant at p-value < 0.05 with all of the other factors. Significant correlations existed with product performance, $r(130) = .30$, $p < .005$; customer, $r(130) = .33$, $p < .005$ (F3); and technology development, ($r(130) = .32$, $p < .005$. Refer to Table 48 for the full list of correlations in Appendix 4.

The section is analysed in two parts: (1) business rules and pricing; and (2) revenue assurance. These areas were managed as separate areas during AR iteration two, but consolidated during AR iteration three.

Business Rules & Pricing

Forty-four percent of NPSD agreed that all applicable business rules for the P&S were available, however 42% disagreed that this was the case in (refer to Figure 86, Appendix 4). Statistically significant differences between groups were detected (refer to Table 9) with the technology group indicating a significantly different mean ranking compared to other groups. The technology group was most affected by insufficient business rules since they lacked information to design and develop P&S.

The content analysis revealed concerns related to incomplete, incorrect or impractical business rules. ‘Business rules dealing with tariff plans and service migrations are not always clear and specific.’ Speaking directly to the availability of business rules, a respondent advised, ‘no single aggregated point (exists) for all business rules’, which also serves to confirm the status of knowledge management within the organisation. It was also perceived that ‘product rules changed at last moment’, and that the business rules are not finalised before P&S testing commenced. The business rules of the P&S often end up as the T&Cs of the P&S. One respondent described that both ‘need fine tuning’.

During AR iteration one 62% of B2C interviewees felt that business rules were stable, but it was noted that too many business rules are amended during the NPSD lifecycle or even post launch (signified by 23% disagreement) (refer to Figure 85 in Appendix 4). The impact of changing business rules resulted in subscriber complaints, refunds and incomplete or incorrect functionality. Business rule changes impact resources, since financial and regulatory assessments need to be updated and technology needs to be redeveloped. A key reason for lack of business rules was that some product managers seemed reluctant to perform extra work to understand, develop and document business rules.

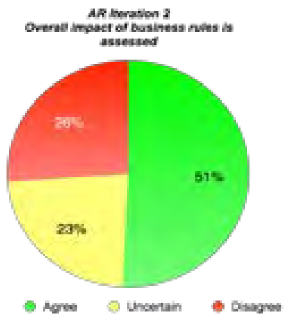


Figure 59: Business Rules Impact

Sometimes, the functional specification only stated, 'refer to existing business rules', yet the information was not available anywhere. The product manager sometimes referred risk practitioners to the organisation’s website, which was considered to be an unreliable source of business rules. In some cases, the business rules were so obscure that the T&Cs developed for the P&S conflicted with existing business rules. The second reason for non-conformity to specified business rules was out-dated systems that were unable to support business rules. A third reason was that senior executive management would change pricing aspects at the last moment without considering the impact on business rules.

Fifty-one percent of NPSD practitioners agreed that the overall impact of business rules was assessed (refer to Figure 59). However, statistically significant differences were detected between the groups (refer to Table 9) with the Technology group indicating a different mean rank when compared to the other groups. Again this is possibly explainable due to product management's lack of understanding of how business rule changes impact on technology developments. Furthermore, the impact of late analysis of risks relating to business rules is explained as:

> Risk, Regulatory and Legal teams are brought in very late during the SDLC resulting in inadequate business rule specifications that are open to security flaws and legal impacts after product launches.

Revenue Assurance

RA ensures the accurate billing of all transactions relevant to the P&S in agreement with the P&S specifications. RA relates to the controls implemented to ensure that revenue is collected and revenue leakages – which occur when transactions are not billed or incorrectly billed – are detected early. Revenue leakage is costly due to lost income and the fact that error corrections and incorrect billing often damage public confidence. The expert risk analysis revealed that the risk practitioners perceived that RM improved the performance of RA at a Level 4, in terms of which risk approaches are adopted and enhanced, but not fully embedded.

During AR iteration one, 17% of B2C respondents indicated that revenue leakage controls were inadequate compared to 66% that regarded controls as excellent (Refer to Figure 91 in Appendix 4). General causes of revenue leakage related to delays in activation or deactivation of services, inaccurate billing records and errors during configuration of discounts. Some of these mistakes could have been proactively prevented if the technology teams were not subjected to severe time pressures and the P&S functionality was adequately defined.

During AR iteration one, revenue leakage incidences were not the rule, but when they occurred there was a financial implication of between R100 000 and up to R3 000 000 per incident. It was estimated that 20% of telecoms operators could leak of up to 10% (KPMG, 2012) or 6% (Juniper Research, 2012) of their revenues. Significant revenue leakage resulted due to business rules that were not correctly implemented. A 2015 survey by the Telecommunications Management Forum (TMforum) estimated that between 52% and 82% of the respondents felt that most new services and technologies were covered by the RA function (TMforum, 2015). While 66% of B2C respondents in AR iteration one felt that RA was adequately addressed, the perceptions seem to have deteriorated in AR iteration two.

Referring to Figure 60, 48% of B2B and 41% of B2C agreed that the P&S was adequately assessed to determine exposures to revenue leakages. A statistically significant difference was detected between the responses of B2B and B2C: H(2) + 4.811, with a mean rank of 78.85 for B2B and 62.00 for B2C which could potentially relate to the large number of uncertain responses from B2C (46%). The extent to which NPSD practitioners were unfamiliar with ‘revenue assurance’ practices, was unusual in a telecoms environment (as evident from both Figure 60 and Figure 61).

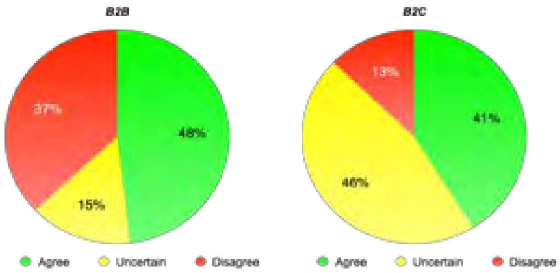


Figure 60: Revenue Leakages Assessment: Comparison between B2B and B2C

The content analysis revealed that concerns originated mainly from B2B practitioners in terms of their views that, ‘not all products are monitored to see if they are billed correctly’. One B2B respondent went further by stating, ‘big issues (exist) with regard to revenue leaking – some customers are not billed’.

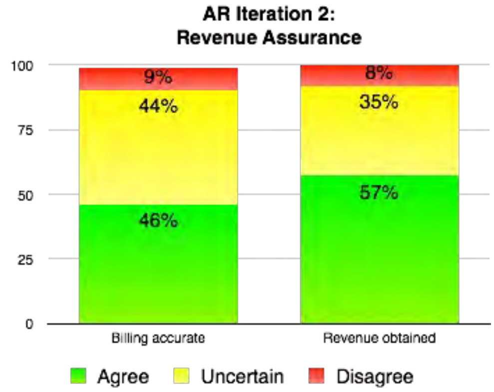


Figure 61: Revenue Assurance Performance

The TMforum (2015) considers the primary challenges to implementation of RA within NPSD as a lack of cross-functional mandate, the immaturity of change management processes and information about changes not being accessible. The risk practitioners experienced similar problems. A contributing factor as to why RA was considered as implemented at a Level 4 was the lack of participation by the RA specialists. Risk practitioners had to assume many of their responsibilities. However, the risk professionals could not go so far as to ensure that automated controls were implemented in the RA systems. These would allow the existence of independent revenue reconciliations so revenue leakages could be determined faster.

The lack of involvement of RA specialists during NPSD meant that they missed out on developing a new skills set. Since P&S are exposed to vast volumes of data transactions and myriads of systems, TMForum (2015) argues that RA specialists are progressing to lead the planning and design of data warehouses due to their experience in managing big data.

The maturity rating of business rules, pricing and RA were indicated as Level 2 at the end of AR iteration three. Some business rules were still regarded as ambiguous and RA controls were not adequately implemented.

External Providers

The second-level construct refers to the maintenance of relationships with external providers to safeguard adequate delivery and sustainable support and expertise of the P&S during their entire lifecycle. The expert analysis revealed that the risk practitioners considered RM to have improved the performance of external providers (vendors) within NPSD to a Level 5 – fully embedded. During the factor analysis, 'external providers' were loaded within 'SLA Quality' and will not be analysed quantitatively.

External provider risk was the third-most prevalent operational risk during AR iteration one. Sixty percent of B2C respondents rated it as an improvement area as indicated in Figure 87 in Appendix 4. The question related to third party delivery expectations, as per contract, as per management of time and resources and providing quality deliverables.

In worst-case scenarios, inadequate vendor management caused failed P&S. In other cases, P&S did not meet expectations, caused delays in delivery, demonstrated non-compliance to industry standards, lacked key business and support process controls, failed to provide sufficient information security controls and compliance management, and fell short of quality processes. In some cases contracts were not concluded, no formal Service Level Agreements (SLAs) were in place and no penalties for failing to deliver on agreements were specified. Contractual obligations were not clearly defined and limited due diligences were conducted. In addition, poor relationship management existed as vendor staff resigned and no continuity plans were in place. In some isolated cases, the work could be performed more efficiently internally within the organisation and the technology resources argued that contracting a vendor was superfluous. Root causes of negative experiences with vendors were that the NPSD group did not follow the formal procurement processes during AR iteration one.

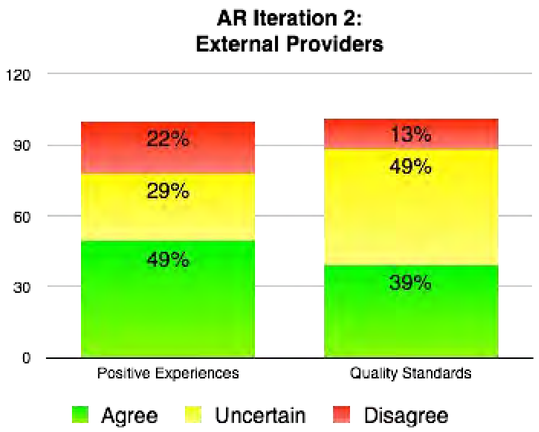


Figure 62: External Provider Performance

During AR iteration two (refer to Figure 62), 49% of NPSD practitioners found past experiences with third party suppliers to be positive. A predominant number of NPSD practitioners (49%) were uncertain whether external providers met the required quality standards, while 39% were certain. It seems that the third party issues from AR iteration one persisted during AR iteration two for B2C.

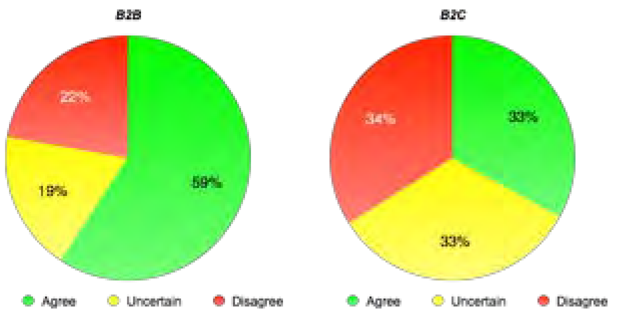


Figure 63: External Providers Reliability: Comparison between B2B and B2C

Regarding whether external providers were considered reliable in delivering requirements, a statistically significant difference existed between B2B and B2C: (H(2) + 4.873, with a mean rank of 51.89 for B2B and 69.07 for B2C. When referring to Figure 63, B2C indicates an almost equal split between 34% disagreeing and 33% uncertain and agreeing. B2B practitioners were more convinced (59%) compared to the B2C group, that external providers were reliable (which explains the differences).

The content analysis revealed concerns, such as scope creep and technical delays introduced by third parties due to miscommunications with technical partners. Some questioned the commitment of third parties on projects and others found that third parties would dictate how work should be performed. B2B indicated concerns about ‘procurement – always changing the goal post’, and the ‘time it takes to get supplier contracts signed’, which suggest that formal procurement processes were adhered to within the B2B organisation. This also supports the business case for following robust procurement and contractual procedures since B2B displayed a more positive outlook regarding external providers than the B2C organisation. It does, however, indicate that procurement and legal processes required improvement to ensure improved support of the NPSD organisation.

The maturity level of external providers according to the IRMF best practice framework was indicated as a Level 3, at the conclusion of the AR cycles.

Second-level Construct: Customer Relationship Management

CRM investigates risks inhibiting delivery of an improved and optimal customer experience during the entire lifecycle of the P&S including the application of effective CRM strategies. The expert risk survey indicated that RM succeeded in improving the performance of CRM (including customer care) at a Level 5 – fully embedded. The risk construct was previously referred to as Call Centre (to reflect the requirements of the outsourced Call Centre) but expanded to include customer lifecycle management aspects (CRM) during AR Iteration three.

Customer care was analysed for relationships with other factors. Weak positive associations were established but significant relationships with all of the second-level constructs (excluding fraud, corruption and security). Refer to Table 50 in Appendix 4. As expected, customer care correlated with reputational risk, $r(130) = .33$ at $p < 0.0005$; project management, $r(130) = .35$ at $p < 0.005$; processes, $r(130) = .33$ at $p < 0.005$; business rules and pricing, $r(130) = .32$ at $p < 0.005$; and service level quality (F13), $r(130) = .31$, $p < .001$. Intuitively these aspects indicate an association because insufficient RM in any of these factors could lead to decreased customer satisfaction and increased customer care calls. It is probable that fraud did not indicate an association with customer care, since fraud was typically not experienced by a wide number of customers and was addressed outside the call centre environment.

The majority of participants (55% good + excellent) during AR iteration one (refer to Figure 94 in Appendix 4) felt that customer-facing employees were sufficiently trained to address P&S queries while 18% perceived customer care to be performing poorly. Reported incidents related to inadequate and undefined escalation procedures; inability to access technology functionalities to assist with resolutions; and insufficient support of customer complaints. Instances also related to the failure of timeous escalations to product managers, which created a false sense of product success during the early stages of the P&S lifecycle. Incidences that could be resolved with easy fixes were not adequately managed in expected timeframes due to the P&S not having defined escalation paths.

The cause of customer complaints related to complex business rules, inoperable functionality, insufficient clarity of communication with regards to qualification criteria (T&Cs) and promotional dissatisfaction. When customer queries and complaints were not resolved promptly, some customers took to public platforms and the media to voice their disapproval.

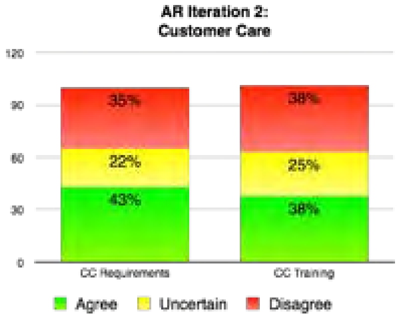


Figure 64: Customer Care Performance

When comparing customer care training between the two iterations, a reduction in satisfaction was noted. Fifty-five percent of AR iteration one (Figure 94 in Appendix 4) compared to 38% in AR Iteration two (Figure 64) perceived customer care agents to be adequately trained; a reduction in satisfaction was noted. While dissatisfaction with training was noted, customer care requirements were however observed to be properly addressed during NPSD according to 43% of NPSD practitioners (refer to Figure 64).

The content analysis revealed concerns, such as escalations that were not timeously addressed, a lack of input by customer care during the scoping and testing of a P&S and the complexity of P&S that made support difficult. The bulk of apprehensions related to unreasonable launch dates and too many P&S. Too short notice periods were provided, since 'products launch before all customer care requirements are met', referring to technical support systems not being ready. Changing launch dates caused logistical problems since the outsourced customer care agents needed to be retrained as the requirements changed. It was also suggested that proper customer assessment could address some of the challenges, including providing more self-service options, which should be considered a priority. Post launch technical problems contributed to an increase in customer complaints.

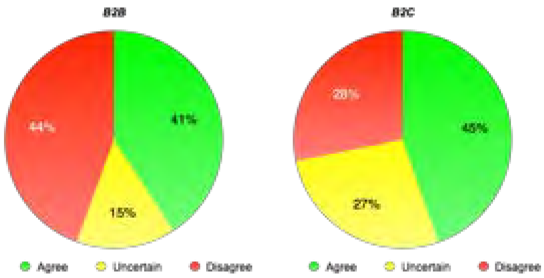


Figure 65: Customer Frontline Equipped to Service Customers: Comparison between B2B and B2C

Regarding whether customer care has sufficient access to information to enable it to provide an efficient service to customers, statistically significant differences between the perceptions of B2B and B2C were revealed: (H(2) + 9.717, with a mean rank of 76.52 for B2B and 62.61 for B2C. Figure 65 indicates that 44% of B2B practitioners disagreed that this was the case, compared to

28% of B2C professionals.

The content was analysed to explain the B2B disagreement. B2B practitioners referred to the insufficient availability of technical resources to service customers that ’can be detrimental to the product's perception in the market’. The B2B concerns can effectively be summarised by this statement of a practitioner who listed the three top concerns in priority order as:

> (1) Insufficiently structured involvement of call centre and technical support staff in the product development lifecycle; (2) no formal process for releasing new products into the support (customer care) and technical support areas; and (3) unstructured/insufficient training of technical support staff on new services.

Since B2B was still relatively new, it seemed that customer support was an area that required improvement. Since B2B was also more technical and complex (due to converged service offerings), the requirements of the support staff were more onerous. Few concerns about CRM were noted such as ‘(my) main concern is that the <CRM> programme is not seen as an important part of the organisation and will be cancelled’. Regarding CRM, a respondent remarked that ‘no single view of customer’ exists. Indications are, therefore, that while customer requirements were sufficiently addressed, combining CRM requirements over the life cycle of the P&S to increase customer satisfaction and loyalty was not entrenched (Khodakarami and Chan, 2014).

The maturity rating at the conclusion of the AR cycles reflected a Level 3 according to the IRMF maturity framework. While agents had been correctly trained and CRM requirements defined, these were not comprehensively automated.

Second-level Construct: Business Processes

The second-level construct refers to evaluation and re-engineering of the business (management and operational) processes that support the efficient and effective delivery and maintenance of the P&S to improve customer value and reduce cost. These business processes include the overall NPSD process. The expert analysis indicated that the risk practitioners perceived RM to have contributed towards more efficient processes at a Level 5 – fully embedded. RM was integrated within the NPSD process at a Level 5 – fully inserted.

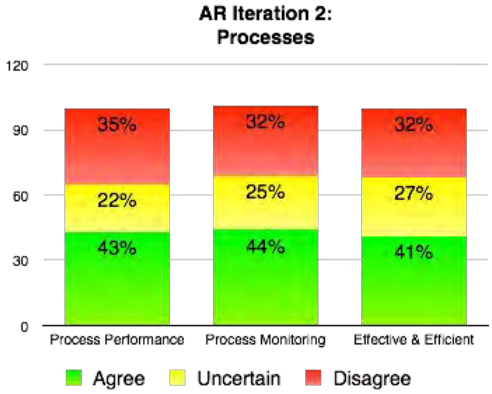


Figure 66: Process Performance

The second-level construct of ‘process’ was analysed to determined correlations with other constructs. Overall weak positive associations were established but significant relationships with 13 of the 16 factors were observed (excluding finance, legal & regulatory and information integrity). Refer to Table 49 in Appendix 4. As expected, processes (F7) correlated with product performance (F1), r(130) = .41 at 0.0005; project management (F15), r(130) = .35 at

0.0001; and reputational risk (F10), r(130) = .34 at 0.0005.

The actual situation in the organisation (refer to Figure 66) reflects that business process concerns existed even though the majority of NPSD practitioners agreed that business processes were adequate (43%); existing business process performed optimally (44%); and 41% agreed that processes were monitored to ensure that they worked efficiently. Dissatisfaction was indicated by high 'disagree' responses

The most prevalent concerns mentioned by both B2B and B2C were related to the NPSD process. The primary concern associated with the process was that the time to market was too slow. Rushing to market caused risks. As a respondent remarked, 'we need to strike a balance between quicker time to market while adhering to proper processes'. It was suggested, 'products are rushed to market, with negative consequences'. A focus on a simplified NPSD process was requested with 'a clear focus on engaging customers before developing services'.

While a formal, documented process existed; it was not considered to be adequate or mature and changed too often. The current process was deemed to be 'cumbersome', lacking 'speed and simplicity' and driving 'quantity, not quality'. 'Formal, mature product cycles are required with knowledge of <the organisation's> strategy based on roadmap planning.' Feedback cycles and finalisation of documentation took too long and the involvement of too many people introduced too much red tape and bureaucracy.

A lack of adherence to processes was perceived. The main culprits were identified as product management, project managers and NPSD executives, who were the primary parties responsible for driving adherence to the process. A shortage of resources in supporting the stage/gate processes exasperated process adherence. Too many P&S were in the pipeline and it was stated that 'priorities cannot be bedded down', which referred to poor portfolio management practices. It was acknowledged, 'development of products is not designed to be generic', which means that a customised process was required for certain P&S categories.

Process maturity rating was at a low level during AR iteration one. Examples were noted of the NPSD process not being adhered with to, causing lack of technical readiness, vendor due diligences not being performed, poorly-designed websites, low levels of active users, low customer awareness and failed, unprofitable P&S and promotions.

B2B was particularly concerned about the NPSD process. During the content analysis, 29% of the top B2B concerns related to the process second-level construct, compared to 15% of B2C. A practitioner advised that 'only one product was launched out of a possible 74'. B2B expressed frustrations such as, 'a standard commercial development process across <B2B>, tracking and escalation processes for product management, financial management and project management cycle timelines' being lacking. One B2B respondent stated that 'lack of documented business process (is) standard for entire <B2B>'. The technical development process, in particular, was noted as a concern. A B2B respondent summarised this section as:

> I just hope that these gaps in business processes can be plugged and good structures and processes that are in place can be strengthened and improved instead of fundamentally changed.

The maturity rating according to the IRMF maturity framework was indicated as a Level 2. Despite the NPSD process being well entrenched at a CMM Level 3, other business processes supporting the P&S were not adequately addressed and introduced bottlenecks.

Second-level Construct: Commercialisation

The second-level construct of commercialisation focused on the complete end-to-end testing of the final P&S, as well as finalisation of the commercial plans, including marketing and sales and communications to the target markets via the supply chain. The objective of commercialisation is to turn the P&S into a commercial success (Crossan and Apaydin, 2010), starting with the final end-to-end testing of the P&S. Testing is the verification that the individual and interrelated components of the P&S (including functional, technical, system and customer testing), will function as operationally intended.

Innovation research focuses on commercialisation activities of sales and promotions but insufficiently on the testing cycle. During AR iteration one, several concerns were raised regarding inadequate end-to-end testing. Improper execution of the testing phase was blamed on: (1) failures to provide test cases; (2) lack of technical solution documentation; (3) a lack of external provider technical documentation; and (4) a lack of customer acceptance testing.

The following scenario explains the snowballing nature of time-pressure risks. When test dates are moved forward due to executive pressures, resources are required to work overtime to meet the obligations. Insufficient adherence to change management (CM) processes can result, coupled with an inadequately configured testing environment, leading to revenue leakages. Management is often not supportive of the commercialisation phase and allowing sufficient time for testing (Maidique and Zirger, 1990). NPSD practitioners were of the opinion that it was the one area where timelines should not be reduced, and stated that, ‘testing schedules can never be cut down’. Inadequate testing resulted in 'increases (in) customer complaints to both online and to customer care'.

During AR iteration one, the proficiency of commercialisation activities were regarded as poor, but improved during subsequent iterations. Some P&S were launched with known operational and technical deficiencies due to executive pressures. The bypass of technical control processes to ensure that P&S launch on specific dates has been known to impact the affected P&S so severely that technical stability is never achieved. In cases where the full technical solutions were unable to meet the prematurely communicated launch dates, the NPSD organisation experimented with interim solutions (such as limited functionality for the first two weeks of launch) that proved to be a failed experiment due to impacting a high number of subscribers.

Concerns raised during AR iteration two included insufficient access to testing equipment, 'to replicate problems that customers get'. Inadequate technology testing platforms introduced additional resource requirements:

> The test/development instance of the portal should be an exact copy of the live environment. We can then complete one test cycle before it is switched to live. Currently, we need to check before and after each deployment increasing cost.

Incomplete P&S functional specification impacted on testers who did not know the full functionality or business rules that needed to be tested. It was noted that ‘technical solution discussions do not always update business requirements through the product life cycle’.

Product managers expressed frustration with consumer test teams who were requested ‘to adopt an attitude that will help in diagnosing technical problems’, and increase the ‘go-to-market’ speed. Product management was also frustrated with marketing resource constraints, noting a need for a ‘bigger commercialisation team to support our marketing initiatives. This impacts on our product management activities’. Inadequate sales force and marketing efforts were recognised as commercialisation risks by innovation researchers (Rothwell, 1972).

The reality was that commercialisation was subjected to time pressures where testing was often condensed. Best practices in NPSD indicate that successful P&S spend up to 67% of their budget on commercialisation activities and significantly more time on commercialisation activities compared to unsuccessful ones. (Booz, Allen and Hamilton, 1982; Cooper, 1988). Despite the improvement of commercialisation activities during the AR iterations, the organisation did not meet best practice in commercialisation. The IRMF maturity framework rating of commercialisation was regarded as a Level 2.

5.4.5.4. Information and Communications Technology (ICT)

ICT risk is defined as the business risk associated with the use, ownership, operation, involvement, influence and adoption of ICT during the NPSD process. The name of the risk was changed from technology to ICT to ensure that it covered not only traditional IT and IS components but also communication elements. The second-level constructs of technology risk consist of the second-level constructs of: ICT Solutions planning, analysis, development and maintenance, ICT Security and ISO ICT Capacity & BCM, Service Level Management, Control and Release processes and Standards conformance.

A difference was detected between how IS studies and RM studies address technology risks. IS studies focus on IS investments, projects, outsourcing and security, while RM studies recognise that technology might fail but the detail of failures are not extensively discussed (Järveläinen, 2013). The role of technology is limited to technological proficiency in NPSD studies (such as that of Evanschitzky et al. (2012), while technology plays a central role in IS research (Maklan, Peppard and Klaus, 2013). The best practices framework for NPD (Kahn et al. 2006) does not reference technology as one of its best practices. It is known from the risk literature review that technology can contribute to the success or failure of a P&S. The next section will hopefully bridge the gap between IS and RM studies.

Second-level Construct: P&S Solution Implementation

The second-level construct is defined as design and development of the total technical solution (including the customisation of systems, databases, communication technology and integration with external providers) that establishes the P&S in agreement with the documented business requirements to ensure the P&S performs as intended. The section is described regarding the following three areas: (1) quantitative analysis; followed by the (2) qualitative analysis; and (3) ICT maintenance.

Quantitative Analysis

The risk practitioners considered RM in NPSD technical development to be fully embedded at a Level 5, except for technical maintenance. Since a vast number of technology factors could impact on P&S development, strong associations were not expected. The researcher investigated the second-level constructs that influenced technology development. As expected, the factor indicated weak positive, but significant correlations with 14 of the factors as shown in Table 51, Appendix 4. No correlations could be found with constructs of information integrity and fraud, corruption and security.

The correlation of technology development with reputational risk (F10), $r(130) = .33$ at $p < 0.005$ was not compatible with success factors in NPSD but matched the risk literature where poor performing P&S (attributed to technology malfunctions) might lead to reputational risk. Technology correlated with the other technology second-level constructs such as technology availability (F12), $r(130) = .33$ at $p < 0.05$ and quality of service levels (F13), $r(130) = .30$ at $p < 0.005$. Significant relationships existed with process (F7), $r(130) = .34$ at $p < 0.001$ and project management (F13), $r(130) = .35$ at $p < 0.005$. Expectations are that the construct of 'technology development' should correlate with almost all of the factors, including financial and customer aspects. The objective of the complex technology process is to deliver value in the form of technological solutions to customers (Grönroos, 2007). Despite technology features that might change according to the different ways in which organisations conduct business, the types of factors that signify quality will remain similar (Bitner, 2001).

Qualitative Analysis

During AR iteration one, technology development was regarded as the third-most prevalent operational risk behind project management and external provider risks. Figure 88, in Appendix 4 indicates that 48% perceived technology development to be poor, compared to 40% that regarded it as above average.

Inadequate specification of the business requirements leads to time that should be spent on development being consumed by refining business requirements. Unclear functionality often related to business rules that were not distinctly defined upfront, nor formally documented. Poorly defined business requirements close to implementation caused some post-launch technical issues, such as mandatory customer-facing functionality not being available at the time of launch.

Unrealistic timelines were another primary concern. The impact was that technology teams did not follow prescribed processes that caused critical requirements not to be implemented. In some cases, the technology department underestimated the work effort required, bypassed formal processes and incorrectly interpreted the functional specification leading to limited functionality being available post launch. In some cases, these features were regarded as critical, resulting in P&S that failed to appeal to the intended customers.

It was proposed that technical feasibility checkpoints could aid in establishing probable delivery dates. The risk practitioners advised that the technical teams at the coalface would often push back regarding unrealistic timelines. However once escalated to executives, adherence to unrealistic deadlines was agreed, in effect overriding the concerns of technical teams.

Figure 67 indicates that 33% of AR iteration one respondents perceived the functionality of the P&S to be inadequately implemented. Respondents suggested that technical delivery could be significantly improved if product managers provided precise, stable, functional requirements before development commenced, placing the blame at the feet of the product managers.

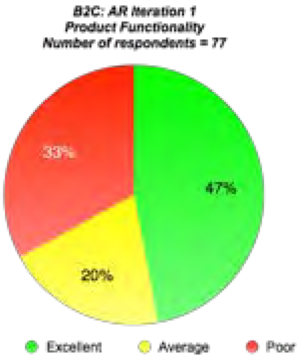


Figure 67: Technology Delivery: Functionality

During AR iteration two, the specification of functional requirements improved. The technology teams delivered functional specifications adequately (73%) and met the functional specification requirements (63% of respondents) (refer to Figure 68). This was an improvement since AR iteration one, where only 47% perceived delivery to be above average. Systems integration during AR iteration two was observed by 48% to be adequate, which indicates even though the P&S intended functionality was working, challenges existed with broader systems integration.

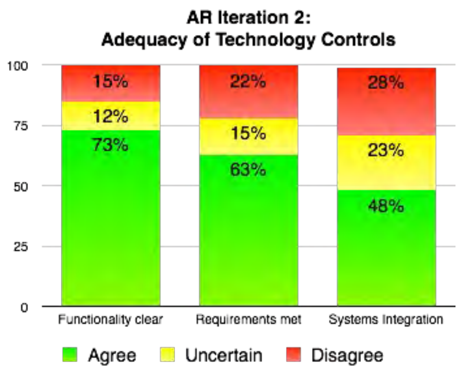


Figure 68: Technology Development Performance

B2C rated technology concerns as the eighth-highest concern (during content analysis) while it featured as the fifth-highest concern for B2B. B2B noted the following difficulties: 'manual integration introduces risk since not all products are integrated into billing systems'; 'converged billing'; 'lack of customisation capabilities'; and 'billing systems not working for the P&S', indicating billing system integration risks. A respondent from the B2B technology support division stated that ‘I’ve been here four years and it is still not working well’.

Product managers blamed technical departments for P&S delays. A product manager remarked that 'technical always experience delays but happily finds ways to hold business accountable'. Technology resources accused product managers of insufficient functional specifications, causing the technical implementation not to adhere to the intention of the functional specification. Resource capacity issues prevented P&S being released. It was suggested that what is required is:

> Better visibility of technical resources that are available. If technology development knew the demand of products and their resources, they could better plan the use of time. This would possibly allow more products to be developed concurrently.

Respondents also suggested that the quality of technical delivery could be enhanced by improved engagement. The technical delivery team ‘needs to be more involved in product functionality to understand how to integrate into our systems’. Others stated that despite improved engagement, the technology delivery team still failed to deliver. The technical solution development team ‘engages with us on support guidelines, but sometimes serious product design issues are highlighted at this late stage’.

B2C concerns related to technical delivery quality and delivery delays. The reason for the ‘significant’ technical delays was described as a lack of ‘overall view of the lower technical deliverables and system interactions’. Respondents suggested that more effective architecture and platform design are required to support future P&S. Due to tight timeframes, manual tasks were performed instead of automating functionality. Respondents additionally referred to platform constraints, which meant that they were unable to deliver certain functionality and advised that, ‘programme optimisation changes needed to cater for the current demand and all components in the system environment must work adequately together between systems’.

One respondent described the pressure of unrealistic target dates as 'products are rushed through. Some products get approved by CEO and implementation dates committed before scoping by technical'. It was also noted that ‘a lack of common priorities’ exist which leads to ‘misaligned releases’, pointing to the lack of portfolio planning. Technology division business analysts were perceived to lack skills. Delays were introduced due to insufficient upfront available information to support technical deliverables and lack of systems integration knowledge.

Technical resources mainly listed concerns about lacking resources, tools and technology practices such as ‘doing standby for systems that you don’t specialise in’, and ‘job order window is too small’. Technology practitioners also referred to the inability of technical partners to deliver, and P&S improvements requiring architecture changes. The NPSD practitioners complained about product managers ignoring the recommendations from risk practitioners concerning technology controls that needed to be implemented.

Maintenance

Maintenance was regarded as a separate construct during the AR iterations, integrated within solution development, during AR iteration three. Maintenance refers to the activities undertaken to maintain the interrelated components of the P&S after implementation. The purpose is to extend the useful lifecycle of the P&S and to maximise investment.

The expert questionnaire did not indicate agreement amongst the risk practitioners with regards to the extent to which risk practices were integrated within the technology maintenance function in NPSD. RM within maintenance was therefore not considered as successfully implemented. Four risk practitioners suggested that risk practices in technology management ranged from adopted (Level 4) to fully embedded (Level 5), while one respondent felt that risk approaches were planned, but not delivered (Level 2).

Forty-eight percent of AR iteration two respondents regarded post-implementation monitoring of P&S to be effective (refer to Figure 69) while 23% were uncertain or unaware of post-implementation monitoring activities. During the content analysis, various examples were listed of technical problems that occured post-launch. It was suggested by respondents that not only technical issues needed to be addressed 'post-commercial launch', but also P&S maintenance 'support processes' required attention.

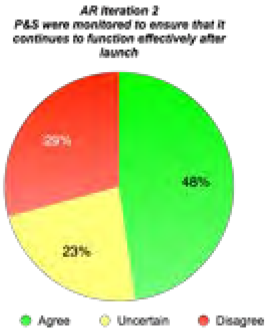


Figure 69: Post-launch Monitoring

A lack of adequate back-end support for P&S was perceived, without clear identification of responsibilities. The problem was further exasperated by a lack of 'proper alarming and support teams'. It was also noted, 'escalation procedures should be clear and outlined in the product specification'. In general, there seemed to be 'not enough emphasis on retention and on-going performance'.

While technology development appears to be adequately addressed concerning RM practices, it appears that maintenance could receive more attention regarding risk interventions. At the end of cycle three, the maturity rating of ICT planning, development and maintenance, in accordance with the IRMF maturity framework was at a Level 3. Maintenance was identified as an area that required improvement.

Second-level Construct: Technology Security

Technology security refers to the protection of the P&S data, information and underlying IS against threats by ensuring that vulnerabilities are identified (originating from authorised and unauthorised sources) and measures are implemented to counter the threats.

Technology security strongly relates to the privacy domain. It is, however retained as a separate construct under technology because of the extensive domain knowledge that is required by ICT security experts. This is in keeping with the IRMF operating as a functional framework that can be used to clarify responsibilities for functions within NPSD. The expert questionnaire indicated technology security as being embedded within NPSD at a Level 5 – fully integrated.

In AR iteration one, information security vulnerabilities were a result of potential systems exposure, leakage of confidential information and vendors or external providers that are not secure. The organisation had a small technology security team indicating high technology security capabilities and by AR iteration two, 68% agreed that confidentiality was ensured, 67% agreed that customer privacy was adequately addressed, and 60% agreed that IS best practices were applied (refer to Figure 70).

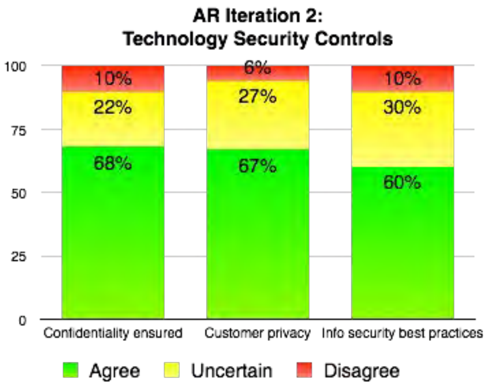


Figure 70: Technology Security Performance

Ensuring that sufficient technology security controls were implemented during NPSD can be attributed to the use of the CEO mandate. During the AR cycles, a few P&S were delayed by the risk teams due to insufficient technology security diligences being conducted.

Only two technology security concerns were mentioned during content analysis, it being noted that technology security should 'be involved sooner', and that the 'due diligence process' on external vendors should be followed. During the final iteration, the technology security team was expanding into functioning as a profit centre by offering technology security services as a value-added service to certain B2B P&S.

According to the IRMF maturity framework, ICT security performed at the highest Level 4, since best practices were implemented and value-added services were offered to support customers of P&S.

Second-level Construct: ISO Compliance

The second-level construct is defined as conformance of the P&S and its associated ICT components to IT/IS service level management, control and release policies and procedures, as well as capacity and Business Continuity Management (BCM) best practices. The second-level construct also includes awareness of best practice guidance from technology standards bodies as developed for new technologies such as cloud computing. During AR iteration two, capacity and BCM & SLA management control and release processes were identified as two separate categories and were addressed in two sections.

Capacity and BCM

The risk practitioners regarded BCM RM to be fully embedded at a Level 5, within NPSD.

The technology availability factor includes capacity, BCM and E2E testing. Considering all of the risks that might impact on NPSD, technology availability was not deemed to be a major contributor. In line with this hypothesis, weak relationships were discovered, but significant with eight other factors (refer to Table 52, Appendix 4). It was expected that the reliability and availability of the systems would correlate with SLA quality and the association with customer care could refer to service desk support. The strongest correlation was however with Project Management, r(130) = .35 at p < 0.005 which could refer to embedding information availability within the processes and practices of NPSD (Alesi, 2008).

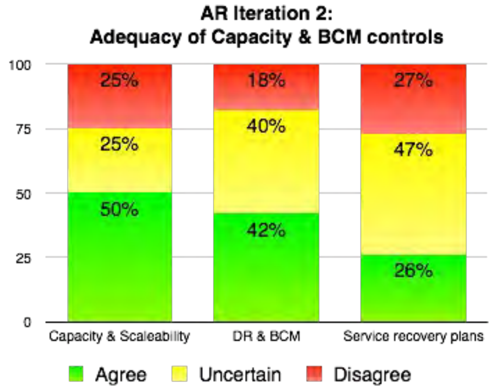


Figure 71: Capacity and BCM Performance

The actual situation reflected in Figure 71 indicated a lack of awareness of DR & BCM procedures (40% uncertain) and the availability of service recovery plans (47%). Since these controls formed part of the technology department's responsibility, it would make sense. However, the extent to which these controls had been implemented indicated similar agreement and disagreement percentages (25%).

Limited operational incidents were reported during the AR iterations, but when such incidences materialised, reputational risk was caused. Examples of occurrences included an external provider system that was not scalable leading to delays in fulfilling transactions and causing significant customer dissatisfaction. In other cases, the uptake of P&S exceeded expectations, which had knock-on impacts on the capacity of other systems and the communication network, which were unable to accommodate the increased volumes of transactions. Scenario planning was implemented to assist such estimates, and a detailed capacity analysis was conducted in cases where similar situations were expected.

SLA Management, Control and Release processes

SLA quality refers to ITIL ITSM service support consisting of incident and problem management, change management, configuration management, release and service desk functions (Hill and Turbitt, 2006). Service level quality is also not considered to be a significant predictor of risks since too many other risks could impact on service level quality in NPSD. Correlations were analysed to determine if there were small but reliable relationships with other risk factors. Weak relationships, but statistically significant correlations with 12 other factors were discovered, including correlations with the second-level constructs of finance and particularly business rules and pricing, r(130) = .35 at p < 0.005 which could correspond to service delivery components and IT financial management (Spremić, Zmirak and Kraljevic, 2008). Correlations with technology development, r(130) = .35 at p < 0.005 and technology availability, r(130) = .35 at p < 0.005 were expected. Project management, r(130) = .35 at p < 0.005 could refer to the implementation of best practice processes to safeguard IT/IS investments. The association with customer care, r(130) = .31 at p < 0.0005 could point to the functions performed by the service desk.

IT governance frameworks, methodologies and practice to manage IT performance include Control Objectives for Information and Related Technologies (COBIT), IT Infrastructure Library (ITIL), CMM, PRINCE, MSP, PMBOK, International Organization for Standardization (ISO) 17799, the Balanced Scorecard, and Six Sigma (Symons, 2006). The proliferation of these frameworks is primarily motivated by regulatory pressures such as Sarbanes-Oxley, Basel II and in South Africa King III (Spremić et al. 2008). It would therefore also follow that legal and regulatory would correlate.

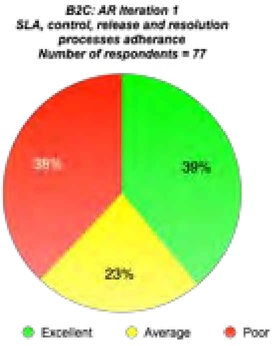


Figure 72: ICT Process Adherence

During AR iteration one, 38% of respondents perceived poor adherence with change and release management-, escalation-, helpdesk- and technical sign-off procedures (refer to Figure 72). However, the interviewees mentioned that technical delivery significantly improved during AR iteration one.

During AR iteration two, 38% of NPSD practitioners perceived service levels to be monitored, 42% perceived SLA/OLA's to be well documented and 59% perceived adherence to formal processes of change control and release management (refer to Figure 73). Compared to AR iteration one, an improvement in compliance to control and release processes were indicated, up from 39% (AR iteration 1) to 59% (AR iteration 2).

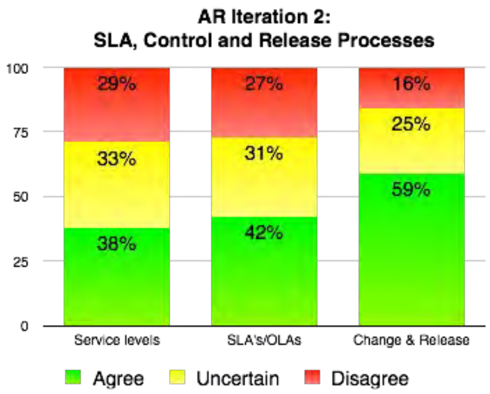


Figure 73: SLA, Control and Release Processes Performance

The content analysis questioned whether competent change management, capacity planning, BCM and DRP plans were in place. It is also requested that 'key parties should be involved from the onset' and that 'risk and capacity of systems (are) not communicated across the business areas'.

The IRMF maturity rating for ICT Standards Conformance was indicated as Level 3 at the end of the AR cycles.

5.4.5.5. Governance, Risk and Compliance (GRC)

The definition of risk and compliance is based on the GRC Capability Model, Red Book, v2.0 (2009) as the management of activities to maximise NPSD performance against objectives, whilst managing risks and complying with applicable laws, regulations and obligations. The second-level constructs of GRC include: legal and regulatory compliance, privacy, governance, fraud, AML and security, which are subsequently discussed.

Second-level Construct: Legal and Regulatory Compliance

Legal and regulatory compliance refer to adherence to laws, regulations, guidelines, specifications, codes of practice and legal requirements that govern the organisation, including anticipation of future changes in the legal and regulatory environment.

The time spent on resolving regulatory compliance issues paid off as Level 1 (fully embedded) was achieved for legal and regulatory NPSD integration. Risk practitioners recommend development of guidance whitepapers to ensure regulatory integration (as explained in the PoPI section of AR iteration three), since expanding on existing guidance is more productive.

The researcher investigated correlations with legal and regulatory. Again, weak positive correlations but significant at p-value <0.05 with nine other factors were established. Only the evidence for associations with p-value <0.005 and explained variances of more than .30 were indicated. Legal and regulatory correlation with business rules and pricing, $r(130) = .30$ at $p < 0.005$ can be explained since these usually constitute the T&Cs for the specific P&S and are compiled by legal. Project management, $r(130) = .35$ at $p < 0.005$ reflected concerns stated as the ‘inclusion of risk, legal and regulatory has been forgotten and causes huge issues post launch’. It was suggested that ‘involving risk and regulatory (and finance) at the early stages of the product development process help to mitigate the risks at an early stage’.

Statistically significant difference was detected between the responses of B2B and B2C, which could be representative of the relative newness of the B2C organisation where B2B expressed concerns with settling of contract arrangements with suppliers (B2B mean ranking 71,91 versus B2C 63.82) and understanding of legislation impacting on P&S (B2B mean ranking 71,50 versus B2C 63,93). Legal concerns noted by the B2B practitioners included ‘ensuring that there is a signed contract in place before launch’, complaints about the ‘time it takes to get supplier contract signed’, and the non-existence of ‘clear terms and conditions that have to be accepted by customers’.

Statistically significant differences could be detected between GRC and technology groups versus NPSD and marketing groups with regards to awareness of regulations that impact on P&S (refer to Table 9). The concerns were explained during content analysis as ‘product managers do not take into consideration the various acts which <the organisation> needs to conform to’, or ‘how the product will put <the organisation> at risk of exposure’. A respondent from the regulatory division was frustrated with the ‘repeated instances of lack of awareness on regulatory implications particularly when the project manager has previously been informed of such issues’. Two regulatory risks that needed attention were stated as the Consumer Protection Act (CPA) and anti-competitive behaviour.

NPSD practitioners raised frustrations about the 'differences in view of different people at legal and regulatory' and requested 'risk, legal and regulatory to have a consolidated view especially in the instance where there is discord in feedback provided by these groups'. As explained, during the AR iteration, the GRC resources risk, legal and regulatory regularly did not have a consolidated opinion about the interpretation of Regulations. The NPSD practitioners frequently requested reviews of legal, regulatory and privacy officer decisions that introduced delays and frustrated NPSD practitioners. The dilemma was explained during the AR iteration.

Legal and regulatory compliance was rated at an IRMF maturity Level 3. Despite proactive anticipation of future changes, there were still instances where regulatory guidance was insufficiently documented.

Governance

Risk evaluates compliance with sound internal governance principles, structures, processes and procedures and the extent to which P&S reflects responsible practices toward people, planet and profit (3Ps). This section discusses governance that includes compliance with internal policies and procedures, as well as risk governance, while the second section explores social responsibility.

Risk and Governance

While the ‘regulatory and legal risk’ second-level construct considers external compliance requirements set by stakeholders external to the organisation, ‘risk and governance’ covers internal compliance in line with the organisation’s policies and control components (Eloff and Eloff, 2005). Governance entails that policies and procedures applicable to the P&S should be reviewed and stakeholders should be advised of relevant requirements.

Referring to Figure 74, 74% (agree + fully agree) that internal policies and procedures were complied with. Regarding whether risk issues were adequately anticipated, 67% (agree + fully agree) supported the expert finding that risk was fully embedded within NPSD. However, statistically significant differences existed between the perceptions of different groups (H(2) = 13.572, with a mean rank of 84.74 for technology, 79.58 for GRC versus 61.64 for marketing and 58.36 for NPSD. The differences could potentially be attributed to the technology and GRC groups having a more detailed understanding of risk requirements. Some negative perceptions of risk practitioners were conveyed by B2B practitioners such as:

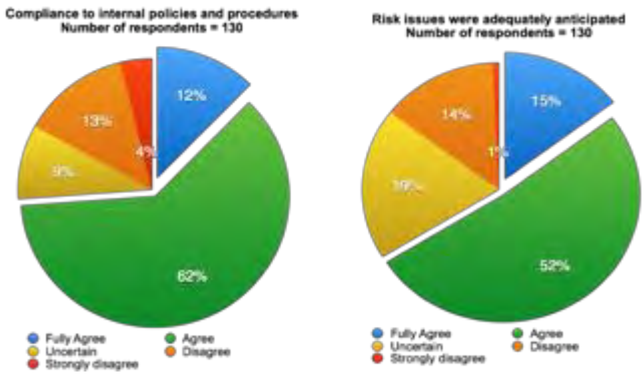


Figure 74: Internal Compliance Performance

> Risk and finance should support the product people. It feels the other way round. Cut the red tape for products and be less of a fear-based organisation.

It was implied that RM and finance were stifling innovation:

> The product process is too heavily weighted in favour of risk and finance. Product people should carry more weight, for example, Apple.

Additional concerns were that 'risk factors were highlighted/thought of too late in process', and that the 'risk evaluation of the product is not documented or quantified'. The content analysis was conducted during the second AR iteration when B2B was newly exposed to RM practices. This shows that RM value-add typically takes more than 15 months to show since B2C practitioners expressed 'product management appreciation of value added by risk'.

Suggestions for improvement included a preference that the risk professionals should manage the interactions between the fraud and product development team, rather than speaking to fraud units directly. It was also suggested to 'sanction non-compliance with risk assessment recommendations', which were implemented by the risk practitioners during the AR iterations.

Health, Safety and Social Responsibility

Health, safety and social responsibility refer to the implementation of responsible practices towards people, planet and profit (3Ps) (King III). Corporate Social Responsibility (CSR) integrates social and environmental concerns into the P&S operations and guides stakeholder interactions on a voluntary basis (King III Report on Corporate Governance for South Africa. 2009).

The expert analysis rated environmental protection the lowest from all risk interventions, ranging from partially implemented to no actions taken. Risk practitioners did not regard integration of Health & Safety RM practices with NPSD as successful. It was described as implemented in critical areas only.

The correlation analysis indicated weak associations but significant relationships with the high-level constructs which are not discussed here, as further research is needed to confirm these and other potential correlations. It is further necessary to explore risks in ‘green’ NPSD projects, which is not sufficiently covered by this research.

Figure 92 in Appendix indicates that 51% of NPSD practitioners perceived that P&S mainly appealed to generally accepted values (e.g. health, safety, nature and environment). However, when considering that 36% of NPSD respondents were uncertain, it greater awareness could be required in the organisation with regards to what CSR and environmental values entail.

Climate change has been largely ignored by the board and CEO levels (Blanchard, 2009). However, increasing pressure is placed on organisations to become more CSR responsible (Huang and Wu, 2010). The VW emissions scandal reminded us how expensive, weak governance can be

(Boyce, 2015; Van der Heyden, 2015). Since the board is ultimately responsible for ensuring that good corporate governance practices are implemented, it is in the domain of the organisation's board members to ensure that good corporate governance practices exist.

Within the organisation, a silo approach existed to health, safety and social practices. Green IT projects were mostly restricted to the domain of engineering and technology fields. Environmental conformance reporting was furthermore the responsibility of PR and communications. Health and safety operated as a separate division reporting to HR. It should be no coincidence that both 'health and safety' and 'environmental' risks were not adequately integrated within NPSD as determined by the risk expert analysis.

Green management focuses on the development of 'environmentally-friendly products and reducing sources of pollution to minimise risks to human health and the natural environment' (Huang and Wu, 2010, p. 1542). Failure to reduce energy consumption, operational cost and non-compliance with environmental regulations are real risks facing all organisations. China Mobile set the benchmark for communication companies by announcing a 40% target to improve energy efficiency (Huang and Wu, 2010). The principal shareholder of the organisation defined modest environmental goals.

Additionally, physical hazards related to the P&S should be analysed (Mu et al. 2009). While environmental impact analysis is imperative, lack of executive support can hamper it (Zutshi and Sohal, 2004). Top management commitment is essential, but unless high-tech companies are convinced of the positive influences on financial performance (Huang and Wu, 2010), this is not likely to occur. While Green IT has been identified as a strategic organisation-wide initiative, it has not been adequately integrated into NPSD.

Socially responsible behaviour can be encouraged during NPSD with corporate value awareness campaigns to promote the desired ethical behaviour and to advise of deterrents and penalties (Banerjee, 1998). One of the successful initiatives noted by NPSD practitioners was campaigns instituted to promote the corporate values of the organisation.

Failure to identify, report and initiate corrective actions for unethical conduct could expose the organisation to major reputational risk. The risk practitioners were only required to report such incidences, and the onus for investigation resided with other parties.

NPSD practitioners were considerate of social responsibility imperatives such as safeguarding the availability of P&S in rural or underserviced areas, the lack of accessibility for elderly and disabled persons and ensuring that welfare initiatives were implemented. During the AR cycle, NPSD teams launched several welfare-related P&S.

The IRMF maturity rating was reported as a Level 2 since 'health and safety' and 'environmental concerns' were not established as being fully embedded within NPSD.

Second-level Construct: Privacy

The objective is to protect the customer right to privacy, by ensuring that personal information gathered while P&S is used is protected and confidential communications are safeguarded. Customers should be able to exercise reasonable control over the use of their data. Privacy also assumes that the consumer is protected against technology security risks. The challenge for organisations is to find an appropriate balance between protecting privacy and safeguarding commercial interests.

The expert analysis expressed consensus that the IRMF and supporting risk processes succeeded in fully embedding privacy within NPSD and significantly improved the performance of the discipline.

Correlation analysis was used to examine the relationships between privacy and the risk factors produced during factor analysis. Weak associations but significant relationships existed with seven of the 16 factors (Refer to Figure 79 in Appendix 4). Interestingly, the pure financial second-level constructs did not significantly correlate, nor did the other technology factors or customer. As expected, privacy related to other GRC second-level constructs including fraud/AML/security, $r(130) = .35$ at $p < 0.001$. Privacy is regulated by legislation while fraud investigators will investigate privacy risks. From perceived risk theory (Featherman and Pavlou, 2003) time risk project management, $r(130) = .35$ at $p < 0.001$ is expected.

Privacy context is described by (Nissenbaum, 2010, cited by Xu and Bélanger, 2013) as safeguarding information as it moves across different contexts, including processes, functions and technology. Privacy studies predominantly measure privacy concerns from the user perspective (using CFIP and IUICP), with few studies considering privacy within organisational contexts (Bélanger and Crossler, 2011). There has been a recent call for more research to investigate the contextual nature of privacy (Xu and Bélanger, 2013).

The NPSD practitioners raised no privacy concerns during any of the interviews, except within the context of compliance to regulations. Despite a vast majority of the risk practitioners' time and effort (especially during AR iteration three) being devoted to privacy-related matters, NPSD practitioners did not view it as a significant concern. Perhaps NPSD practitioners considered privacy as somebody else's problem, perhaps relegated to the domain of regulatory and risk, for which they were not directly responsible.

The risk practitioners generally perceived NPSD to lack awareness of what constituted customer personal and sensitive information and what constituted privacy-intrusive activities. This could explain the statistically significant differences reported regarding awareness of regulations, information security and anticipation of legal and regulatory restrictions (Refer to Table 19). Since privacy has such a wide impact on different functions, (Popovic and Hocenski, 2010) recommend the formation of privacy steering committees as instituted by the organisation (following AR iteration three) to assist with decision-making on data privacy as it relates to both customers and regulators.

Managing privacy risks within NPSD in high-technology organisations is complex and requires extensive specialised knowledge and skills. Organisational culture and group dynamics play a critical role in privacy, which explains the call by Bélanger and Crossler (2011) for more design and AR research to be conducted.

Privacy was considered to be a Level 3 according to the IRMF maturity framework.

Second-level Construct: Fraud, Corruption, AML, Security

The Chartered Institute of Management Accountants (CIMA, 2011, p. 7) advised that the term ‘fraud’ 'commonly includes activities such as theft, corruption, conspiracy, embezzlement, money laundering, bribery and extortion'. During the factor analysis the second-level constructs loaded together, so it made sense to combine them in one construct.

Correlation analysis was used to examine the relationships between the fraud, AML and security construct and the factors produced during factor analysis. Weak positive correlations, but significant relationships existed with six of the 16 factors (refer to Figure 80 in Appendix 4).

As can be expected, a relationship with ‘customer’ exists since fraud impacts on customer loyalty (Hoffman and Birnbrich, 2012). The relationship with ‘legal/regulatory’ is also anticipated as these disciplines are informed by a strong regulatory regime. Since fraud losses are calculated in terms of monetary losses and often lead to the reimbursement of customers (Douglass, 2009) the relationship with the ‘financial’ and ‘business rules’ factors are also expected. Customer intentions to use the P&S are positively associated with fraud prevention measures (Hoffman and Birnbrich, 2012). The correlation with the ‘process’ construct can point to the contextual nature of fraud, where fraud can be perpetrated via many channels and processes by internal and external fraudsters (Sudjianto et al. 2010). Process mapping is also one of the techniques that is used to identify fraud exposures (CIMA, 2008).

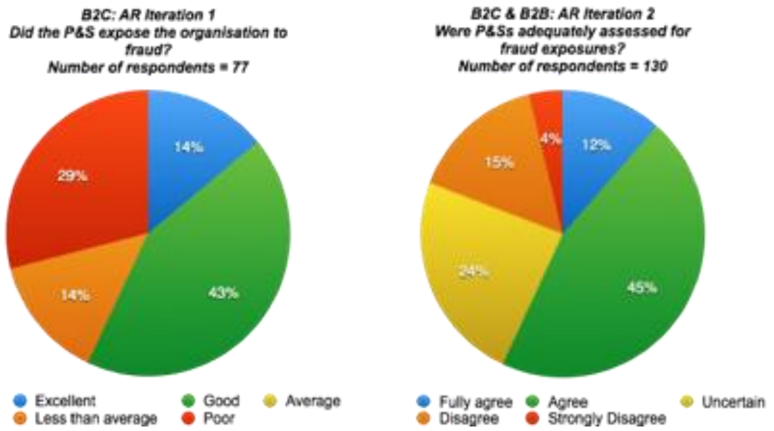


Figure 75: P&S Fraud Exposures: Comparison between AR Iteration One and Two

The results indicated that changes in fraud, corruption and security incident prevention related to changes in ‘financial’, ‘process’ and ‘regulatory’ risks, which could also influence P&S

‘performance’ and ultimately customer satisfaction. These areas are discussed below to determine the extent to which these risks were addressed within the organisation.

Fraud Management

The risk practitioners judged fraud management as one of the functions that were regarded as fully embedded within NPSD.

During AR iteration one, judging from Figure 75, 57% (good + excellent responses) perceived fraud exposures to be adequately addressed. During AR iteration two, (fully agree + agree) the number of respondents who rated fraud management practices as substandard decreased by 24% (AR iteration one: Poor and Less than average minus AR iteration two: Disagree and Strongly Disagree), which indicates improvement.

During the content analysis, a fraud practitioner listed three main concerns in order of importance as: (1) limited fraud resources exist to support the volumes of P&S; (2) expectations of the NPSD practitioners that fraud professionals need to provide 24x7 support; and (3) manual tasks need to be automated as far as possible. Effective fraud detection seemed to be hampered by fraud resource constraints and system integration concerns. It was suggested when new revenue streams are introduced, HR should assess the impact on supporting functions (fraud management), appoint additional resources and determine the availability of technology tools to assist in fraud detection.

Fraud incidences increased in line with increased on-line (web) usage where physical not present transactions provided more opportunities for fraud. The practice of ‘phishing’ was validated, as Bergholz et al. (2010) explain, becoming a significant online security threat. Over 300 000 subscribers identified modules (SIM) swap transactions were performed daily by the organisation, which could leave customers vulnerable to phishing scams. During the AR cycles, the online environment was exposed to a variety of frauds, including subscription, credit card and criminal upgrade fraud.

Fraud management is a mandatory compliance legislated in regulations such as the Companies Act, The Prevention and Combating of Corrupt Activities Act, King II & III, RICA and the Telco’s internal Fraud Policy. The correlation between ‘regulatory’ and ‘fraud’ suggests such relationships.

The failure to implement adequate fraud controls has a significant impact on the P&S viability and reputation of the organisation. Hoffmann and Birnbrich’s (2012) retail banking study emphasised the importance of fraud prevention as not purely to reduce financial losses and operating cost, but a way to build loyalty, by effectively communicating fraud prevention to customers. It is, therefore, imperative that fraud management should be considered when analysing risks in NPSD.

Anti-money Laundering (AML)

Money laundering is the activity, whereby criminals process ‘dirty’ money from the proceeds of illegal activity, through successive transactions to conceal the nature, source, location, disposition or movement of the proceeds of unlawful activities until the funds seem 'clean' and legitimate (Gao and Xu, 2009).

The expert analysis judged AML as fully embedded within NPSD. Fourty-four percent of NPSD was uncertain about potential AML risks, which indicated a lack of awareness. No concerns about AML were raised during the content analysis, which perhaps affirmed the perception of the NPSD practitioners that AML is a risk domain managed by risk experts.

The importance of analysing risks in NPSD gradually increased as the organisation pioneered the launch of several financial and mobile money P&S. Financial service P&S are strongly governed by AML regulations. P&S that allow the electronic transfer of money across borders could be especially vulnerable to money laundering (ML) activities.

An AML risk review evaluates the extent to which the P&S is exposed to potential money laundering activities. The regulatory requirements need to be analysed and designed early during the NPSD process. AML controls required the implementation of additional rules on customer agents, software changes on SIM cards and AML audit trails.

Not only mobile money products can suffer from AML exposures but also any P&S that allows electronic transfer of money, or accepts or conveys cash could be vulnerable. Some popular online games where certain functions or tokens are purchased are suspected of supporting money-laundering activities. In the telecommunication environment, many P&S can be used by criminals to launder money, including the acquisition of certain P&S, airtime, cell phones, online purchases, airtime transfers for cash, games and some promotions. All of these require proper AML monitoring and reporting procedures.

To meet the extensive monitoring and reporting requirements, automated technology tools are employed. Quality criteria and benchmarks additionally need to be in place to satisfy due diligence principles such as Know Your Customer (KYC) to establish the actual beneficiary of the P&S.

Regulators are increasingly advocating strict AML obligations since criminals use technology to dispose of proceeds from illegal activities. Due to these detailed requirements, compliance can only satisfactorily be addressed by the use of automated AML tools and technology that consistently need to adapt to the ever-changing risk landscape (Gao and Xu, 2009). Analysing risks in NPSD should therefore also consider AML requirements. It is additionally recommended that NPSD practitioners should be trained in AML requirements since a lack of awareness seems to exist.

Physical Security

A physical security risk review evaluates the extent to which the service presents security risks to customers and employees. Security safeguards the interests of the organisation (including staff, customers, assets, information, reputation and value) through implementation of appropriate physical security controls. The risk expert questionnaire indicated a 60% consensus opinion that physical security risks were embedded at a Level 2, indicating that risk approaches were adopted but not fully embedded.

NPSD practitioners displayed ignorance about physical security risks where the majority of 52% were uncertain (as indicated in Figure 96). Security risks were not mentioned during the content analysis. This correlates to the expert questionnaire finding that security risks were only partially addressed.

During the AR cycles, requirements for considering physical security risks evolved due to new ventures such as mobile money, where agents who handled cash needed to be protected against physical dangers by implementing layered physical security protection. Physical security is also an important component of effective information security governance, as the implementation of physical and environmental security controls are necessary to protect against unauthorised access to secure facilities and the loss of confidential customer and product information (ISO/IEC 17799, 2005). Further physical security risks are presented during P&S launches and events, such as the launch of a new handset where dedicated customers would stay overnight at the organisation's premises to be the first in cue the next morning.

Potential physical security risks were identified by the risk practitioners, upon which security specialists were consulted to determine appropriate mitigation actions. It is likely that this risk category will only be applicable to a small number of P&S. However, physical security failures have the potential to cause reputational damage, especially if customers and third parties are injured due to an unsafe working environment.

Fraud, corruption and security were considered to be at a Level 3 maturity rating according to the IRMF maturity framework, since not all controls were automated.

5.4.5.6. Organisational Culture

The expert questionnaire assessed the extent to which human and cultural factors were considered during risk assessments. RM recognises the capabilities, perceptions and intentions of external and internal people that can facilitate or hinder achievement of the organisation's objectives (refer to Q11a to 11b3 of Table 17). This capability strongly reflects the organisational culture dimension and as indicated during the analysis. It was confirmed by the risk practitioners that this was the area where further improvement was required.

Conformance opinion at Level 4 existed that RM processes consider the capabilities of critical NPSD resources and consider leadership skills as well as communication. However, risk practitioners considered the extent to which RM contemplated human factors and culture at a Level 3 – meaning that risk approaches were only implemented in key areas.

Conformance opinion at level 4 exists that RM processes consider the capabilities of critical NPSD resources, consider leadership skills as well as communication. However risk practitioners considered the extent to which RM contemplate human factors and culture at a level 3 – meaning that risk approaches are only implemented in key areas. Quantitative analysis was not conducted for organisational culture. The content analysis, however, indicated culture and leadership as the second-most prevalent concern listed by both B2B and B2C.

Senior management support was regarded as an important indicator of innovativeness in terms of providing enabling conditions to support innovation. Descriptive statistics indicated that leadership was effective in ensuring that sufficient support and resources were allocated during the NPSD lifecycle is indicated in Figure 76. B2C seemed to have a more favourable disposition (49% agree) towards leadership than B2B, where 52% indicated that leadership was not effective in ensuring that sufficient support and resources were allocated during the NPSD. The less favourable perception of the B2B organisation can perhaps be attributed to:

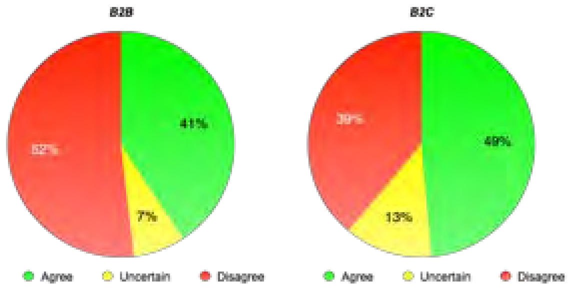


Figure 76: Leadership: Comparison between B2B and B2C

> I am troubled by the constant state of flux ushered in with changes in management as pertaining to business processes and structures. This has a general tendency to disrupt business processes and (allow) gap creep making processes vulnerable.

The B2B division restructured every few months, which created internal challenges. A sales resource explained the impact of B2B restructuring, as three different sales resources were responsible over a one-year period to build relationships with a particular enterprise customer. Relationship management was regarded as especially important to support B2B sales efforts and under these circumstances, it would be difficult to build relationships if the sales staff was not allowed sufficient time to establish connections. Lacking adequate resources was also considered a problem that led to 'work overload that drives quantity less quality'.

Leadership was indicated for ‘lack of decision-making’, and using ‘incorrect targets and measurements’ to measure P&S. Top management was blamed for lacking clear strategic direction and a lack of agreement whether to proceed with a product ‘to ensure that time is not wasted’. As ‘launch dates (were) dictated from the top down’, it often led to ‘products (being) rushed’. Further accusations were that insufficient ‘executive buy-in’ existed and inadequate support was described as a lack of accountability.

Signs of internal conflict were indicated in the project management division, which included allegations of favouritism as ‘certain individuals get certain products’. Also particular business areas were blamed for ‘not providing constructive input during the process’, or in other cases ‘the non-contributors always get the credit for what has been kept brewing by the committed guys’.

Conflicts between business units were indicated as, ‘targets between business and technical are not aligned’, or ‘priorities are not agreed to’ or ‘lack of teamwork’ or ‘no sense of urgency from some departments'. A respondent remarked that 'no trust <existed> between business and technical. Working communication should be established in these areas'. In general, project management was considered as not empowering 'individuals to feel some ownership of the product/process, thus project managers will always lack morale'. Additional concerns related to 'too many product development groups'; 'lack of communication between groups'; and a lack of tools.

Organisational culture constraints often prevented NPSD practitioners from sharing risks with NPSD leadership. As mentioned during the AR cycles a 'yes'-culture existed and NPSD were uncomfortable sharing the negative news. The NPSD practitioners would prefer to communicate risks to the risk professionals who would take on the role of mitigating the risks.

Soft or background resources like 'climate, culture, experience, top-management commitment, and risk aversion' have a significant influence on NPSD outcome (Kleinschmidt, 2006, p. 120). However practical challenges exist when attempting to address these forces. It would not be practical in an organisational context for risk practitioners to list risks such as an executive's communication style as not conducive to the creation of an innovation culture.

Kuczmarski (2006, p. 121) considers the following organisational culture factors as critical for innovation: rewards linked to P&S marketplace performance; executive commitment; the existence of an agreed strategy; sufficient resources; and sufficient time to allow innovation to take place. These practices were not apparent in the organisation under study.

When comparing the results of the content analysis with the innovation literature review, it appears that the organisation was not aligned with NPSD best practices, in terms of leadership, organisational culture, communication and resources. The maturity rating according to the IRMF maturity framework was thus indicated as a Level 2 at the end of AR iteration three.

5.5. Conclusion

The IRMF presents an organised framework to manage complex NPSD risks. Relationships between the different high-level and second-level constructs of the framework were established in the quantitative analysis and areas where further developments and research is required were indicated in this section. The IRMF evolved over five years of research.

The IRMF can be described as a framework that consolidates best practices in NPSD with best ISO 31000 compliant RM practices, to identify, evaluate and treat risks according to the individual components of the IRMF. From the research results, it is clear that many of the risks can proactively be addressed by adhering to more robust practices.

Some advantages presented by applying RM techniques have been presented, such as reducing ambiguity and uncertainty to improve quality of the P&S. As RM becomes more embedded in the NPSD processes, the value of RM becomes clearer. The extent to which risk is embedded correlates to the maturity levels of the IRMF maturity framework.

This qualitative and quantitative analysis describes risks within the context of the organisation. Some of the content analysis, maturity levels and statistical analysis is specific to the organisation. Validation of second-level constructs and some qualitative comments are generic. The findings are summarised and discussed in Chapter 6, with specific reference to which findings are generalisable to other contexts.

The IRMF and supporting risk processes is designed to cater for different contexts, which require different strategies to improve NPSD. A similar NPSD framework that supports this flexibility has not been introduced by the innovation literature. To the best of the researcher's knowledge, this is the first approach that provides a comprehensive consolidation of innovation and risk factors and provides such extensive guidance to enable the launch of quality P&S.

6. Chapter 6 – Summary of Findings and Discussion

6.1. Introduction

The primary research deliverables are the IRMF and risk methodology. These were found to be useful artefacts to manage risks in NPSD. This chapter argues that not only is the IRMF and supporting risk processes transferable to other ICT organisations, but that significant knowledge contributions are made to NPSD, RM and IS academic and practitioner theory.

The next section provides a brief overview of the research question (Section 6.2) followed by a discussion of the two streams of research, namely innovation (Section 6.3) and RM (Section 6.4). The research contributions of AR (Section 6.5) and the DS artefact design (Section 6.6) are discussed, followed by a conclusion.

6.2. Research Questions

The secondary research questions are answered in this section: (1) What are the primary risks NPSD face within an ICT context? (refer to Section 6.3.1); (2) How can RM be effectively embedded within an NPSD context? (refer to Section 6.4.1); (3) What are the differences between managing risks for B2B innovation and B2C innovation? (addressed in Section 6.4.1); Can RM frameworks and risk processes support effective risk mitigation within NPSD? (refer to Section 6.4.1).

A key finding of the research, in line with the objective of the research question, was whether RM can be embedded within NPSD by the development of an IRMF and supporting risk processes to allow more effective RM. The expert survey indicated that RM was effectively embedded at the highest level in all critical areas and NPSD groups by the end of this study.

A generalisable finding of the study is that the time required to embed RM fully within the NPSD operations follows, at least, a three-year cycle. African operations were only introduced during AR cycle three, and RM was regarded as being embedded in critical areas, such as the dashboard and in the fact that risk assessments were being conducted on critical projects.

The complete IRMF, high-level and second-level constructs were validated by the research. The IRMF provides a generic, flexible, customisable consolidation of risk and opportunities that can be applied by risk and NPSD practitioners to deliver risk interventions.

The fundamental approach that was implemented in this study is AR. A DS artefact was introduced during AR iteration three in the form of a risk dashboard. This research used mixed-methods to accommodate the scale of the study. When compared to other AR studies, which focus on a few projects, it can be safely stated that this research are comprehensive. The study was conducted in a large, technology-intensive organisation within the ICT industry that predominantly launches services. The scope of the study expanded during the AR iterations from initially focusing on consumer services (B2C) to also include the launch of enterprise services (B2B). Since the organisation expanded into new markets, the risk interventions could also be tested on financial and insurance projects, m-money, m-commerce and m-health. The risk interventions implemented by this study were tested on multiple NPSD projects and are believed to be transferable to other ICT contexts. The research also raised several questions, the results of which are explained in this chapter.

6.3 Innovation Empirical Findings

The empirical findings concerning the RM of innovations is subsequently summarised and discussed.

6.3.1 Risks for Large Organisations that are IT-Intensive

The second research question requested identification of the primary risks facing NPSD within an ICT industry. Since there are too many to list here, only the most significant findings are summarised in this section, according to the six high-level constructs of the IRMF.

Organisational Culture

Research on the impact of organisational culture on NPSD is required to advance innovation theory and practice (Di Benedetto and Nakata, 2012). Unique to the case of the organisation, organisational culture was the second-most prevalent concern of B2C and B2B. (The high-level construct of the process was the biggest concern). Leadership failures were perceived around the lack of a clear strategy and not managing time and resources adequately to stimulate innovation activities. The research indicates that robust portfolio management processes, which are strongly dependent on organisational culture, can effectively address this risk. Therefore, it is likely that if the executives in charge of the NPSD groups are not aligned to following best NPSD practices, the organisation will be plagued by poor development practices.

When rewards are not clearly linked to P&S performance in the marketplace, this also contributes towards individuals' non-compliance with best practices is (Kuczmarski, 2006). It may be unique to the organisation surveyed, that reward structures do not drive behaviour aligned with best practices. However, it is relevant that other ICT organisations observe that incentive structures can promote best practices and improve the quality of P&S.

The NPSD group was subject to constant organisational restructuring activities, which had a detrimental effect on innovation. While governance and target volatility influences have been studied in IT projects (Sauer et al. 2007), they have not been effectively addressed in NPSD research. Governance instability (loss of resource or sponsor) was especially harmful, and it is therefore not surprising that the rate and extent of organisational restructuring activities would predict innovation performance. This finding is generalizable to other ICT contexts too.

Strategy and Portfolio Management

Alignment to the organisational strategy and portfolio management are considered top determinants of NPSD performance (Cooper and Kleinschmidt, 1995; Cormican and O’Sullivan, 2004; De Brentani et al. 2010). Unique to this study, strategy and portfolio management were indicated as the fourth-biggest concern for both B2C and B2B new product development. Whilst the strategy existed, the organizational reality revealed the ineffective realisation of the strategy. Also, the lack of tools and criteria to support portfolio management were attributed to undisciplined leadership (Cooper et al. 2012). During the content analysis, NPSD resources continually lamented that insufficient resources existed to manage the workload. Given the number of and speed with which services that are being launched by service organisations, it is argued that portfolio management is especially important for ICT organisations. Very few services were retired during the timeframe of the study, possibly because the profitability of services is not adequately understood or measured during their lifecycle.

Market Orientation

Innovation researchers have focused on three sub-dimensions of the market, namely customer, understanding the market and competition and marketing activities (Berry and Hensal, 1973; De Brentani and Cooper, 1992; Szymanski and Henard, 2001). This study extended the high-level construct of the market to include two additional second-level constructs of public relations and investors and stakeholders.

This research therefore conforms to an emerging trend in innovation research, to consider the needs of the general public and stakeholders across organisational boundaries (Keizer et al. 2005; Smith and Fischbache, 2005). Shareholder interests in NPSD were identified as both an opportunity and constraint for the organisation. The specific incidences might be unique to the organisation, yet the right shareholders will be supportive of strategies ensuring the long-term sustainability of the organisation, while those only interested in short-term strategies should be discouraged from interfering in NPSD strategy.

Peculiar to the organisation was the fact that some reputational risk incidences were noted during the study. The risk impact was so severe that services were prevented from launching or were recalled from the marketplace. It would, therefore, be relevant to consider that other ICT organisations might be exposed to similar risks. It is especially pertinent in a developing, price-sensitive market to consider potential reputational risk and long-term commercial sustainability when pricing rules change.

One of the key best practice findings arising from the innovation literature and verified in this research, is that the best-performing consumer services had extensive customer participation. It is therefore recommended that ICT organisations actively employ this practice during the development of strategic consumer services.

Innovation Process

Innovation researchers do not clearly identify activities that take place within the high-level construct of 'process' definition. This research contributes to the identification of process activities according to the organisational functions that are responsible for delivering them. The innovation literature identifies product, project and financial management as significant second-level constructs. However, additional second-level constructs were determined by the research. This section will be discussed in two parts. Firstly, validation of existing innovation research constructs will take place, followed by a discussion of the new second-level constructs being introduced.

Product, Project and Financial Management

The role of product management is arguably most crucial to ensuring effective NPSD. However, the roles of technology development and project management might be even more crucial, as no projects would be implemented without them. In the context of this study, it was not always clear what value the product manager added to the delivery of the P&S. However, it was clear that behind every successful project was a savvy product manager. The best- performing product managers were those that took responsibility for their projects and were technologically astute. It would, therefore, be safe to say that product managers need a broad base of knowledge to enable effective product management, similar to risk practitioners who need to be skilled at establishing a broad range of risks. It would be particularly beneficial for ICT organisations to appoint product managers who have been in technical roles and had proven strong IT/IS capabilities. Having this experience would allow product managers to develop improved P&S functional specifications and relate better to the technical development team.

It was noted that product managers inadequately tracked the performance of services, and remedial actions were not applied to underperforming projects. In such cases, product managers were allowed to relinquish responsibility for poor-performing projects. It is not clear why NPSD executives seem disinterested in understanding, which projects are performing. It is therefore recommended that ICT organisations develop a Scorecard with KPIs, rather than relying on ad-hoc practices to ensure uniform criteria for measurement are institutionalized, in order to compare the performance of product managers and their products.

Specific to the NPSD group, the consumer group identified project management as the top concern during the operational risk review (AR iteration one) and the third-most prevalent concern during AR iteration two. The important role of project management in innovation is often overlooked. While the P&S idea might be commercially viable, a poorly executed project could lead to failure.

Organisations that fail to conform to best practices in project management would experience similar problems as the organisation under study. A key problem specific to the organisation was that project managers did not perceive themselves to have influence regarding ensuring resource availability, managing scope or timeframes. Target dates for project implementation were established by senior executives without due consideration of the technology implementation timeframes and showed a lack of understanding of the complexity of implementing such services and the consequences of their decisions. Furthermore, lack of technology skills also hampered B2C project managers, while this was not regarded as a problem for the enterprise division that employed technologically skilled project and product managers. Therefore, the requirements for tech-savvy project managers are generalizable to other ICT organisations.

Financial management in innovation research refers to outputs such as cost advantages derived (Gruner and Homburg, 1999) or financial analysis of the P&S (Parry and Song, 1994). This research additionally indicated that financial constraints impacted on P&S development such as insufficient budget impacting on the scope of P&S activities. The study established the difficulty in determining the cost of service development and the impact it has on determining the financial viability analysis of services. Financial assumptions are therefore not based on sound data, which explains why information integrity emerged as a new factor during factor analysis. In these cases, ICT organisations should ensure that assumptions are formalised and that the same assumptions are used across the business. These difficulties experienced in costing services introduce risks to the price of the service, investments and cost control of the services in question. In the context of other ICT organisations experiencing similar problems in costing service delivery as a result of a myriad of interacting systems and project resources, the problem would be likely to present itself in other ICT organisations as well.

Elements informing the new second-level constructs introduced by this study

The new sub-constructs of KM (forming part of project management), business model and value chain, external providers, customer relationship management, business rules, pricing and revenue assurance and business process, are subsequently discussed.

KM within NPSD is not well researched in innovation literature but was introduced in this study as an additional prerequisite for effective project management. KM could be even more important for service organisations due to information being less structured and free flowing in service environments (Den Hertog and Bilderbeek, 1999). Good KM leads to competitive advantages and improvement opportunities for the organisation (Den Hertog and Bilderbeek, 1999). Because the organisation restructured often, effective KM was even more critical. It is recommended that ICT organisations consider the key practices and supporting technologies of KM to stimulate learning and innovation.

Business model innovation is a promising area of NPSD research (Teece, 2010). A lack of understanding of the business model, risk accountabilities and financial viability, as well as cost structure of the business model elements have been indicated as risk incidences in this study. The researcher recommends business model innovation as an area where competitive advantages can be introduced. However, sufficient time and resources are a prerequisite to allowing business model innovation. It is also regarded as a field in which additional research needs to be conducted. It could be argued that the newer the organisation is, the more exposure exists to business model and value chain risks as indicated by the B2B organisation.

Another contribution to the innovation research is the sub-construct of business rules, pricing and revenue assurance. Strong relationships between business rules and the systems needed to enforce them were indicated, pointing to the fact that technology development can be influenced by the extent to which business rules are clearly defined and can be reasonably enforced. RA, as a specialist risk function, ensures accurate billing, which was indicated as a challenge during the AR cycles. Since the B2B organisation was especially prone to revenue leakages due to difficulties experienced with converged billing, the sub-construct should also apply to other similar ICT organisations.

The role of CRM is introduced as another construct that is not supported by innovation research. The content analysis revealed that CRM initiatives to increase customer satisfaction across the life cycle were not supported. Since customer retention is such a strong motivating factor for organisations, it is perhaps negligent not to consider CRM strategies during NPSD.

The NPSD process is well researched and indicated as a primary reason for P&S failure. Unique to the organisation, the study indicated that the NPSD process was regarded as slow and cumbersome, driving quantity, not quality. It was regarded as the top concern of B2B and B2C practitioners. This study expanded the innovation concept of NPSD process to look at other processes that would support NPSD.

This study confirmed that other processes, such as procurement and contractual ones, have also been found to be deficient. Innovative services such as M2M require new organisational business processes to support these P&S effectively. As indicated, new organisations might be especially prone to deficient processes, but the problem persists in mature organisations, which are not adaptable to the rate of change. Due consideration for the effectiveness of business processes during the NPSD will ensure that customers are more efficiently supported. The CMM demonstrates that low-maturity of processes could lead to poor quality projects. Therefore, the thorough business process second-level construct would also be transferable to the context of other organisations.

External providers are another new second-level construct introduced by the research. Unique to this study, these providers were shown to be especially problematic during the first AR cycle when this construct was rated as the third-most prominent operational risk. However, external provider problems, such as not having reliable external partnerships rendering quality services on time, are a challenge for all ICT organisations electing to utilize outsourced providers. As more partners are being introduced to deliver more complex business models, it will be even critical for future services to conduct robust due diligence on external providers, in order to ensure acceptable levels of service delivery. Due diligence analysis is mostly restricted to the external supplier capability. However, external providers often also rely on their external partners to deliver. It is recommended that due diligence processes be extended to cover the extent of support provided by these second-level external providers.

Since most big contracts for enterprise services are awarded via tenders, it is proposed that RM processes be extended to incorporate tender responses. As has been shown, a very real risk exists that long-term contracts might not be profitable and selecting the wrong partners could inhibit the options of pursuing new opportunities. Most tender documentation requires risk feedback regarding financial, regulatory compliance and technology security controls. It is therefore necessary to extend risk services to tenders.

Information and Communications Technology

P&S cannot be commercialised without using technology. Technology and alliances were regarded as top areas that were missing in NPSD (Adams-Bigelow, 2006). Technology is an integral part of NPSD and the primary output of innovations (Ehrenhöfer and Kreuzer, 2012; Maglio and Spohrer, 2008).

Technology support in service development is underestimated in the innovation literature. A reason for insufficient customer care and help desk support was insufficient and timely access to supporting systems and reliance on manual procedures. Similarly, not having a single view of the client or insufficiently targeted market information could be traced to insufficient data warehousing and data mining technology. Escalations procedures that are inefficient are also blamed on inadequately managed systems. Poor quality services launched in the market can often be traced to poor testing procedures that are likely attributable to an insufficient technology testing environment and inadequate access to testing equipment. Privacy incidences can result from a lack of technology security controls that have not been entrenched during the P&S lifecycle. The NPSD can be aided by the use of workflow systems to track timely deliverables.

It would be remiss of innovation researchers to ignore the importance of technology development during NPSD. Without technical or SDLC knowledge it would be difficult for product managers to relate to the technology development team and understand their requirements and constraints. Without the technology group, there would be no product or service. To the best of the researcher's knowledge, this is the first study that considers the SDLC within the NPSD lifecycle.

It was previously mentioned that technologically skilled project and product managers perform better than those who do not have a detailed understanding of technology. The success of risk practitioners can also be partially attributed to strong IS/IT skills. During the AR cycles, lack of technology understanding resulted in risk exposure. An additional observation was that Regulatory, Legal and Privacy employees sometimes failed to understand the context of risks due to insufficient IS knowledge.

A further risk unique to this study is technology development, which was regarded as the third-most prevalent operational risk after project management and external provider risks. New technology elements were added as a result of the research, such as technology security, standards conformance and ICT solution planning development and maintenance (covering the full SDLC). Additionally, ICT technology problems such as architecture and platform design, systems integration, old technology that lacks flexibility, manual integrations in billing systems, scalability of systems, lack of adherence to change control and release processes were noted. For service organisations that are driven by unrealistic timeframes, compliance to robust ICT practices is essential.

Pure technology challenges such as systems integration, architecture and platform design and lack of customization ability on systems hampered the development of new P&S. In the Consumer business unit, the technology team was restricted by incomplete functional specifications, whilst the product managers blamed the quality of technical delivery on the technology teams. Insufficient attention was paid to both post-commercial launch maintenance activities, aggravated by a lack of alarming systems to ensure stable, ongoing system performance. Technology security was entrenched during the systems development cycle and the strong capabilities of the technology security team prevented incidences from arising during NPSD. It could, however, not be the case for other ICT organisations that do not follow these principles and do not have a strong technology security team. However, not following change management procedures during the SDLC could expose the P&S to further security information incidents, as security testing is not conducted with new application releases.

Product managers lacked awareness of capacity and BCM requirements until incidents arose, due to a lack of scalable vendor systems. In some cases, the adoption of services exceeded expectations; a scenario that was not anticipated and led to system downtime adversely impacting on customers. Adherence to formal change and release management, escalation and insufficient helpdesk support had further permutations for the quality of NPSD.

In addition to the operational problems that plague technology development, there is always the consideration of new technologies such as data commoditization and cognitive technologies. These present new challenges in terms of skills development to deliver the best solutions. In this respect, standards and conformance to well-known technology standard organisations can drive best practice behaviors.

New technology capabilities would, to a large extent, drive future opportunities for new P&S. The first prerequisite is to keep up with current technology developments. Technology ‘everything as a service’ (XaaS) and the Internet of Things (IoT) will determine the capacity at which growth will take place. Consumer usage of these services will also be a determining factor in sizing environments for these services.

It is the researcher's perception that technology teams are so bogged down by everyday challenges; crippled by unrealistic expectations of delivery, that they often implement technology without considering how innovation opportunities can be exploited. Examples include consolidation and virtualization, which affords businesses with scalability, agility and allows the organisation to do more, with less. This would provide sufficient time for operational teams to deliver flexible and efficient solutions as a prerequisite for meeting consumer needs and stimulating innovation practices.

Business model innovation will become more relevant to technology teams since organisations need to consolidate parts of solutions to deploy capital-intensive investments. Many IoT deployments seem like 'technology for technology's sake', rather than driving 'real-world benefits', which is where business model innovation would assist in providing a Connected Service eXperience (CSX) (O'Donnel, p.1, 2016). To become a significantly differentiated presence in an increasingly competitive landscape will undoubtedly require an innovation mentality from technology teams.

Governance, Risk and Compliance

Innovation researchers have largely ignored the second-level risk constructs of legal and regulatory compliance, privacy, governance, fraud management, money laundering and security. From these, regulatory compliance and privacy are considered to be more important than the other risk factors. However, any of the risk factors could impact on the success or failure of a P&S.

Consideration of GRC sub-constructs will become more prevalent in future with particular reference to regulatory compliance being shown to be a major driver of technology procurement. New technology initiatives like IoT, presents a myriad of regulatory and privacy risks that should be considered during the NPSD lifecycle. Fraud, CML and security are all subject to regulatory compliance and lack of awareness of these aspects could expose ICT organisations to significant risks. It is also especially relevant to consider opportunities for and implications of corruption during tender processes.

It is further recommended that product managers increase their knowledge of risk and compliance factors. We live in a world stringently governed by regulations. Proactive compliance and stakeholder management can possibly be turned into strategic advantage by building credibility in the brand, its products and services and ultimately, drive customer satisfaction.

The next section discusses the research contributions of the high-level constructs.

Information and Communications Technology

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Technology support in service development is underestimated in the innovation literature. A reason for insufficient customer care and help desk support was insufficient access to supporting systems and reliance on manual procedures. Similarly, not having a single view of the client or insufficiently targeted market information could be traced to insufficient data warehousing and data mining technology. Escalations procedures that are inefficient are also blamed on inadequately managed systems. Poor quality services launched in the market can often be traced to poor testing procedures that are likely attributable to an insufficient technology testing environment and inadequate access to testing equipment. Privacy incidences can result from a lack of technology security controls that have not been entrenched during the P&S lifecycle. The NPSD can be aided by the use of workflow systems to track timely deliverables.

It would be remiss of innovation researchers to ignore the importance of technology development during NPSD. Without technical or SDLC knowledge it would be difficult for product managers to relate to the technology development team and understand their requirements. Without the technology group, there would be no product or service. To the best of the researcher's knowledge, this is the first study that considers the SDLC within the NPSD lifecycle.

It was previously mentioned that technologically skilled project and product managers perform better than those that do not have a detailed understanding of technology. The success of the risk practitioners was also partially attributed to strong IS/IT skills. During the AR cycles, lack of technology understanding caused risk exposures. Regulatory, legal and privacy employees sometimes failed to understand the context of risks due to insufficient IS knowledge.

Unique to this study, technology development was regarded as the third-most prevalent operational risk behind project management and external provider risks. New technology elements were added as a result of the research, such as technology security, standards conformance and ICT solution planning development and maintenance (covering the full SDLC). Additionally, ICT technology problems such as architecture and platform design, systems integration, old technology that lacks flexibility, manual integrations in billing systems, scalability of systems, lack of adherence to change control and release processes were noted. For service organisations that are driven by unrealistic timeframes, compliance to mature ICT practices is essential.

Pure technology challenges such as systems integration, architecture and platform design and lack of customization ability on systems hampered the development of new P&S. On the consumer side, the technology team was restricted by incomplete functional specifications while the product managers blamed the quality of technical delivery on the technology teams. Insufficient attention was paid to both post-commercial launch maintenance activities, aggravated by a lack of alarming systems to ensure ongoing performance. Technology security was entrenched during the systems development cycle and the strong capabilities of the technology security team prevented incidences from arising during NPSD. It could, however, not be true for other ICT organisations that do not follow these principles and do not have a strong technology security team. However, not following change management procedures during the SDLC could expose the P&S to further security information incidences, as security testing is not conducted with new application releases.

Product managers lacked awareness of capacity and BCM requirements until incidences arose due to a lack of scalable vendor systems. In some cases, the adoption of services exceeded expectations; a scenario that was not anticipated and led to system downtime adversely impacting on customers. Adherence to formal change and release management, escalation and insufficient helpdesk support were additional challenges impacting on the quality of NPSD.

In addition to the operational problems that plaque technology development, there is always the consideration of new technology such as data commoditisation and cognitive technologies that present new challenges in terms of skills development to deliver the best solutions. In this respect, standards and conformance to well-known technology standard organisations can drive best practices.

New technology capabilities would, to a large extent, drive future opportunities for new P&S. The first prerequisite is to keep up with current technology developments. Technology 'everything as a service' (XaaS) and the Internet of Things (IoT) will determine the capacity at which growth will take place. Consumer usage of these services will also be a determining factor in sizing environments for these services.

It is the researcher's perception that technology teams are so bogged down in everyday challenges, crippled by unrealistic expectations of delivery that they often implement technology without consideration of how innovation opportunities can be exploited, such as consolidation and virtualisation which creates agility and allows the organisation to do more with less. This would provide sufficient time for operational teams to deliver flexible and efficient solutions as a prerequisite to meet consumer needs and stimulate innovation practices.

Business model innovation will become more relevant to technology teams since organisations need to consolidate parts of solutions to deploy capital-intensive investments. The point is that currently many IoT deployments seem like 'technology for technology's sake', rather than driving 'real-world benefits', which is where business model innovation would assist in providing a Connected Service eXperience (CSX) (O'Donnel, p.1, 2016). To become a significant player in this market, an innovation mentality is required by technology teams.

Governance, Risk and Compliance

Innovation researchers have largely ignored the second-level risk constructs of legal and regulatory compliance, privacy, governance, fraud management, money laundering and security. From these, regulatory compliance and privacy are considered to be more important than the other risk factors.

However, any of the risk factors could impact on the success or failure of a P&S.

Consideration of GRC sub-constructs will become more prevalent in future with particular reference to regulatory compliance being shown to be a major driver of technology procurement. New technology initiatives like IoT, presents a myriad of regulatory and privacy risks that should be considered during the NPSD lifecycle. Fraud, CML and security are all subject to regulatory compliance and lack of awareness of these aspects could expose ICT organisations to significant risks. It is also especially relevant to consider corruption during tender processes.

It is further recommended that product managers increase their knowledge of risk and compliance factors. We live in a world stringently governed by regulations. It could be entirely possible that proactive compliance can be turned into a strategic advantage by building trust in the brand and promoting customer loyalty.

The next section discusses the research contributions of the high-level constructs.

6.3.2 High-level Constructs Relative Importance

The research contributions relating to the main dimensions of the IRMF are subsequently discussed, once the relative importance of the high-level constructs has been examined.

Innovation practitioners do not agree on the relative importance of dimensions (Cooper and Kleinschmidt, 1995; Kahn et al. 2012). In this study, the high-level construct of 'process' was listed as the biggest concern of NPSD practitioners. It can be assumed that the importance of the dimensions changes according to the maturity and requirements of the organisation.

From the researcher's experience, 'organisational culture' could be the most important high-level construct. For the whole IRMF, it is suggested that the priority order of high-level constructs are: (1) culture; (2) process; (3) strategy; (4) technology; and (5) market. Each of these high-level constructs should be assessed in term of the high-level construct of GRC. A leadership culture that promotes innovation will drive adherence to a robust NPSD process that will, in turn, foster innovation best practices that could lead to improved performance and quality of NPSD. An innovation leadership culture would define a clear long-term robust NPSD strategy aligned with organisational strategy and ensure that robust portfolio management processes exist. Portfolio management would ensure sufficient resource allocation and that only the very best P&S, as determined by the strategic direction of the organisation, will be developed. If a robust NPSD process with clear stage/gates and metrics exists, the metrics will determine if a P&S can progress to the next phase. Included in these metrics will be clear requirements for market and customer research, aligned to best practices to effectively exploit opportunities in selected target markets.

The organisation studied is known as a market leader in the industry, yet failed to comply with best NPSD practices. It shows that organisations could still be useful at NPSD with practices that significantly differ from those that are recommended (Markham et al. 2012).

6.3.3 Characteristics of B2B and B2C Services

A secondary question that was asked by this research is, what are the differences between managing risks for B2B innovation and B2C innovation? This section discusses generalizable findings of the research particular to the unique characteristics of services as analysed in the literature review (refer to section 2.5.5.1).

The primary reason for launching B2C services was as a response to competitive actions. The prevalence of short-term consumer services is predominantly driven by aggressive competition that indicates strategic alignment to customer retention strategies. It therefore may not seem that B2C services are always financially viable, but retaining a customer is always a sustainable long-term business proposition. The primary objective of launching B2B services was to introduce new technology initiatives in response to new market opportunities. Since bigger financial investments were required to support B2B innovation, alignment with organisational strategies is more critical to procure sources to support financial investment. A fundamental requirement for the continued sustainability of B2B organisations is a strategy that is supportive of procuring new technologies to allow more efficient converged billing and subscriber monetisation to create competitive opportunities, replace legacy technology systems and obtain new technology.

The types of services that are predominantly launched by B2C are low-risk incremental services. However, indicative of the need to search for new revenue opportunities, some new ventures are introduced focusing on long-term strategies for new markets. Using customer market research effectively will assist in developing monetisation strategies to support the introduction of more competitive services.

B2B services largely fitted the portfolio category of ‘new developments’, which are technology developments for current markets with known needs. However, new ventures exploring new markets, made possible by new technology opportunities, are also explored. It is established that ICT organisations, in general, are consistently seeking new revenue opportunities by branching out into new ventures and markets. These types of new ventures introduce both technology and market risk and fall within the highest category of the service portfolio. The ability to perform an effective risk assessment with consideration of not repressing opportunities becomes more imperative. It can, therefore, be argued that RM will become more important in future for NPSD.

B2B mainly used market analysis and the technology landscape as sources for new ideas, which means that, similar to B2C it looks, to some extent, to competitors for ideas. Technological barriers to prevent competitors from replicating services were hardly ever applied by B2C, except when new ventures, like mobile money, were launched. New investments in new technologies and storage created such barriers for enterprise services. While B2C is subject to intense competitive pressures, the main sources of demands on B2B relate to requirements from top customers for new functionality.

B2C customers require the organisation to be innovative and provide competitive offerings. Perceptions of the innovativeness of the organisation directly impact brand value. Relevant to innovation, it is noteworthy that the organisation introduced a separate functional department to focus on innovation opportunities at the end of AR iteration three, with financial awards being offered for innovation ideas. Essentially, there was some acknowledgement that innovation was stifled, which is indicative of a mature organisation. However, innovation research indicates that while product innovation can benefit from a separate R&D function, innovation for services should be ingrained during the NSD process. It is therefore unlikely that a silo approach to innovation would work in a service organisation. As supported by the literature review, ineffective portfolio management, allowing too many services to be launched and keeping the resources occupied, instead of allowing free time to experiment and collaborate, stifles innovation.

Both B2B and B2C were perceived as inefficient regarding market segmentation and customer needs analysis. The organisation was sitting on a mine of 'big data' but could not implement an effective data warehouse environment. Due to this ineffective harnessing of customer information, and no single view of the customer, a lack of focus on market segmentation and customer needs analysis resulted. Privacy risks were additionally created as data mining was outsourced to third party providers in attempts to fill the gap. Furthermore, mining data in silos did not achieve a comprehensive view of the customer. Therefore, all ICT organisations that are not effectively mining their customer data could be exposed to these risk aspects.

B2B organisations typically have fewer, higher-value clients compared to B2C organisations. High-end enterprise customers assume more risk when purchasing B2B services. To reduce the risk perception of the business customer, robust, flexible technology controls and adequate customer support are essential. The risk for business consumers is being locked into long-term investments, which might be detrimental when more competitive offerings are available in the market. Hence, there is a requirement for B2B to stay ahead of the technology innovation curve.

B2C services were harder to evaluate for consumers due to lack of tangible aspects. Marketing strategies also did not extend to the 5P's and failed to convey elements of tangibility. Service advantages are not effectively advertised since the focus is often on advertising the brand. Focusing on brand advertising, to the detriment of selling service functionality, effectively harms NPSD.

B2C marketing typically consists of advertising campaigns, which would be inadequate for some B2B customers. In addition to targeted advertising campaigns, extensive relationship building is essential to obtain sales. Furthermore, the sales cycle in B2B is typically slow. Investment in training and collaboration with sales staff is especially important if the B2B service is complex. If the sale cycle is too slow, the technology could be outdated and return on investment might not be realised in time. Upgrading to technology that allows faster roll-out of services could assist in mitigating such risks.

For B2B, increased collaboration with sales staff is required to ensure realistic sales projections and selling of the enterprise service. A sales person is also inclined to sell services that are easy to sell and provide the most personally profitable incentives. Such risks should be considered during the design of enterprise services and incentives should be customised to allow sales of complex services with lengthy sales cycles.

Innovation research indicates that losing a B2B customer is potentially more onerous than losing a B2C consumer. However, a large percentage of the B2B customer base offer opportunities for fixed income via fixed line rentals (such as Small and Medium Enterprises (SMEs)) while for B2C, consumer income is more unpredictable and dependant on usage. The IoT, for instance, offers more growth opportunities for consumers while B2B services can easily become saturated if the B2B customer does not outgrow their usage capacity.

B2B services are more technologically intensive than B2C services. Subsequently, the development of platform capabilities that allow the rollout of additional services more easily was a higher priority for enterprise services. It should equally be beneficial for consumer markets. However, within the current fast-changing market, investing in a platform that is inflexible and unable to compete with technology advances, can present more risks.

B2C services were more exposed to stakeholder and reputational risk than B2B, since the potential reputation and brand damage was bigger, due to the large customer base and therefore, the likelihood of social media exposure is augmented.

Many more distinguishing characteristics between B2B and B2C were noted, but only the most significant ones are reported here. Further recommendations regarding distinguishing characteristics are contained within the IRMF.

In summary, the following suggestions (based on this study) can support high-technology service organisations to be more effective at innovation:

a) Leadership sets the tone for following best practices in NPSD. Appoint executives that will create a culture of innovation and drive best practice.

b) Link performance of teams to best NPSD practices. Formalise KPIs and apply across the business.

c) Institute robust portfolio management practices to reduce the number of projects and focus on quality. Additionally, free-up resources by retiring non-performing P&S.

d) Invest in technology that can support NPSD to drive strategy and increase performance. These include workflows, KM systems, and Data Mining. Any manual processes need to be examined for associated risk.

e) Exploit customer understanding (within a framework of privacy) to drive innovation.

f) Apply KM practices since this saves time and cost and prevents reinventing the wheel.

g) Innovation requires time. To unlock innovation capacity allows employees free time and resources to experiment with new ideas and business models.

h) Do not only focus on the immediate service, but also the supporting environment to improve efficiencies such as supply chain and business processes.

i) Follow a robust but flexible NPSD process customised according to the risk profile and type of P&S.

j) Favour appointing technology skilled resources in NPSD.

k) Exploit opportunities in compliance and do not only focus on the negative side of risk. At the same time consider risks in opportunities such as tenders.

l) To launch good quality services requires attention to many risks and opportunities. Having a defined framework that considers both opportunities and risks, will improve the capability of the organisation to deliver improved P&S.

The RM process is generic and transferable to other environments. It has been tested extensively over several iterations with a broad range of P&S.

6.3.4 NPSD Research Contribution

The next section discusses the research contributions to NPSD. Researching NPSD innovation as well as risks is considered to be a promising field of study (Eris and Ysar, 2006; Ostrom et al. 2010; Wu, 2012). This study makes several contributions to the NPSD literature. Firstly, the IRMF provides a framework that comprehensively defines risks and innovation factors. Effective frameworks for NPSD do not currently exist (Leiponen, 2005; Maglio and Spohrer, 2008). Most NPSD studies have focused on quantitative aspects, failing to provide an accurate representation of 'real world complexity' (Biemans, 2003, p. 524). When frameworks exist, they are often not regarded as being sufficiently comprehensive to guide NPSD implementations (Ernst, 2002; Papastathopoulou and Hultink, 2012; Yen et al. 2012). Furthermore, practical guidance facilitating daily NPSD working conditions is lacking (Barczak and Kahn 2012; Krishnan and Ulrich, 2001).

NPD frameworks consist of between four and seven dimensions (Evanschitzky et al. 2012; Henard and Szymanski, 2001; Kahn et al. 2012; Montoyo-Weiss and Calantone, 1994). Agreement on the number of dimensions does not exist, nor are the activities identified that are associated with the dimensions (Papastathopoulou and Hultink, 2012). The IRMF produced by this study consists of 24 NPSD risk categories consolidated in six dimensions. The number of risks is representative of the actual situation within an organisation that launches a vast number of new P&S. NPSD studies fail to address risk factors such as regulatory compliance or privacy risks that influence the potential success or failure of a project (Drew, 1995). The risk framework furthermore provides definitions and objectives for each second-level construct, which NPSD researchers often fail to do. Ernst (2002) blames fragmented innovation research on the lack of defined dimensions.

The premise behind the IRMF is that NPSD requires consideration of a wide number of risks. Therefore, this study offers a comprehensive set of risk and innovations factors. The quantitative analysis indicated 20 factors responsible for more than 75% of the total variance of the model. The model did not test the high-level construct of organisational culture and the second-level construct of portfolio management during the quantitative analysis. Considering that some factors loaded together, only two risk second-level constructs were not meaningfully represented, namely governance and investors and stakeholders. As indicated by the factor analysis and actual NPSD practice, these constructs could currently not be a major contributor to the IRMF. These constructs were, however retained as proactive measures since these were indicated as new research areas for NPSD (Smith and Fischbache, 2005). The IRMF should evolve as new research emerges about innovation best practices and risks.

No single risk factor was a strong predictor in the model. However, significant relationships were detected amongst all second-level constructs, confirming that effective NPSD RM requires analysis of several potential risks that have not previously been studied. All of the risk factors indicated significant relationships with product performance, which means that changes in some risk factors are related to changes in product performance and that the quality of RM can impact on the quality of the P&S.

The vast majority of innovation research focused on products rather than services (Evanschitzky et al. 2012; Papastathopoulou and Hultink, 2012; Magio and Spohrer, 2008). A contentious point in NPSD is whether to analyse products and services separately or combine the two streams (Hull et al. 2000). Since services have unique attributes, knowledge transfer cannot be automatically assumed (Yen et al. 2012). This study bridged this gap by initially examining products and services separately to determine distinctive characteristics of each. However, criteria reported as essential for products were also in many cases regarded as significant for services.

During the AR research, mainly service developments were studied. However, some products were launched and the study could not detect clear differences. This study, therefore, supports the use of the assimilation approach whereby P&S research is combined as it reflects similar critical success factors (Hull et al. 2000). Nonetheless, this study supports the finding that the importance of particular dimensions can differ depending on whether it is a product or service (Nijssen et al. 2006). Such differences have been included as recommendations within the IRMF.

Due to the intangible nature of services, research is more challenging and complex, which could be an attributing reason for insufficient academic attention to services (Maglio and Spohrer, 2008). Despite the renewed interest in services, service research is scarce (Yen et al. 2012). This research extends the body of knowledge on service development.

While service research has been scarce, innovation research focusing on businesses as customers is even rarer (De Brentani and Raggot, 1996; Leiponen, 2005). From AR iteration two, the B2B division was included, which allowed the opportunity to analyse the differences between consumer and business innovation. Similar critical success factors exist but some factors could be especially beneficial in the B2B context. These recommendations are indicated in the IRMF and primary distinctions are advised.

NPSD researchers often discuss best practices or critical success factors. Kahn et al. (2012) argue that consensus exists among NPSD practitioners about what constitutes poor and best practices, while Kuczmarski (2006) disagrees. The research shows that product managers who are responsible for the overall performance of the product display behaviour that indicates ignorance of best practices. To ingrain ‘best practices’ in the organisation, the IRMF second-level constructs ratings were customised along four levels of maturity. To the best of the researcher’s knowledge, no previous innovation and risk research adopted such an approach. The generic IRMF maturity framework is useful in providing what Notargiacomo (2006, p. 123) describes as a ‘common language’ and tool for benchmarking performance. This research furthermore applied the maturity framework to indicate the maturity levels of the organisation under study during the closing phases of AR iteration three. While these ratings are specific to the organisation, they provide a manner in which other ICT organisations can monitor status against the maturity framework for a leading ICT organisation. Extensive testing was conducted to verify the application of rating criteria to second-level constructs. The maturity framework provides guidance and does not support the notion that the highest level of maturity should be achieved, as some ICT contexts could require more flexibility, and best practices could differ amongst ICT organisations for NPSD to exist (Henard and Szymanski, 2001; Loch, 2000).

This research also applied CMM models, to evaluate the NPSD processes at the start of each AR cycle. These were, however regarded as insufficient to address the complexity of NPSD in a large organisation in high-technology environments. This study detected correlations between the maturity rating and the extent to which RM was implemented in the organisation. It seems the more RM was entrenched, the higher the maturity rating. However, since the CMM was applied within the context of the organisation, further research would be required to verify if correlations exist in other organisations.

The research additionally expanded on existing theory regarding factors that would lead to more successful products and services.

6.4 Risk Management

The RM findings are summarised and discussed in terms of RM research contributions to practice (section 6.4.1) and research contributions to theory (section 4.4.2).

6.4.1 Risk Management Research Contributions to Practice

This section provides characteristics for the successful RM within NPSD. A key finding of the research in line with the objective and research questions was that RM was effectively embedded in various NPSD settings within the organisation. Risks were fully embedded in all the major NPSD activities and specialist risk functions.

This study has indicated that managing risks in NPSD is complex, time-consuming and requires the attention of dedicated risk practitioners. It is not a once-off exercise, as new risks can be introduced during each stage of the NPSD lifecycle. Risks not sufficiently addressed in the planning phase, have a direct impact on the development phase. RM approaches that are restricted to one-off risk assessments are not likely to succeed.

The IRMF high-level and second-level constructs were validated by the research and the IRMF provides a generic framework for the managing of risks. An important contribution of this study is the inclusion of several risk disciplines within the GRC second-level constructs. Of these, regulatory and privacy was regarded as the most relevant to each P&S. However, the other second-level GRC constructs cannot be discarded as it has been shown that a single risk that has not been efficiently addressed can have major financial and reputational risk impacts. Risks areas that require additional research include environmental hazards and supporting a green IT environment for NPSD. However, the inclusive practices in the IRMF can serve as guidelines to develop more comprehensive risk interventions for these second-level constructs.

The high-level construct of culture was embedded in critical areas. While the risk practitioners holistically succeeded in embedding a culture of RM within the organisation, full integration of organisational culture was not achieved. The expert analysis validated that RM has succeeded in assisting the NPSD teams to prioritise better and consider alternative courses of actions, contemplate and improve their understanding of the source and/or scope and/or nature of uncertainty and assist in their consideration of how to treat uncertainty. The risk practitioners would not have been able to implement successful risk interventions without changing the organisational culture. The AR study indicated that risk practitioners were hesitant to point out poor organisational culture practices that could influence NPSD, especially if related to executive behaviour. The risk practitioners overcame such constraints by improving relationships and obtaining executive buy-in as support for good RM practices.

The study has furthermore indicated that different groups have different opinions and concerns about the extent to which RM practices exist in the organisation. Differences were detected between the various ways that the technology, marketing, GRC and NPSD groups view risks. The collective impact on ICT organisations is that product management creates risks by wanting to launch products faster and not providing sufficient information for technology teams. When risk awareness training is conducted, these different perceptions should be considered and training should be provided in areas that are lacking for the different groups. Furthermore, distinctions existed between the responses of the B2B and B2C practitioners. Dissimilarities could be attributed to different levels of maturity between the B2C and B2B organisations that were still relatively new.

However, many differences could be generic to the ICT context and are included as recommendations within the IRMF. The risk analysis should, therefore, consider the unique qualities of the P&S.

The RM approaches used in this study were based on characteristics of successful RM practices in NPSD (refer to section 2.11.6). The features that aided implementation of RM within the context of this study are subsequently discussed.

RM within NPSD requires an executive mandate. Without such a mandate it would be challenging to convince product and project managers to conform to RM practices. A mandate is especially mandatory in the early stages as the power base of RM (as a supporting discipline) is weak compared to perceived more important disciplines like NPSD (Leonard, 1992).

Included in the mandate is the assumption of the existence of a dedicated and independent RM team to assess risks in NPSD. The study confirmed that RM in NPSD would best be conducted by an independent risk team and not by NPSD practitioners since some have been indicated as prime sources of risks through failure to align with best practices in NPSD.

A key success factor for the study was the motivated and multi-skilled risk professionals. The team had a multitude of degrees and industry-specific technology certifications, as well as expertise in many other risk disciplines. This allowed a thorough understanding of the various risks and enabled them to guide the implementation of robust controls. However, the team was required to be flexible to accommodate continuous changes, had influence with senior leadership and could communicate persuasively while being persistent in the face of resistance. The team was exceptionally motivated to ensure that risks were adequately managed and protective of the brand reputation of the organisation. The qualities of the group indicated that they had a good understanding of the risk complexity, had extensive technology experience and were able to communicate effectively with stakeholders.

A systematic and efficient process to conduct RM is furthermore required. The process should not be rigid, but customisable to fit the context of the P&S. The process should also be integrated into the NPSD lifecycle phases with clear risk deliverables at each stage/gate.

The risk appetite and culture of the organisation should be acknowledged when analysing risks in NPSD. Control measures should consider the P&S objectives and risk appetite in a manner that establishes the benefits versus risks. Such an approach can protect against innovation being stifled by ensuring that risks are mitigated without affecting the success of a P&S.

A critical success factor of the IRMF was that the risk methodology was designed for an innovative, technology-intensive industry by consolidating best practices from various disciplines such as project RM, change management, stakeholder management and software development. Risk assessments are therefore unique since they consider elements that can be effective in improving the NPSD capabilities of the organisation. Furthermore, such a strategy is beneficial to the NPSD group since areas of weakness are identified that are most critical to the performance of NPSD and ultimately improve the organisation.

The risk mitigation strategy is unique as it concentrates on reducing ambiguity and uncertainty and building proactive RM by implementing controls early in the process. The strategy was combined with audit approaches to ensure that controls are implemented before launch. Furthermore, risks and controls were based on facts and not hearsay. A lesson that was learnt early during the AR iterations was that NPSD practitioners do not always ensure that requested controls are implemented. The search for factual information was carried through to the operational risk questionnaire where interviewees' perceptions were validated with factual information by linking observations to incidents documented in an incident register.

The risk process is also aligned to ISO 31000 to ensure more efficient and effective risk management. The ISO principles were especially helpful considering stakeholder communications that are included as a second-level construct of the IRMF.

The risk process allowed precise identification of responsibilities and accountabilities to ensure that risks are adequately addressed. In a big organisation, which regularly restructures, it is not always clear who is responsible for individual risk mitigation actions.

Finally, the lessons learnt, risk databases, incidence registers, whitepapers, maturity frameworks and risk documentation facilitated learning and improvement of the NPSD groups. A practice that has not been well-implemented during this study, due to the excessive workload of the risk practitioners, but when applied, has worked very successfully, is the necessity of communicating risks and risk initiatives to employees and partners to improve risk responsiveness. The research has indicated many areas where NPSD practitioners were largely unaware of certain practices, such as RA. Such communication strategies can potentially be extended to reach customers to increase customer loyalty as has been confirmed by fraud studies.

In summary, the attributes of successful RM practices in high-technology environments are deemed to be:

a) The existence of a CEO mandate providing authority for the risk team to implement RM within NPSD and applying veto powers in case of excessive risk exposures.

b) The presence of a dedicated, motivated risk team with good communications skills who are multi-skilled in a variety of risk, IT and NPSD disciplines.

c) A systematic and efficient process aligned to ISO 31000 RM standards that is adapted to the context of NPSD and considers risk appetite and culture of the organisation.

d) A comprehensive framework that consolidates best practices from various disciplines with potential risk incidences in an easy-to-use framework that can promote learning and serve to expand the NPSD capabilities of the organisation.

e) NPSD risk assessments should be proactive, based on factual information, allow risk-informed decision-making and reduce ambiguity and uncertainty by allocating responsibilities for risk mitigation.

f) The RM process should facilitate learning from past lessons and increase risk awareness by applying effective communication strategies.

The RM process is generic and transferable to other environments. It has been tested extensively over several iterations with a broad range of P&S.

6.4.2 Risk Management Theory Contributions

The research was based on an existing body of knowledge in IS, RM and NPSD as well as other supporting disciplines. These insights have been combined into a framework that supports effective RM within NPSD.

Existing NPSD risk frameworks have limitations concerning guiding informed risk decision-making during NPSD lifecycle activities (Nada et al. 2010; Trajtenberg, 1990). RM is often not integrated within the lifecycle of NPSD or focuses on a limited number of risk categories and cannot be considered comprehensive (Barczak and Kahn, 2012; Mu et al. 2009; Nada et al. 2010; Olechowski et al. 2010). Consensus about risk categories and risk methods do not exist and critical success factors for innovation are often not considered (Keizer et al. 2001; Wang et al. 2010). Additionally, existing frameworks rely on a limited number of projects and fail to consider the context-specific characteristics of P&S (Oehman et al. 2010; Tang et al. 2011). Risk studies performed in IS were deemed to be weakly supported by innovation and risk theory (Lyytinen et al. 1998).

The contribution of this study is framed against the background of deficiencies sketched above. The study is performed in a real-world organisation that launched over 600 products and services during the AR cycles. The IRMF and supporting risk processes are integrated within the NPSD lifecycle and focus on a considerable number of risk categories provided as second-level constructs.

Risk approaches for NPSD are based on a between eight and 12 main risk categories (Nada et al. 2010; Keizer et al. 2002). The study utilises 24 second-level constructs that provide a generic but comprehensive overview of initial success and risk factors that can be adapted to the unique characteristics of the organisation and used as a basis to develop resolution strategies.

The IRMF and risk methodology effectively support multiple diverse settings as it has been demonstrated that the IRMF can effectively be applied within B2B, B2C, mobile-health, M2M, financial, insurance, m-money, IT projects and in other countries. The usefulness of the IRMF increased as it became more robust during the AR iterations by expanding, consolidating and discarding some risk second-level constructs and combining others. The IRMF is straightforward and easy to use and understand, but the IRMF risk approach is designed to be guided by risk practitioners who are the experts in a broad range of risk disciplines.

Limited research exists on how to establish and implement RM practices within NPSD (Oehman et al. 2014; Park and Kim, 2011). The IRMF and methodology provide a structured and generic approach to implementing RM within NPSD that can meet the needs of any ICT organisation. The IRMF and methodology provide practical ways to allow practitioners to anticipate possible risks.

The risk methodology supports NPSD practitioners to prioritise the NPSD project according to the overall risk profile of the project and the type of P&S. The method offers an easy-to-use and practical approach to prioritise the workload of risk practitioners. Prioritisation extends to the specific risk factors associated with the type of P&S. Three different engagement processes are followed, depending on the risk profile of the project. Few previous studies have adopted this approach.

This study introduces several departures from traditional RM practices. First, the IRMF methodology evaluates risk not individually but per second-level risk construct. Most studies assess each risk by defining its impact, probability and control effectiveness. Each risk second-level construct has many associated risks. Instead of following the arduous route of assessing each risk individually, an overall rating is assigned to the second-level risk construct. The idea is to reduce information overload.

Second, the risk ratings are indicative of maturity ratings. Theoretically, the higher the maturity rating of the NPSD process, the higher the quality of the resulting P&S (Dooley et al. 2001). Four levels of risk criteria exist. Levels 1 and 2 indicate poor practices, Level 3 intermediate, and good practices are indicated at Level 4. During NPSD 'there are clearly some poor practices that managers should avoid and best practices to which managers should ascribe' (Kahn et al. 2012, p. 180). Levels 1 and 2 require interventions to improve practices to an acceptable standard of quality. These interventions are mandatory. Level 3 actions are voluntary and consist of improvement suggestions, but the implementation is left to the discretion of the product or project manager.

Third, maturity ratings are not applied to individual projects. This is another significant departure from conventional risk methods. The research proposes that if the maturity of individual projects can be increased, it follows that the overall maturity of the processes will improve. The risk criteria combined an audit approach with the risk approach that ensured that actual controls implemented were verified.

The fourth distinction from other studies is the focus on risk resolution actions. Many risk studies do not list risk resolutions actions but merely serve to identify risks (Sarbacker and Ishii, 1997). The risk methodology not only considers risk mitigation but also differs regarding the risk reduction strategies applied. A special departure from other studies is that the primary risk resolution strategy applied focuses on reducing ambiguity and uncertainty during the NPSD process. Absent information and a lack of understanding inhibit achievement of the P&S objectives. Level 1 and 2 ratings will often indicate areas where ambiguity and uncertainty exist. At the start of the NPSD lifecycle, the risk ratings will reflect many instances of uncertainty, which gradually decrease to an acceptable level signifying readiness for commercial launch.

A fifth distinction relates to positive risk management. IS studies predominantly investigate risks from a negative perspective to avert losses, such as those of Alter et al. (1978) and Boehms (1991). The approach followed by this study is to increase positive impacts rather than exclusively focus on reducing the negative aspects. For this reason, both critical success factors and risks are combined in the IRMF framework.

A sixth distinction is that the risk methodology is based on ISO 31000 (2001) standard that guides and provides best practices for RM. The standard was effectively applied within NPSD contexts (Olechowski et al. 2012). Few of the previous risks studies effectively aligned to RM standards. These distinctive approaches worked well in the organisation and were found to address the dynamic and complex nature of NPSD effectively.

A further contribution of the study was to develop a questionnaire to evaluate the effectiveness of RM. Such a comprehensive approach has not been previously applied in research studies to assess the effectiveness of risk interventions.

Furthermore, since the study was conducted in a large organisation in high-technology environments, the RM CMM did not fit the context of the organisation that launches a diverse number of P&Ss At the end of AR iteration three, risk practitioners adapted the CMM maturity model with adaptations for the organisation. It is recommended that high technology organisations adopt similar models and that the current model is expanded to fit the context of different organisations. A generic version of the model called ‘the Navigator’ is presented in the research, which can be customised to the context of other ICT organisations. However, while the Navigator was considered to be successfully applied in a wide number of contexts, further research will be required to rate the applicability to other ICT organisations.

Despite the IRMF adaptability, the risk methodology allows consistent application and comparable results to other risk assessments. The expert risk assessment additionally describes the RM methodology as reliable and contributing to increased efficiency within NPSD.

Since numerous risk and innovation factors were derived from the literature, it could entail that other risk contexts could benefit from this approach. The IRMF was also applied within IS project contexts with some adaptations. The IRMF methodology assisted IS practitioners to identify risks, opportunities and strategies to develop a shared risk perception and action strategy. However, the IRMF was only applied to a small number of IS projects and further research is required to verify its applicability to traditional IS projects.

The IRMF is adaptable, allowing second-level constructs to be aggregated or split depending on the functional requirements of the organisation. The IRMF is categorised according to process elements and business activities that can be combined in different ways. Its flexibility suggests that many organisations can benefit from adopting the approach and that the approach is transferable to other NPSD contexts.

6.5 Action Research

Discussion of the AR process considers the roles, approaches, and processes that were followed to meet the criteria of relevance and rigor.

The value of AR contributions is vested in achieving desired change interventions. The NPSD group was exposed to risk, and the practitioners were resistant to the implementation of RM, as it was perceived as inhibiting innovation. However, perceptions about RM changed during the cycles of the AR iterations. The more embedded RM practices became, the more the perceptions changed. More risk-based decision-making was noted from NPSD practitioners. The P&S specifications were updated with RM feedback to include best practice suggestions. Furthermore, the control requirements to improve P&S quality and protect against potential risk vulnerabilities were implemented. Awareness of risks increased and while some risks were accepted, action plans to address priority risks were implemented. No projects were unduly exposed to risks that followed the formal RM methodology during any of the AR cycles. In some cases, the product managers proactively consulted with risk practitioners before the P&S were introduced into the NPSD lifecycle. It was, therefore, clear that the intervention succeeded in enhancing the competencies of the NPSD practitioners via increased awareness of risks in NPSD.

The research was mandated by a researcher-practitioner agreement that guided ethical considerations such as confidentiality of the organisation and professionals. The researcher acted as researcher-practitioner who collaborated with risk practitioners to develop, implement and reflect on the usefulness of the interventions. All risk practitioners participated in all of the AR activities. While much of AR is collaborative, the risk practitioners did not take part in the final writing of the thesis, which is customary AR practice (Herr et al. 2004). In turn, the risk practitioners and researcher (as a practitioner) collaborated with NPSD professionals.

A cooperative, participatory method was followed, whereby the researcher directed the AR process but collaborated with the risk practitioners to decide, develop and implement the interventions. The researcher initiated the development of the risk framework and informed the risk practitioners of best practices presented in the literature. Collaboratively, the team developed the framework based on additional information sources such as risk incidences. Table 105 in Appendix 8, provides a summary and overview of the AR approach followed with an indication of which activities were conducted in collaboration with practitioners and researcher.

Risk practitioners, under guidance from the researcher, developed risk lists, risk action lists and the risk processes. Reflection on the processes and guidelines was carried out in collaboration with the risk practitioners and NPSD resources. Learning was assessed regarding how the process was conducted and what learning was produced.

Early in the iteration, the team was restructured during a collaborative exercise, which assisted the risk practitioners to subscribe actively to their new roles. Effective risk management is reliant on having motivated, qualified and skilled resources (Olechowski et al. 2012). The clear allocation of defined responsibilities afforded the risk practitioners more opportunities to engage with their respective NPSD team members. Risk practitioners were able to spend more time on relationship building in their area of responsibility and work on cultural changes required towards the development of a more proactive risk culture. The risk practitioners were highly involved during all phases of the AR cycles. They were responsible for the design and implementation of the approaches within the NPSD teams.

The researcher involvement as a practitioner in core activities (development of the IRMF and supporting risk processes) gradually diminished. During AR iteration three, the involvement of the researcher was restricted to reflection and learning phases. In AR iteration three, specialised IRMF versions were developed to meet the needs of B2B and B2C. These adaptations conformed to the specific context of the organisation such as laws, regulations and internal compliance requirements of the organisation. The researcher controlled the general IRMF and risk processes, and the results of the specific IRMF versions are not presented in this study, as these approaches are considered to be peculiar to the organisation. This, however convincingly indicates that the generic IRMF provides a strong baseline from which to develop customised frameworks and make the IRMF transferable to other ICT contexts.

The diminishing role of the researcher-practitioner during the AR iterations indicates that the risk practitioners understood the method and assumed responsibility for meaningful embedding of the AR method, ensuring continuity and development of leaders.

The researcher resumed practitioner duties when new activities were introduced during AR cycle three, such as the design of the privacy/PoPI compliance elements. The generic role of the practitioners was to plan, develop and implement the interventions, document the risk approach, gather and analyse data while the researcher guided activities and documented the lessons learnt from the collaboration. The risk practitioners were highly involved in all work of the research process (except consolidation of information and writing the thesis) and functioned as researcher-practitioners.

Data was predominantly produced by AR interventions through direct involvement, documented as risk assessments, post-implementation reviews, emails, meeting minutes, incidences, risk strategy lists, presentations, databases, memos and additional notes. The researcher's notes included all the surveys and questionnaires, development of the framework and supporting processes, retrospective interviews and participatory observations such as informal discussions with risk and NPSD practitioners regarding how problems were perceived and evaluated.

The data also included the broader context of the organisation with project documentation, including P&S documentation such as functional specifications, technical design specifications, testing documentation, market research, communication plans and project management documentation. The data was collected at the organisational level and per project level, spanning the timeframes of the AR iterations. This context influenced the development of the risk approaches. Additional reference data, such as snapshot surveys lasting four months to establish typical volumes and complexity of the organisation, was collected together with the additional employment of surveys and questionnaires. Triangulation techniques and use thereof implies that the study follows a pluralist approach, by adopting multiple research methods such as interviews and questionnaires to validate findings. The advantage according to Mingers (2001) is that this leads to increased understanding of opposing viewpoints that improves professional practices. The primary purpose of triangulation was to reduce data bias and provide perspectives from NPSD practitioners.

The risk prioritisation strategy failed in the first iteration due to the product manager inadequately completing the assessment, which led to high-risk projects being indicated as low-risk projects. The qualifying questions were insufficient to capture the complexity of a project and the risk practitioners felt uncomfortable abdicating responsibility and preferred to understand the P&S detail. In AR iteration two, a new risk prioritisation methodology was designed, with risk categories informed by quantitative analysis using WBS and removed organisational constraints. Full control was allowed for risk practitioners to complete and change the ratings. However, this too failed as the risk questions were still insufficient to capture the complexity of the P&S and the process of prioritisation was too laborious. This strategy was replaced by AR iteration three, with the use of a portfolio classification which proved to provide an effective means to prioritise services.

The AR approach also contributed to research regarding methods applied during the AR cycles. These include DS approaches for the development of an artefact, the application of the CMM models to measure maturity between AR cycles and the use of SSM methods during the initiation phase to express the problem situation and develop root definitions to develop models of purposeful activities guiding further phases. Delphi techniques were applied to select risk approaches guided by Coughlan and Coghlan’s (2002) planning steps and expert evaluations to determine the effectiveness of RM. The interviews and questionnaires were used during the exit phases of AR cycles one and two to minimise potential observer bias and used NPSD practitioner inputs to improve the IRMF and inform further AR cycles.

For organisations wanting to implement change, AR provides useful perspectives. It is rare to find concrete examples of research-inspired change intervention in an organisation that has delivered such endurable change as in this study. The NPSD practitioners were much more risk and best practice aware and the risk-decision making style and NPSD practices reflected this change. The AR research methodology can then be rightfully credited as a change intervention methodology that can lead to ingrained practices that support the sustainability of the organisation.

For a large-scale study, the following lessons learnt and reflections by the research are important when conducting AR. Although these appear to be formulated as personal experiences at a first glance, the researcher feels that these are quite generalisable and useful advice (if not warning) to all researchers intending to pursue AR.

a) To conduct robust AR research is intrinsically difficult, more so than quantitative studies. Despite its deceptive initial attraction, the proper practice of AR is an uncomfortable, challenging and very work-intensive but rewarding experience.

b) An AR researcher requires a suitable support structure of other students and mentors that can provide guidance and additional reflection opportunities. It is important that the support group includes members who have conducted AR before. Those that have not conducted AR will not understand why the last six months' progress reports consist of: 'I am still editing'. The general public, including friends and family, are unlikely to understand the context and potentially assume that the researcher is not as productive as they claim to be.

c) Establish the criteria for developing robust AR studies early on and work out an AR strategy accordingly. However, be prepared, if not assured, that the plan will (have to) change to accommodate external influences. Nevertheless, the criteria will provide a good support structure from which to deliver interventions.

d) Understanding AR takes time. This researcher perceived that she was knowledgeable when the research started. However, the method and content requirements only become visible as the research process unfolded. Learning about how to conduct AR during the study was as important as delivering the practical interventions. Few studies can guide the researcher more quickly through this process. The shift from single-loop learning to double-loop learning (Argyris and Schön, 1974) in AR is a gradual and painstaking process.

e) In a large organisation, the context changes often. It is therefore important to ensure that the organisational context is newly examined at the start of each phase as part of the initiation phase, especially if the phase cycles are more than six to 10 months in duration.

f) For large organisations, it would be difficult, if not impossible, for a researcher that is external to the organisation to embed practices to the level that was conducted in this study. It is advised that the researcher-practitioner model is best suited for studies of this scale.

g) Literature reviews need to be repeated throughout the AR cycles and would require that the IRMF be continuous updated as new information becomes available. Interventions need to be grounded in theory, as it provides the necessary structure to contextualise the research.

h) A major challenge was to keep track of the deliverables in a structured manner. Many of the phases overlapped and due to the workload demands, progress was often slow. This was overcome by instituting two-weekly meetings to track progress and encourage work-from-home days to speed up delivery. The researcher-practitioner had the authority to do so; outside practitioners would be unlikely to have this advantage.

i) The researcher personally did not find keeping a diary to be useful. Not due to a lack of discipline, but the tendency to focus on outliers rather than general themes guiding the research. It was more practical to reflect in hindsight and in collaboration with the risk practitioners to ensure that broad themes were noted.

j) For studies similar in scope to this one, too much reflection on low-level individual artefacts and components is deemed to be unnecessary. The practice yields more information than can be recorded in a PhD thesis. To save time, it is necessary, from the start, to reflect on a higher level of abstraction and generalisable principles and artefacts.

k) The researcher found the most difficult part of AR to consist of the thesis writing. The researcher tried various alternative formats since initially it did not seem possible to accommodate an AR thesis within a traditional thesis format. However, it is important to satisfy institutional requirements first and as this thesis shows, the structure does fit, with some adaptations.

l) Studies of this size cannot be accomplished without extensive collaboration. It would not have been possible for the researcher to design, implement and reflect on the interventions by herself. It is additionally important to get the buy-in and support from executives and practitioners that a research mandate offers.

m) AR assisted the researcher’s career. The additional work that was conducted as a result of AR led to the researcher receiving excellent performance reviews and industry accolades. These included the Institute of Risk Management (IRMSA) risk manager of the year in 2015, validating the premise that AR leads to good organisational practices and can be rewarding.

The IRMF and risk processes were regarded as useful to manage risk in NPSD, supplement theory and can be transferred to the context of other organisations. Contrary to other AR studies based on a limited number of observations, this study is based on a vast number of projects, which supports the argument for generalisation of the study. Furthermore, the trustworthiness of the research is increased by collaborative practices and mixed-method research application. The research was successful in addressing the problem situation while the knowledge contributions are valuable for other research disciplines.

6.6 Design Science Artefact

This study applies DS to develop an organisation artefact within the main study method of AR. AR and DS methodologies are similar and complementary. However, the measurement criteria are different and key learnings offer unique knowledge in terms of artefacts, while AR knowledge is applied to guide interventions.

This section is presented as three steps. Firstly, the DS approach followed is summarised according to the first three DS stages and the supporting theories that were used for each stage are explained. Secondly, the knowledge contribution (DS phase 4) is articulated reflecting Gregor et al.'s 2013 DS knowledge framework by explaining the knowledge contributions in terms of descriptive knowledge (what?) and prescriptive knowledge (how?). The section is concluded with a practical summary of generic guidelines for the development of risk NPSD dashboards.

6.6.1 Summary of Design Science Process and Theories

The researcher developed a combined approach based on Peffers et al.'s (2006, 2007) DS framework and Sein et al.'s (2011) ADR framework. The difference between ADR and DS is that ADR focuses on the design of organisational-relevant artefacts, while DS focus on technological rigor. Following a combined ADR and DS approach was relevant to this study since the artefact emerges from an organisational context and a purpose was to establish if DS approaches can be applied effectively within an organisational context and AR study. The focus was to aid organisational decision-making rather than present a technological design (Sein et al. 2011).

The research contribution of the DS artefact is subsequently discussed according to Sein et al.'s (2011) ADR 'formalisation of learning' phase to generalise the results in terms of the problem, solution and development of new design principles.

The researcher was interested in using a DS approach to design an organisational artefact, yet models of that nature were not available at the time of research. The design of the dashboard was further based on AR (which formed the basis for the development of knowledge and understanding of risks) and best NPSD practices. The next section is discussed in terms of the first three phases of the DS approach used, namely: (1) problem formulation; (2) design and development of the artefact; and (3) implement and evaluate.

Problem Formulation

The development of the dashboard was incepted by using the first few phases of SSM to identify the problem situation. The RD identified the objectives as to:

> Develop a risk dashboard as a business management decision-making tool for use at NPSD stage/gate meetings, provide key risk metrics in a stylish, reliable, usable and customizable interface and improve understanding and subsequent management of risks and RM processes within NPSD.

Purposeful activities were analysed by using the CATWOE mnemonic to identify customers, transformation actors and ideas, owners and external constraints supported by the worldview. The application of SSM provided a structured formalisation of the problem.

Design and Development of the Artefact

Phase two of the DS approach started with dashboard design. Eppler and Aeschimann's (2009) systematic framework for risk visualisation in RM request answers to *why*, *what*, for *whom*, *when* and *how,* and which kinds of risks and risk-related information (*what*) were analysed. The objectives of the risk visualisation should contain reference to a RM process, framework and the RM process. The content of the risk visualisation was based on which decisions need to be made and whether detailed information or overall patterns of information should be presented. The different stakeholders, and how they can benefit from the process, were identified. The specific contexts within which the risks would be presented, as well as the main purposes and constraints were identified. Lastly, the methods of risk visualisation, such as charts, qualitative or conceptual diagrams were analysed.

Eppler and Aeschimann's (2009) systematic framework provided the basis for establishing how RM should be grounded within risk frameworks, which prompted the evaluation of the dashboard requirements according to the ISO 31000 framework. New objectives were defined based on ISO requirements. The risk dashboard conformed to the RM framework that was used for NPSD, as well as the overall RM framework of the organisation based on the ISO 31000 framework. Additional requirements emerged as a result of the analysis shown above: (1) the dashboard should facilitate consultation with various stakeholders; (2) enable informed risk-decision-making; (3) present the context of the organisation, RM and NPSD; and (4) be representative of the complete RM processes.

The development phase of phase two applied Markus et al.'s (2002) EKP principles. The first principle was to use naïve users as customers and the second, to design prototypes. Conceptual models of the NPSD risk dashboard that could identify 'what' as well as 'how', were prototyped. Many information gaps were addressed by utilising the risk practitioners as naïve users. For instance, the abstraction layer and consolidation of the risk categories were addressed, as were the differences between the two dashboards.

The third principle of designing for offline action was addressed by compliance with the ISO 31000 framework where risks were colour-coded to inspire prioritised action. The fourth principle of integrating expert knowledge with local knowledge sharing, informed the inclusion of unstructured communication. To a large extent, the value of the dashboard was vested in its ability to provide a consolidated view of expert knowledge.

Principle five was to design for implicit guidance. All the terms were clearly defined. The overall risk profile appeared at the top, encouraging users to seek out reasons for the rating by reviewing the top risks below. It was also realised that training sessions were required to guide the users of the dashboard on how to use it.

Principle six focused on 'componentisation' leading to the dashboard design consisting of four components: overall risk rating; compliance rating; portfolio category risk (applicable to development dashboard only); and risk analysis. The compliance rating was based on the captured risk review automated in the dashboard as an overall compliance rating consolidated as a pie chart. The applicable second-level construct compliance ratings were indicated in a spider map diagram. The principal risks heat map and analysis were also automated from the risk review. All of these components were built on top of a knowledge base that consisted of the IRMF risks and controls lists. Changes to the content could easily be made. To maintain the integrity of information, only the risk practitioner was allowed to make changes to the dashboard.

The researcher additionally applied best practices for dashboard development based on principles in Gestalt theory as well as other guidelines.

Implement and Evaluate

The dashboard was presented to the executive in charge of the RM group and not found to be intuitive to use. The dashboards were subsequently demonstrated at five sessions with B2B and B2C teams with users ranging from eight to 12 at a time. The attendees were questioned based on evaluation questions in terms of their impressions of the dashboard relating to usefulness, relevance, adequateness, understandability, complexity and the presentation layout. Positive responses were received, with the strong selling point being the abstraction layer that enabled a bird's-eye view of risks.

The dashboard was implemented and used for a period of five months, after which a final evaluation was conducted. Alignment to its stated objectives was confirmed. As indicated, both the risk and NPSD practitioners, including executives, found the dashboard to be useful. Furthermore, the dashboard complied with Pauwels et al.'s (2009) metrics for analysing the adoption and success of marketing dashboards (refer to Figure 112 in Appendix 8). All relevant users were consulted, the decision-making style of the organisation was considered, interdepartmental coordination was included, as were key industry metrics. The fit between the metrics, sophistication, visual display and drill-down capabilities with the user needs were considered. Implementation considered key success factors such as support of top management, user involvement, prototyping, communication, training and IT department involvement. A positive predisposition was indicated in terms of attitude, trust and delivering on expectations. These criteria can be effectively applied for the development of NPSD risk dashboards.

The dashboard was evaluated in several ways, first by developing proof of concepts to the risk practitioners. Second, by demonstration in two environments, namely B2B and B2C, during which a qualitative analysis was conducted. Thirdly, in practice for a period of five months, after which it was again evaluated by a panel of risk experts. Lastly, the dashboard was implemented in additional contexts which allowed additional cross-case analysis to establish if the dashboard would be applicable to the context of IS projects, mobile-health and the financial and insurance industries in which the organisation operates. At the end of AR iteration three, the dashboard was implemented in other countries in which the organisation operates. The dashboard was also widely tested on over a hundred NPSD projects and could easily accommodate diverse requirements. The adoption and success of the dashboard can be indicated by its increased adoption and use.

6.6.2 Knowledge Contribution

The main knowledge contribution is the way the DS artefact was designed. While a dashboard is a popular tool in the business environment, scientific literature is lagging. Few academic studies exist and limited guidance is provided in terms of dashboards to analyse risks in NPSD (Pauwels et al. 2009; Yigitbasioglu et al. 2012). Dashboard design is still a relatively new area of research (Eppler et al. 2014; Ganholm, 2013). DS approaches were used to design EIS dashboards (Marx et al. 2011), but no risk dashboards were developed for use in NPSD by DS. To the best of the researcher's knowledge, no dashboards were specially developed for managing risks in NPSD on a per project basis.

DS knowledge can be divided into two types, namely descriptive knowledge (what?) and prescriptive knowledge (how?), with the former being a presentation of the problem that informs the research questions and the latter the design theories used to solve similar problems (Gregor et al. 2013).

Sources of descriptive knowledge (what?) included the IRMF and supporting risk artefacts and models developed during the AR. The IRMF consolidated both best practices and risks into the dashboard. The abstraction layer was based on the prioritisation methods developed during the AR iterations, including consolidation of risks into second-level constructs and portfolio classifications. Further contemporary information is being introduced by knowledge about the NPSD lifecycle, stage/gate processes and the different types of knowledge that are utilised at each stage/gate. The ISO 31000 RM process requirements were further introduced during the design of the dashboard.

Prescriptive knowledge sources (how?) were explained in the previous section and subsequently explained as knowledge contributions. The DS research methodology followed a combination of the Peffers et al. (2007) and Sein et al. (2011) ADR processes. This study proposes a methodology that can effectively be applied within the context of a large high-technology organisation, as well as within an AR study. The methodology consists of four phases, of which phase two followed an iterative approach. As new requirements became visible, due to the application of additional theories and methods, these were built into the dashboard design.

Peffers et al.'s (2007) DS approach and Sein et al.'s (2011) ADR processes offer high-level guidance but do not explain how the actual activities of the processes should take place. This study expands on existing research by providing guidance for problem formulation. Support is provided in terms of structuring the problem to obtain a clear understanding of the context, actors and cultural aspects. Application of SSM RD and CATWOE can aid in understanding the problem and serve to guide purposeful action at a high level.

This study additionally suggests that a deeper-level understanding of the class of problem will aid design. For this study, the class of problem was firstly thought of as EIS. The design theories of traditional EIS literature were analysed but were not deemed to be helpful to design the risk dashboard. EIS literature assumes that information is readily available and applies to static organisational environments. This clearly did not fit the circumstances of the organisation. A more creative and flexible approach was required. Following a rigid structure could stifle the development of the NPSD risk dashboard.

The study further expands on existing DS and ADR research by providing guidance for the design of the risk dashboard. Further design requirements can be uncovered by building on structured problem formulation by applying further structured methods aligned to the disciplines that inform the study. In this study this was achieved by applying Eppler and Aeschimann's (2009) systematic framework for risk visualisation. The design requirements were further expanded by introducing another layer of design requirements by including compliance to the ISO 31000 framework. It is thus suggested that design should also consider best practices applicable to the development of the artefact. The approach followed by this research implies that for unstructured problem resolution, the problem should be analysed from several perspectives. It is further recommended that design principles should be analysed in an iterative fashion to allow more structured thinking. If the problem was clearly structured, such a layered approach would not be necessary.

These models served as a useful starting point. However, they fell short in terms of defining 'what' (the content) and 'how' (method). Additional guidance was required to define the content and methods that would be applied to the dashboard. The six principles of Markus et al.'s (2002) EKP theory were applied to design for: (1) customer engagement; (2) knowledge translation; (3) off-line action; (4) integration of knowledge; (5) provision of guidance; and (6) componentisation. The EKP theory was supportive of the way the NPSD group was structured and indicative of the competitive, fast-changing and unique requirements of each P&S. This study expands on Markus et al.'s (2002) EKP theory by proposing that additional processes to support near real-time consolidation of information are supported. One of the reasons for the success of the dashboard was attributed to inclusion of up-to-date, last minute, unstructured information.

Prototyping assisted in solving some of the IS design challenges, such as identification of the right level of information abstraction and visually displaying the diverse elements of the risk analysis cycle, as well as integrating elements of the risk knowledge base. Furthermore, all of these requirements needed to be delivered in a limited time, following a flexible approach to support a high technology, fast-changing context while ensuring that learning resulted. Dashboard design principles were applied to analyse how to arrange volumes of disparate data in a sensible way that conveys meaning (Few, 2013).

The application of EKP addressed IT requirements that Markus et al. (2002) summarise as: (1) inability to define specific user roles; (2) requirement to accommodate knowledge bases that are complex and evolving; and (3) the process that the EKP needs to support is unstructured and changes frequently.

The design of the dashboard would not have been possible without knowledge and understanding of risks and best practices consolidated into the IRMF. The researcher had extensive knowledge of the organisational NPSD development practices and tools and personally conducted risk reviews for a vast number of NPSD projects. The organisation's NPSD lifecycle and stage/gate processes and the different types of knowledge that were utilised at each stage/gate provided descriptive knowledge sources. Other types of 'what' knowledge sources were applied to understand the different categories of P&S. For this purpose, Davis's (2002) model of four major product categories was adapted to more specifically suit services and the requirements of the organisation that predominantly launched services in both B2C and B2B areas. The prototyping followed an iterative process that resulted in the final artefact.

This research also expands on existing knowledge by the evaluation methods that were applied within the organisation. Qualitative approaches were used with the NPSD practitioners guided by open-ended questions, followed by expert-analysis and usage within a variety of contexts. This multi-disciplinary approach validated the success of the dashboard since usage increased over many different departments and types of P&S.

However, because the dashboard was specifically developed for the purpose of the organisation, it is not clear to what extent it would be transferable to other organisations. It also depends on the extent to which other organisations actively manage risks in new P&S. The question of transferability between B2B and B2C organisations can be answered as the dashboard was found to be equally applicable to both. In addition, the dashboard and risk processes were introduced in the financial services function of the NPSD organisation, where it was found to be working equally well. The dashboard was also introduced in other countries in which the organisation operates, of which three countries are active users. Considering these contexts, it is viable that the research can be transferable to other ICT contexts. Generalisable design principles are subsequently articulated

Generalisable Design Principles

The following lessons learnt could stimulate the design and implementation of a successful NPSD risk dashboard in large organisations in high-technology environments. Design principles that can be shared with practitioners are deemed to be:

a) Obtain a clear understanding of the problem by using structured methods.

b) Understand the extent of flexibility that is required to address the problem. Applying rigid methodologies to flexible problems is not suitable.

c) Use a variety of methods that offer different perspectives to obtain a deeper understanding of the problem.

d) Consider best practices suited to the discipline to inform the requirements.

e) Apply a personal one-on-one approach to collaborate with selected experts during the design of prototypes to obtain buy-in and commitment.

f) To elicit requirements, develop prototypes that are diverse and opposing. It is easier to gage negative and positive responses and define requirements from these responses.

g) Consider the decisions and actions that need to be taken by the different customers as a result of the dashboard, as part of requirements.

h) Design the abstraction layer by developing classification models that can reduce the risk indicator values from the risk knowledge base into manageable components.

i) Use colours to signify priority information and apply general dashboard design principles to aid decision-making.

j) Design supporting processes to obtain the latest, most accurate information for inclusion in the dashboard, as well as rules for maintenance of the dashboards.

k) Use several methods to evaluate the artefact in different contexts to ensure transferability to other environments.

Summary

The artefact was practical, delivered a new design and proved to be accepted and used within the organisation. The design additionally met criteria of completeness consistency, accuracy, performance, reliability, usability and fit (Hevner et al. 2004). The design of the artefact delivered contributions in terms of prescriptive and descriptive knowledge (Gregor et al. 2013), was grounded in theory and delivered new knowledge, since no similar NPSD risk dashboards were produced by the literature. Following a formal DS approach for an organisational design was time and resource intensive but the benefits made the effort worthwhile.

6.7 Conclusion

The AR project was ambitious in terms of scope and objectives. RM was implemented within a context where aversion to RM existed. The context was complex and multi-varied in terms of technology and types of P&S exposed to a wide-ranging number of risk and innovation factors. Despite these challenges, RM was sufficiently embedded within various contexts within NPSD, effectively answering the research question.

AR combined RM and NPSD knowledge to deliver practical interventions guiding risk and NPSD practitioners. The research findings are valuable in terms of practice and research contributions. AR improves understanding of complex social IS domains and solves business problems whilst expanding on scientific research.

The suggestions are consistent with NPSD literature, whilst practical methodologies are offered to deliver risk initiatives consistently with reliable comparable results. It is recommended that application of the IRMF will assist in improving NPSD and reducing the likelihood of failures.

The study also provides generic methods to tailor RM approaches according to the specific characteristics of the P&S. The RM approaches were found to be equally beneficial to other contexts, and the research has demonstrated the complexity and difficulty inherent in launching new P&S and the need to manage a wide variety of risks.

RM was highly effective in delivering new knowledge to support the improvement of professional practices (Iversen et al. 2004, p. 124). The introduction of RM within NPSD is therefore encouraged. The IRMF and risk methodology are recommended as an approach that can be applied effectively.

The research contributes by developing a large-scale study of RM within a complex NPSD environment. It presents strong evidence of successful RM in NPSD. The key is to consider a wide number of risks and opportunities that have not previously been considered by other innovation and risk studies. Evidence suggests that RM positively contributed to increasing NPSD performance, stakeholder and customer satisfaction. The research established that RM could assist to promote best NPSD practices and guide the development of quality P&S.

7. Chapter 7 – Conclusion

7.1. Introduction

Researching innovations is a promising field of study since they are either subject to high failure rates or, if successful, can introduce competitive advantages. Innovation studies have failed to address future challenges and have not kept pace with current market and technology trends. Manufacturing remains the most widely empirically researched area of innovation, despite its diminishing relevance, since services offerings (even by manufacturing firms) are outpacing product offerings. Innovations studies seem to ignore a significant economic activity that can introduce much-needed future relevance to the field of NPSD.

Even innovation studies that focus on manufacturing are lacking in terms of providing comprehensive, practical solutions to stimulate innovation, and have a narrow focus that does not recognise the complexity of developing P&S. The actual impact of such narrow focus is that product managers might be inadequately prepared and skilled in facing the real world complexity of P&S development. Innovation studies additionally neglect the role of technology and compliance aspects that can be both an inhibitor and driver of innovation. The usual course of conducting business is increasingly being governed by regulations, especially those guiding fair conduct to customers. Technology plays a vital role in ensuring the economic sustainability of companies but is often neglected by innovations studies. As service development becomes more exposed to systematic, complex risks, the importance of managing risks in innovations, and the study thereof, increases. and additional areas that have been neglected by innovation studies.

7.2. Summary of Research

The research question asks how RM practices can be embedded effectively within NPSD groups within large organisations. The objective of the study was to embed RM within NPSD by the development of an IRMF and supporting risk processes, for effective risk mitigation. The research was conducted within the ICT Industry, for a large organisation in a high-technology environment that launches several P&S on an annual basis. Secondary research questions established the primary risks that NPSD faces within an ICT context and determined differences between how risks should be managed for B2B and B2C innovations.

The intervention took the form of an AR study that was conducted over four years, extended to five years to accommodate the time required to carry out the analysis. The real world problem situation was to manage risks in NPSD in a manner that improved the organisation’s RM and NPSD capabilities. The research themes of NPSD and RM served as the context for examining how risks and opportunities can be effectively managed within the NPSD environment to ensure more successful P&S. The AR methodology guides the study.

The AR approach was based on Iversen et al.'s (2004) methodology, consisting of: (1) an iteration phase during which the researcher conducted literature reviews, collaborated with risk practitioners to understand the problem situation and select the risk approach that guided the interventions that were delivered during the iteration; (2) an iteration phase during which planned actions, including the development of a risk framework (IRMF) and risk processes and supporting artefacts, were applied and evaluated. These activities took place in three cycles; and (3) a closing phase, consisting of an exit, assessment of usefulness and research results. The researcher, in collaboration with practitioners reflected on the IRMF, the risk interventions and the risk processes implemented. The findings are reviewed collaboratively and are empirically validated.

This thesis highlights the complexity of innovation and presents the requirements to have an organising framework that will support innovation but is sufficiently flexible to cater for diverse needs. Such support is shown via the integrated IRMF that provides a schema presented as six high-level dimensions: strategy (alignment to organisational strategy and portfolio management); market (assessment of the market environment, marketing activities and reputational risk); NPSD functions (performance of NPSD process activities including product- project and financial management with consideration of elements such as external providers, CRM, business rules, models and processes); ICT (technical delivery guided by best IT/IS practices and ISO standards conformance); GRC (internal and external compliance requirements); and organisational culture (consideration of leadership, team dynamics and skills). The scope of the AR study expanded from services launched for consumers, to accommodate business products and eventually to provide financial and insurance projects, m-money, m-health and telemetrics services, as well as expansion into other countries. The framework accommodates NPSD lifecycle requirements as well as classes of P&S. Additional support is provided via the development of a generic maturity structure that lists best practices.

A DS artefact in the form of a risk innovation dashboard was developed within the AR study. The dashboard provides a visual decision-making interface that is presented at two stage/gate meetings to allow the P&S to pass through to the next stage gate. The dashboard is built on a RM knowledge base that displays information relevant to the stage/gate and the P&S. Processes to update information from unstructured sources support the dashboard. The dashboard was implemented and evaluated over a period of nine months. Proof of concept was delivered to risk practitioners, and cross-case implementation in two NPSD contexts occurred, complemented with qualitative analysis, application in practice and lastly evaluation by risk experts. The risk dashboard is widely used in the organisation and expanded to other markets in which the group operates. The dashboard is in the process of being commercialised by a RM system developer.

The IRMF is supported by other risk interventions that evolved during the AR cycles. This included the development of a generic RM process that is flexible to accommodate the risk profiles and type of service category, as well as other interventions such as frameworks that support privacy and PoPI implementation. Risk incidence registers, surveys and questionnaires and risk assessments supported the development of the IRMF and supporting artefacts. The NPSD lifecycle is integrated within the formal risk processes.

Since the context of the study was complicated, mixed-method research complemented and expanded on the framework. It allowed a more comprehensive view by including perspectives from the vast number of NPSD practitioners that the risk team collaborated with during the AR cycles. It served to provide another layer of validation for the second level constructs of the IRMF..

7.3. Research Contribution

The study makes several contributions to the body of knowledge in IS, RM and NPSD. The study provides an academically grounded and empirically validated IRMF. As is the tradition of AR, the disciplined process of applying change interventions within a business environment offers significant contributions to practice. These contributions are subsequently discussed.

The integrated IRMF has been empirically validated following a sound AR practice. This research provides a theory-based approach to assessing risks and opportunities by succeeding to operationalise the academic literature. It emphasises critical requirements for effective RM in innovation and considers key characteristics of B2C and B2B innovations. The framework allows the examination of the different characteristics of P&S and provides support for analysing the contextual changes that take place during the NPSD lifecycle. The framework acknowledges the complexity of NPSD and presents a logically coherent, yet comprehensive structure, to assess risks enhancing the chances of P&S to reach their stated objectives.

The research contributions include, but are not restricted to: offering a comprehensive, multidimensional framework of success and risk factors in NPSD by consolidating fragmented literature and observations from the field into high-level and second-level constructs; validating risk and innovation factors that impact on NPSD; distinguishing between the differences and the criteria that are important for B2B and B2C innovation; providing a service typology to characterise services into four distinct classes; offering a risk and innovation maturity framework aligned to the IRMF; and introducing RM best practices to innovations.

An important contribution of the study is an awareness that successful innovations require investigations of a broad variety of risks and opportunities. A knowledge claim of the framework is that consideration of several risks and opportunities will contribute to P&S success or failure. Therefore, a mathematical equation for the framework could be explained as (n1 + n2 + n3…. +n24) = more successful P&S development. Any risk impact and failure to implement a critical practice (presented in any of the sub-dimensions of the framework) could lead to a failed P&S.

Studying RM in NPSD is informed by technology. Development of a P&S is primarily an IT/IS project where a product manager defines the requirements. Therefore, risk factors that impact on P&S technology development have a direct effect on project success. This study offers research contributions to the field of IS. IS research on RM applied within projects, predominantly focuses on identifying risks, without ensuring that such risks are addressed. The research contributions for IS include but are not restricted to: considering of additional risk factors such as organisational constraints that impact on successful delivery of projects; offering an integrated method for managing risks within the NPSD lifecycle; providing practical risk approaches that have been empirically validated across a wide number of technology-diverse P&S; and determining conditions that can aid successful RM in NPSD. The knowledge claim to IS is that managing risks during NPSD requires a broader scope than what current IS studies offer. The study furthermore provides models that can aid the development of privacy and regulatory compliance such as privacy matrixes that can guide the design of technology developments.

Studying RM in innovation, albeit also regarded as a promising field, is also subject to limitations. Risk research has applied approaches that have been criticised for not being integrated within the NPSD lifecycle, not being comprehensive and not being validated across a large number of studies or ignoring the context-specific characteristics of the P&S. RM research can therefore be described as fragmented.

This study contributes to the field of RM by delivering frameworks and methods that offer novel approaches to managing risks. The study addresses disjointed research by providing a comprehensive framework that covers a broad range of risks consolidated in 24 risk sub-dimensions. The framework has been extensively tested on over 600 P&S during the AR cycles, including B2B and B2C, and has been empirically validated by mixed-method research. The framework is representative of a real world situation where NPSD required the management of risks on a daily basis. The research contribution to RM includes: developing a comprehensive framework for managing risks in innovations that supports multiple diverse contextual settings; providing a methodology for prioritising NPSD projects; contributing to the existing body of knowledge with additional risks that impact on NPSD; expanding on the risk resolution strategies that are required to address these risks efficiently; and offering original approaches to RM by introducing maturity ratings and audit principles to stimulate good working practices. The research is also one of the few studies that comprehensively aligns to the international RM standard ISO 31000. The research also contributes to the body of knowledge by designing a questionnaire based on ISO 31000 to evaluate the effectiveness of RM within NPSD. The principles are generic to most organisations. This study offers guidance regarding how to successfully embed RM within NPSD.

The IRMF is a significant improvement on other NPSD and RM frameworks as it expands the theoretical body of knowledge about best practices and risk factors that can influence the success or failures of new P&S. To the best of the researcher's knowledge, no innovation or risk researcher has succeeded in studying NPSD over an extended timeframe, by applying AR approaches to study change interventions in NPSD and use additional qualitative and quantitative methods to validate the findings.

The research offers further knowledge contributions to conducting AR studies in IS. The AR framework that was utilised in this research was based on the Iversen et al. (2004) study, but was applied to a much wider scope and delivered many more interventions. The researcher could not find any similar studies in terms of scale and focus on large organisations in high-technology environments with multiple participants and projects. The study offers further research contributions to AR by the use of mixed-method studies, applying a DS study within the AR study, using multiple methods to structure the AR cycle phases, delivery of multiple interventions and offering a detailed evaluation of the research contributions. The AR research sheds light on how to introduce successful change interventions based on research within large technology-intensive organisations. The researcher additionally provides generic guidance to researchers who wish to embark on similar AR based large-scale studies.

The DS artefact was introduced as a complementary method to AR. The DS methodology combined ADR (Sein et al. 2011) and DR (Peffers et al. 2006) approaches that suited the context of the AR study. The DS approach succeeded in delivering a unique artefact, as supported by the scientific literature. To the best of the researcher's knowledge, no similar dashboards for managing risks in NPSD could be found. The artefact development was grounded in layers of the theory that informed the stages of the DS approach, including prescriptive and concrete knowledge sources. The study further expands on existing theory by providing practical knowledge of how activities within the different DS cycles take place. The researcher offers generalisable design principles for the development of risk dashboards that can be shared with practitioners as lesson learnt.

The AR approach and DS approach succeeded in delivering several practical interventions that can be used by organisations to guide RM in innovation. The research is specifically conducted in the ICT industry and risks that influence ICT development should equally apply to other environments. The study furthermore provides a manageable set of recommendations that can support high-technology service organisations to be more efficient at P&S development. Risk practitioners can benefit from learning about the attributes of successful RM practices in high-technology environments to emulate such practices.

This research should, therefore, be of interest to academics that study RM as well as those who study innovation. Innovation and RM concepts are clearly understood by academics, but practical guidelines, which can be applied within organisational settings, are lacking. Practical approaches provided by this research can aid the effective anticipation and response to possible risks within NPSD. As such, it allows RM to be implemented as a strategy that can improve NPSD and IS technology development within NPSD.

7.4. Limitations

AR studies should be both relevant and rigorous. Relevance refers to a significantly improved understanding of a real-world problem while rigor emphasises defence of the research claims. To address these requirements and guard against limitations of the study the researcher formulated criteria to guide the AR process, based on Lau's (1999) assessment criteria, expanded with Iversen et al.'s (2004) transferability criteria. The criteria and this study conformance to the criteria are discussed in Section 3.3.4 of Chapter 3. However, this AR study is conducted in a specific domain to resolve a particular research problem. As a result, it is subject to some limitations.

Transferability refers to the extent to which the research can claim to be of practical value external to the organisation that was studied. The study was based on a large number of observations and was conducted in an ICT organisation that launches technology-diverse P&S to the consumer, business, financial services, insurance, m-health, e-commerce and m-commerce applications. The research has also been conducted in IS projects and in other countries in which the organisation operates, and is based on existing bodies of knowledge based on innovation and RM. These are all criteria that support the argument for generalisation of studies (Iversen et al. 2004; Mathiassen, 2002; Rappoport, 1970). The study furthermore complies with an internationally recognised risk standard that introduces further elements of transferability. Despite the study meeting the criteria for transferability to other similar ICT domains, caution should be applied when the framework is applied to other fields. However, the IRMF has been shown to be well equipped to provide a generic platform from which more customised frameworks can be developed, supporting the idea of the generalisability of the framework.

Smaller organisations than the one under study, would not have access to specialised risk resources. In addition, the framework has been designed to be applied by risk resources and not NPSD practitioners, despite the latter being able to benefit from the knowledge. The framework has, however, been developed to support the functional NPSD activities, according to which the second-level constructs of the framework have been organised. The framework hence allows smaller organisations with the flexibility to consolidate second-level constructs to reflect the context of their particular organisations. The validity of the research, which means the extent to which the research succeeded in achieving its goals, is a sound criterion to argue for generalization of research according to Keen (1991). This is another factor that supports the generalizability of the study.

The validity and robustness of the DS artefact were evaluated according to Hevner et al.'s (2004) guidelines. Firstly, the artefact had practical relevance and conformed to characteristics of a new design, reasoned by the absence of similar models in the literature. Secondly, the problem was relevant and challenging to solve. Thirdly, the evaluation of the design was robust and used several methods and contexts to evaluate the performance of the artefact. The artefact showed representation fidelity by being used within a business environment to solve a problem and was implementable in the business environment. Fourthly, the artefact was based on research methodologies to design and develop it, as well as expertise developed during the AR research cycles. The result produced both descriptive and prescriptive knowledge. The means used to create the artefact fitted the result and considered external environmental constraints. The artefact was applied in a particular domain, namely RM within NPSD, which is deemed to be appropriate for the development of dashboards. This does, however, introduce transferability concerns. However, due to the testing of the artefact in different contexts, it is likely that the dashboard can be transferable to other ICT organisations.

A limitation of the study is that some risks associated with second-level constructs are repeated and can be considered as overlapping, which does not meet the criteria for disjointed constructs. However, this characteristic is only required when conducting quantitative assessments to prevent double-count (Kaplan et al. 1981). Since this research approach follows a qualitative risk approach, it is perceived that some overlap can be allowed. The framework was developed to be practically applied and activities organised into functional organisational groups. Therefore, flexibility is permitted whereby sub-constructs can be consolidated and split according to the requirements of the organisation. However to allow this flexibility, the validity of dimensions can be argued in terms of inclusivity, equality and maturity (Kahn et al. 2006). Since these high-level and second-level constructs are strongly based on existing literature and informed by the AR practices and mixed-method research and offer a comprehensive inclusion of risks, validity claims are met. However, it is possible that other researchers could produce evidence to support the development of other high-level and second-level constructs. It is also suggested that some high-level constructs might be more important than others as indicated by the literature review, so these high-level constructs are not equal in weight. The sophistication of the high-level constructs is measured according to four levels of maturity that are provided in a generic maturity framework that supports the IRMF. Further research is needed to validate the generic maturity framework and validity of dimensions across different industries. In particular, the area of 'governance', with specific reference to environmental, 'green-IT' perspectives requires additional validation, as well as 'stakeholder' management.

Several other potential risks to validity were identified. To guard against these, appropriate and robust validation criteria were applied during the design of the quantitative and qualitative research. Retrospective analysis, 'hindsight bias' and researcher bias were addressed via reflection in collaboration with risk practitioners. An essential requirement of risk analysis is to base risk assessment on facts. This requirement for factual validity was continually considered during the design of AR interventions to eliminate potential biases. The formulation of findings from the mixed-method research was based on the Ventakesh et al. (2013) criteria for applying mixed-method research, and approaches of bracketing (considering diverse opinions between different NPSD groups as well as B2B and B2C divisions) and bridging (derived consensus views) were applied.

Threats to the validity of longitudinal research were addressed by conformance to Pettrigrew's (1990) longitudinal guidelines by following a robust AR approach by continually considering changes in context, content and processes. Clear exit points were provided, which signified that problems that were meant to be addressed during the cycle were suitably addressed. Applying the CMM model at the beginning of each AR cycle added to an improved understanding of changing patterns during the research. To reduce the volumes of data, it was organised into broad themes from the literature review, which were then developed into the high-level and second-level constructs.

A further aspect that can influence the transferability of the result to other studies is that the researcher had access to excellent resources during the AR study and additionally took a year sabbatical to write the thesis. The scope of the study is so broad that a study of this nature needs to be supported by a dedicated team of skilled and motivated risk resources to introduce all these interventions into business. If other researchers do not have access to similar resources, it will make it difficult to conduct a study of this size.

Another limitation of the study is the requirement of confidentiality that was clarified during the researcher-client agreement. For this purpose, the anonymity of the organisation is protected as well as that of the research participants, who gave consent and collaborated in the research. However, considering that the study provides an accurate reflection of how decision-making occurs within an organisation, some findings, despite being validated from multiple resources, could be regarded as sensitive. Since the organisation restructures often, these observations could no longer be of relevance. What has, however, endured is that a team of dedicated risk professionals continue to conduct risk assessments on all new P&S for the organisation with a CEO-enforced mandate.

The objective of this study was to be comprehensive. This means that a large number of risks and opportunities, which may impact on the success of P&S, have been considered. This study will, therefore, claim to be encompassing and contributing towards the development of a comprehensive innovation and RM model that can be practically applied in a wide variety of ICT environments..

7.5. Future Research

Herr et al. (2004, p. 86) state that ‘solid action research leads to a deepened understanding of the research question posed, as well as to more sophisticated questions’. Many future research opportunities flow from this research. However in this section, the researcher will focus on future research that could be regarded as innovative and delivering substantial advantages to the organisation, on the basis of empirical validation.

‘Organisational Culture’ was the only high-level construct that was perceived to be partially implemented. In particular, difficulties were experienced regarding how to address leadership behaviour that inhibits innovation. Research findings pointed to organisational restructuring activities harming innovation, as well as the pursuance of short-term goals and not implementing the right reward structures to stimulate innovation. These are all attributable to practices that need to be driven top-down for assimilation in lower structures. More studies are required to address this and, in particular, to foster an innovation culture within the governing structures of NPSD groups. Organisational culture has been shown to have a strong moderating influence on other NPSD activities, especially the conduct of portfolio management. The absence of formal portfolio of activities could be based on the perception that flexibility is valued over discipline. The reasons for non-conformance to best practices and how to change the culture at the top could be explored by further studies.

Some of the new second-level constructs introduced by the research require additional exploration and validation. Shareholder and stakeholder risks were indicated as an additional influence on NPSD performance. NPSD studies can benefit from the application of stakeholder management processes to improve stakeholder relationships. What and how these practices should be implemented and under what conditions, require additional research.

Reputational risk has a profound impact on brand reputation, and since this study indicated that consumer services (B2C) are particularly vulnerable to negative public opinions, especially in a price-sensitive developed market, it is necessary to explore how best to address such potential vulnerabilities. Particularly with the advent of social media risk, it is an area that requires further research regarding what, how and when to apply mitigation strategies.

Consumer participation during NPSD was only scarcely enforced by the organisation under study, largely due to tight timeframes and the risk that knowledge about the P&S would leak to the competition. However, when applied, consumer participation provided clear competitive advantages. It seems that service organisations are particularly reluctant to solicit customer assistance during development. Studying how and when to introduce customer participation in service studies can, therefore, be a valuable research contribution, especially with consideration of the potential risks associated with applying such approaches.

The complexity of costing the myriad of people, systems and processes involved in producing services is a difficult task for service organisation. Providing valid costing assumptions for service environments will provide benefits to organisations and the customer, as well as regulatory governing bodies. In particular, it is necessary to provide costing assumptions that guide complex, multifactorial, integrated, multi-disciplined and technology systems development and integration aspects. This would allow more transparent decision-making and assumptions that can potentially be transferable across industries as best practices. It could very well be that financial management advances could assist in creating more profitable business models.

Developing cooperative structures between business partners and external providers could lead to more innovative business models. In particular, the research has noted that IoT innovations will be driven by business model innovation. The business model aspect of NPSD is scarcely examined by innovation studies. Business models also introduce many risks and opportunities. Delivering of large-scale enterprise systems requires the integration of multiple partners to collaborate effectively to provide a solution. In line with this business trend of increased amalgamation and collaboration, it is perhaps surprising that this aspect has received limited attention from innovation studies. Conducting sufficient due diligence to ensure delivery of these multiple partners is another complex area and not an easily solvable dilemma, as it is customary only to perform due diligence on the first level. How best to address such aspects is another area of research.

This study acknowledges that the contribution of KM and its associated advantages are underestimated in NPSD. It is probable that effective KM could lead to dramatic competitive benefits for the organisation. This is another area where additional research is required, especially regarding how to implement KM effectively, as well as assessing the impact of effective KM on NPSD.

CRM has not received much attention from the innovation literature. It is probable that short-term, P&S restricted views will not deliver sustainable competitive advantages. A specific requirement of P&S development should be to increase customer loyalty. The application of CRM practices within NPSD has not been well researched and indicates another research opportunity. The use of CRM within the enterprise environment, as a supporting tool for sales, requires additional attention.

While the NPSD process has received much attention in NPSD literature, other supporting processes that could stifle innovation have not been researched. The integration of Business Process Reengineering (BPR) with development practices of NPSD can deliver competitive advantages to a service organisation. Every P&S should be treated as a new opportunity to improve the overall customer experience, yet has been neglected by innovation research. Similarly, weak processes significantly hamper speedy delivery and impact on the quality of services. Effective integration of BPR into NPSD could offer valuable insights into how to incorporate a systems view.

Technology support for NPSD activities has also been neglected. If the right technologies support NPSD, it is probable that competitive advantages can be realised. However, it is not clear what technologies or applications offer the best support for P&S activities. Research is required regarding the specific NPSD activities that can benefit from technology support. Another technology area that requires further exploration is the development of platforms to support the launch of incremental services to aid faster service deployment. Both advantages and disadvantages should be studied since it is possible that increased flexibility will be required in future, and if the platform restricts development, it could potentially be seen as a liability to innovation. It has been noted that further research is necessary for supporting green IT projects during NPSD. This study furthermore proposes that NPSD can benefit from improved collaboration between the technology development teams and product managers. How to address this disconnection gap between the P&S functional specification and technical delivery is another area that would be advantageous to increase the quality of P&S development.

Compliance with regulations is viewed as a risk that introduces additional cost to doing business (without being perceived as adding business value). Organisations treat compliance aspects as necessary but define adherence requirements at a minimal level with the primary objective of avoiding regulatory penalties. Legal teams tend to advise compliance requirements in terms of whether these minimum requirements will be defensible in court. It is seldom that the spirit of the law, in this case translated into protecting the customer, is considered. The researcher is convinced that regulations provide both opportunities and risks. For instance, PoPI compliance can help the organisation to build trust and engender loyalty. Providing customers with indicators that the institution can be trusted should be beneficial in the long-term. Further research on how to introduce such perspectives into NPSD could be valuable to organisations.

Based on the technology security team that turned a cost centre into a profit centre, it could also be possible for other risk areas to apply similar principles. However, support areas are often understaffed, and it is possible that insufficient times and resources also stifle innovation in these functions. Studying potential opportunities to achieve such lofty ideals for supporting disciplines and turning RM (as an example) into a profit centre for NPSD could be immensely valuable.

Further research is required to customise the IRMF to other contexts. Applying the IRMF to support new technology ideas such as IoT, to connect everything that can be attached to the Internet, could provide valuable perspectives. Such frameworks will guide developments from a business perspective and provide a holistic risk and opportunity analysis and encourage systemic thinking about opportunities.

7.6. Conclusion

It is the supposition of this research that RM and innovation should not be viewed as two opposing disciplines, where RM is perceived as stifling innovation. Effective RM considers both risks and opportunities in NPSD. In fact, effective RM in NPSD could lead to competitive advantage for organisations by increasing knowledge and facilitating informed risk decision-making. However, efficient RM practices in NPSD require flexibility and at the same time cognisance of a vast number of risks. For this reason, the IRMF and supporting risk processes are considered to offer valuable research contributions concerning comprehensiveness, validity, functional activity focus, customisability and the facilitation of learning. The AR interventions are abstracted in a visual display via the risk dashboard to guide NPSD stage/gate decisions.

This research also delivers valuable research contributions on how to conduct large-scale studies to provide successful interventions. These practices have been indicated as facilitating double-loop learning by fostering risk-informed NPSD practices.

As the requirements for innovation research grow, it is essential that researchers and practitioners understand the important enabling and inhibiting factors of innovation, including risks. A systemic view is encouraged, as reliable knowledge is required on how best to succeed at innovation and exploit competitive advantages.

A central theme of the research has been to consolidate knowledge contributions from various other disciplines to reflect the systemic and multi-disciplinary nature of NPSD. However, it has been indicated that several additional challenges exist. It is probable that knowledge accumulation via the application of multi-disciplinary research holds the key to unlocking further advantages and would lead to new exemplar studies in IS, RM and NPSD.

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9. Acronyms

ADR	Action Design Research
AML	Anti-Money Laundering
AR	Action Research
B2C	Business to Consumer
B2B	Business to Business
BCM	Business Continuity Management
BIE	Building Intervention and Evaluation
BPR	Business Process Reengineering
CaAR	Canonical Action Research
CAR	Collaborative Action Research
CBU	Consumer Business Unit
CEO	Chief Executive Officer
CM	Change Management
CMM	Capability Maturity Model
COBIT	Control Objectives for Information and Related Technology
COSO	Committee of Sponsoring Organisations
CPR	Collective Practice Research
CRM	Customer Relationship Management
CRO	Chief Risk Officer
CSR	Corporate Social Responsibility
DR	Design Research
DS	Design Science
EBU	Enterprise Business Unit
EIS	Executive Information System

ERM	Enterprise Risk Management
GRC	Governance, Risk Management and Compliance
HHM	Hierarchical Holographic Modeling
HR	Human Resources
ICT	Information and Communications Technology
IIA	Institute of Internal Auditors
IIF	Integrated Innovation Management Framework
IoT	Internet of Things
IPC	Integrated Property Management
IPR	Intellectual Property Rights
IRM	Institute of Risk Management
IRMF	Innovation and Risk Management Framework
IS	Information Systems
ISACA	Information Systems Audit and Control Association
ISO	International Organisation for Standardisation
IT	Information Technology
ITIL	Information Technology Infrastructure Libarary
KM	Knowledge Management
KMO	Kaizer-Meyer-Olkin Measure
KPI	Key Performance Indicator
KRI	Key Risk Indicator
KYC	Know Your Customer
LBS	Location Based Services
M2M	Machine-to-machine
ML	Money Laundering
MNO	Mobile Network Operator

MVNO	Mobile Virtual Network Operator
NPD	New Product Development
NPSD	New Product and Service Development
NPVR	Net Present Value Risk
NSD	New Service Development
OBS	Organisational Breakdown Structures
PAR	Participatory Action Research
PI	Personal Information
PIR	Post-Implementation Review
PMO	Project Management Organisation
POPI	Protection of Personal Information Act
PR	Public Relations
P&S	Products and Services
PSM	Problem Structuring Methods
RA	Revenue Assurance
RBS	Risk Breakdown Structure
RCA	Risk Categorisation Assessment
R&D	Research and Development
RD	Root Definition
RDM	Risk Diagnosing Methodology
RI	Radical Innovation
RM	Risk Management
RMM	Risk Management Maturity
RMMo	Risk Maturity Model
RRF	Risk Reference Framework
SDLC	Systems Development Lifecycle

SEI	Software Engineering Institute
SIM	Subscriber Identity Module
SLAs	Service Level Agreements
SMEs	Small and Medium Enterprises
SPI	Software Process Improvement
SSM	Soft Systems Methodology
T&Cs	Terms & Conditions
TCI	Team Climate Inventory
WBS	Work Breakdown Structures

10. Appendix One: The Innovation and Risk Management Framework

Table 23: Integrated Innovation and Risk Management Framework

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
Organisational Strategic Alignment									
The risk evaluates how well the P&S are aligned with the organisational strategy. Strategy refers to unique activities that the organisation will perform differently and better than the competition to more effectively compete in a market. Objective is to improve chances of successful P&S by ensuring synergy exist between P&S goals and organisation's	*To what extent are the following indicators present? :* Do a well-defined organisational vision and strategic objectives exist? Has the corporate strategy been effectively communicated to NPSD? Does NPSD practitioners have a clear understanding of the strategic objectives? Does the organisation strategy present a long-term strategic view of NPSD? Does the org plan indicate an explicit commitment to NPSD	*Research and development resource allocation*	*Competitive actions* *Resource planning and commitment* *Market and competitive understanding* *Customer price sensitivity analysis*	*Technology competitive landscape* *Competitive pricing* *Reducing risks for business customers*	*Enhancement will indicate short-term tactical objectives* *New ventures will indicate long-term strategic view* *New developments will indicate technology innovation* *New market will indicate exploring new competitive opportunities*	*Sources:* Strategic objectives Objectives of P&S External documentation about risks and opportunities Competitive landscape Market landscape Technology strategic plans Resources skills and experience planning Customer needs	*Responsible:* NPSD executives *Accountable:* The CEO and board are ultimately accountable for innovation culture and strategy. *Consulted:* Technology teams Risk Management Legal and Regulatory teams	*Concept phase:* Primarily during NPSD concept phase as input to determine if P&S should proceed to next stage. *Planning phase:* The P&S objectives are aligned to organisational targets in the functional specification. *Launch phase:* Reviewed to evaluate if deliverables meet objectives. *Maintain phase:* Evaluated during the post-implementation review.	The P&S fails to contribute to long-term strategic objectives. Cause a weakening of brand image impacting on long-term sustainability. Consuming resources that could have been better utilised. Inability to sustain and improve market share due to a lack of clear vision and mission. Failure to innovate or understand customer demands. Lack of innovation can lead to stagnation of the organisation and ultimately impact on the continued sustainability

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
strategic vision, with consideration of organisational competencies. The strategy should consider responses to new technological developments and replace obsolete technology. An environment that enables innovation should be strategically embedded. Innovative companies are more sustainable, demonsrated by increased turnover, improved competitiveness and profitability.	regarding assigning resources, budget and technology systems? Does a standardised methodology exist within NPSD to measure alignment to strategic objectives? Does the strategy consider ways to enhance customer experience and empower customers? Does the strategy indicate a clear awareness of pricing and competitiveness strategies? Does the strategy consider ways in which customer support can be improved? Does the strategy examine how internal processes can be enhanced to support better customers e.g. using simple but agile processes? Does the strategy indicate an apparent					analysis Innovation strategy *Documented:* P&S concept specification P&S functional specification Presentations Stage/gate deliverables Risk assessments	Product Manager Risk specialist teams Strategy department *Informed:* NPSD practitioners and more specifically the product manager considers strategic alignment during P&S functional specification. Technology development team is responsible for ICT innovation strategy		and profitability. Obsolete and inflexible technology Lack of competitiveness

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	synergy between market, service and the organisation? Does the strategy consider ways in which stakeholder management can be improved? Does the strategy examine how growth strategies can be accelerated regarding technology, pricing and value, speed and quality, customization, content, E-commerce, M-commerce and self-provisioning? Does the strategy consider ways to streamline customer interactions and reduce turnaround times across key customer interactions? Does the strategy consider ways to increase efficiency & reduce cost? Does the strategy consider changes in industry structure &								

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	macroeconomic changes? Does the strategy take cognisance of and understand legal and regulatory changes and challenges? Does the strategy consider the development of technology platforms to increase the speed of NPSD delivery? Does the strategy consider the availability of NPSD experience and technical expertise (both length and depth of experience)? Does the strategy consider organisational innovation abilities and present a clear understanding of how to improve and sustain innovation capabilities within the organisation? Does the strategy consider research and development capabilities to support								

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	NPSD? Were risks that the strategies can be exposed to analysed and were potential vulnerabilities to the implementation of the strategy considered? Were constraints identified concerning expertise, cost, infrastructure or pay-back period? Does the strategy consider P&S family and brand positioning risks? Does the strategy consider how commercial viability risks will be addressed? Does the strategy indicate a good understanding of the current strengths and weaknesses of the organisation and are strategies implemented to enhance the strengths and mitigate the deficiencies?								

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Is Innovation considered a high strategic priority which is embedded within the processes, structure, culture and behaviour of organisational resources? Does the strategy allow for the provision of significant financial investments in NPSD?								
					Portfolio Management				
Selection of portfolio of P&Ss that most effectively invest NPSD resources to achieve the organisational strategy. Objectives include: Ensuring alignment with corporate strategy. Maximise the value of the portfolio. Ensure that	*To what extent are the following high-level indicators present during portfolio planning:* Does a portfolio management process exist and is it consistently been followed? Is consistent portfolio management criteria applied? Were scoring models utilised that considers financial indicators, cost and long-term sustainability?	*Strategic alignment with organisational strategy*	*Use of robust scoring models, tools & techniques for selection of portfolio* *Balanced portfolio not predominantly skewed to short-term incentives.* *Considering adequate resource allocation.* *Developing an effective prioritisation*	*Development of portfolio management process and scoring models for selection of most profitable projects, with a clear understanding of the corporate market needs.* *Using portfolio management to establish focus and sufficient resource allocation.*	*Portfolio management needs to ensure an adequate presentation of all four types of P&S classifications to present a balanced portfolio.*	*Sources:* Organisational strategy P&S portfolio Financial analysis Concept development documentation Market research *Documented:* PMO portfolio of prioritised projects	*Responsible:* NPSD executives compile information *Accountable:* NPSD senior managers in charge of NPSD *Consulted:* Specialist support units such as Technology and Finance	Portfolio reviews performed a few times per year and lead to the list of prioritised projects. Portfolio management is process that is external to NPSD process but serves as valuable input to determine the priority of the P&S and allocation of limited resources.	Incorrect P&S being implemented Inadequate resources (people and systems) Delays in going to market Unprofitable P&S Increased risk Increased cost Decreased value to customers Insufficiently prioritised projects Too many mature P&S

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
sufficient capacity exist concerning resources, funding and time	Was a high-level economic viability analysis reviewed and the payback period defined? Was market and customer potential considered? Was competitor strategies considered and are these based on market intelligence? Were the increased sales versus cost (fixed and variable) and overhead costs considered? Does an informed estimate exist of the time to commercialization? Is there an understanding of the business model and value chain requirements, core competencies and network of agreements with partners required? Is particular expertise required and is it		*strategy.* *Following a repeatable portfolio management process delivering consistent results.* *Retiring P&S that no longer deliver value.* *Reducing the number of projects.* *Overall systems view of multiple interrelated projects.*			Roadmaps	*<u>Informed:</u>* NPSD practitioners and PMO office		leading to decline Lack of growth in new or emerging markets Inability to sustain and/or improve market share Delayed projects due to non-adherence to roadmaps Insufficient diversification of product range

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	available internally within the organisation? Does portfolio management fit the organisational strategy? Is the likelihood of technical success considered? Is the P&S complex concerning business model, value chain and technology development? Is the portfolio balanced regarding short-term and long terms P&S, high- and low-risk P&S and small and large projects? Is there a high probability of commercial success? Could the project be expanded to further enhancements or a family of P&Ss? Were regulatory constraints considered?								
Competitor and Marketplace									

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
Competitor analysis presents a plan to anticipate and respond to competitor activity and understand market potential, market attractiveness and identification of particular market segment that would be targeted by the P&S. The objective is to understand the market and competitors to anticipate effectively reactions.	<u>*To what extent are the following market & competitor indicators present?*</u> Market size. Market pricing and competetive pricing analysis. Profitability analysis to understand return on investment (ROI) periods. Analysis of the competitor market share versus organisation. Adequate understanding of potential market growth. Localised understanding of the market. Existence of dominant competetitors. Strenths and weaknesses of competitors. Competitors frequently introduce new P&S. The maturity of the	*Market potential and size* *Market competitiveness* *Market intelligence* *Competetive response likelihood* *Understanding market characteristics*	*Competitive response intensity* *Clearly defined target market segmentation strategy* *Clearly specified competitive advantages* *Perceived innovativeness compared to competitors*	*Monitoring of competition* *Integrity of market research* *Clearly specified competitive advantages*	<u>*Enhancement:*</u> value proposition to target market <u>*New market:*</u> detailed competitor and market analysis <u>*New venture:*</u> Detailed market and competitor research <u>*New development:*</u> Existing market, so understanding already exists	<u>*Sources:*</u> Estimated market share and predicted revenues will be the key input to support further investment in development resources. External resources can be used to gather market intelligence. <u>*Documented:*</u> P&S functional specification and presented at NPSD stage/gate meetings	<u>*Responsible:*</u> Product manager ensures that research in terms of market potential and competitor analysis is conducted. <u>*Accountable:*</u> NPSD executive <u>*Consulted:*</u> Depending on the size of the organisation a separate function such as market intelligence can gather or consolidate the data from various sources. <u>*Informed:*</u> Input for the marketing team to design targeted	Different formats of competitor analysis will be presented at all stage/gate meetings, but it is especially important during the planning phase, before development starts. <u>*Concept phase:*</u> Preliminary market analysis conducted <u>*Planning phase:*</u> Detailed market and competitor analysis <u>*Launch phase:*</u> Evaluate alignment between market analysis and promotions <u>*Maintain phase:*</u> Evaluate effectiveness of P&S as post-implementation review to determine lessons learnt.	Can lead to unprofitable P&S and failure of business strategies. Damage the reputation of the organisation amongst its shareholders. Pricing wars can erupt where the focus is on the cost of services rather than value. P&S development expenses exceed P&S revenue. Incorrect decision-making due to inaccurate market research. Unreliable sources of market research information. Failure to analyse market conditions and upcoming trends.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	market. Analysis of applicable competitors in the market (both large and small). Possible response of the competitor to the introduction of the P&S. Quickness of anticipated competitor response. P&S pricing could start a pricing war. Competitor P&S are hard to emulate regarding business model or technology. Performance in the marketplace. The potential target market and the characteristics of the target market. Analysis based on reliable market intelligence. The P&S offer differentiated advantages in the						campaign and promotions. The financial analyst will use market indicators to conduct financial feasibility studies.		

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	marketplace. The functional design aligns to market and competitor analysis.								
Customer									
Customer analysis presents a good understanding of the customer needs within the market segment and translating these requirements into functionality that is necessary for the customer while considering any potential risk impacts to the client. The objective is to create superior value for customers by utilising market research.	*To what extent are the following customer indicators present?* Was a customer needs analysis conducted? Does an understanding exist of the current challenges that are experienced by the client? Is the customer analysis conducted based on secondary data or primary data? How much customer involvement took place to understand customer requirements regarding price, performance and quality? *Is the customer requirements explained concerning:* Complexity / Ease of	*Product advantage* *Meet customer needs* *Price sensitivity*	*Market segmentation targeted for specific customer needs* *Functional specification reflective of customer requirements and needs* *Customization ability* *Value proposition clearly specified* *Quality P&S* *Enhanced customer experience* *Pilot customer testing*	*Reducing customer risk* *Relationship building with corporate customers* *Corporates understan-ding the value proposition.* *Corporates being involved during the desing of the P&S.*	*Enhancement:* Price sensitivity *New market:* Understanding target market customer requirements *New development:* Good knowledge exists of customer needs *New venture:* Customer needs	*Sources:* Both internal and external sources of information can be utilised. Primary research data is new research that is primarily conducted for the specific purpose of the P&S. Secondary research utilises generic research that has been published or research for other uses. *Documents:* The customer functionality will be contained in	*Responsible:* The product manager will analyse the market research to design a P&S that meets the needs of the targeted customer segment. *Accountable:* The P&S executives ensure conformance to process. *Consulted:* The customer needs analysis can be conducted by research or market intelligence	*Planning phase:* Customer requirements should be finalized in the P&S functional specification before development starts. *Develop phase:* The customer functional specifications will be assessed before launch phase to determine how well the final functionality meets the requested criteria. *Maintain phase:* The customer functionality is again evaluated during the post-implementation review during the maintenance phase to the adequacy of the functional specification and if the client was exposed to unintended risk scenarios. High-level summaries of the customer requirements are presented at stage/gate	Not developing the P&S according to needs of the customer. Incorrect interpretation of the client needs into required functionality. Inhibit customer adoption of P&S. Not considering the customers risk exposure leading to reputational damage. Incomplete or changing customer requirements leading to project delays and increased cost due to rework. Insufficient quality of customer research could produce inferior functionality that does not address customer needs. Increased cost due to

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	use Relative advantage Customer value Performance risk Financial & fraud risk Time & image risk Physical risks Harassment, SPAM, bill-shock, cyber bullying, predators, etc. Consideration of customer guarantees, up-front disclosures, dispute resolution processes, user-driven personalization, CRM initiatives and pace of contact required CRM requirements to extend the value to the customer during the P&S entire lifecycle					a functional specification description that will be employed by the development teams to design and develop the P&S.	teams, the product manager or by external providers. Additional research methods such as interviews and focus groups can be conducted to determine if a customer prefers a certain type of functionality to another. *Informed:* The NPSD practitioners teams and especially the development teams need to understand the functional requirements. The marketing and testing teams also need to understand the	meetings.	redeveloping the P&S. Inability to attract and retain customers. Inappropriate market segmentation. Ineffective marketing messages.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
							customer requirements.		
Marketing and Sales									
Marketing strategy should promote the objective of the P&S by effectively targeting the intended market, by utilising effective marketing and communication channels. The risk evaluates the extent to which the marketing strategy succeeds in promoting the P&S. This includes adequate identification and targeting of the intended market and using effective channels. A primary indicator of a	*To what extent is the following marketing indicators present?* A clearly defined marketing strategy. Marketing strategy target a clearly defined market segment. P&S positioning within the target market? Use of what marketing channels and why Defense of above-the-line or below-the-line advertising Application of 4P's or 5P's in the market strategy Customer agents informed of marketing activities Existence of sales plans to target market. Involvement of sales staff during the planning	The 4 Ps of marketing namely product, pricing place and promotion.	5 Ps for service (adds a P for people) creation of a positive customer service experience. Providing tangible clues of the reliability of the service. Ensuring that the advertising campaign is designed to meet the needs of the target market with a clearly targeted message of the value proposition and not only brand. Robust understanding of customer needs.	*The design of effective sales strategy.* *Education of sales staff to clearly understand the value proposition of the P&S.* *Involvement of sales staff during sales forecasting and finalising sales figures.* *Training and communication to sales staff of target readiness and P&S capabilities. The more complex the P&S is, the more training is required.* *Aligning of sales targets to*	*Enhancement:* Value proposition *New market:* the effective reach of the target market. *New development:* Sales staff to understand the technology benefits. *New venture:* Effectively reaching the target market as well as conveying the value proposition of the P&S.	*Sources:* Input from P&S functional specification to establish target market. Additional market research can be conducted. Market and forecasting trends. *Documents:* The outcome is the delivery of a marketing strategy and campaign that advises how and where the marketing campaigns will be applied. Informing and development of a sales plan to the sales team.	*Responsible:* Resources with specialised marketing skills. Marketing specialist analysis the market and customer requirements and determines the optimal marketing campaigns based on these inputs. *Accountable:* The NPSD executives. *Consulted:* The product manager and project teams. *Informed:* The product manager and NPSD teams.	*Planning phase:* A preliminary marketing strategy will be delivered. *Develop phase:* The design of the marketing campaign is conducted. *Launch phase:* The completed marketing plans will be presented as one of the deliverables to ensure commercialization readiness. The marketing campaign coincides with the official launch of the P&S. *Maintain phase:* The effectiveness of the marketing and sales campaigns will be evaluated during the post-implementation review to determine lessons learnt.	Inadequate marketing can lead to a failed P&S. Insufficient communication and customer education. Ineffective communication of the value of the P&S. Insufficient budget to support advertising and promotion strategies. Poor marketing strategy could lead to adoption failure. Use of external providers can introduce additional risks. Non-compliance with advertising standards. Failure of sales to understand the P&S leading to a concentration on other P&S that is easier to promote. Marketing was not meeting the needs of the

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
successful P&S is the effectiveness of the marketing strategy. The objective is to ensure that the P&S are effectively advertised, promoted and sold to reach its stated goals.	of the marketing and sales plan. Consisten application of market creatives across various media domains such as TV, Radio, Print, Online, Social Media and Mobi that speaks to the intended target market. Viable timing of P&S announcements. Risks associated to outsourcing of marketing activities to agencies and business partners Target customer educated about the value of the service through effective advertising and promotion strategies. Budget alocated to support marketing and sales activities. Testing of marketing campaign before launch. Advertising campaign			*promote certain project categories* *Allocating sufficient budget for marketing and provide more support to the marketing department.*					target market. Significant variance between sales results and forecasting due to optimism.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	align to organisation strateg.y Advertising consistent with the P&S functionality. Consistent application of metrics to monitor success of sales strategy and effectiveness of the sales force. Forecasting assumptions and trends based on reliable data.								
Investors and Stakeholders									
The risk evaluates the extent to which key stakeholders have been identified that may have a significant influence on the P&S. The objective is to ensure that the P&S contribute to positive investor and stakeholder relationships by proactive	*To what extent are the following investor and stakeholder indicators present?* Consideration of trends regarding workforce, creditors, customers and other stakeholders. Evaluate opportunities for proactive partnering with other interested parties. Potential to lead on industry issues.	*Regulatory stakeholders*	*Wider public concerns to be addressed due to bigger market being addressed* *Online media strategies* *Regulatory and governing bodies requirements* *Main shareholder requirements*	*Main shareholder requirements and influences*	*New venture & new market:* *Understanding the stakeholder and shareholder requirements and obtain appropriate support for the P&S.*	*Sources:* A stakeholder analysis will mostly be conducted with the risk practitioners in conjunction with the product manager. *Document:* Depending on the P&S, the stakeholder requirements will	*Responsible:* The product manager is responsible for identifying the complex stakeholder relationships. *Accountable:* The NPSD executive, Exco and board of the organisation, needs to ensure	*Concept phase:* Stakeholder analysis can be conducted. *Planning phase:* The stakeholder and shareholder requirements need to be addressed and finalized before development starts. *Launch phase:* The testing of stakeholder and shareholder requirements takes place before the launch of the	If the P&S do not contribute to positive investor ad stakeholder relationships, the P&S could be viewed as a liability that could decrease investment and ultimately decrease shareholder value. Ineffective or inaccurate communication could decrease trust in the organisation. Inability to protect confidential requirements

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
partnering and collaboration.	Proposals to work with governments on issues such as health and education. Conduct stakeholder analysis to understand the impact and authority of governing and regulatory bodies. Plan to garner the support of the primary influencers for media partners and social media. Support of principal shareholders and conformance to shareholder plans and expectations. Key influencers such as analysts, brokers, shareholders, key people, groups of people and institutions who should be aware of this P&S and who could impact on the success. Real or perceived influence of majority shareholders and stakeholders.		*and influences*			be documented in the risk assessment or if of minor impact on email assessments.	that an effective strategic approach exists to network and build relationships with stakeholders. Conformance to shareholder strategies and requirements should be considered. *Consulted:* The risk practitioner teams consult with regulatory and legal to identify governing bodies and preliminary requirements. *Informed:* The NPSD project teams and executives are informed about	P&S. *Maintain phase:* Any unexpected deviations or problems are noted during review of the lessons learnt.	of stakeholders. Oversight in identifying key stakeholders in unknown markets could cause P&S to be stopped, redesigned and/or discontinued leading to financial losses. Poor corporate brand perceptions. Failure to consider shareholder proposals. Inability to meet shareholder expectations. Failure to pay adequate attention to stakeholders and shareholders could lead to poor cooperation. Inadequate knowledge of stakeholder responsibilities and influences could negatively impact on P&S.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Stakeholder intelligence and market data gathered. Lobbying activities for pending legal and regulatory changes. Interests of third party and joint venture requirements understood. Conflict of interest with shareholders stakeholders. Disputes with labour relationships.						requirements The public relations teams need to design strategies to communicate effectively with stakeholders and the wider audience than merely the customers impacted by the P&S		
Public Relations and Communications									
The risk evaluates the extent to which public relations are adequately prepared to communicate new P&S releases to stakeholders and can respond timeously to reputational risks.	*To what extent are the following indicators present?* Communication to staff and front-line customer care Engagement of Public Relations department Design of PR communication strategy Relevant content to reach the intended	*Consideration of the external environment.*	*Ensure PR and Media Plans exist for high-risk projects to address public acceptance risks.* *Any significant pricing changes should be evaluated for potential reputational*	*Ensure PR and Media Plans exist for key products.*	New ventures: Strategic projects that require additional PR and media plans. Enhancements: Price increases	Sources: The stakeholder analysis will serve as input for the design of the communication strategy. Risk practitioners will conduct a risk assessment and collaborate with regulatory and	Responsible: The product manager and project manager ensure that PR specialists are engaged. The PR specialists are responsible for designing an effective communications	Planning phase: Stakeholder requirements will be refined. Development phase: The communication strategy will be developed. Launch phase: The communication strategy will be assessed before the launch of the P&S.	Failure to communicate proactively could reduce loyalty and decrease trust of customers and stakeholders. Incorrect information due to insufficient understanding of the P&S can lead to reputational damage. Lack of communication to internal staff could lead to a lack of buy-in to the

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
The public relations team are also responsible for internal marketing of P&S to staff. The objective is to build relationships with the wider society to establish customer loyalty through effective publicising of information.	target audience. Communication channels appropriate. Consistentcy of communications to internal and external parties. Validation of content of the PR communications message such as technical information. Crisis Response Plan for high risk projects to manage negative publicity Communication plans to stakeholders, shareholders and stockholders. Analyse requirements of external stakeholders (agencies, channel partners, media, government, industry bodies and institutes, and general public. Controls for outsourced communications to third parties.		*damage.* *The anticipation of possible adverse external reactions.* *Communicating launch dates when certainty is achieved.*			legal to determine stakeholder requirements. *Document:* The risk assessment will initially document the associated PR needs, which will be followed up by the project team. The PR team will document the communication strategy.	strategy. *Accountable:* The NPSD executives are responsible for ensuring that potential negative publicity is proactively addressed. *Consulted:* The risk practitioners, Regulatory and legal and technical resources (if the technology is the source of risk). *Informed:* The NPSD teams are informed, and risk practitioners evaluate the strategy.	*Maintain phase:* The effectiveness of the communication strategy and any unintended risk consequences will be evaluated as part of the lessons learnt.	P&S. Inconsistent communication to internal staff could lead to confusion. Delayed response to negative publicity could result in reputational damage. Inaccurate reporting could lead to a lack of credibility. Ineffective response to negative events and crisis management could erode the brand.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Viable timing of P&S announcements?.								
Product Management									
The product performance and the extent to which the product manager facilitate effective P&S performance throughout all the NPSD lifecycle phases and ensure that the P&S functional requirements are adequately articulated in the functional specification. The product manager is also responsible for ensuring that reports exist to enable the tracking of the P&S performance during its lifecycle and enable implementation of remedial actions, where required. The objective is to ensure that the	*To what extent are the following product management indicators present?* Precise and differentiated P&S advantages. P&S functional specification comprehensively documented. P&S attributes clearly defined in documented specifications to technology development teams. Measurable P&S performance objectives and targets. Alignment of P&S specification to customer and target market requirements. Ability of technology teams to deliver on the requirements. Identification of	*Product advantage* *Product quality* *Cost advantages* *Clarity of performance requirements*	*Service advantage* *Innovativeness* *Quality of service* *Service objectives clear* *Product Manager takes ownership* *Product manager track performance criteria.* *Measured product performance targets.* *Compiling robust business cases.* *Holistic understanding of P&S impact.*	*Technological sophistication* *Clear service advantages for B2B* *The degree to which design and performance specifications is known.* *Quality of service*	*Product management is important for all four classifications.*	Sources: The source for the P&S idea could be the product manager but also executives, stakeholders or other external resources. The P&S functional specification consolidates the market and customer analysis and consolidates all the P&S related information that is handed over to the technology development teams. The product manager needs to have a good understanding of the technology that supports the	Responsible: The product manager is the resource that is vested with the overall responsibility for the development of a successful P&S and ensuring that it conforms to quality parameters. The product manager is responsible for all aspects relating to the design of the P&S and as well as the continued performance and monitoring of the P&S performance against targets that were set for the specific	Idea phase: The product manager will present the product idea at the stage/gate meeting and if viable will pass through to the next gate. Concept phase: The product manager will produce a preliminary P&S description that is evaluated by the NPSD teams and updated with their input. Planning phase: The phase where the product manager delivers the most critical input is during the planning stages when the P&S functional specification is being developed. Development phase: During the development stage, the product manager works closely with technology development teams. Testing phase:	Ineffective product manager could lead to inferior P&S. Ineffective P&S specification can result in inefficient P&S that does not meet the needs of the customer, scope creeps, increase cost, delay projects and ineffective use of resources. Additional risks can also be introduced due to competitor and marketplace actions that force changes to the P&S. Vague or unrealistic P&S objectives could lead to the development of unfeasible P&S. Ineffective P&S design could result in poor quality P&S. Failure to minimize risks to customers and organisation. Inadequate support of

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
product manager performs adequately to ensure that optimal and successful P&S are launched as aligned with the goals of the P&S.	technology constraints. Alignment of P&S objectives, revenue and profits to organisational strategic objectives. Design of performance parameters to monitor the project during its lifecycle, including market performance against estimated performance and the goals of the P&S. Defined reporting requirements to monitor incidences for enhancements and remedial actions. Plan to address underperforming P&S. Benchmarking of performance against industry projects. Definition of metrics to characterise the P&S as successful, a failure or identify when it needs to be discontinued. Monitoring of customer complaints from		*Product manager communicates effectively.*			P&S as this will serve as input during the design phase. P&S functional specification should ensure that sufficient information exists about the business model and business rules that restrict usage of the P&S as well as financial and pricing models. *Documents:* The product manager is responsible for delivery of two important deliverables during NPSD lifecycle, namely the functional specification and objectives of the P&S.	P&S. Overall delivery of the P&S functional specifications. *Accountable:* The NPSD executives are ultimately responsible for ensuring that sufficient resources are provided to ensure the success of the P&S. *Consulted:* The product manager consult with the NPSD teams, especially development teams and supporting resources. *Informed:* The NPSD practitioners	The P&S testing results are a key input to determine launch readiness. *Maintain phase:* The product manager will provide input to the lesson learnt and ensure that the P&S are monitored post-launch and reach its intended objectives.	clients due to failure to understand CRM requirements. Lack of cohesion between project teams due to lack of information. Failure to track P&S performance in the marketplace. Unrealistic forecasting assumptions and lackluster performance.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	different channels. Description of the timing of reports and sources of data. Monitoring impact of competitor and marketplace changes on scope. Unresolved functionality and aspects that could delay development of the P&S. Identification of unintended scenarios that could result due to the use of the P&S identified.						need to be continually and timeously informed of changes.		
Project and Knowledge Management									
The risk evaluates the extent to which the individual projects that result from P&S development are well managed. Knowledge management is the process of gathering, utilising and	_To what extent are the following project management indicators present?_ Formal best practice project management methodology. Planned and coordinated project management activities allowing project team members to be up to	*Cross-functional integration.* *Project performance.*	*Intra-organisational development functions* *Knowledge management* *Project risk management* *Scope change management and realistic*	*Technical skills and understanding of technology by project managers.* *Knowledge management activities and systems.*	*More complex projects require prime project management skills. The best project managers should manage new ventures.* *Only technologically skilled project managers*	_Sources:_ NPSD practitioner teams were selected to participate during the development of P&S. _Documents:_ Project	_Responsible:_ Project management activities performed by the project manager who liaises with other project teams. Oversees micro- and	The project manager is assigned to the specific P&S during the planning phase and ensure that basic project management activities are in place for all projects take place including tracking progress during all of the NPSD phases. Knowledge management is an essential objective of post-implementation reviews to assist in the improvement of	Inadequate project management can lead to increase in project risks and scope creep. A large number of projects can result due to single P&S, which can introduce additional sources of risk. Project manager with inadequate skills or an underperforming project

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
retaining best practice and knowledge for the organisation to improve P&S.	date. Formal approaches to planning, scheduling and controlling followed such as minute compilation, distribution, template utilisation, and project plan development. The use of project metrics and performance indicators to monitor timeframes, resources and scope. Management of variations from schedules and clashes between deadlines. Project monitored using quality criteria during the project lifecycle. Defined scope of projects and scope creep managed through a formal change control process. Clear roles and responsibilities for project team members. Performance of lessons		*timeframes* *Authority to exercise control over the project.* *Technical skills and understanding of technology.*		*should work on new development and new ventures.*	documentation should contain knowledge management aspects. Lessons learnt should be documented in a manner that can increase performance. Documentation should be retained in a central repository during the lifecycle of the projects and adequately protected and secured. Formal documented planning, scheduling and controlling of projects, including compiling of minutes of project teams, distribution of the minutes and development of	macro projects during the NPSD lifecycle. The project manager is best suited to perform knowledge management capabilities due to involvement in all the micro- and macro-projects. Communication to relevant cross-functional NPSD practitioners timeously and adequately. *<u>Accountability:</u>* The PMO executives are accountable to ensure that quality project management processes are followed. *<u>Consulted:</u>*	future P&S. Knowledge management aspects should be integrated during all stages of the NPSD lifecycle to ensure that critical knowledge is retained.	manager can lead to project and/or P&S failure. Not applying effective knowledge management techniques can lead to repeating the same mistakes and deficiencies, increasing cost, schedule and risks. Insufficient knowledge management can restrict organisational learning and inhibit improvements, by the inability to reuse knowledge, which is also costly, and resource-intensive. Failure to assign responsibilities for tasks could lead to delayed projects. Failure to assign ownership of risk can lead to P&S delays and conflicting priorities.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	learnt and extent of integration to increase performance. Conduct root-cause analysis techniques to prevent recurrence of the same deficiencies? Identification of key stakeholders and involvement. Definition of scope and goals aligned to overall NPSD objectives. Identification and prioritisation of critical problems. Retainment of knowledge. Tools and technologies exist to retain knowledge reliability and securely.					project plans. Project metrics should track timeframes, resources and scope. Project status reports. Consolidation of information from different project teams.	The product manager consults with the NPSD practitioner teams and consolidates and communicate the information to relevant stakeholders. *Informed*: The NPSD practitioner teams and especially the product manager should be well informed about the status of the project.		
Financial Management									
The risk evaluates the financial analysis and management of the P&S and investigates whether it is	*To what extent are the following financial management indicators present?* Analysis of financial risk	*Product pricing* *Economic success of new product* *Cost*	*Financial commercial viability analysis of service* *Availability of*	*Budget constraints* *Building an effective business case for the*	*Harder to conduct a commercial viability analysis for new venture since so many*	*Sources:* Financial analysis obtains input from other areas such as market research	*Responsible:* Financial functional specialist responsible for financial	*Concept and Development phase:* Financial analysis takes place mainly during the concept and development phases to determine whether the project	Insufficient funds to meet project objectives. Incorrect assumptions could lead to incorrect calculation of investment opportunity of P&S.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
adequately performed. The primary objective is to correctly understand the revenue advantages and commercial viability derived from the implementation of the P&S.	of business model. Budget sufficient to support the different activities of the NPSD lifecycle. *Does the P&S commercial viability analysis consider:* Cost advantages derived. Project cost and investment estimates. Realistic proposed volumes, process and cost estimates on which the ROI is calculated. Market potential. The value of potential customers and transactions per customer. Appropriation of value (price of service, cost saving, an estimate of the value of increased sales, cost (fixed and variable) to deliver the P&S and overhead costs).	*advantages of product*	*reliable data* *Budget constraints on marketing* *Taking accountability for assumptions such as projected adoption figures market sizing* *Understanding market price sensitivity*	*corporate service*	*unknown variables exist.* *<u>New Development:</u>* *The costing of the technology and transactions could be challenging.* *Enhancement:* *Pricing changes are the primary consideration* *For the new market, the market adoption assumptions should be based on reliable first-hand data and not secondary data sources.*	to determine the size of the market as determinant of financial viability including: Business model analysis Budget Cost of external providers Value chain elements and incentive payments Pricing Cost estimates Marketing activities Target market estimations. *<u>Documents:</u>* Financial viability studies are documented and approved as a distinct	management, which include forecasting, assumptions and risks are noted. Large organisations the role is performed by financial functional specialists while in small organisations it is probably fulfilled by the product manager. *<u>Accountable:</u>* Financial executive is ultimately responsible for ensuring that the financial viability analysis is accurate. The NPSD executive is responsible for ensuring that the correct process is	should proceed through to next stage/gate. *<u>Maintain phase:</u>* Financial estimations are also evaluated during the post-implementation review of the maintenance phase to confirm the validity of the financial estimations. *<u>Portfolio planning:</u>* Financial viability will be presented at portfolio meetings to determine if P&S should be prioritised for development.	Incorrect financial viability analysis, could lead to selection of inferior P&S to progress through NPSD in favor of more optimal P&S. Using inappropriate business assumptions could lead to poor decisions. Use of unreliable information during planning and budgeting. Lack of integrity of financial data leading to inaccurate investment decisions. Inability to understand the P&S functionality could lead to incomplete analysis of cost structures. Inability to adapt financial models to cater for innovative P&S and models. Too much emphasis on risks and not opportunities can stifle innovation.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Assumptions based on reliable sources of data (especially if data originates from secondary sources). Specification of risks contained within estimates (conservative or optimistic). Critical assuptions supported by what-if analysis or scenario planning. Controls exist to ensure completeness, currency and reliability of data on which financial estimates is based. Consideration of external providers and value chain aspects. Budgetary control process in place with monitoring responsibilities. Consideration of investments required. Considered the rate of penetration in the					deliverable of the NPSD	followed and that assumptions on which the cost estimates are based are clear. *<u>Consulted:</u>* The NPSD teams are consulted to provide input to the financial estimates and the risk practitioners review the documentation. *<u>Informed:</u>* The NPSD teams are informed of the financial estimates.		

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	market. Existence of automated tools and systems to support estimation and forecasting data. Estimations relevant and appropriate to the P&S and aligned to the strategic objectives. Understandability of rationale behind estimates.								
Business Model and Value Chain									
The business model is the concretization of the organisation and financial architecture with the objective of creating value for customers and transforms payments into value. The business model risk evaluates the extent to which the business logic or business model is	*<u>To what extent are the following business model indicators present?</u>* The business model is innovative and contain flexible elements. Value chain risks to customer experience and support in delivery channel. The business model or value chain advantages would be difficult to replicate such as using differentiated, effective, efficient and hard to	*Business model innovation* *Cannabilisation of other services* *Supply chain and sourcing* *Trade customer risks*	*Quality of support in value chain* *Legal agreements governing business model* *Understanding the comprehensive value chain solution in terms of ensuring that it is competetive* *Innovativeness of business*	*Establishment of profitable business models.* *Business models with risk accountabilities clearly defined.* *Capability of value chain partners to deliver*	*New business models can be introduced during new ventures and new development.* *New supply chain requirements can be introduced for new market and new ventures.*	<u>Sources:</u> Third party Value chain elements Financial estimates Pricing Business rules Business agreements Previous incidences	<u>Responsible:</u> Function delivered by product manager supported by financial functional specialist. Product manager is responsible for designing the elements and bringing them together to ensure that each partner	<u>Responsible:</u> Function delivered by product manager supported by a financial functional specialist. The product manager is responsible for designing the elements and bringing them together to ensure that each partner obtains revenue and that risks are managed between a network of partners. <u>Accountable:</u> The NPSD executive is primarily responsible for ensuring that business models	Complex business models, especially strong ICT and e-business components can introduce a variety of risks that could cause P&S failure. Failure to capture value for the organisation. Stagnant business models lead to a lack of competitive advantages. Innovative business models often result in cannibalization Partners providing

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
holistically understood concerning the value that the P&S offers to generate profitably and sustainable revenue streams. The risk evaluates the ability to identify the delivery channels that are relevant to the product and customer experience and maximise the support of all delivery channels for the projects, products and services.	replace architecture. The opacity of business model makes it difficult for competition to understand and emulate. Cannibalization of existing sales and profit. Interpretation of business logic and monetary consequences from the different revenue streams to deliver profitable and sustainable sources of income and cost structure employed. Analysis of the underlying components and critical success factors (CSF's). Examination of the perceived value of the different parties contribution, including: Identification of the specific services. Types of expertise		*model*			*Documentation:* Business model and value chain elements are documented as part of the functional specification supplemented by additional documentation.	obtains revenue and that risks are managed between network of partners. *Accountable:* The NPSD executive is primarily responsible to ensure that business models deliver value. The analysis of the business model should identify the relevant elements specific to the P&S and the relationships that exist between elements. The different elements include (1) the value that is provided to customers, (2) how this is done	deliver value. The analysis of the business model should identify the relevant elements unique to the P&S and the relationships that exist between elements. The various components include (1) the value that is provided to customers, (2) how this is done and (3) with which financial consequences as well as (4) identification of any additional concepts and relationships that support the business model for the P&S. *Consulted:* Legal and regulatory Risk practitioners Finance Technology development *Informed:* NPSD teams	different technology elements of aspects of the business model/value chain can produce additional risk. Not fulfilling the needs of the customer due to misunderstanding of customer needs Business interruptions in the supply chain Weak processes or bottlenecks can be introduced Inefficient communication channels where risks are not timeously communicated Inadequate assessment of the inventory required leading to delays Failing to forecast demand and plan capacity accurately Poorly defined return, recall and credit policies Insufficient visibility and oversight or enforcement over supply chain result in

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Core competencies required Quality delivered Security requirements Assuming risk Cost structures? Legal and contractual liabilities Ownership of customers Alignment of business goals and processes. Identification of value chain configuration required regarding resources and activities. Analysis of network of agreements in place with partners to deliver the value chain requirements. Integration of customer requirements into value chain and stores. Logistics sourcing physical products include: procurement, warehousing, outbound						and (3) with which financial consequences as well as (4) identification of any additional concepts and relationships that support the business model for the P&S. *Consulted:* Legal and regulatory Risk practitioners Finance Technology development *Informed:* NPSD teams		inferior customer experience.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	logistics; supply and demand; post-delivery support logistics such as return processes; maintenance stock levels. Establishment of responsibilities for coordinating activities between the different parties in the value chain. The existence of contingency plans in case of business interruptions.								
External Providers									
The risk evaluates how well the business relationship with external providers are managed concerning ensuring adequate service delivery and continuous support of the P&S, during the NPSD lifecycle and after implementation.	*To what extent are the following external provider indicators present?* Due diligence performed to ensure that the vendor is competent to do the work, before entering into an agreement. Vetting of external provider expertise to deliver and perform adequately.	*IP risks by external providers* *Ensure that expertise is retained within the organisation*	*Following a robust procurement process* *External provider meeting quality standards*	*Reliable external providers* *Following procurement processes that are fast and effective* *Legal and contractual agreements are easy to understand and are implemented*	*External providers is more likely to be introduced for new developments and new ventures as suppliers of technology.*	*Sources:* Supply chain Technology security Technology development Business model Risk management Legal and Regulatory	*Responsible:* The product manager is responsible when external providers are introduced to assist the delivery of the P&S. The technology specialists are responsible if the external provider is	*Concept phase:* The requirements to introduce new external providers can already be assessed during the concept phase. *Planning:* The introduction and procedures to induct external providers are mostly instituted during the planning phase. *Development:* The external supplier delivers	Failure to deliver in agreement with contractual obligations leading to project delays. Unauthorised sharing of sensitive, confidential information. Failure to ensure adequate IP protection. The external provider can go out of business. Disruption of P&S

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
If all of the elements of the P&S cannot be delivered internally by the organisation, existing or new external providers can be utilised to produce part of the P&S solution. The objective of employing external providers is to save cost, bring in additional expertise and to increase innovativeness. Maintaining good business relationships with external providers to ensure adequate P&S delivery and continued sustainable support of the P&S during the NPSD lifecycle.	Implementation of information security due diligence to ensure that adequate security risk management processes are in place by the external provider. The existence of escalation, arbitration or mediation processes to resolve potential disputes. Responsibilities for liabilities such as the cost of delays, errors, omissions, fraud and negligence contractually defined. Were lines of communication clearly defined to address internal controls problems and challenges? Are delegations and written consent in place for external providers performing management functions or acting as employees of the organisation? Is formal written			*via swift and efficient process*		Previous incidences *<u>Documentation:</u>* The use of external providers can be documented in the P&S functional specification or the technology solution design	introduced to assist with the technology delivery of the P&S. Technology security is in charge of delivery of the technology security due diligences. *<u>Accountable:</u>* The Supply chain executives are ultimately accountable to ensure that proper procedures are being followed in conjunction with the NPSD executives who need to comply with these internal governance procedures. *<u>Consulted:</u>* Supply chain,	on the component that is required for delivery of the P&S usually during the development phase especially if it is a new technology partner.	delivery. Exposure to reputational risk due to non-compliance to regulations and/or unethical business practices. The external provider is not financially stable and unable to deliver on requirements. Overreliance on sole source vendors. A weak contract could lead to an inability to protect against violation of terms and lead to legal disputes. Abuse of organisation IP or knowledge. Not sharing knowledge with organisation or training of organisation employees.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	contracts, SLA's, OLA's and agreements in place that define the scope of work? Monitoring to revise agreements when the organisational context change, including restructuring, processes, systems and risk exposures. Alignment to formal organisational procurement procedures. Due diligences consider financial stability analysis and advise on personnel changes to ensure sufficient support. Procedures to ensure compliance with ethics, regulations and social responsibility provisions Protection against IP abuse and providing knowledge transfer Robust contractual agreements in place						technology development and legal are consulted *Informed:* The NPSD practitioners will be informed		

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Expected quality of service parameters Strategic fit of external provider aligned with organisational objectives.								
Customer Relationship Management									
The risk evaluates the extent to which customer relationship management (CRM) strategies is applied and customer interactions are planned to service adequately the client for the specific P&S and ensuring that the clients receive optimal service. The objective is to improve the customer experience to improve the profitability of an organisation ultimately.	*To what extent are the following CRM indicators present?* Support activities are designed to ensure that the customer can resolve challenges via 'one call resolution'. Technology and media channels used as support for CRM activities Adequate training of front-line office agents to enable efficient resolution of customer queries Sufficiency of CRM resources to meet demand. Tools and systems in place to allow agents to self-diagnose and	*Efficient customer support*	*Having sufficient access to technology functions* *P&S are easy to use as complexity introduce additional calls to Call Centre* *Escalation procedures are robust to ensure that customers problems are efficiently addressed* *CC should be involved during NPSD to determine functions required for*	*Not having sufficient access to information to support customers* *Lack of involvement during NPSD* *Unstructured of inefficient training of customer support areas* *Insufficient technical knowledge of customer support staff* *Insufficient staff* *No structured formal process*	*More attention to customer support should be provided the more complicated the P&S are perceived and the more innovative the P&S offering.* *Customer support would need extensive attention during the launch of new venture P&S categories.*	*Sources:* NPSD specification Technology specification Supply chain Business model CRM teams Fraud Previous incidences *Documents:* Agent briefing Call scripts P&S guidelines FAQs	*Responsible:* Product manager is responsible for ensuring the CRM requirements are considered during the NPSD lifecycle. *Accountable:* The CRM executives and NPSD executives are accountable to ensure that the customer experience is optimal to support the P&S within the organisational constraints.	*Planning phase:* Evaluation of the CRM requirements early in the NPSD lifecycle and ensuring that these demands are built into the product specifications. *Development phase:* The technology components supporting the P&S are being developed. *Launch phase:* The readiness of the CRM channels is tested. *Maintenance phase:* During post-implementation reviews, the effectiveness of the CRM activities is analysed as lessons learnt	Inability to deliver an adequate service experience for the customer. Loss of confidential information Fraud impacts Inaccurate data could lead to inability to service customer Insufficient capacity to serve the client can result in huge delays and customer frustration Service interruption due to lack of resilience and redundancy Significant failings of ERM systems or processes may result in declined customer satisfaction and eroding

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	resolve incidents within specified time frames. Surveys of customer satisfaction Employees service attitude Customer complaint reporting systems. New processes required to support customers during the lifecycle of P&S Existence of channels to share new information and knowledge about the P&S. Escalation procedures Limits of service delivery Supporting data inputs required Verification procedures for customers. Agent training such as FAQs, guidelines and call scripts. Communication to		*effective customer support* *Self-service support for customers* *No single view of customer across the customer lifecycle*	*for releasing new services to support*			*<u>Consulted:</u>* Technology teams CRM teams Supply chain Fraud teams Risk management *<u>Informed:</u>* NPSD teams		customer loyalty and ultimately decreased market share and lower ROI

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	supply chain Long term CRM requirements Measures that are used to ensure the integrity of information. Availability of CRM systems Single-view of customer.								
Business rules, Pricing and Revenue Assurance									
The risk evaluates the extent to which all appropriate business rules have been adequately defined, implemented and the most suitable pricing strategy is applied. The extent to which the P&S can expose the organisation to potential revenue leakage activities are also	*To what extent are the following indicators present?* Business rules that restrict usage of the P&S. Clear identification of the business rules and pricing related to the customer, organisation, third party, application developer, music company, artist, service providers, dealers, incentives and commission payments. Identification of the specific services,	*Value proposition important for customer*	*Price is important for customer especially consumer prepaid market*	*Assuring that revenue is generated and billed*	*Most important to define during the design phase to ensure that technology team can develop according to the correct specifications, especially new markets and enhancements.*	*Sources:* Previous incidences NPS functional specification Technical solution development Financial documentation Regulatory lodgment documentation *Documents:* NPS functional	*Responsible:* The product manager is responsible for ensuring that business rules and pricing and potential revenue leakage concerns have been identified and addressed. Financial resource will be responsible for the financial analyses of the business rules	*Concept phase:* A preliminary pricing strategy will be developed at concept stage on which the financial feasibility of the P&S is based, *Planning phase:* The final business rules and pricing rates will be finalized during the planning phase, upon which revenue assurance risks will be established and controls suggested. *Develop phase:* The financial measures and controls will be implemented	RA leakages can lead to lost revenue, increases in cost to correct problems and loss of public confidence. Abuse of business rules may result in fraud and financial losses Incorrect billing such as overbilling of customer can result in losing customers to competitors Vague billing rules can be incorrectly interpreted by technology development teams leading to abuses or fraud

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
considered. Revenue Assurance is defined as accurate billing for transactions, P&S in accordance with contracts and tariff plans.	expertise, quality and security requirements. Identification of the entire pricing structure of customer tariff including other party payments. Clearly identify payment models and commission structures to dealers. Clear identification of the perceived value that the different parties are paying. Business rules must be unambiguous with minimal unintended negative impact on revenue. Business rules with integrity are maintained in a central repository. Ensure pricing is market-related; P&S is affordable to the customer. Consider discounts, payment periods, credit terms, CIB, penalties.					specification Technical solution development Financial documentation	and pricing. *Accountable:* The NPSD executive is ultimately accountable for determining the pricing strategy, considering the competitive environment *Consulted:* Finance Revenue Assurance Risk Management Technology development teams Consult with relevant stakeholders that P&S are being monitored in revenue assurance systems. *Informed:*	*Launch phase:* The financial controls will be tested and verified before proceeding with the launch of the P&S. *Maintain phase:* The effectiveness of the business rules, pricing model and revenue assurance controls will be analysed for any lessons learnt and corrective actions implemented.	Failure to detect fraud and revenue leakage occurrences timeously Business rules not clearly defined can be incorrectly interpreted by development team leading to project delays and rework Lack of data quality and integrity to detect incidences Failure to consider unintended scenarios Failure to implement robust controls to detect leakages Allowing freemium models without fair usage policy can lead to abuse and disruption of service for other customers Lack of flexible pricing mechanisms Ineffective or inappropriate pricing leading to customer dissatisfaction

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Consider pricing strategy to apply to P&S i.e. freemium, premium pricing, penetration pricing, economy pricing, price skimming and its relative advantages and disadvantages. Ensure that all business rules related to the P&S have been identified, documented and communicated. Assess the overall impact of the company rules to reduce potential conflicts. Ensure that consideration was given to the inclusion of Revenue Assurance processes during the design of the P&S. *Type of generic revenue assurance problems can include:* Provisioning – delays in service activations/deactivations Incomplete records –						NPSD teams		

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	billing records are inaccurate Collections – failure to manage accounts receivables (C&R) Rating – errors in configuration of rating & discounts Bad debt – Customers unable to pay due to bill shock (Credit & Risk) Unlimited offers – fair usage policies to be implemented Ensure that reports exist that the P&S revenue can be reconciled with different sources so revenue leakages can quickly be determined.								
Business processes									
The risk evaluates the extent to which adequate management, operational and support processes have been defined and conform to best	*To what extent is the following indicators present?* The existence of NPSD process forms part of this second-level construct. Compliance with the NPSD process is an essential	*More static processes, so would not be as important for products*	*A robust but flexible NPSD is essential to accommodate the fast changing scope and requirements.* *A process*	*The maturity of the processes are essential to provide sufficient support in the supply chain.* *Processes should be*	*For any new venture, new processes are required and often new business partners. Therefore optimal processes*	Sources: Objectives of process Activities that should be performed as part of the	Responsible: Product Manager is ultimately responsible for identifying business processes that do not support	Concept phase: If P&S is brand new, there would be some preliminary consideration at concept phase regarding new supporting processes that would be required	Defective business processes can lead to significant business risk such as: Failure to comply with internal and external regulations

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
practises. A business process is a set of related activities that is performed in order to reach a certain objective. Clearly defined and optimised business processes will drive competetiveness of the organisation. The objective is to ensure that the business processes is optimally designed to increase effectiveness (value for the customer) and increases efficiency (reduced cost to organisation).	requirement. These include requirements of stage/gate processes. Identification of new and existing processes that need to be adapted Business process requirements are documented and available i.e. returns, refunds, credit vetting, cancellations, swap outs, etc. Sufficient understanding of standard processes exist and adequate training and communication has taken place Evaluation of the existing processes against the Capability Maturity Model (CMM) to identify possible room for improvement. Process compliance is monitored and action is taken where processes appear not to be working effectively. Identify the potential or		*facilitates more structured communication sharing.*	*adequately documented and process owners identified.*	*should be designed from the start.* *Technology processes should be especially mature to prevent revenue leakages and adequate escalation processes should be in place.*	process Identification of the functional units that is responsible for executing the tasks Identifying the input and output data Determining the systems that are utilised Evaluating risks and events that occurred during process execution. *Documentation:* Process documentation Policies P&S functional specification Project documentation Technical Solution	the successful delivery of the P&S The process owner is responsible for ensuring that the process is effective and efficient *Accountable:* The NPSD executive, as well as the owner process executive, is ultimately accountable However due to the strong cross-functional orientation of business processes improvements would not occur if it is not driven by CEO and board. *Consulted:*	Planning phase: Processes are identified during the planning phase Develop phase: Processes are implemented according to stated requirements Launch phase: Processes are evaluated to ensure that it meets requirements before launch Maintain phase: Processes are assessed during PIR to ensure lessons learnt It could also be that defective processes need to be corrected after launch	Loss of customers Security IT breaches Public relations crisis P&S can fail due to inefficient and poor processes Poor processes also lead to project delays and unnecessary frustrations for project teams To obtain document approvals due to the multitude of signatures puts unnecessary time pressures on resources Failure to ensure the scheduling and timely completion of processes

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	actual bottlenecks and the opportunities for cost savings or other improvements, applying these enhancements in the design of the process. Identify areas where business processes can be improved to lead to more efficient operations and management of the P&S. Establishing ownership of processes Non-adherence to process instances Processes that did not keep track with changing organisational context Complex and costly processes Unresolved process issues Identification of process constraints regarding infrastructure or					development and architecture documentation	Process owners NPSD teams Technology resources Risk practitioners Legal & Regulatory *Informed:* *NPSD teams*		

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	supporting data								
Commercialisation									
The risk evaluates the extent to which the total solution was adequately tested and includes activities intended to take the P&S to the market. Testing includes functional, technical, system testing as well as customer experience testing. The objective of end-to-end testing is to ensure that the flow of the product/ service/ application works as expected as defined within the business requirements. The objective of commercialisation is to turn the P&S	<u>*To what extent is the following indicators present?*</u>: Clarity of sales targets Precise identification of target consumers in target markets Evaluation of execution plans of marketing activities Staff training Internal marketing Sales and distribution planning Inefficient advertising and promotional campaigns Ineffective coordination of publicity and display material Ineffective communication to internal and external parties, such as	*Easier to test than services and quality management parameters would not vary as much as processes are more stable.*	*More time required for testing and access to necessary equipment to allow testing.* *Especially on the consumer side that would experience the service different depending on the type of technology interface, they are using.* *Tendency of teams to cut down testing times due to urgent launch dates.* *More arduous to ensure that all the scenario's and complex systems integrations are*	*Having adequate platforms to test.* *More complex and larger customers can be more exposed to risk.* *Thus, it is even more important to ensure a quality service than for the consumer market.* *Ensure that automated alarming is in place to detect problems before customers.* *Inadequate consultation with the sales team to ensure that go-to-market*	*All products and services should be adequately tested.* *There should not be an acceptable reason to allow poor quality services into the marketplace.*	<u>*Sources:*</u> Testing should include testing transactions through the different interfaces and systems used by the P&S. <u>*Documents:*</u> NPSD functional specification Technology solution development	<u>*Responsible:*</u> Product managers should ensure that the solution is tested end-to-end for all possible scenarios. Project manager should ensure that relevant stakeholders have been identified who will be performing the tests and will be providing the test results. Product manager should retain an issue log and ensure that all major concerns are resolved before the P&S launch. <u>*Accountable:*</u>	<u>*Develop phase:*</u> *Testing plans are finalised during the development phase* <u>*Launch phase:*</u> Testing is conducted before launch and any major residual risks would prevent the launch of the P&S All commercialisation activities are tested <u>*Maintain phase:*</u> Any testing oversights will be documented at the lessons learnt	Inadequate testing can lead to implementing P&S that is not functional P&S that does not function efficiently result in declining trust in the organisation P&S that does not adequately work as intended need to be withdrawn and redeveloped that has additional cost, time and resourcing impacts Implementation of new technologies is time-consuming, complex and costly and increase risks. New technology projects take longer to complete New technology projects are often subjected to competitive time-pressures leading to increased pressure on project teams Lack of required skills can

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
into a commercial success.	suppliers and resellers. Identify how the P&S will be promoted during the lifecycle and what promotions and communications will be provided to customers to increase use and adoption. Also, consider what additional CRM requirements exist and how this can be implemented. <u>Testing</u> Ensure overall UAT and technical testing processes flow as expected, that systems be integrated and that the correct information is passed between systems. *Tests that can be performed include:* Volume or stress testing - to ensure the load on the application, web interface, databases can be managed.		*tested so potentially, better planning would be required to test in a service environment.* *Post-monitoring of the service needs to take place.*	*strategy meets the need of the customer.*			The NPSD and technology executives are responsible for ensuring that proper end-to-end testing procedures are implemented and not bypassed. *Consulted:* Technology teams Risk Management teams Customer experience and marketing practitioners *<u>Informed:</u>* NPSD teams		lead to project delays Customers often need to be refunded that have process and financial considerations Errors or poor performing P&S can result in excessive calls to the call centre that increase resourcing requirements Errors in P&S can lead to fraud and risk exposures for the customers and reputational risk for the organisation Poor commercial activities can lead to the organisation being exposed to reputational risk Due to changes in other systems, the P&S could not be functioning, as it should, result in customer complaints. Inability to identify critical problems during testing Poorly written test scripts Lack of cause analysis for

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Negative testing - to ensure that the system reacts to unexpected inputs. Unit testing – to ensure that specific elements within the solution react as expected to both expected and unexpected inputs. Error handling testing – compliance testing to ensure that the system handles errors as expected Recovery testing – to ensure the service is restored to its stable state after the service has been recovered from a backup. User and Customer Acceptance Testing – to ensure the system functions comply with business requirements from a client or user perspective. Control testing – to ensure that all controls as defined by the relevant stakeholders								test bugs Testing environment is inadequate Inadequate testing of required functionality Misinterpretation of customer requirements that is only detected after P&S launch Non-performance of systems Not considering all testing scenario Inappropriate quality of testing Not conducting customer experience testing

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	function as required and anomalies are sent to the correct departments. The testing requirements should be clearly documented.								
ICT security									
The risk evaluates the extent to which the organisations data and information and ensures potential vulnerabilities are adequately mitigated. Information systems security is the protection of information systems against unauthorised access to or modification, whether in storage, processing or transit, and against the denial of service to authorized users or the provision of service to	*<u>To what extent are the following indicators present?</u>* Ensure adequate authentication, identification and logical access controls in place. Ensure that confidential information is protected via the use of digital certifications ensure safe storage, transmission and processing. Ensure that digital signatures manage non-repudiation such as hashing, SHA1, AES, Triple DES. Ensure that the P&S is operationally secure via media back-ups, implementation of	*The customer could feel less exposed to technology security leaks when a physical product is bought.*	*Consumers could feel more exposed during the use of certain services like location-based services* *Consumers would be more concerned about privacy aspects for instance in terms of their browsing habits.* *Technology security should consider risk exposure from the customer aspect and also provide indicators of reliability.*	*Technology security controls should be entrenched during the P&S lifecycle since large customers could be more exposed due to their databased being vulnerable to B2B activities such as hosting.* *The focus would, however, be on integrated technology security controls rather than protecting individual customer*	*Depends on the type of technology or service that will be employed.* *Cloud services can, for instance, be exposed to many security risks that need to be considered.* *Therefore, the categories of new development and new venture would require the most attention.*	<u>*Sources:*</u> Systems Processes NPSD functional specifications Resources Policies and procedures Regulations and laws ICT external documentation reviews <u>*Documented:*</u> Requirements are documented in NPSD functional specification	<u>*Responsible:*</u> Technology Security teams are responsible for performing risk assessments on P&S. Product manager is responsible for ensuring that assessments are conducted and liaising with Information Security department. <u>*Accountable:*</u> The Exco and Board are ultimately responsible for ensuring that	<u>Planning phase:</u> Technology security requirements are refined during the planning phase. <u>*Develop phase:*</u> Controls are implemented during the design of the P&S <u>*Launch phase:*</u> Controls are tested prior to launch. <u>*Maintain phase:*</u> Any incidences are monitored and reported a lessons learnt to improve further projects	Law and non-compliance regulate technology security can lead to significant financial losses and damage the reputation of the organisation Lack of awareness of technology security can result in internal staff being subjected to social-engineering or viruses Inadequate safeguards of the telecommunication infrastructure can lead to snooping and infringing privacy Inadequate physical and system infrastructure protection can lead to compromising data and systems Insufficient processes related to change and

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
unauthorised users, including those measures necessary to detect, document, and counter such threats (NSTISSI 4009, 2000) Information security risk management protects the organisation against liabilities and reputational risk.	change control on firewalls, patch updates, virus protection and patch management. Penetration and vulnerability assessments should be performed on all P&S applications and web facing servers. Software based controls should be implemented to ensure that backend systems and servers that support the P&S are hardened and protected such as ensuring that web servers cannot receive SQL injections requests. Ensure penetration and vulnerability testing are performed on web-facing applications Ensure that controls and escalation paths to relevant stakeholders are documented in the case of a breach in security. Ensure compliance with external regulations as			*requirements such as opt-in and opt-out. Therefore, the requirement focus will be different.* *Corporate customers are more vulnerable to DDOS risks and hacking*		Controls are specified in technology solution development specification	adequate technology security measures are implemented and that appropriate resources are assigned to address these risks. *Consulted:* Risk practitioners Legal and regulatory Technology development teams liaise with relevant departments to understand the information security requirements. *Informed:* Ensure that NPSD practitioner teams are		patch procedures could introduce additional vulnerabilities External providers can introduce additional risks

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	well as compliance with internal policies and procedures. Communication of technology security issues to NPSD practitioners Evaluate potential risks that can be introduced by external providers of technology services Best practice technology safety and industry considerations are implemented during the development of the P&S architecture						aware of risks while handling secure information and ensure proper due care is taken when handling this information.		
ICT Solution Development and Maintenance									
The risk evaluates the extent to which the technical implementation of the solution conforms to the documented business requirements to ensure the P&S performs as intended. System	<u>*To what extent are the following indicators present?*</u> Ensure those business requirements and functional requirements are clearly defined within CPD's The technical solution documentation reflect all functional requirements of the P&S.	*Dependable on the type of product.* *It is potentially harder to design a physical product due to the initial investment that needs to be made to build a platform.*	*Dependent on the type of service.* *Services families can also require the development of platforms. Services are perhaps easier but due to the systems integration, another layer of*	*B2B could be more reliant on technology development than the consumer market and skilled technology, project and product manager teams are required.*	*Since most of B2B's services exist of new developments integration aspects should receive attention as well as ensuring that adequate and mature processes exist.*	<u>*Sources:*</u> P&S functional requirements Systems Interfaces Third parties Communication infrastructure <u>*Documents:*</u>	<u>*Responsible:*</u> The technology development teams are responsible for development. The product manager is responsible for that the technology team have a clear	<u>*Concept phase:*</u> The technical feasibility of the P&S should be determined early in the lifecycle. <u>*Planning phase:*</u> The technology teams should ensure that they have a clear understanding of the requirements and clear up any confusion that exist. <u>*Develop phase:*</u>	Failure of the P&S Failure to identify all impacted systems and interface requirements The P&S can fail to meet the user requirements Insufficient understanding of the complexity of the system can lead to target dates being exceeded Lack of experience of

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development is the process of custom designing, testing and implementing the new P&S through the customization of systems, databases, communication technology as well as integration with external providers. The risk evaluates the extent to which adequate plans and responsibilities exist to maintain the P&S after implementation. The objective of maintenance is important to ensure that the P&S remains reliable and that the useful lifecycle of the P&S is extended and maximised to	The solution proposal offers a complete end-to-end solution, which has considered all technical systems impacted by the P&S. Architecture standards from eTOM or TOGAF have been considered when creating the solution proposal. Ensure user interface, user management, data inputs, outputs and coding requirements are clearly defined aligned to specifications. P&S requirements are well documented and includes impacts on others services or products. Seamless integration into third party systems where applicable. Automation of manual processes with appropriate controls. Ensure hardware and software versions and operations are	*If proper solution development processes are instituted during design, the production aspect of build once, deploy many can be deployed.*	*complexity is introduced that expose service development to risks.* *The risks to service development would also be harder to proactively address due to the fast-changing nature of systems in an ICT environment.* *Communication with the technology team is also more necessary to verify understanding of requirements.*			The P&S requirements are clearly defined in the technical solution as functional requirements. *Sources:* Maintenance plans Responsibilities assigned Reporting on P&S performance *Documents:* P&S technical support documentation	understanding of the requirements of the P&S. *Accountable:* The executives in charge of NPSD and Technology teams are responsible for development. *Consulted:* Finance team can be consulted to clarify business rules Members of the NPSD teams Regulatory and Legal Risk management Fraud Team Technology security	Actual development of the solution takes place. *Launch phase:* P&S is launched once it passed the testing phase. *Maintain phase:* Any system faults are recorded to use as input for lessons learns *Develop phase:* Any requirements for additional maintenance are developed as part of the solution that is offered. *Maintain phase:* Any incidents that arise during the maintenance phase are logged as lessons learnt.	development teams can result in excessive rework and project exceed cost and time estimates Inability to deliver on the technical solution or some of the requirements can lead to P&S being cancelled while resources have already been consumed. Inadequate attention to security and controls can lead to reputational risks Inadequate executive support and buy-in Unrealistic timeframes Unrealistic expections that are not adequately managed. Scope changes late in P&S lifecycle Insufficient budget Lack of flexible systems Legacy systems Lack of resources

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
realise the investment.	compatible with the application to provide the solution. Controls are being build into the system to ensure that all functions are adequately monitored. Ensure that the design is optimal and can be reused for future products. Risk practitioners evaluate maintenance plans in terms of a customized scoring model that considers elements such as: Planning for corrective maintenance procedures that are required for the P&S such as functionality that was not adequately implemented or phased requirements that still needs to be implemented. Preventative maintenance considers a re-evaluation of the P&S to determine its						***Informed:*** The NPSD teams		

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	adequacy and effectiveness. Too many complaints and breakdowns indicate that the P&S is not working, as it should. A predictive maintenance plan to prolong the useful operational life of the P&S. Reports should be available early that can indicate warning signs predicting impending P&S failure and problems. Develop a pro-active maintenance plan for implementation of future and additional requirements and enhancements to the project to ensure timely implementation and communication to customers. Assign accountabilities for the different maintenance requirements of the								

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	P&S. Implement key performance measures to identify poor performance by different parties. A process for P&S retirement needs to exist and be adhered to.								
ISO ICT Standards Conformance									
The risk evaluates the extent to which capacity and BCM requirements impact and present vulnerabilities to the P&S. The objective is to ensure that the P&S is flexible, scalable and that business continuity is in pace to ensure availability. Ensuring availability protects the interest of principal	<u>*To what extent are the following indicators present?*</u> Ensure that P&S are designed with sufficient capacity and scalability in mind. Ensure Disaster Recovery and/or Business Continuity Management was considered during the NPSD lifecycle for the P&S. Systems and procedures should be in place to ensure that P&S are available during a disaster, or there are alternative	*Standards conformance would be mandatory*	*Risks on the consumer side mostly due to the unanticipated adoption of the services that impact on quality of other services.*	*B2B are usually more aware of these type of control requirements and build these requirements early into the service specifications.*	*New ventures and new development would be more vulnerable*	<u>*Sources:*</u> Systems External Providers Policies Procedures SLAs/OLAs Architecture <u>*Documents:*</u> P&S functional specifications Technical solution development	<u>*Responsible:*</u> Technical development teams are responsible for ensuring compliance with internal policies and procedures The project manager is responsible for ensuring that projects related to ICT are delivered. <u>*Accountable:*</u> The CTO is responsible for ensuring that	<u>*Planning phase:*</u> Risk practitioners identify standards and liaise with relevant stakeholders to determine requirements <u>*Develop phase:*</u> The necessary controls are implemented <u>*Launch phase:*</u> Controls are tested before proceeding with launch <u>*Maintain phase:*</u> Any significant incidences are noted as lessons learnt and recorded in incident database	Organisation could be liable if proper SLA's are not in place with vendors or third parties Unauthorised changes could be implemented into the production environment, causing other systems or the P&S not to be functional. Unauthorised changes could be carried out in production environment, leading to unavailability of P&S Inability to identify critical problems and provide appropriate solutions Inadequate testing of

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
stakeholders, reputation, and brand. The risk additionally evaluates the extent that the P&S conforms to best IT/IS service level management, control and release policies and procedures.	plans in place. All P&S should be logged and classified by to determine the impact of the P&S and whether full or partial BCM plans need to be in place. Plans for service recovery should be documented, tested and available. Escalation procedures are documented, and the relevant stakeholder involvement exists. BCM and capacity plans are tested on a regular basis and documentation is up to date. Enhancements and changes to the P&S post launch do not affect the capacity or BCM requirements. Review continuity requirements with internal policies that governs BCM. Ensure SLAs and OLA's					Business analysis Testing Email Risk reviews	safe practices are followed *Consulted:* BCM risk management team Risk practitioners *Informed:* NPSD teams		changes Failure to involve key stakeholders Inadequate business impact analysis to address the business continuity needs Inability to build alternate infrastructure capabilities to handle urgent requirements Insufficient funding for BCM requirements Ineffective BCM communication, training and testing Inadequate planning for P&S that exceeds specified adoption by customers Unauthorised changes in production systems Inability to timeously recover processing capabilities Non-performance of post validation changes

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	have been documented, and approved. Create measurements in line with these SLA's and OLA's for the P&S. The Service Level Managers should be aware of the SLA's and manage the service levels and implement penalties for poor adherence to timelines, quality and maintenance of the P&S. Ensure documented policies and standards exist as to how changes in the production environment should be implemented. Adherence to application patch management process. External providers should not implement changes on systems without following a formally approved process. Development teams should not have access								

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	to production systems. Adherance to formal processes and release cycles. Production teams are aware what systems and products are affected by changes. Evaluate the need for SLA's and OLA's with external providers and stakeholders. Ensure those responsibilities in SOW is clearly defined and accepted by relevant stakeholders. Create a change management and release management process and ensure that project implementation complies with controls. Where applicable put penalties in place for non-delivery concerning time and quality.								
Legal & Regulatory Compliance									
Compliance with external laws and	*To what extent are the following indicators*	*Mandatory compliance*	*Consumer protection and*	*Unique compliance*	*Legal and regulatory*	*Sources:*	*Responsible:*	*Concept phase:*	Failure to comply with regulations have serious

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
regulations that govern the organisation including anticipation of future changes in the external legal and regulatory environment. External compliance refers to compliance by external parties of the organisation as well as international codes of practice, legal requirements and internationally standards. Legal compliance risks such as IPR risks refer to trademarks and patent laws need to ensure that the original know-how of P&S will be protected and that P&S can be secured against competitor legal and patent rights.	*present?* Exercise prudence to ensure compliance with local and international laws. Identification and mitigation of potential liabilities Legal-driven intellectual property rights are considered Existence of confidentiality agreements with external providers. IP protection in terms of trade secrets, know-how and proprietary information. Verify that third parties have the necessary patents and IP protection standards in place. Consider piracy and illegal copying, distribution or use of media resulting in lost revenue for publishers.	*requirements*	*competition laws and requirements are more applicable to consumer services.*	*requirements for B2B exist due to the nature of the services*	*compliance is applicable to every service category.*	Compliance to laws that govern electronic regulations, communications, corporate governance, consumer protection regulations, financial and tax regulations, privacy regulations and international regulations. *Documents:* The compliance requirements are documented in the P&S functional specification. Controls are included in the solution description.	The legal and functional regulatory specialists ensure that correct strategies are applied and addressed in contracts and agreements Any potential infringement or unauthorised use of IP by external party need to be brought to attention of legal specialists Legal specialists identify legal aspects such as identification of new contract Regulatory aspects are identified by regulatory specialists who advise compliance	Regulatory analysed during project selection when evaluating the probability of commercial success *Planning phase:* Government regulations should be established early in the design phase of the P&S to be included in functional specifications. Product manager will update P&S functional specification with requested functionality that should be developed to ensure compliance *Develop phase:* The technology team will implement the requested regulatory functionality *Launch phase:* Testing of the functionality will take before launch and if not correct, it will lead to a failure to launch Maintain phase: Any incidents related are monitored and reported as lessons learnt.	consequences such as financial liabilities, reputational risk and ultimately P&S that are either not launched or delayed until the relevant compliance aspects are dealt with Regulatory compliance could impose additional cost and lower profits but benefits from lower uncertainty and first mover advantage Contracts can include unprofitable agreements and fail to ensure that liability for risks is transferred or outsourced. If intellectual property is not contractually protected knowledge can be lost and/or customers can be deceived or confused and it could ultimately lead to dilution of deceived. Failure to comply with disclosure requirements Inability to monitor compliance with laws leading to post-P&S

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Patent registration requires publication of invention. Consider protection of 'know how' confidential information. Registration of IP rights: Include trademarks, patents, models, designs, copyrights, software, domain names, Internet keywords and other IP protected artefacts. Protect against copyright infringement on media, music, TV and internal usage. Alignment of financial regulatory reporting to accounting standards and governing body requirements. Communication of mandatory legal and regulatory requirements. Compliance opinions represent views of risk, regulatory, legal and privacy						elements *Accountable:* The executive in charge of Legal and Regulatory in addition to the NPSD executive is responsible for ensuring compliance *Consulted*: Risk practitioner teams NPSD teams Informed: NPSD practitioners		implementation non-compliance Terms and conditions not compliant with laws and regulations Late provision or incorrect regulatory and financial reporting can cause loss of confidance of stakeholder trust.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	Existence of whitepapers and matrixes to guide decision making								
Privacy									
The risk evaluates the extent to which the P&S protect the customer's right to privacy, which requires protection of an individual personal information as well as consideration of ensuring confidential communications during transactions and that privacy matters of interest to the customer are considered such as receiving unsolicited communications, spam and surveillance is addressed.	*To what extent are the following indicators present?* Identification of sensitive information which includes: racial or ethnic origin, religious or spiritual beliefs, physical or mental health. Identification of organisation specific sensitiive information which could compromise privacy includes: calling or billing information, credit card information, the content of communication, location data as well as browsing or behavioural data. Refrain from privacy intrusive actions: monitoring of communications on the network, monitoring employee	*As ownership is transferred, further transactions and changes to product require the purchase of a new product.* *Unlike services every transaction and new systems or enhancements may introduce further vulnerabilities.*	*The consumer could feel vulnerable due to not knowing what the organisation is doing with their personal information and how this is protected.* *Potentially more important to ensure that indicators conveying security are provided to consumers.*	*Depends on the type of service* *Corporate customers are more vulnerable to espionage risks than consumers*	*Privacy should be a consideration for all new P&S development.* *Even a small enhancement can expose a customer PI and should be assessed for privacy risk.*	Sources: Data privacy officer Risk practitioners Legal and regulatory Documents: NPSD functional specifications Technical solution documentation	Responsible: The product manager is responsible for ensuring that the P&S do not infringe on the privacy of customers. The privacy officer is responsible for attending to privacy related matters. Accountable: The CEO and board is ultimately accountable for ensuring compliance to regulations. Consulted: Risk	Concept phase: Privacy considerations are reviewed during the concept phase and could prevent a P&S from progressing to the next phase. Planning phase: Privacy considerations are included in the design of the P&S. Develop phase: The control components are developed. Treatment of risks could include designing privacy management features during the development process that could minimize the risks such as obtaining customer consent and anonymising data. Launch phase: Privacy controls are tested and if non-compliant the project will	Reputational risk could result due to failure to comply with legal obligations; Failure to adequately respect customer's privacy despite achieving legal compliance could still result in reputational risk exposure. Loss of stakeholder trust can result if privacy violations are exposed. Liabilities regarding non-compliance with strict penalties can be imposed. Privacy infringements can lead to loss of customers. Failure to establish formal privacy policies Inability to implement a privacy program Inability to provide

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	communications, location-enabled applications and services, network storage of personal content, social networking and social media, remote application management, profiling and covert data capture. Consider privacy risks namely (1) analytics and advertising (2) location services (3) traffic management and deep packet inspection (4) global information flows and governance (data travelling between countries) and (5) law enforcement requirements. *Customer specific privacy concerns: (Includes but is not restricted to):* What data are collected and how? What and how is the customer advised? (obtaining consent)						management Legal and Regulatory Technology Security *Informed:* NPSD team	not be launched. *Maintain phase:* Any privacy related incidences are monitored and included in the lessons-learnt.	direction concerning applicable technological interventions that are required to protect customer privacy Legal could provide incorrect advice, due to lack of understanding of P&S Failure to obtain input from all relevant stakeholders Inability to report privacy incidences.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	What is the date use for? (requirements regarding collection of data) To whom may the data be disclosed and for what purpose? How long and where are the data retained? Who owns the systems? How is a customer informed if data is lost? Conduct a privacy risk and impact assessment to determine privacy concerns and highlight key risks identified. Ensure P&S such as those, which allow customers to track each other, are secured.								
Governance									
The risk evaluates the extent to which sound internal governance principles, structures, systems, processes,	*To what extent are the following indicators present?* Compliance with organisations internal policies and procedures where applicable.				*Only applicable to a small number of P&S and especially new venture could be exposed to ethical dilemma's due*	*Sources:* Internal policies and procedures NPSD practitioners behavior	Responsible: The project manager is responsible for ensuring that internal governance procedures are	*Concept phase:* Compliance with internal governance processes is considered as early as concept phase Specific requirements will be noted in the concept phase, and	Non-compliance with shareholder internal policies can lead to breakdowns in relationships Not following the correct procedures during the NPSD lifecycle can lead

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
procedures and controls are exercised within new P&S development. It additional evaluates the degree to which the P&S reflects responsible practices towards people, planet and profit (3Ps). Corporate Social Responsibility (CSR) consider social and environmental concerns regarding the P&S operations and guides stakeholder interactions on a voluntary basis. Consider both internal and external CSR practices. External social responsibility considers the society and the planet. Internal	Review and evaluate policies and departmental internal control procedures. Evaluate the extent of compliance with policies and procedures. Adherence of NPSD practitioners and external provider employees to best practices for health and safety. Consideration targets for going green (reducing the carbon footprint per annum) and environmental impact. Potential workplace problems. Existence of ethical dilemma's. Awareness of corporate values and promotion of socially responsible behaviour Stakeholder support for green IT initiatives.				*to new business partnerships that need to be formed.*	P&S specifications Promotional activities NPSD practitioners Risk practitioners Portfolio of projects Market research Regulations Risk incidence register *<u>Documents:</u>* Project management documentation NPSD functional specification Email and other suitable documentation	being followed. Risk management is responsible for oversight of these processes. *<u>Accountable:</u>* The NPSD executives are accountable for ensuring compliance with processes. *<u>Consulted:</u>* Policy owners Risk practitioners Technology teams Regulatory / Legal Product manager *<u>Informed:</u>* NPSD teams	the origin of the idea could be related to a social responsibility project. *<u>Planning phase:</u>* *The requirements are documented in the functional specifications.* *Depending on the CSI requirement, if it is related to a particular project it will be scoped and designed.* *<u>Develop phase:</u>* *Controls are implemented during development.* *The particular CSI project can be developed.* *<u>Launch phase:</u>* *Compliance with requested controls is tested before launch.* *<u>Maintain phase:</u>* *Any incidences related to non-compliance are noted and integrated as lessons-learnt.*	to project delays and rework. Oversights regarding a lack of awareness of procedures of other departments could result in project delays and lack of buy-in. Lack of knowledge of policies and processes may result in failures to implement controls Improper integration of rules and regulations Lack of policies and procedures for new technologies The organisation reputation can be tarnished if unfair, unethical and a lack of transparency incidences is exposed Irresponsible behaviour by employees can lead to death and injury of themselves and other people. Environmental hazards produced by the

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
responsibility towards the organisations own workforce includes practices related to health and safety, equal opportunities, and ensuring safe working conditions for internal and external employees. It also considers work-related stress that can be experienced when the demands of the work environment exceed the employees' ability to cope or control it.	Corporate social responsibility priorities engrained within the overall business strategy and P&S portfolio of projects. Compliance with environmental regulations. Reduction of energy consumption and operational costs. Communication of organisation corporate social responsibility initiatives. Provision of services for rural and underserviced areas. Services for elderly and disabled persons and ensuring accessibility								organisation or supplier such as the conditions of facilities or not conforming to health and safety requirements can expose organisation to reputational risk Lack of support for CRS initiatives leading to failure to demonstrate corporate responsibility A lack of awareness of 3Ps and not having a balanced approached to 3P's.
Fraud, AML & Security									
The risk evaluates the extent that potential fraud, AML and security implications for the P&S are identified and	<u>*To what extent are the following indicators present?*</u> *Considering P&S exposure to the following types of fraud risks:* Subscription;	*Products would be more exposed to credit cared and payment fraud as well as online type fraud is*	*Online activities is especailly vulnerable and should be protected.* *The volumes of*	*Default on payments, late payments or subscription fraud as well as more sophisticated IP frauds*	*New ventures like m-money and financial products and services potentially have more fraud exposure.*	<u>*Sources:*</u> Fraud and AML incidences Regulations and laws	<u>*Responsible:*</u> *Product manager is ultimately responsible for ensuring that the P&S do not*	<u>*Concept phase:*</u> Potential fraud and CMT exposures can be considered during the concept phase. Security requirements typically only become noticeable much later in the project. However for	Ineffective anti-fraud programmes can expose organisation to fraud risks Introduce organisation to liability risk exposures due to non-compliance

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
mitigated. Fraud is the use of dishonest or deceptive practices for personal gain by creating a loss for others. Money laundering is the activity, which is likely to conceal the nature, source, location, disposition or movement of the proceeds of illegal activity. Security is the task of securing the interests of the organisation, protects staff, customers, assets, information, reputation and value through implementing appropriate physical security controls. The objective is	credit card not present; cheque fraud; third party fraud, subsidy loss; internal fraud, m-commerce, e-commerce; fictitious accounts, fake billing, asset misappropriation, financial reporting, abuse of access to information. Compliance requirements to fraud management legislation. Availability of data and reports to assist with fraud detection? Integration of fraud detection measures within the existing fraud management systems. Consider sensitive transactions such as electronic transfer of money for money laundering activities especially across borders. Monitoring of suspicious operations and reported as prescribed by the financial oversight	*products is sold through these channels* *Physical security risks of collecting cash*	*transactions could make fraud detection more dificult.* *Consumers can be more exposed to scams than product customers and the controls would be different.*			Reporting requirements *Documents:* NPSD functional specification Technical solution development	*lead to major fraud, security and CML exposures* *The fraud, security and CML practitioners are responsible for review of the P&S to determine the requirements* *Accountable:* The NPSD executive is responsible for ensuring that sufficient mitigation controls are implemented. *Consulted:* Consultation with the AML division to determine the exposure and potential mitigating controls that need to be	certain projects like the collection of physical cash the risk is evident early in the project. *Planning phase:* Fraud analysis must be sufficiently analysed and mitigation controls suggested. Assessment of P&S for any potential exposure to money laundering activities. Security requirements can be analysed if it applies to the P&S. *Develop phase:* Integration of the P&S into existing and new fraud management tools to be implemented where necessary. Development of adequate controls to minimise exposures to money laundering activities which should be automated as much as possible, *Launch phase:* Monitoring and testing of whether the mandatory fraud, CML controls and security controls were implemented.	with regulations Insufficient fraud controls can lead to organised criminal cells using weak controls to defraud private individuals which can expose the organisation to litigation. The P&S can be stopped as a result of excessive fraud exposure Additional cost and resources are required to implement fraud controls after the P&S launch Exposure to security and privacy risks due to using Internet/e-commerce and m-commerce for operations and sales Non-compliance with AML regulations could lead to reputational risk exposures and fines Financial losses for the organisation that needs to refund customers Due to the complexity of NPSD fraud investigations is

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
to promote safe working conditions and environment related to the P&S. The aim is to ensure that adequate fraud, AML and security controls exist to ensure the continued viability of the P&S and enhance the reputation of the organisation.	bodies and committees. Cash conveyance or acceptance of money require compliance with anti-money laundering legislation. Monitoring of financial services transactions and services, such as insurance P&S by determining threshold values, frequency and volumes of transactions. Criminal opportunities or unethical practices presented by the P&S. The existence of adequate audit trails to conduct fraud investigations. Requirements for additional processes to mitigate potential fraud and AML risks. Requirements for layered physical security protection. Are customers aware of physical risks associated with certain						implemented. Risk practitioners and fraud determine whether the risk of fraud has been identified and ultimately evaluate the P&S. Consultation with security team to perform a risk assesment and suggest mitagations controls *Informed:* NPSD practitioners	Security requirements often arise late in the project due to additional campaigns to promote the project which should be detected during finalisation of commercial activities. *Maintain phase:* Monitoring of fraud, security and AML incidences as lessons learnt. Especially considering the impact of not having automated controls and resource impact.	expensive and resource-intensive Failure to implement monitoring procedures for P&S that can be exposed to money-laundering activities Inadequate reporting of money-laundering activities to appropriate external stakeholders Lack of data to monitor fraud and AML incidences can lead to late detection which increases the cost of the associated damage. Insufficient protection of assets could lead to stolen laptops and handsets and potential exposure of confidential organisation information. Failure to adequately protect employees and customers can lead to legal risk and tarnish the reputation of the organisation.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	P&S? Is NPSD practitioners and customers knowledgeable to prevent social engineering attacks and not providing information or access to unauthorised people? Physical security risks presented by staff or customers while using P&S. Physical security during big events with large crowds. Activities that can lead to corruption if proper procedures are not adhered with. Consider the potentially harmful environmental impact of P&S. Protect physical assets such as cell phones and laptops for promotions. Support for community development initiatives. Awarenes and impact of								

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	crime in vulnerable areas.								
Organisational Culture									
The risk evaluates the extent to which the organizational structure, management support and resources stimulates an environment that is conducive towards innovation . A favorable work environment with minimal dysfunctional conflict and efficient communication improve the probability of P&S success. Organisational culture is what resources do and how their behaviors influence the performance of the organisation	<u>*To what extent are the following indicators present?*</u> Reinforcing behaviors that indicate support for the creation of a climate of innovation, such as senior management support, the existence of P&S champions, internal communications, cross-functional coordination and open communication channels. Encouragement to experiment with business models for product managers, allowing freedom to network and collaborate with external parties and forming new alliances. Behaviors can translate to how comprehensively the activities of the NPSD process is addressed?	*Innovation can be vested in a R&D development department which means that leadership influence could be less than for services.*	*Major influencer and organisational culture conducive ot innovation should be driven top-down.* *Technology savvy product managers communicate better with development teams.*	*Major influencer* *Not too many restructuring activities ensuring continuity.* *Technology skilled resources especially for adequate customer support.*	*All categories* *Strategic projects such as new ventures require dedicated organisational structures in support.*	<u>*Sources:*</u> NPSD documentation quality and completeness The proficiency of performing tasks during the NPSD lifecycle Behaviors Resourcing Team communications Non-verbal communications Observations <u>*Documents:*</u> Organisational structure Project prioritisation Email	<u>*Responsible:*</u> Every resource in NPSD teams can choose to create an environment, which supports or inhibits innovation. <u>*Accountable:*</u> Executives need to provide the best resources and funding and drive engagements during innovative projects Organisational culture is dependent on the quality of resources and leadership capabilities	Through all phase of the NPSD lifecycle Portfolio management will be influenced by the disciplined approach used and NPSD resources following the prescribed processes Influence delivery of all deliverables during NPSD stage gates, but most importantly the extent to which a robust NPSD process and portfolio management practices are followed	NPSD success can be enhanced by the existence of an innovative culture and allowing a climate of learning. Risk taking environment is essential If senior management is not supportive free flow of information will not take place across cross-functional teams and continuous learning is not encouraged Favourable work environment with minimal dysfunctional conflict and efficient communication increase probability of P&S success. Organisational culture will influence the way risk management is conducted and whether risks will be adequately addressed Affect the quality of stage/gate meetings and

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
as it manifests in artifacts and basic assumptions. Risk assessments are unable to establish the attitudes of NPSD practitioners, but attitude manifest as behaviors that can be studied. Behaviors that indicate support for innovation are how the organisation is structured and how management support manifest regarding provision of availability of resources and how these resources are communicated with and allocated during the NPSD lifecycle.	Conformance to best practice and if these are encouraged by senior management. The extent that executives guides NPSD practices and interact to communicate such practices. Executive management demonstrates commitment, leadership, direction, and control. An effective response to risk situations indicating risk-based decision-making behaviour. How teamwork and cross-functional coordination activities are performed. Existence of champions to drive innovation and in particular, if the product manager assumes the role of NPSD champion Good understanding of the resource requirements during all					communications	*Consulted:* *External resources can be consulted to create a more favourable environment* *Informed:* *Board needs to be informed if an unfavourable environment for innovation exist that could negatively impact on the continued sustainability of the organisation*		exercising discipline to allow only best and most viable P&S to progress through stages. Inadequate communication from top management can negatively impact employee morale Misalignment of NPSD culture to organisational strategy Lack of quality directives could lead to poor standards of P&S Project management failure can be attributed to cultural factors such as lack of top management support. Abuse of authority Inappropriate decision-making Unclear lines of authority Inability to attract and retain employees Unreasonable performance expectations

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	NPSD lifecycles including post-launch monitoring and maintenance To what extent does the executive leadership drive quality of the P&S. P&S launched in new markets required a dedicated organisational structure, management and resources to be allocated. Ensure sufficient (internal and external) resources to support the P&S during its entire lifecycle Identify competencies and skills needed for the development of P&S and support training and development activities required to ensure continued maintenance. New technologies could require new technical expertise. Sufficient continuity and handover of skills and knowledge								Due to poor working conditions, the NPSD teams could suffer from excessive stress that increases absenteeism. Exposure to violence, harassment and bullying in the workplace without adequate addressing these charges confidentially, can expose the organisation to risk.

What	IRMF Factors	Products	Services	B2B	Product category	Where	Who	When	Why
	management from third parties and between NPSD teams. Identify critical resources required for delivery of the P&S and implement succession planning. Focus resources on strategic products and inspire them to be passionate about the P&S. Ensure that roles and responsibilities have been defined for the project team and are dedicated to the project during certain critical times, as resources are limited. Evaluate risk-taking climate and if decisions are made without consideration of risk factors. Being too risk-averse and not considering opportunities.								

11. Appendix Two: Surveys and Questionnaires

11.1.Operational Risk Survey

Table 24: Operational Risk Survey, AR iteration 1

		Not Appli-cable	Poor	Less than Average	Average	Good	Excellent	
#	Question	0	1	2	3	4	5	Comments
Section 1: Product Performance								
Q1	Has the product/service/campaign achieved the forecasted subscriber and revenue figures? **Product performance reports- review product statistics*					X		Yes – Project x continuously realised high revenue even though APRU is below R100 due to Y4L being a default tariff.
Q2	Does the product/service/campaign function as intended and documented in the CPD/memo?				X			There was a technical constraints where there was the inability to automate most of the functionality.
Q3	Is the product/service/campaign easy to gain access to and function?					X		Yes, it is the default tariff loaded on the system
Q4	Does feedback obtained from Customer Care indicate customer satisfaction with the product/service/campaign? **Customer Care reports(Nature of calls logged and the total number of complaints/queries)*				X			There have been a few complains about customers not getting 100% discount this due to lack of product understanding. This leads back to inadequate customer education.
Section 2: Technical								
Q5	Has the product/service/campaign experienced technical defects since launch? **Technical Defects Log- Nature and criticality of the issues*					X		No defects were experienced.
Q6	How effectively have the technical components provided the necessary support for the product? *-System* *-Database* *-Application* *-Communication Platform* *-Network*					X		Good - Technical teams have developed a solution to the best of their ability

		Not Appli-cable	Poor	Less than Average	Average	Good	Excellent	
#	Question	0	1	2	3	4	5	Comments
Q7	Were the prescribed technical processes adhered to? *Change Management and release management* **Escalation and Helpdesk* ** Technical sign off*					X		All process was adhered to.
Section 3: Business Rules								
Q8	Have there been changes to the business rules since the product/service/campaign launched?					X		The business rule changed due to the promotion requiring it.
Section 4: Project Management								
Q9	Did the project adhere to the project timelines and milestones stipulated in the Project Plan?					X		Product was launched on time
Q10	Was the product launched with outstanding technical and commercial issues?					X		Product was launched with no outstanding issues.
Q11	Did all the relevant stakeholders deliver on their deliverables within the expected project timelines?					X		
Section 5: Customer Care								
Q12	Has Customer Care support been adequate? **Systems (view thru's through Morpheus, Flex etc)* **Escalation procedures* ** Classification of call types* **Query resolution(Agent knowledge of the product)*					X		Product was launched with no outstanding issues.
Section 6: Third Party								
Q13	Did the third party deliver as expected? **Delivery as per contract* **Management of time and resources* **Quality deliverables* **Transfer of knowledge (minimise reliance)*					X		
Section 7: Fraud/Revenue Leakage								
Q14	Did the product/service/campaign expose the *Organisation* to fraud committed by employees and customers?					X		
Q15	Was there revenue leakage as a result of the product/service/campaign?					X		
	What went well with the product/service/campaign?		The ability to respond to competitors activity timeously.					

		Not Appli-cable	Poor	Less than Average	Average	Good	Excellent	
#	Question	0	1	2	3	4	5	Comments
	What did not go well with the product/service/campaign?		All teams worked well together and delivered as promised.					

11.2.Questionnaire

2012 LESSONS LEARNT REVIEW

23 January 2012

Introduction

The risk division has established a risk management improvement framework that support leaning in product innovation though post-implementation reviews and lessons learnt. A yearly Lessons-Learnt review is conducted which drives improvements in product innovation. The Lessons Learnt Review on products/ services/ campaigns and promotions in 2011 has the following objectives:

- Capture key learning points for future improvement of products and services
- Review the performance of project and product management activities

The lessons learnt review will incorporate all departments that are responsible for the delivery of new products and services, including the Telco’s Business-to-Business division. The review will be in the form of interviews as well as surveys that will take place during February 2012. The target date for delivery of the report will be by the end of the financial year, 31 March 2012. The risk management team has obtained permission from Executive Management to conduct the Lessons Learnt.

Survey Confidentiality

The completion of the survey is voluntary and the information anonymous. While you will be listed as an interviewee in the final report, we will ensure that no individual comments can be traced to you specifically. No individual or company details will be published in the final report.

Survey Methodology

Resources who are responsible for developing products, services, promotions and campaigns in within the company are interviewed. Your willingness to complete the survey can assist us in establishing improvement areas for service development. Even if you are not directly involved in the specific area that the question address, your input will be valuable to determine how much you agree or disagree with a specific statement. Note that the final statistical analysis will ensure that the opinions of people directly involved with the area, will be captured separately, so that perceptions can be monitored.

When answering the questions, you will notice a middle value which is labelled as ‘undecided’. If at all possible, try to determine whether you lean more towards the ‘agree’ or ‘disagree’ end of the scale. All in all, there is really no wrong way to answer. Just try to answer all questions.

The Survey is in two sections. Section A is in the format of a survey while section 2 allows you to make specific recommendations that could improve your specific area of involvement in new service development. These areas of improvement as mentioned by you as a primary stakeholder in the product development process will hopefully provide a useful starting point that can ultimately be utilised to improve the company’s innovation processes and ensure that our company is better equipped at service innovation.

Survey: Lessons Learnt Review of products, services, promotions and campaigns conducted in 2011

The company are conducting a survey to assess what risk factors are important to manage during the development of products and services.

Classification Information:						**Date:**		**Survey #:**	
Group:	PMCI	VB	WB	CC	RM	Fin	Marketing	Legal	HR
Procurement	Regulatory	HR	Supply Chain	Online					

The survey will take approximately 30 minutes of your time. Please be sure that your anonymity is ensured and all answers will be treated in the strictest confidence.

The survey measures your overall perception regarding products, services, promotions and campaigns that was implemented or in the process of being implemented during 2011. When the survey refers to a product, this also refers to a service, promotion or campaign. All questions should be answered within the context of the new service development environment.

A. Please answer the following questions

Please circle the appropriate option		**Strongly Disagree**	**Dis-agree**	**Un-certain**	**Agree**	**Fully Agree**
1	**Competitor and marketplace:** The risk evaluates the extent to which the product anticipates competitor activity.					
1.1	Competitor actions are adequately monitored and responded to					
1.2	New service will be launched before competitors					
1.3	Service will provide clear competitive advantages					
2.	**Customer:** The risk evaluates the extent to which the service understands customer needs and market segments					
2.1	The target market is clearly defined using convincing research data					
2.2	The product specifications meet customer standards and demands					
2.3	Customers will be convinced that they receive value for money					
3.	**Technology and Innovation:** The risk evaluates the extent to which the organisation responds to technological developments and is considered innovative.					
3.1	The Org launches innovative products					
3.2	The Org management and teams are innovative					
3.3	In the case of new technology resources with prior experiences will be consulted					
4	**Regulatory and Legal:** The risk evaluates compliance to local and international laws that govern service development					
4.1	Legal and regulatory restrictions are adequately anticipated					
4.2	Appropriate contract arrangements with suppliers will be settled					
4.3	A good understanding exist of legislation that impacts on products					
5	**Investors and stakeholders:** The risk evaluates the extent to which key stakeholders have been identified that may have a significant influence on the products. Stakeholders include governing bodies, banks, shareholders, media partners etc.					

Please circle the appropriate option		Strongly Disagree	Dis-agree	Un-certain	Agree	Fully Agree
5.1	The key opinion formers for the service are known					
5.2	Support of key opinion formers will be assured					
5.3	Potential shareholder impacts are adequately considered.					
6.	**Business Model:** The risk evaluates the extent to which the business logic is holistically understood in terms of the value that the service offers.					
6.1	The business model is generally clearly defined					
6.2	The business model will succeed in generating profitable revenue					
6.3	Accountabilities for risks are clearly defined between different parties					
7.	**Organisation Structure, Management and Resources:** The risk evaluates the extent to which the organisational structure, management support and resources are sufficiently allocated during the service development lifecycle.					
7.1	Leadership and support is sufficient to ensure effective services					
7.2	Sufficient resources are allocated during the service lifecycle					
7.3	The work environment is generally free of dysfunctional conflict					
8.	**Intellectual Property, Trademarks and patents risks**: The risk evaluates the extent to which trademarks, patents and IPR associated with the product are sufficiently protected					
8.1	Original know-how for services is well protected.					
8.2	The relevant trademarks and IPR issues are well understood.					
8.3	The Telco are well protected against any IPR and trademark infringements					
9	**Third Party risks:** The risk evaluates how well the business relationship with third parties are managed in terms of ensuring adequate service delivery and continued support of the product					
9.1	Past experiences with third party suppliers are positive					
9.2	Third party suppliers are reliable in delivering according to requirements.					
9.3	Third party suppliers will meet the required quality standards					
10.	**Trade customer risks:** The risk evaluates the ability to identify the delivery channels that is required to ensure support for products and services.					
10.1	The trade will give the new service proper care					
10.2	Trade customer appreciation will be tested and measured adequately					
10.3	Customer support in the distribution channels is of high quality					
11.	**Strategy:** The risk evaluates how well products align to the organisations overall business strategy.					
11.1	P&S helps to achieve most of the organisations key business strategies					
11.2	P&S, pricing and processes are simple and smart for customers					
11.3	P&S put the power of the Internet in people's hands					
12.	**Internal Governance:** The risk evaluates the extent to which good internal governance principles, structures, processes and procedures are adhered to					
12.1	The organisations internal policies and procedures are adhered with					
12.2	Quality of deliverables are ensured with effective controls					
12.3	The service development process is effective					
13.	**Business Rules and Pricing:** The risk evaluates the extent to which all appropriate business rules applicable to the service have been assessed					
13.1	All applicable business rules for the service is available					
13.2	The overall impact of business rules is assessed					
13.3	Knowledge of customers pricing sensitivity is available					
14.	**Business Process:** The risk evaluates the extent to which adequate management, operational and support processes have been defined					
14.1	Existing business processes performs optimally					
14.2	Processes are monitored to ensure that they work effectively					
14.3	Processes are generally effective and efficient					
15.	**Customer Care:** The risks evaluates the extent to which CC is able to adequately service the customer for the service					
15.1	Customer Care requirements are sufficiently addressed					
15.2	CC have sufficient access to info to sufficiently service customers					
15.3	Agents are well trained to support products					

Please circle the appropriate option		Strongly Disagree	Dis-agree	Un-certain	Agree	Fully Agree
16.	**Financial Management, Budget and Forecasting:** The risk evaluates the extent to which the products financial analysis is performed.					
16.1	Sales projections for the product are realistic					
16.2	Only the most financially viable products are implemented					
16.3	Estimated profit margins are based on convincing research data					
17.	**Project and Knowledge Management:** The risk evaluate the extent to which the PMO adheres to best practice project management principles					
17.1	Best practices are followed in project management in terms of scope management, delivering on time, budget and quality is monitored					
17.2	Project teams are learning from past experiences					
17.3	Delays in service launch will leave the commercial viability of services untouched					
18.	**Financial and Regulatory Reporting:** The risk evaluates the extent to which the service complies with the Telco's financial and regulatory reporting requirements					
18.1	The financial assessment provides a clear picture of the commercial viability of the service					
18.2	Volume estimates are based on clear and reliable estimates					
18.3	The lodgement complies to key stakeholder requirements					
19.	**Product Management Reporting:** The risk evaluates the extent to which the product manager defines reports that can track the product performance and ensure that remedial actions are implemented					
19.1	Product performance in the market is adequately tracked.					
19.2	Remedial actions are applied to underperforming products.					
19.3	New product performance targets are adequately measured					
20.	**Risk Management Methodology:** The risk evaluates the extent to which the product adheres to Risk Management process and requirements					
20.1	Risk issues are adequately anticipated					
20.2	High risks are adequately mitigated					
20.3	Risks are effectively anticipated during the product lifecycle					
21.	**Internal and external fraud:** The risk evaluates the extent to which the product might be abused or the company defrauded.					
21.1	The non-intended use of the product by customers and fraudsters are adequately anticipated.					
21.2	Customers are adequately protected against fraud risks and scams					
21.3	Products are adequately assessed for fraud exposures					
22.	**Money laundering:** The risk evaluates the extent to which the product is exposed to unlawful money laundering activities					
22.1	The use of the product to hide money laundering activities is adequately considered.					
22.2	Effective due diligences is performed on vendors					
22.3	Adequate awareness of anti-bribery and corruption exist					
23.	**Revenue Assurance:** The risk evaluates the extent to which the product exposes the organisation to potential revenue leakage activities.					
23.1	The product are adequately assessed to determine exposures to revenue leakages					
23.2	Products are accurately billed in accordance with tariff plans					
23.3	All revenue related to products are accurately obtained and accounted for					
24.	**Physical Security:** The risk evaluates the extent to which the product present security risks to customers and employees					
24.1	Safety issues will be adequately anticipated					
24.2	Physical product assets are properly secured through appropriate security controls					
24.3	Customers are protected against physical risks associated with products					
25.	**Health, Safety and Social Responsibility:** The risk evaluates the extent to which the product reflects responsible practices towards people, planet and profit (3Ps).					
25.1	Product meets safety and technical requirements standards					

Please circle the appropriate option		Strongly Disagree	Dis-agree	Un-certain	Agree	Fully Agree
25.2	Product appeals to generally accepted values (e.g. health, safety, nature and environment).					
25.3	Environmental issues will be adequately anticipated					
26.	**Technology: Capacity and BCM:** The risk evaluates the extent to which capacity and BCM requirements impact and present vulnerabilities to the product.					
26.1	Products are designed with sufficient capacity and saleability in mind					
26.2	Disaster recovery and/or business continuity management were adequately ensured					
26.3	Plans for service recovery of the product are documented, tested and available.					
27.	**Technology: Information Security:** The risk evaluates the extent to which products protects data and information and ensures that potential information security vulnerabilities are adequately mitigated.					
27.1	Confidential information is adequately secured.					
27.2	Customer privacy issues are adequately anticipated.					
27.3	Products conform to industry best practices in terms of information security management.					
28.	**SLA management, control and release processes:** The risk evaluates the extent to which the product conforms to best IT/IS service level management, control and release policies and procedures.					
28.1	Service levels are monitored for adherence to timelines, quality and maintenance					
28.2	SLA's and OLA's relevant to the product are well documented					
28.3	Formal processes is followed in terms of change control and release management					
29.	**Technical Solution Design:** The risk evaluates the extent to which the technical implement of the product conforms to the documented business requirements to ensure the product performs as intended.					
29.1	Products intended functionality are well known and specified					
29.2	Products meets the functional requirements					
29.3	Interactions of products with other systems are well understood					
30.	**End-to-end testing:** The risk evaluates the extent to which the total product solution was adequately tested. Testing includes functional, technical, system and customer testing.					
30.1	Tests will provide reliable evidence					
30.2	Adverse performances as a consequence of technology or scripts changes will be tested and adequately measured.					
30.3	Consumer appreciation of the product will be tested and measured adequately.					
31.	**PR and Communications:** The risk evaluates the extent to which PR and communications are adequate in communicating new product releases to stakeholders and are able to respond timeously to reputational risks.					
31.1	Products will enhance and support the Telco's's reputation and brand					
31.2	It is clearly understood who is responsible for PR of the product					
31.3	Possible negative external reactions will be effectively anticipated					
32.	**Marketing:** The risk evaluates the extent to which the marketing strategy succeeds in promoting the product. This includes adequate identification and targeting of the intended market and customers.					
32.1	Marketing communication clearly convey the benefits and advantages of the product.					
32.2	Advertising of products will be effective					
32.3	Products are communicated successfully to target customers					
33.	**Product Maintenance:** The risk evaluates the extent to which adequate plans and responsibilities exist to maintain the product after implementation to ensure that the useful lifecycle of the product is extended to maximise investment.					
33.1	Adequate plans to support the product after implementation exist.					
33.2	Responsibilities for maintaining the product is clear					
33.3	The product is monitored to ensure that it continues to function as it should					

B. Please use the space below for additional comments regarding the survey above

Section 2: Interview

The next section should be answered for the area that you are responsible for:

Area of responsibility:	
34	**What is the 3 main concerns that you have in order of importance**
34.1	(1)
34.2	(2)
34.3	(3)

35. What went well?

36. What could be improved?

37. Recommendations.

Thank you very much for your time and assistance

11.3. Expert Questionnaire

AR Iteration 3: Expert Questionnaire

The objective is to establish the degree of consensus amongst the risk practitioners whether the risk management (RM) process, practices and framework implemented by RM within NPSD (New product and service development) was effective i.e. overall perception whether RM was effective in NPSD. These include all of the risk management artefacts implemented such as dashboards, toolkits, risk assessments and policies.

Number	Criteria
5	Risk approaches are fully embedded within the day-to-day business processes and strategies of new product development
4	Risk approaches are adopted and improved but not fully embedded
3	Risk approaches has been implemented in key areas
2	Risk approaches has been planned but is not delivered
1	A level of awareness exist of risk approaches but no actions has been taken

#	P	Question	5	4	3	2	1
1	*3a*	*Did risk management (RM) assist in creating and protecting value within NPSD?*					
2	*3a*	*Did RM assist in achieving the objectives of the products and services?*					
3	*3a*	*Did RM assist in improving NPSD?*					
4a	*3a*	*Did RM assist in improving the performance of other risk disciplines (within NPSD)*					
4b	*3a*	*Did RM assist in improving the performance of the following risk disciplines?*					
4b1		• Health & Safety					
4b2		• Security (Physical)					
4b3		• Fraud Management					
4b4		• AML					
4b5		• Revenue Assurance					
4b6		• Legal					
4b7		• Regulatory					
4b8		• Technology Security					
4b9		• Privacy					
4b10		• BCM					
4b11		• Environmental protection					
4b12		• Audit					
4c	3a	*Did RM assist in improving the performance of the following functions?*					
4c1		• CRM (including customer care)					
4c2		• Marketing					
4c3		• PR & Communications					
4c4		• Finance					
4c5		• External providers (vendors)					
4c6		• Product development					
4c7		• Project management					
4c8		• Technical development					
4c9		• Technical maintenance					
4c10		• Sales					
4c11		• Supply chain					
4d	*3a*	*Did RM contribute towards improved performance of the following aspects?*					
4d1		• Improved product and service quality					
4d2		• More efficient processes					
4d3		• Improved reputation of organisation					
4d4		• Improved innovation					
4d5		• Improved customer experience					
4d6		• Create value for investors					
5a	*3b*	*Were RM integrated within the NPSD practices*					

#	P	Question	5	4	3	2	1
5b		*Were RM integrated within the following areas of NPSD*					
5b1		• The new product and service development process					
5b2		• The strategy of NPD					
5b3		• Change management processes					
5b4		• Project management processes					
5b6		• The stage/gate processes					
5b7		• Project management processes					
5b8		• Portfolio management processes					
6a	*3c*	*Did RM assist the NPSD teams to make better decisions*					
6b		*Did RM assist the NPSD teams in the following manner*					
6b1	3c	• Prioritise actions better					
6b2	3c	• Consider alternatives courses of action					
7a	3d	• Consider uncertainty					
7b	3d	• To better understand the source/scope or nature of the uncertainty					
7c	3d	• Help the NPSD teams to have a better understanding of how uncertainty can be addressed					
8a	3e	*Were RM processes consistently applied within NPSD*					
8b	3e	*Were RM results comparable with other risk assessments in NPSD*					
8c	3e	*Can RM within NPSD be described as being reliable*					
8d	3e	*Did RM contribute to increased efficiency within NPSD*					
9a	3f	*Were RM within NPSD based on sufficient available information*					
9b	*3f*	*Were RM inputs based on a wide variety of sources*					
9c	*3f*	*Did RM consider limitations inherent to the sources of information*					
10a	3g	*Were the RM process tailored to the requirements of NPSD*					
10b	3g	*Did RM consider any of the following*					
10b1		• External context: Such as competitors, customers					
10b2		• Internal context: Compliance to internal policies and processes					
10b3		• Risk profile (appetite)					
11a	3h	*Did RM consider human factors and culture that can facilitate or hinder the achievement of objectives within NPSD*					
11b	3h	*To what extent do you think that the RM processes considers the following factors in terms of:*					
11b1		• The capabilities of key NPSD resources					
11b2		• Leadership capabilities					
11b3		• Communication					
12	3i	*Could RM within NPSD be considered as transparent and inclusive*					
13	3i	*Did RM within NPSD allow for the appropriate and timely involvement of <u>stakeholders</u> during the RM process*					
14	3i	*Did RM processes within NPSD allow for the appropriate and timely involvement of <u>decision-makers</u> in the process*					
15	3i	*Did RM allow alternative views to be considered when determining risk criteria*					
16	3j	*Did RM within NPSD continuously responds to change*					
17	3j	*Did the leadership (executives) clearly promote RM within NPSD within Organisation*					
18	3j	*Was ownership of risks readily accepted within NPSD teams*					
19	3k	*Did the maturity of the RM processes improve*					
20	3k	*Was the RM processes monitored to ensure that they work effectively*					
21	3k	*Did RM within NPSD assisted to continually improve Organisation?*					
22		*Did RM succeed in reducing risk during NPSD*					
23		*Did RM succeed in ensuring effective risk mitigation in NPSD*					
24		*Was the RM framework effective in ensuring risk mitigation in NPSD*					
25		*Was the risk supporting processes effective in ensuring risk mitigation in NPSD*					
26		*Did RM succeed in embedding RM within NPSD for Organisation Consumer products*					
27		*Did RM succeed in embedding RM within NPSD for Organisation Business products*					
28		*Did RM succeed in embedding RM within NPSD for Organisation Financial service products?*					
29		*Did RM succeed in embedding RM within NPSD within other Opco's in Africa*					
30		*Did RM succeed in embedding RM within other projects within Organisation*					

Please let me know any other ways in which you think RM was successful or unsuccessful.

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12. Appendix Three: Framework Summaries

12.1. Factors that Stimulate NPD Innovation

Table 25: Summary of Factors that Stimulate Innovation Per NPD Category

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
Montoya-Weiss *et al* (1994)	Technological synergy Marketing synergy Company resources Strategy of product	Market potential/size Market competitiveness External environment *Product advantage *(moved from strategic)*	Proficiency of: technical activities, marketing activities, up-front homework product definition speed to market financial and business analysis	Internal and external relations Organisational factors *Top management support *(moved from development)*
Evanschitzky et al, 2012	Marketing synergy Technological synergy Order of entry Company resources Strategic orientation	Likelihood of competitive response Competitive response intensity Market potential *Environmental uncertainty *(moved from product factors)* Product advantage Meet customer needs Product / Price Technological sophistication Innovativeness	Structured approach Predevelopment task proficiency Marketing task proficiency Technological proficiency Launch proficiency Reduced cycle Time Market orientation Customer input Cross-functional integration	Organisational climate Project/Organisation size Organizational design External relations Degree of centralisation Degree of formalisation *Dedicated human resources (*moved from strategy)* *Dedicated R&D resources *(moved from strategy).* *Cross-functional communication (*moved from process)* *Senior management support (*moved from process)*
Henard and Szymanski (2001)	Marketing synergy Technological synergy Order of entry	Likelihood of competitive response Competitive response intensity *Market potential (*moved from product)* Product advantage Meet customer needs Product / Price Technological sophistication Innovativeness	Structured approach Predevelopment task proficiency Marketing task proficiency Technological proficiency Launch proficiency Reduced cycle Time Market orientation Customer input	*Dedicated human resources *(Moved from strategy)* *Dedicated R&D resources *(Moved from strategy)* Cross-functional integration *(moved from process)* *Cross-functional communication *(moved from process)* *Senior management support *(moved from process)*

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
Atuahene-Gima, 1995		Market performance	Project performance	
Balbontin *et al*, 1999	Selection of products			Project manager with the necessary skills High level of information flow between technical and commercial entities Ensuring adequate resources especially with market research skills and adequate sales and marketing skills
Barczak, 1995			A professional NPD process especially regarding screening of ideas and Idea generation	Service champions
Burgelman *et al*. (2004)	Understand relevant technological developments and competitor strategies Strategic management			Structural and cultural context of the organisation Resource availability
Calentone & *Benedetto*,1988		Marketing activities (resources and skills) Competitive marketing intelligence	Technical activities (technical resources and skills)	
Cooper *et al* (1991)	NPD strategy		NPD process	Organisation, Culture and management commitment
Chiesa *et al*. (1996)			Systems and tools	Resource provision Leadership
Chakrabarti, 1974				Existence of a service champion
Cormican *et al*. 2004	Strategy and leadership		Planning and selection	Culture and climate Communication and collaboration Structure and performance
Dwyer *et al*, 1991			Initial screening Preliminary market and technical assessment Product development Test market, trial sell and market launch	
Goffin and Pfeiffer,1999	Innovation strategy Portfolio management		Project management	Creativity and human resources
Griffin, 1997			Existence of a formal NPD process	Use of multi-functional teams

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
Gruner *et al*, 1999 cited from Ernst, 2002			Economic success of new product New product quality Quality of NPD processes Cost advantages derived from new product	
Kotzbauer, 1992 cited from Ernst, 2002		Marketing impact (efficiency of marketing activities)	Planning quality prior to development, including: Identification of target market Customer requirements analysis Product concept developments Assessment of technical specification	
Maidique et al, 1984				Clearly identifiable product champion
Mishra *et al*, 1996		Market intelligence especially Customer requirements customer specifications Price sensitivity Competitor strategies	Proficiency of formal NPD processes especially regarding: Initial service screening Market research In-house prototyping testing	
Parry *et al*, 1994		Market research Preliminary market assessment	Proficiency of process activities such as: Product development Financial analysis Initial product screening	
Pinto et al, 1990				Cross-functional cooperation
Rothwell *et al*, 1974		Strong customer orientation Improved understanding of customer needs	Careful project selection Early indication of customer dissatisfaction Intensive customer training Update of customer information during NPD process	
Rubenstein *et al*, 1976		Availability of information about characteristics of potential market	Project structure and process: Level of project planning Clarity of performance requirements. Availability of technical information	Organisational structure with reference to: Level of interdepartmental communication Project team communication Clarity of communication regarding project demands and responsibilities
Song et al,		Market information	Proficiency of the	Internal commitment

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
1997(a)		Market research proficiency	predevelopment planning process Concept development and evaluation proficiency Technological information	(people dedicated to service success) Existence of service champion Cross-functional co-operation and cross-functional integration
Souder et al, 1997		Proficiency of marketing activities Marketing skills and knowledge about the market	Proficiency of technical activities Completeness of information exchanged during project	
Thamhain, 1990				Team autonomy High team involvement and visibility Good communication Experienced and qualified project team
Verhaegde *et al* 2002			Idea generation Technology acquisition Networking Development Commercialisation	
Yap et al, 1994				Ensuring high quality interdepartmental communication Recruiting influential service champion

12.2. Factors that Stimulate NSD Innovation

Table 26: Factors that stimulate NSD Innovation

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
Atuahene-Gima, (1995)		Proficiency of launch Marketing synergy	The use of new technology	HR strategy Good coordination and team work
Atuahene-Gima, (1996)		Market orientation as it relates to the project		
Berry, LL and Hensal, S. (1973)		Customer view Targeted market segments Behaviour change Customer risk (free-trial) Customer communication		
Bortree (1991)		Service target market		
Davison et al (1989)			Pre-launch testing and effective market launch	

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
De Brentani (1989)		Understanding customer needs Proficient marketing	Proficient service delivery Internal marketing	
De Brentani (1991)		Market attractiveness Service offering factors such as innovativeness, quality of service and consumer-based	Proficiency of NSD process Overall service synergy	
De Brentani (1993)		Formal and extensive launch programme	Formal up-front design and evaluation Marketing and customer driven orientation towards NSD process	Supportive NSD environment with high-management involvement
De Brentani (1995)	Overall corporate synergy	Client need/market attractiveness	Effective NSD management Formal market-based NSD process Quality of service Expert/people based service	
De Brentani and Cooper (1992)	Synergy (service/ company fit)	Service/market fit Quality of execution of launch Marketing Service advantage	Service expertise	
Easingwood and Storey (1991)		Offering a differentiated service Service fit and internal marketing	Overall quality of service Use of technology	
Edgett (1996)		Preliminary market assessment Detailed marketing study	Initial screening Service Development Post-launch review	
Edgett and Jones (1991)		Clearly defined target market Differentiated service	Thorough and well organised development process Effective performance by the service development manager A strong launch campaign supported with sufficient funding	Assumption of service champion role by the service manager Strong top management support
Edgett and Parkinson (1994)	Synergy between market, service and company		Intra-organisational development across functions Rigorous NPD process	
Garden-Ellson	Commitment to	Customers should be used	Formal development	Promotion of teamwork to

Author	Dimension 1 Strategy	Dimension 2: Market	Dimension 3: Process	Dimension 4: Organisational
et al (1986)	service development Clear strategy for services	extensively for ideas generation and evaluation	process especially early stages Internal marketing and training to front-line staff	ensure cross-function coordination
Hodgson (1986)	Well-defined corporate vision Concentration on existing strengths	Better market knowledge (extensive research)	High quality and experienced staff Clear objectives for the service.	Culture and systems to support the innovation process Accepting the limitations of available resources
Martin and Horne (1993)	Fit of services to current portfolio	Make better use of customers information		Ensure service champions manage launch phase
Voss, 1985				Good management practices especially regarding risk taking climate

12.3. Risks in NPSD

Table 27: Consolidation of Risk Factors that Impact on Innovation

Author	Strategy	Market	Process	Organisation	Technology	Risk & Compliance
Keizer et al (2002)	Product family and brand positioning risks	Consumer and trade acceptance Public acceptance Competitor risks	Commercial viability (financial) Co-development with external parties Supply chain and distribution Project management Screening and appraisal	Internal organisation Project team	Product technology risks Manufacturing technology risks	Intellectual property
Sharbacker et al, 1997		Will the product with targeted product attributes create value for customer and organisation	Does the product design embody the targeted product attributes		Can the development team deliver the product as designed	
Davis (2002)		Market risk relating to newness of market segment The extent to which customer research is performed	Presence of value chain elements The degree to which design and performance specification for product is known		Technical risks relating to newness of technologies and capabilities of development team	

Author	Strategy	Market	Process	Organisation	Technology	Risk & Compliance
Nader et al, (2010)	Organisational strategy		Knowledge management Innovation process Commercialis-ation	Organisational structure Innovation culture Resources for innovation	Open innovation Innovation network Innovation assessment	Intellectual property management
Keizer et al, 2005	Commercial viability risks Product family and brand positioning risks	Competitor risks Customer acceptance risks Marketing risks Public acceptance risks	Project management risks Screening and appraisal risks Supply chain and sourcing Trade customer risks	Organisational risks	Manufacturing technology risks Product technology risks	Intellectual property risks
Homburg et al, 2013		Customer integration	Inter-organisational collaboration Cross-functional integration			
Yong et al, 2011	Innovation strategy	Model development Marketing network	Project management Marketing method	Availability of staff Effective communication	Technology acquirement	Method of RM RM environ-ment Department of RM Technique of risk assessment Credit risk Technology IP protection
Segismundo et al, 2008	Identification of product objectives Changes in product priorities	Changes in market	Unrealistic timeframes Poor project management	Organisation conflict	Unproven technology Changes in technology	Changes in legislation
Mu et al (2009)	The firm manages the external relationship well The firm manages external marketing relationships well	Marketing feedback integrated into product design Competitive analysis exist Customer commitment Product value & benefits can be clearly communicated	Product meets functional spec NPD process is flexible Sufficient budget and other resources allocated	Product development team is strong and well-organised Cross-functional cooperation Experience of product team Marketing channel is well-organised	Products technology match industry trends	Physical hazards of product Manage uncertainty of total project investment

Author	Strategy	Market	Process	Organisation	Technology	Risk & Compliance
		to customer				
De Bakker et al (2010)		User commitment	User participation Incomplete, incorrect or changing requirements	Top management commitment		
Olechowski et al,(2012)			Familiarity with supply chain		Familiarity with key technologies	RM employees are motivated to perform RM employees are experts Sufficient RM employees exist Tailoring and integration of the RM process
Wang et al (2010)			On-time schedule Data schedule Lead time Predictability of models			Mortality rate (drug usage in pharmaceutical companies)
Berglund (2007)		Customer relations Customer orientation of company Lack of external relations	Quality assurance Partner relations Lack of financial funds Formal and efficient processes Business model and vision of department	Human capital risks Business culture Receptiveness to new ideas Understaffed working environment Competence of staff	Obsolete support systems Development not up to date with technology Expensive sophisticated technology	Customer contracts
Leithhead (2000)	Competitor reaction risk Maturity and obsolescence of product range	PR, marketing and stakeholder communication risks	Investment risk analysis Project risk management analysis Performance standards Change management Supply chain management		Anticipating changes in technology	Limit on amount of risks to be accepted Risk practices in place to manage the most serious of these risks
McDermott and O'connor (2002)	Building alliances to stretch competencies		Cannabilisation and/or familiarity with business model	Informal networks to gain market and technical insights		Use of alliance partners IP risks with

Author	Strategy	Market	Process	Organisation	Technology	Risk & Compliance
				Developing competencies in managing radical innovation Team composition (breath and depth of experience) within organisation Leadership and champion roles Fit into organisational structure		outsourcing
Riek (2001)		Test commercial assumptions regarding market Understand customer purchasing decisions	Cost of commer-cialisation Quality focus Skipping development steps lead to launch and fix mode Supply chain requirements early	Inconsistency of decision making of management 'Skunk work' projects need technical competency and commercialistion skills Incentive programmes should be carefully designed Team building between multi-functional teams Coaching to voice opinions	Obsolescence of existing products and technology Understanding technical risks Understand and track use of competitive technologies Testing should include all potential environment for use of the product Understanding the development implications early in the development process	Protection of Intellectual property during partnerships International product launches understand market and regulations Milestone checkpoints should include legal and IP issues
Nordin et al (2011)	Wide range of offerings		Degree of customisation Bundling strategy		Financial, operational and strategic risk analysis	

12.4. IRMF from Literature Review

When researchers analysed the dimension of strategy they mainly referred to the following elements as shown in Tables below.

Table 28: Strategy High-Level Construct

Elements	Innovation literature New Product Development (NPS)	Innovation Literature: New Service Development (NSD)	Risk literature
Technology synergy	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Szymanski *et al* (2001);		Leithhead (2000)
Market synergy	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Szymanski *et al* (2001);	Edgett et al (1994)	
Company resources	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012);		
Product strategy	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Cooper et al (1991)		Segismundo *et al* (2008);
*Portfolio management	Evanschitzky *et al* (2012); Szymanski *et al* (2001); Balbontin et al (1999); Goffin and Pfeiffer, (1999)	Garden-Ellson *et al* (1986); Martin et al (1993)	Keizer *et al* (2002); Segismundo *et al* (2008); Nordin et al (2011)
*Organisational & innovation strategy	Cormican et al (2004); Burgelman et al (2004); Goffin and Pfeiffer, (1999)	De Brentani (1995); De Brentani et al (1992); Edgett et al (1994); Garden-Ellson *et al* (1986); Hodgson (1986)	Nader et al (2010), Yong et al (2011), McDermott and O'Connor (2002)

** The collective dimensions that all of the other elements align to or form part of.*

Researchers who analysed risk and innovation factors related to market, focused on four main elements as indicated above, namely customer, competitor, public and trace acceptance and market segment research.

Table 29: Market Dimension

Elements	Innovation literature New Product Development (NPS)	Innovation Literature: New Service Development (NSD)	Risk literature
*Customer value creation and acceptance research	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Szymanski *et al* (2001); Mishra *et al* (1996); Rothwell *et al* (1974)	Berry *et al* (1973); De Brentani (1989, 1991); De Brentani *et al* (1992); Easingwood *et al* (1991); Edgett *et al* (1991); Garden-Ellson *et al* (1986); Martin *et al* (1993)	Keizer *et al* (2002); Sharbacker *et al* (1997); Davis (2002); Homburg *et al* (2013); Mu *et al* (2009); De Bakker *et al* (2010); Berglund (2007); Riek (2001)
*Competitor analysis	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Szymanski *et al* (2001); Calentone & *Benedetto*, (1998); Mishra *et al* (1996)		Keizer *et al* (2002, 2005); Mu *et al* (2009)
Public and trade acceptance			Keizer *et al* (2002, 2005); Leithhead (2000)
Market segment research	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Szymanski *et al* (2001); Parry *et al* (1994); Rubenstein *et al* (1976); Song *et al* (1997a); Souder *et al* (1997)	Atuahene-Gima (1995, 1996); Berry *et al* (1973); Bortree (1991); De Brentani (1991, 1995); De Brentani *et al* (1992); Edgett (1996) Edgett et al (1991); Hodgson (1986)	Davis (2002); Yong et al (2011); Segismundo *et al* (2008); Mu *et al* (2009); Riek (2001)
*Marketing activities (commercialization) and	Montoyo-Weiss et al (1994); Evanschitzky *et al* (2012); Dwyer	Atuehene-Gima (1995); Davison et al (1989); De Brentani (1993);	Sharbacker et al (1997); Nader et al (2010); Yong et al

Elements	Innovation literature New Product Development (NPS)	Innovation Literature: New Service Development (NSD)	Risk literature
orientation towards customer and market	et al (1991); Rothwell et al (1974); Verhaegde *et al* (2002)	Edgett (1991)	(2011); Mu et al (2009)
Internal marketing		De Brentani (1989); Easingwood et al (1991); Garden-Ellson et al (1986)	

* *The main dimensions. The other factors can be included as part of the sub-dimensions.*

Table 30: Process High-Level Contruct

Dimension	Innovation literature New Product Development (NPS)	Innovation Literature: New Service Development (NSD)	Risk literature
*Product management & product specification	Montoyo-Weiss et al (1994); Evanschitzky *et al* (2012); Dwyer et al (1991)	De Brentani (1989); Edgett (1996, 1991); Hodgson (1986)	De Bakker et al (2010)
*Following a formal and robust NPSD process	Montoyo-Weiss et al (1994); Evanschitzky et al (2012); Barczak, 1995; Cooper et al (1991); Dwyer et al (1991); Griffin (1997); Mishra et al (1996); Parry et al (1994); Souder et al (1997); Verhaegde et al (2002)	Atuehene-Gima (1995); De Brentani (1991); Edgett (1994, 1996); Garden-Ellson et al (1986)	Keizer et al (2002, 2005); Nader et al (2010); Mu et al (2009); Berglund (2007); Riek (2001);
*Financial and business model analysis, viability of product, sufficient budget	Montoyo-Weiss et al (1994); Parry et al (1994); Gruner et al (1999)	Edgett (1991)	Keizer et al (2002); Mu et al (2009); Wang et al (2010); Berglund (2007); Leithhead (2000); McDermott and O'Connor (2002); Riek (2001); Nordin et al (2011).
*Project management	Chiesa et al (1996); Goffin and Pfeiffer (1999); Rubenstein et al (1976)		Keizer et al (2002, 2005); Yong et al (2011); Segismundo et al (2008); Wang et al (2010); Leithhead (2000)
Customer front-line orientation	Rothwell et al (1974)		De Bakker et al (2010)
Third parties			Keizer et al (2002); Berglund (2007)
Supply Chain (value-chain elements)			Keizer et al (2002); Davis, (2002); Keizer et al (2005); Olechowski et al (2012); Leithhead (2000); Riek (2001);
Knowledge Management			Nader et al (2010)

* Core activities

Table 31: Organisational Culture High-Level Construct

Dimension	Innovation literature New Product Development (NPS)	Innovation Literature: New Service Development (NSD)	Risk literature
*Top management support	Montoyo-Weiss et al (1994); Evanschitzky et al (2012).	De Brentani (1993); Edgett et al (1991)	De Bakker et al (2010); McDermott and O'Connor (2002)
*Relationships / Communications / Cross-functional collaboration	Montoyo-Weiss et al (1994); Evanschitzky *et al* (2012); Balbontin et al (1999); Griffin (1997); Pinto et al (1990); Song et al (1997a); Thamhain (1990); Yap et al (1994); *NSD*: Atuehene-Gima (1995).	Garden-Ellson et al (1986)	Keizer et al (2002); Yong et al (2011); Segismundo et al (2008); Mu et al (2009); Riek (2001)
Organisational culture /	Evanschitzky et al (2012); Cooper et al (1991);	Hodgson (1986)	Nader et al (2010);

Dimension	Innovation literature New Product Development (NPS)	Innovation Literature: New Service Development (NSD)	Risk literature
climate of innovation	Goffin and Pfeiffer (1999); Song et al (1997a).		Berglund (2007); Riek (2001)
*Organisational structure & sufficient resourcing	Evanschitzky et al (2012); Szymanski et al (2001);Burgelman et al (2004); Burgelman et al (2004); Chiesa et al (1996); Rubenstein et al (1976);	Hodgson (1986)	Nader et al (2010); Yong et al (2011); Berglund (2007); McDermott and O'Connor (2002)
Champions	Barczak, (1995); Chakrabarti (1974); Maidique et al (1984); Song et al (1997a).	Edgett et al (1991); Martin et al (1993)	McDermott and `O'Connor (2002)

** Core Activities*

Table 32: Compliance & Supplementary High-Level Risk Construct

Dimension	Innovation literature	Risk literature
Intellectual property		Keizer *et al* (2002, 2005); Nadar et al (2010); Yong et al (2011); McDermott and O'Connor, 2002; Riek, 2001
*Legislation & regulations		Segismundo et al (2008); Riek (2001)
Risk management	Risk taking climate (Voss, 1985)	Process, structure and practices (Riek, 2001, Olechowshi et al 2011, Leithhead, 2000);
*Supplementary risks		Credit risk (Yong et al 2011, Berglund, 2007); Physical hazards (Mu et al 2009, Wang et al 2010); Third party risks (McDermott and O'Connor, 2002);

** Core activities*

Table 33: Technology High-Level Construct

Dimension	Innovation literature	Risk literature
Technology development proficiency	Montoya-Weiss *et al* (1994); Evanschitzky *et al* (2012); Szymanski *et al* (2001); Calentone & *Benedetto*, (1998); Chiesa (1996); Dwyer et al (1991); Parry *et al* (1994); Rubenstein *et al* (1976); Song *et al* 1997(a); Souder *et al* (1997); De Brentani (1985, 1989); Easingwood *et al* (1991); Edgett (1996)	Keizer *et al* (2002, 2005); Sharbacker *et al*, 1997); Riek (2001);
Testing	Mishra *et al* (1996); Davison *et al* (1989)	Riek (2001)
*Innovation (new technology)	Verhaegde *et al* (2002); Atuahene- Gima (1995)	Davis (2002); Nader *et al* (2010); Yong *et al* (2011); Segismundo *et al* (2008); Mu *et al* (2009); Olechowski *et al* (2012); Berglund (2007); Leithhead (2000); Riek (2001)
*Technology factors (development and testing)	Montoyo-Weiss et al (1994); Evanschitzky et al (2012); Szymanski et al (2001); Calentone et al (1998); Dwyer et al (1991); Kotzbauer, 1992; Mishra et al (1996); Rubenstein et al, 1976; Song et al (1997a); Souder et al (1997); Verhaegde *et al* (2002) Testing (Davison et al (1989), Easingwood et al (1991); Mu et a (2009)	Davis (2002), Leithhead (2000)

**Main sub-dimensions*

12.5. Conclusion: IRMF Sub-dimensions

Table 34: Explanation of Second-Level Constructs

Dimension from researchers	Name	Explanation of sub-dimension
Organisation & innovation strategy	Organisation	Strategic organisation alignment establishes how well the P&S are

Dimension from researchers	Name	Explanation of sub-dimension
	strategy	aligned to the overall strategic objectives of the organisation
Portfolio Management	Portfolio management	Portfolio management is the process whereby portfolio of projects is selected that best aligns to the strategy of the organisation.
Competitor analysis, Market segment research	Competitor & Marketplace	Competitor analysis evaluates the extent to which the P&S anticipates and responds to competitor activity as failure to identify and understand competitors and competitive activity have a direct impact on the success of products, services and business strategies. The risk of not understanding a potential market is also analysed in this section. Market research studies should take place in new markets to understand the market potential and attractiveness of the market and the specific market segment that should be targeted.
Customer value and acceptance research	Customer	The product team should have a good understanding of the customer needs within the market segment and translate these requirements into functionality that is important for the customer (Berry *et al* 1973; De Brentani 1995; Edgett *et al* 1991; Martin *et al* 1993). The objective is to create superior value to customers by utilising market research (Langerak *et al* 2004). Customer risk, from the perspective of the organisation, resides in developing the right product according to the right needs of the customer and the extent to which these needs are translated into product functionality (Davis, 2002).
Marketing activities (commercialization) and orientation towards customer and market	Marketing	Separate category to reflect the functional activities and risks related to marketing functional activities. The proficiency of marketing is a key input during the NPSD process (Evanschitzky et al, 2012; Souder et al, 1997; De Brentani, 1995). The marketing strategy should succeed in promoting the P&S, by adequate targeting of the intended target market by making use of effective marketing channels. The marketing strategy should also consider internal marketing of the P&S to internal staff (De Brentani, 1989) as well as ensure that customer front-line staff is able to sufficiently service customers (De Bakker *et al* 2010).
Product management & product specification	Product Management	Separate function that reflects the activities of a product manager. The product manager is responsible for the overall success of the P&S as well as the continued performance and monitoring of this performance against the targets that was set for the specific P&S.
Financial and business model analysis, viability of product, sufficient budget	Financial Management	The financial risk evaluates the extent to which the products financial analysis and management are adequately performed. The financial function is also responsibly for ensuring that sufficient budget exist to ensure that the objectives of the P&S can be reached.
Project management	Project Management	Project management method refers to the extent to which projects within the NPSD lifecycle is managed using formal project management methods and techniques. Additional project specific risks are also included in this dimension, specifically risks relating to lack of familiarity with supply chain (Olechowski et al 2012; Leithhead, 2000; Riek 2001) and third party relations (Berglund, 2007) were regarded as risks related to new P&S projects.
Organisational culture / climate of innovation	Organisational	Organisational factors refer to the creation of a climate of innovation within the organisation. Supporting elements for innovation are organisational structure design, leadership, communication and quality of resources (Evanschitzky et al, 2012; Kessler et al, 1996; Cormican et al, 2004). NPD and NSD researchers recite similar organisational factors to support innovation. Elements that reinforce innovation include senior management support, the existence of product champions, internal communication, cross-functional coordination as well as open

Dimension from researchers	Name	Explanation of sub-dimension
		communication channels. (Balbontin et al, 1999; Barczak, 1995; Edgett et al, 1991; Garden-Ellson et al, 1986).
Legislation & regulations	Compliance	The category refers to compliance with external laws and regulations that governs the organisation. One of the objectives of Enterprise Risk Management (ERM) framework and policies in companies is to ensure effective responses to external events such as compliance to policies, regulations and standards (Dafikpaku, 2011). This includes anticipation of future changes in the external legal and regulatory impact that could impact on the product or service. Legal compliance and in particular IPR, trademarks and patent laws need to be considered during NPSD to ensure that the original know-how of the P&S will be protected, and that the P&S can be secured against competitor legal and patent rights (Kaizer et al, 2002).
Other risks	Supplementary risks	The supplementary risk category deals with risks that are external to the NPSD process, which can relate to statutory, regulatory, contractual, laws, audits and organisation policy requirements. Additional risk such as physical hazards and credit risk that is managed by specialist risk functions are also included.
Innovation (new technology)	Technology & Innovation	The risk evaluates the extent to which the organisation responds to new technological developments and is considered innovative. Obsolescence of existing technologies can have serious consequences for the P&S and can prevent the delivery of functionality that is provided by competitors and requested by customers meaning that the organisation is unable to compete effectively (Yong et al, 2011). However implementation of new technologies can introduce its own risks that are specific to the technology.
Technology factors (development and testing)	Technical operations	The development of the P&S can be exposed to many risks due to different systems and technologies being applied and refers to the delivering of a working P&S as an artefact. Technology is indicated as a separate dimension in the framework. Any P&S innovation will involve an element of the technology dimension. The technology dimension not only addresses the technical elements but also non-technical elements that forms part of the risk resolutions aspects. The technical elements refer to investment in information and communication technology (ICT). This sub-dimension is not focusing on the details of the design but overall principles and concepts that could impact on the successful delivery and functioning of a P&S.

12.6. High-level Conceptual Process Map

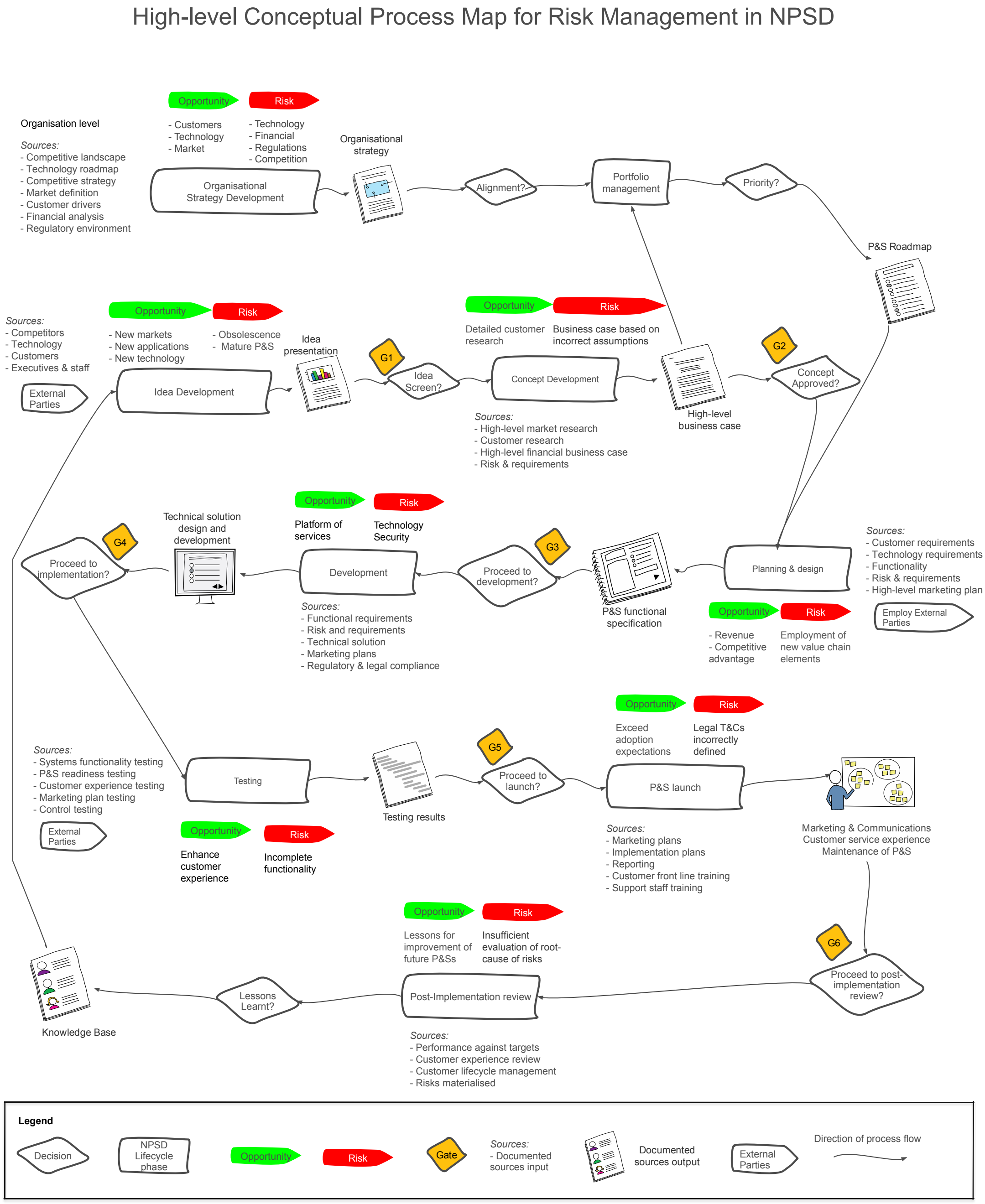


Figure 114: High-level Conceptual Mapping of Risk NPSD Process

12.7. IRMF Maturity Framework

Table 35: IRMF Maturity Framework

IRMF Categories	Level 4	Level 3	Level 2	Level 1
Org strategic alignment	The P&S is fully aligned and form a key part of delivering on the strategic initiatives Long-term strategic view of NPSD exists. Organisational innovativeness is a high priority and embedded within the processes, structure and culture of the organisation and behaviours of organisational resources. The organisation indicates a good awareness of its innovation and research and development capabilities that are consistently improved. Technology innovativeness is a key part of the strategy and investment in technology is prioritised as a strategic initiative. The strategy indicates a clear awareness of market and customer requirements and put the customer first. Significant investments in NPSD are made.	A clear and common awareness and understanding of the organisational strategy exist. Innovativeness is considered as a strategic priority but not fully embedded within the culture and structures of the organisations. Technology innovativeness is considered and plans are made to replace obsolete technologies to support P&Ss. Customer and market awareness is not fully based on integrity information. The customer requirements are considered a priority. Sufficient budget and resourcing is allocated.	The objectives of P&S are unclear and not aligned to key strategies of the organisation. A silo's approach to innovation exists where the task of innovation is assigned to specific functions. Budget and resourcing constraints could exist.	The P&S demonstrates limited adherence to the strategic plans of the organisation. Short-term tactical view P&Ss are predominantly launched.
Portfolio Manage-ment	Project initiated via a formal and systematic portfolio management process within a balanced and ranked portfolio. Consistent portfolio management criteria based on scoring models contain financial indicators, cost and long-term sustainability exist. The portfolios are balanced in terms of long and short-term projects, P&S portfolio characteristics and high and low risk projects. Sufficient resources are provided to support the implementation of projects selected for the portfolio.	Project clearly fit within a set of planned portfolio projects. A portfolio management criterion are applied as well as scoring model but is not consistently applied across all projects. Scoring models do not contain sufficient financial criteria and cost calculations, so a true profit cannot be calculated. The portfolio is not fully balanced and a	Projects are not fully supported in portfolio of projects and resourcing has not been obtained. Portfolio management process is not standardised and the criteria used to choose between different projects are inconsistent. Portfolio management allows pet-projects that are not fully aligned to organisational objectives to be launched.	P&Ss fall outside portfolio management process. Portfolio consists predominantly of short-term tactical projects and services. Resourcing is not allocated to project.

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	Portfolio management is fully aligned to the strategic objectives of the organisation and only the very best or most aligned P&Ss are launched. The capabilities of technology and resources to deliver are assessed.	preference for P&S 'enhancements' is displayed. Resourcing to support the P&S is not efficient.		
Competitor and Market-place	Considered all potential competitors and competitive activity and conducted market research with customers. Marketplace research is based on a wide variety of reliable sources including first hand information about competitors and market. The P&S specification is updated to reflect the target market requirements.	Conducted market and competitive research that can be used to refine the P&S specification. The positioning of the P&S within the target market is defined.	Have failed to consider significant competitors that launched similar P&Ss. Marketplace studies conducted but use secondary resources for marketing studies. The target market is not clearly defined.	Have conducted limited or no competitor analysis or market research. No studies done to understand marketplace. A specific target market is not targeted.
Marketing & Sales	Marketing strategy has been adequately defined and is consistent across the various media channels that speak to the intended target market. The marketing strategy can be described as innovative. Creative concept and marketing channels are appropriate for the target market. The future needs of customers are anticipated. The market strategy effectively targets the customers within the specific marketplace with a clear value proposition. Market testing is performed. Sales force motivated to sell the P&S as they clearly understand the value proposition for potential customers.	The marketing strategy has been developed but is not consistently applied across various media such as TV, Radio, Print, Online, Social Media and Mobile. All 5 P's of marketing are considered. The value of the P&S to the specific target is adequately conveyed to customers. The Sales force is fully trained and understand the benefits and drawbacks of the P&S.	The marketing plan and campaign does not effectively target the intended markets. Market plan are based on insufficient market research. The marketing strategy is not creative and fails to convey the value properties of the P&S. The marketing approach does not consider the 5 P's have marketing which are price, place, promotion, product and people. Sales staff is inadequately trained to sell the P&S.	No or insufficient marketing plan exist. Insufficient marketing for the P&S is conducted. The marketing strategy is not aligned or based on market research. The marketing strategy is not targeted for a specific marketing segment. Awareness of the P&S does not exist amongst Sales staff.
Customer	Show a total dedication to customer and can be described as being customer-obsessed. Customer participation during NPSD.	Have a clear understanding of customer needs and have translated this into functional requirements. Demonstrate	Customer needs in terms of CRM requirements, value chain and risks is not clearly defined. Customer requirements are based on secondary information sources.	Customer needs and target markets are not researched. The P&S functional specification listing of customer's requirements are

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	On-going market and customer research to understand future customer needs. Fully deliver on customer needs in terms of functionality introduced by P&S. A clear understanding of customer requirements in terms of price, performance, quality and variety exist.	understanding of customer needs and problems. Customer needs are based on reliable information and first-hand information sources.	The P&S functional specification does not clearly specify the customer requirements and is unlikely to deliver on customer expectations.	vague. A clear understanding of customer requirements and expectations do not exist.
Investors & Stakeholders	The product will strongly contribute to positive investor and stakeholder relationship. A detailed stakeholder analysis identifying all persons, groups or institutions with an interest in the project was conducted. Stakeholder map clearly identifies the importance of stakeholders in terms of supporters or opposes to the P&S and can be categorised as advocates, followers, indifferent, blockers and opponents. A stakeholder management strategy exists to initiate discussion and build improved relationships supportive of the P&S.	Stakeholder's needs are clearly identified and sufficiently addressed, with the exception of a few minor stakeholders. A stakeholder map exists which identify stakeholder allegiances according to the importance of the stakeholders to the success of the P&S. Discussions are initiated and strategies developed to counter negative stakeholder sentiment.	Key Stake/shareholders with potential negative sentiments are not considered during the stake/shareholder analysis. Stakeholder analysis is conducted but support from key stakeholders are not solicited. Shareholder is not actively engaged where applicable to ensure alignment between organisation and shareholder strategies.	Limited or no stake/shareholder analysis was conducted. Limited awareness of potential negative sentiment exists. Support of key opinion formers is not solicited. The project is not aligned to shareholder strategies or shareholder strategies are not aligned to organisation strategies.
Public Relations & Commu-nciations	Best practices PR and Communications strategy will allow effective communication to relevant stakeholders. A wide variety of communication channels are utilised to address potential reputational risk. The external and internal communication plan will succeed in improving the brand reputation. The crisis response plan will be effective in addressing potential negative publicity.	The communication strategy is adequate and awareness exists about potential reputational risk impact. A credible external and internal communication plan exist that is coherent, credible and consistent. A crisis response plan exists. Appropriate channels to deliver the communication are utilised.	Communication strategy has been developed but is not adequate to protect against reputational risk. An internal and external communication plan exists, but does not adequately communicate to stakeholders. Validity checks to ensure the consistency and accuracy of information do not exist. The communication plan is inconsistent with P&S specifications.	The potential for reputational risk exists and a communication strategy has not been developed. Communication plans to internal and external stakeholders are not in place.
Product Management	The P&S will likely succeed in meeting its states objectives.	Adequate reporting exist that can track	The P&S is likely to underperform and not	The quality of the P&S is poor and

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	The performance of the P&S is tracked during its lifecycle. Appropriate actions can be taken that are based on reliable data. Poor performing projects are killed.	the performance of the P&S in line with its objectives. Timeous identification of corrective action on P&Ss can be identified and strategies developed to address the lack of performance.	meet its stated objectives. Performance can be tracked but is inadequate to identify if remedial actions is required. Performance tracking is not aligned to the stated objectives of the P&S. The quality of the P&S is not in line with expectations of customers.	performance will be insufficient to meet its stated objectives. Performance cannot be tracked and sales and revenue figures are not based on integrity of data. The overall quality of the P&S is poor and do not deliver on all the requirements.
Project & Knowledge Management	The project activities are robust, visible and well documented and aligned to best practices in project management. The project management activities are monitored and improved to ensure that quality projects results. Secure knowledge management technology platforms exist through which knowledge about P&S can be disseminated across the organisation to authorised personnel. Knowledge is successfully retained in a manner that can lead to sustainable innovative advantages.	Project management activities is disciplined and well communicated, which will contribute toward the success of the project. A formal project management methodology is adhered to. Lessons learnt from the project are documented in a central library and can be utilised by other project teams to improve delivery of future projects.	PM activities and deliverables are of insufficient quality to guide the projects towards successful delivery. A structured project management approach is followed. Knowledge management is insufficiently documented to ensure that other projects can learn from mistakes.	Basic PM activities such as project plans and scope management are not adequately performed. The project management methodology is unstructured and differ on a per project manager basis. No knowledge management activities take place.
External Providers	The relationship with the external provider is seen as that of a trusted partner of the NPSD project teams. The external provider is aligned to achieve the objectives of the organisation. The external provider is effective to deliver on requirements in conformance with time, quality and scope requirements. Knowledge management procedures exist to ensure that external provider expertise is retained during the lifecycle of the project. Collaboration with external providers succeeds in	Robust due diligences was conducted on external provider. The procurement cycle are adhered with and detailed due diligences was conducted including information security due diligences. Dedicate resources exist to ensure effective communication and relationship with external providers. Contractual obligations are robustly defined to	The relationship with external providers is poorly managed. The full procurement cycle including due diligences are not adhered with when external providers was appointed. The contract and SLA's are insufficient to ensure quality deliverables. Dedicated resources to specific external providers do not exist to manage relationships. The external provider is unable to fully deliver on the requirements of the P&S for which they were	No due diligences were on external providers conducted to validate the expertise to deliver the P&S. The external provider is appointed outside the formal procurement process. Relationships with the vendor are poor and not formalised in contractual obligations and SLA's.

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	delivering competitive advantages for the organisation.	ensure quality deliverables.	contracted.	
Financial Management	Sufficient funds exist to meet the P&S objectives, including marketing budget. The financial viability estimate is based on integrity information to enable the P&S performance in the market. A good understanding exist of the price that customer attributes to the P&S. The cost (fixed, variable and overhead) to deliver the P&S is clearly specified. The necessary investments (research, NPS, advertising) and rate of P&S penetration in the market is considered.	Funds exist or slight reduction in scope of P&S is required due to budgetary constraints. The financially viability assessment is based on verifiable assumptions. The cost of delivering the P&S is estimated.	Insufficient funds exist meet the needs of the project, including marketing budget. The project will not be able to deliver on its stated objectives. The Financial viability analysis and financial projections are insufficiently robust to estimate market potential.	No or limited financial planning is in place to secure budget for the project to enable delivery on its stated objectives. Financial viability of the P&S is based on poor assumptions and lack of data.
Customer Relationship Management	Customer Care has full access to automated technology to facilitate superior customer service. Agents have been adequately trained and have a good understanding of potential customer concerns and how to effectively address these. CRM requirements have been build into the P&S and will assist to extend the lifecycle of the P&S. Potential or actual bottle-necks (such as escalation procedures) in servicing customers have been identified and addressed.	Customer Care has sufficient access to information to enable them to service customers. Some aspects of the technology support systems has not been automated and automatic escalations are not build into the systems. The agents have been adequately trained. CRM requirements have not been automated.	Customer Care requirements have partially been addressed and will not enable adequate service levels to customers. Insufficient access to automated technology exists to facilitate customer support. CC training has been conducted but not all aspects of the P&S are adequately addressed. CRM requirements have not been defined.	The customer care requirements have been insufficiently defined. Customer care will not have access to information and technology to service the customers of the P&S. Agents are aware of the P&S but have not been fully trained to service the P&S.
Business Model and Value Chain	The business model leads to sustainable revenue streams. All business model components and their CSF's were identified. A good understanding exist of the value proposition that the different parties in the business model contribute (expertise, quality, security & technology). The technology infrastructure that supports the business model and value chain is robust and secure. The business model can be considered to be innovative. The value chain service providers deliver a superior service according to expected customer requirements. The	A good understanding exists of all the components and parties of the business model and the value that each contributes including the technology infrastructure components. All the interaction and coordination activities of the different parties in the supply chain have been identified, but monitoring of the quality of service within the supply chain are not monitored. The	The business model has been defined and analysed but some components of the business model that could introduce risks for the P&S have not been addressed. The supply chain elements have been identified but since certain capabilities do not exist, it needs to be outsourced to third party providers. Monitoring of service delivery by external providers is not possible. Some processes have not been defined such as post-delivery support for returning products.	The business model is complex and business model components and value propositions are unclearly defined. It is not clear which parties will perform which tasks nor was accountability for risks clearly defined. The value and supply chain activities has not been identified, nor does the capabilities exist internal in the organisation.

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	goals of the value chain providers and those of the organisation are aligned.	objectives of the organisation and external supply chain providers are not fully aligned.		
Business Processes	Processes have been optimally designed and are adhered with. The NPSD process is considered mature and is continually monitored for optimisation opportunities. New and existing process are re-engineered to increase effectiveness (value for the customer) and increases efficiency (reduce cost).	Processes are documented but room for improvement exist in certain areas. Compliance to processes is monitored and action is taken where activities deviate from prescribed processes. Adequate training and communication of NPSD and other processes take place. The processes are analysed for optimisation opportunities but not re-engineered. Enhancements to processes are not included in the functional specifications of P&Ss.	The NPSD process is adhered to at a minimum level, indicating low levels of maturity. The processes are not adequately documented and are not easily accessible by project team members. Supporting processes of the P&S have bottle-necks that are not addressed.	The NPSD process is not comprehensively adhered with and/or followed. A poor awareness of NPSD processes exists. The existing processes maturity level is adhoc level 1 with functional silo's being prevalent. Processes to support the P&S have not been identified and documented and will lead to a poor quality P&S.
Business Rules, Pricing & Revenue Assurance	Business rules are clearly defined, available and documented in a central repository. Pricing strategy is market related, considered affordable for the customer and competitive. The pricing strategy is based on robust, reliable customer and market information and can be considered innovative. RA leakage risks are sufficiently mitigated with automated technology controls to enable quick detection of leakages.	Business rules are unambiguous with minimal unintended negative impact on revenue. Business rules with integrity are maintained in a central repository. RA leakages and detection controls are in place but mostly based on manual processes. Impact of the pricing strategy such as cannibalisation has been assessed.	Some business rules have not been clearly defined or are ambiguous or unclear. Business rules supporting the P&S are not documented in a central repository. The pricing strategy is based on secondary market research and does not indicate an understanding of customer price sensitivities. Potential revenue leakages have been identified but no controls implemented.	Business rules with a potential high impact on the success of the P&S have not been defined. Business rules supporting the P&S are not freely available. The pricing for the P&S has changed but is not based on market or customer research. The impact of the pricing change is not understood. Potential revenue leakage was not considered due to inadequate business rules or transactions that cannot be billed.
Commercialisation	Commercialisation activities are monitored to ensure quality deliverables.	Sufficient time is allowed for commercialisation	The time allowed for commercialisation activities is condensed	Insufficient time allowed for commercialisation activities and some of

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	Sufficient time and budget is allocated to commercialisation activities. Formal test plans are created. All systems are tested with both positive and negative testing. The marketing plan and customer experience is tested in the market.	activities. End-to-end testing takes place on a testing platform that is optimally configured to resemble the production environment. Sufficient handsets, resources and budget exit to conduct customer experience testing and marketing testing.	and teams are pressurised to deliver, but some testing can still be conducted. Testing is adhoc and does not follow a formal plan to establish end-to-end effectiveness of the P&S. Insufficient budget and resources hamper customer experience testing and marketing. A testing environment exists but it is not optimally configured.	the activities cannot be performed. The NPSD teams are pressurised to deliver testing results. Budget does not exist to support commercialisation activities such as marketing and testing. The P&S is not sufficiently tested before launch. The customer experience is not tested. A proper testing environment does not exist.
ICT Planning, Development & Maintenance	Technical solution design conforms to best practices. All aspects of product maintenance have been adequately defined to maximise continued useful lifecycle of the P&S. The technology enables innovative P&Ss. The technology teams have wide range expertise in deploying the technology solution.	The technical solution aligns to the requested P&S functionality. P&S maintenance plans are documented but responsibilities are not clearly defined. Technology platforms are utilised to deliver additional P&Ss. The P&S teams are knowledgeable about the technology.	The required functionality is ambiguous. The full technical solution for the P&S cannot be implemented due to system inflexibility. The phased requirements for the P&S are not clear. Impacted systems have not been included in the technical solution. Product maintenance plans are not documented. The technology is unable to deliver on the P&S functional specification. The technology team have limited familiarity and lacks expertise regarding the technology.	Major components with high impact on the product were neglected in the product design. The technical solution is not robust and/or the technology is obsolete. A clear understanding of the required functionality that is required for the P&S do not exist. Product maintenance plans are not in place. The technology is inflexible and slow. The technology team is unfamiliar with the technology. Insufficient understanding exists of the complexity of the P&S and integration required across multiple platforms and systems.
ICT Security	Product conforms to industry best practices inline with organisations and industry security standards.	Product designed in accordance to standards, minor security controls can still be implemented.	The P&S has technology security exposures and certain controls are lacking. Backend systems and	The technological security vulnerabilities of the P&S are not adequately considered. Basic technology

IRMF Categories	Level 4	Level 3	Level 2	Level 1
		Penetration and vulnerability testing has been conducted on web-facing and P&S applications. Response plans are documented in terms of controls and escalation paths. Suitable cryptography methods is used to ensure the safe storage, transmission and processing of information.	servers are vulnerable to exposures that could impact the P&S. Web servers are not hardened to protect against security vulnerabilities. Insufficient authentication, identification and logical access controls are in place. Confidential information is not adequately protected. The operational security of the P&S has not been adequately considered.	security controls are not in place. The technology security department has not been consulted.
ICT Standards Confor-mance	P&S conforms to ICT policy and best practices. P&S designed in accordance to organisations and industry standards. Processes are documented and repeated. Quality of processes is monitored. Systems are designed to ensure availability during the product lifecycle.	SLA's and OLA's are clearly defined with responsibilities being accepted by relevant stakeholders. Quality standards are monitored. Penalties for non-delivery exist. Sufficient capacity and scalability controls are in place. Disaster recovery and business continuity plans have been documented and tested.	SLA's and OLA's are inadequately defined. Change and release management processes are not adhered with. A lack of awareness exists with regards to what systems affect P&Ss during change control processes. The P&S design does not consider capacity and scalability. A disaster recovery and business continuity requirement for the P&S has not been considered.	DR/BCM/CP plans are inadequate in line with the P&S profile in the market. SLA's and OLA's are not defined. Change and release management processes do not exist or poorly adhered with. A lack of formal change control and capacity planning policies, procedures and measurement for controls exist.
Legal & regulatory compliance	Adherence to Regulations and adaptation of the P&S proactively in anticipation of future changes in the legal and regulatory environment. Adherence to the spirit and intentions of laws, not merely the requirements. Compliance to best practices in terms of financial and regulatory reporting. Legal contracts are sufficiently robust to ensure that external provider delivers on time, with escalation clauses build into the contract.	Potential liabilities have been minimised to the maximum extent permitted by applicable laws and regulation. In case of vague regulations and where no previous case precedents exist, a written regulatory opinion needs to be provided. Financial documentation and lodgements were timeous and	Contracts in draft and potential liabilities may exist. Incomplete or inaccurate information provided in financial and regulatory lodgements. IPR, trademarks and patents risks not adequately mitigated. Partially compliant to regulations which can lead to regulatory exposures. Legal provide a silo opinion, based on the	Non-compliant to regulations or regulations not considered. Contracts not approved with external providers. IPR, trademarks and patents risks not considered. Failure to submit regulatory and financial lodgements with telecommunication authority in time. Legal followed a silo's

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	The sales staff is fully informed about obligations contained in legal contracts.	adequate. Legal contracts are in place with all external providers. Legal and Regulatory consult with other stakeholders to provide uniform opinions. Legal considers the interests of the customer and those of the organisation. Sales staff is aware of contractual obligations with customers.	ability to defend the P&S in court, exclusively biased towards the interests of the organisation. Regulatory and Legal do not agree on interpretations of laws and regulations. A limited understanding of the technology scope of the P&S leads to an regulatory and legal opinion that does not consider the full risk exposure.	approach to provide a legal opinion without a full understanding of the risk or considering the wider risk impact. Regulatory and Legal do not consult on interpretations of laws and regulations and have divergent interpretations of laws and regulations.
Governance	Verification mechanisms for internal policy compliance exist such as internal audit or peer reviews. The product team are proactively engaging the RM teams and/or making informed RM decisions. Innovative adherence to CSR practices and environmental impact for the P&S exist. The P&S teams exemplify ethical corporate values. External providers and NPSD resources are exemplars of promoting safe working conditions during all phases of NPSD.	Internal governance processes are mostly adhered to but some have low maturity ratings. Compliance to Risk Management methodology and awareness of RM roles and activities that are integrated within the NPSD process. CSR practices are considered and implemented for the P&S. Full compliance of health and safety obligations and ensuring that external providers comply with provisions to promote safe working conditions. The P&S teams are aligned to the corporate values and code of conduct of the organisation.	Policies and procedures are not adhered with. Selective compliance to risk methodology. Failure to adhere to comprehensive process. Environmental concerns, CSI, heath & safety are only partially addressed as it is applicable to the P&S. Awareness of the Code of Conduct and corporate values of the organisation exist but instances of social irresponsible behaviour are not addressed. Health and safety obligations are partially addressed within the organisation and with external vendors. Environmental impact and carbon footprint of P&S are only partially addressed (where applicable). The P&S Social responsible practices are only partially considered.	Lack of awareness of internal organisational policies relating to NPSD project, that should be complied with. Non-compliant to risk management methodology and reporting requirements. No awareness of the Code of Conduct and corporate values of the organisation exist. No or limited awareness of health and safety obligations of the organisation. Nor are external providers aware of the necessity to promote safe working conditions. Failure to consider environmental impact and targets to reduce the carbon footprint (where applicable to the P&S). The P&S indicate a lack of social responsible practices and initiatives.

IRMF Categories	Level 4	Level 3	Level 2	Level 1
Privacy	Privacy controls are embedded within NPSD technology developments. Privacy provisions are consistently treated across all P&Ss. Uniform opinions between Risk, Regulatory and Legal about privacy are documented and communicated. Privacy are proactively addressed by NPSD teams and treated as a competitive advantages for the organisation. Responsibilities and ownership for privacy has been identified. Processes are in place to inform the customer and the relevant authorities if customer data is lost.	Clear identification of instances where sensitive information is used and controls are in place to treat it appropriately. The P&S is comprehensively analysed for privacy infringements across all technology platforms, including consideration of external providers. Customers have control over how much data is collected and for what purposes it is used. Clear directives is provided and adhered with regards to how long and where data will be securely retained Data disclosures for legal and regulatory purposes is noted in the T&Cs of the P&S.	Sensitive information are utilised without effective controls. Privacy infringements exist but not directly related to P&S, such as browsing on websites. Privacy intrusive actions such as monitoring of communications, profiling and covert data capturing takes place. Customers are not fully informed about data collection activities and do not have full control despite providing consent for these activities. External provider accesses to information that can lead to privacy intrusions are not considered.	Lack of awareness that sensitive information is utilised during information gathering for new P&S. Privacy infringements exist directly related to gathering of information during P&S, such as gathering behavioural data and location data. Customer consent for data gathering is not obtained. Data is not anonymised to reduce privacy impact. Lack of awareness of general privacy provisions.
Fraud, Corruption and Security	Fraud detection and mitigation practices were implemented which is automated in the fraud management systems and allow early detection of fraud Fraudulent transactions have sufficient audit trails to ensure prosecution where applicable. Changes to the P&S are monitored to ensure that fraud controls have been implemented. Money laundering controls are automated which allows continual monitoring and a strong awareness exists within the organisation of the regulatory compliance requirements for AML. Physical security requirements are sufficiently mitigated and a high awareness exists of the need to safeguard the organisation against crime, reduce business legal risk and	Fraud controls have been implemented but have not been automated in the fraud management systems. However continual monitoring of the P&S for fraud incidents are implemented. Potential money laundering exposures and controls are mitigated but some transactions are manually monitored due to insufficient data or systems functionality. Physical security controls have been implemented and awareness exist and layered physical security has been implemented such as securing entry points.	The P&S have been assessed for fraud risks, however appropriate mitigation controls have not been identified. Consultation with the AML division to determine the exposure and potential mitigating controls that need to be implemented has taken place but the AML controls have not been implemented. Liaison with the relevant security departments took place to understand the physical security requirements for the P&S, however sufficient physical security controls have not been adequately implemented.	The P&S have not been adequately assessed to determine potential fraud risks. Assessment of P&S to determine potential exposures against money laundering activities has inadequately been conducted. . The physical security requirements for the P&S have not been adequately evaluate (if applicable).

IRMF Categories	Level 4	Level 3	Level 2	Level 1
	protect the organisation's image and reputation. Customer awareness of physical security risks associated with the P&S exist, such as location based P&Ss which allows tracking of customers as well as protecting their PINs. Training should be sufficient that staff members are knowledgeable of physical security, fraud and AML risks to prevent incidences.	Training and awareness of fraud, physical security and AML should exist. Physical assets should be suitably secured.		
Organisational culture	The organisational structure, management and resources are sufficiently and adequately allocated to support the P&S during its entire lifecycle. A favourable work environment supportive of innovation is identified, which gives resources the power, time and freedom to experiment and generate new ideas. Executive leadership ensures commitment to the delivery of a quality P&S. Knowledge is retained and sufficient continuity exists within the organisation. Handover of skills exist between project teams. Succession planning for critical resources is in place. Leadership focus resources on strategic P&Ss and inspire them to be passionate about the P&S.	Sufficient resources (human, technology) exist to support the P&S during its entire lifecycle. Training and development activities have been identified where insufficient competencies and skills required for P&S exist. A favourable work environment with minimal dysfunctional conflict and effective communication improve the probability of product success. Executive management provides sufficient leadership, support and commitment towards the P&S. Critical resources have been identified and succession planning has been implemented.	A dedicated organisational structure with dedicated resources is required to support the P&S, which has not been adequately implemented. The P&S require resources with certain expertise, which are not adequately available within the organisation. External resources need to be contracted to ensure sufficient support of P&S during its entire lifecycle. Executive management support is insufficient to provide clear direction and control and for the sufficient allocation of resources.	Significant changes in the org structure are required to support the P&S. Insufficiently skilled resources exist to implement and/or support the P&S. Unresolved workplace problems exist with dysfunctional conflict that directly impacts on P&S teams ability to deliver effectively. Communication about the P&S is not adequately shared between teams (Silo's approaches) to ensure a functional P&S. Executive leadership are not supportive of the P&S.

13. Appendix Four: Data Analysis

13.1. Determining Effective Risk Management

Table 36: ISO 31000 principles for effective Risk Management

Dimension	Definition	Evaluation (IIA, 2010)
Risk management creates and protects value	Risk management contributes to the demonstrable achievement of objectives and improvement of performance in, for example, human health and safety, security, legal and regulatory compliance, public acceptance, environmental protection, product quality, project management, efficiency in operations, governance and reputation	A range of techniques at variable levels of exposure should be available – most rigorous assessment when value at stake is higher.
Risk management is an integral part of all organizational processes.	Risk management is not a stand-alone activity that is separate from the main activities and processes of the organization. Risk management is part of the responsibilities of management and an integral part of all organizational processes, including strategic planning and all project and change management processes.	RM should not be seen as an add-on task.
Risk management is part of decision making.	Risk management helps decision makers make informed choices, prioritize actions and distinguish among alternative courses of action	The more important the decision the more explicit the association
Risk management explicitly addresses uncertainty.	Risk management explicitly takes account of uncertainty, the nature of that uncertainty, and how it can be addressed	Risk assessments should document areas of uncertainty and consider how best to address this
Risk management is systematic, structured and timely.	A systematic, timely and structured approach to risk management contributes to efficiency and to consistent, comparable and reliable results.	
Risk management is based on the best available information.	The inputs to the process of managing risk are based on information sources such as historical data, experience, stakeholder feedback, observation, forecasts and expert judgment. However, decision makers should inform themselves of, and should take into account, any limitations of the data or modeling used or the possibility of divergence among experts.	Obtaining information is expensive and the process should provide guidance on what constitutes sufficient info
Risk management is tailored.	Risk management is aligned with the organization's external and internal context and risk profile.	It is not an out-of-box experience and integrated with organisational processes
Risk management takes human and cultural factors into account.	Risk management recognizes the capabilities, perceptions and intentions of external and internal people that can facilitate or hinder achievement of the organization's objectives.	The processes must be appropriate to the competence and culture of those that use them.
Risk management is transparent and inclusive.	Appropriate and timely involvement of stakeholders and, in particular, decision makers at all levels of the organization, ensures that risk management remains relevant and up-to-date. Involvement also allows stakeholders to be properly represented and to have their views taken into account in determining risk criteria.	Appropriate and timely involvement of all stakeholders
Risk management is dynamic, iterative and responsive to change.	As external and internal events occur, context and knowledge change, monitoring and review take place, new risks emerge, some change, and others disappear. Therefore, risk management continually senses and responds to change	The process should be regularly reviewed to respond to changes of the organisation and the environment so it stays relevant
Risk management facilitates continual improvement of the organization.	Organizations should develop and implement strategies to improve their risk management maturity alongside all other aspects of their organization.	RM should mature along with other organisational processes.

The research question refers to the embedding of RM within NPSD. The Institute of Internal Auditors (IIF, 2010) advocated 7 tests to assess the adequacy of RM using ISO 31000 by asking whether risk management is…?

Table 37: Embedding of Risk Management: Seven Tests

Dimension	Question (IIA, 2010)	Alignment ISO principles
Sponsored	Does leadership clearly sponsor and challenge activity?	Risk Management is based on best available information and means that informed risk decision taking takes place
Owned	Is ownership accepted and acted upon at all levels?	Risk management is an integral part of all organizational processes which would entail that ownership is accepted and acted upon
Decisive	Is key decision influenced?	Risk Management is based on best available information and means that informed risk decision taking takes place
Communicated	Are outcomes visible and actively discussed?	Risk management is transparent and inclusive.
Integrated	Part of day-to-day core processes and procedures?	Risk management is an integral part of all organizational processes
Valued	Price and commitment drives continuous improvement	Risk management creates and protects value
Sustained	Robust, reproducible and not dependent on key individuals	Risk management is systematic, structured and timely.

The baseline criteria for scoring are based on the IIF (2010) report but adapted from Hindson (2011) Institute of Risk Management (IRMSA) report, which provides indicators for different level of embedding and criteria as demonstrated below.

Table 38: Criteria to determine level of embedding

Level of embedding and criteria	
5	Approaches to managing risks are fully embedded within day-to-day business processes and strategies
4	Approaches are adopted and improved but not fully embedded
3	Implementation has been completed in key areas
2	Implementation is planned but not delivered
1	There is a level of awareness or understanding but no action has been taken

13.2. Expert Questionnaire Results

Table 39: Expert Questionnaire Scale

Number	Criteria
5	Risk approaches are fully embedded within the day-to-day business processes and strategies of new product development
4	Risk approaches are adopted and improved but not fully embedded
3	Risk approaches has been implemented in key areas
2	Risk approaches has been planned but is not delivered
1	A level of awareness exist of risk approaches but no actions has been taken

Table 40: Expert Survey Results

#	P	Question	5	4	3	2	1	Consensus %
ISO 3100 principle 1: Risk Management creates and protect value								
1	3a	Did risk management (RM) assist in creating and protecting value within NPSD?	3	2				60%
2	3a	Did RM assist in achieving the objectives of the products and services?	2	2	1			0%
3	3a	Did RM assist in improving NPSD?	4	1				80%
4a	3a	Did RM assist in improving the performance of other risk disciplines (within NPSD)	1	3	1			60%
4b	3a	Did RM assist in improving the performance of the following risk disciplines?						
4b1		Health & Safety		2	3			60%
4b2		Security (Physical)		3	1	1		60%
4b3		Fraud Management	4			1		80%
4b4		AML	3	1		1		60%
4b5		Revenue Assurance	2	3				60%
4b6		Legal	4	1				80%
4b7		Regulatory	3	2				60%
4b8		Technology Security	4		1			80%
4b9		Privacy	4		1			80%
4b10		BCM	3	1		1		60%
4b11		Environmental protection		2	2		1	0%
4b12		Audit	1	2	1		1	0%
4c	3a	*Did RM assist in improving the performance of the following functions?*						
4c1		CRM (including customer care)	4	1				80%
4c2		Marketing	4			1		80%
4c3		PR & Communications	1	3		1		60%
4c4		Finance	1	2	1		1	0%
4c5		External providers (vendors)	3	2				60%
4c6		Product development	4	1				80%
4c7		Project management	4	1				80%
4c8		Technical development	4		1			80%
4c9		Technical maintenance	2	2		1		0%
4c10		Sales		2	2	1		0%
4c11		Supply chain	2	2			1	0%
4d	3a	*Did RM contribute towards improved performance of the following aspects?*						
4d1		Improved product and service quality	4	1				80%
4d2		More efficient processes	3	2				60%
4d3		Improved reputation of Organisation	3	2				60%
4d4		Improved innovation	3	1	1			60%
4d5		Improved customer experience	3	1				60%
4d6		Create value for investors	3	1	1			60%
ISO 3100 principle 2: Risk Management is an integral part of all organisational processes								

#	P	Question	5	4	3	2	1	Consensus %
5a	*3b*	*Were RM integrated within the NPSD practices*	4	1				80%
5b		*Were RM integrated within the following areas of NPSD*						
5b1		The new product and service development process	4	1				80%
5b2		The strategy of NPD	4		1			80%
5b3		Change management processes	1	3		1		60%
5b4		The stage/gate processes	4			1		80%
5b5		Project management processes	4	1				80%
5b6		Portfolio management processes	2		2	1		0%
ISO 31000 Principle 3: Risk Management is part of decision-making								
6a	*3c*	*Did RM assist the NPSD teams to make better decisions*	4	1				80%
6b		*Did RM assist the NPSD teams in the following manner*						
6b1	3c	Prioritise actions better	2	3				60%
6b2	3c	Consider alternatives courses of action	3	1	1			60%
ISO 31000 Principle 4: Risk Management address uncertainty								
7a	3d	Consider uncertainty	4	1				80%
7b	3d	To better understand the source/scope or nature of the uncertainty	2	3				60%
7c	3d	Help the NPSD teams to have a better understanding of how uncertainty can be addressed	3	1	1			60%
ISO 31000 Principle 5: Risk Management is systematic, structured and timely								
8a	3e	*Were RM processes consistently applied within NPSD*	4	1				80%
8b	3e	*Were RM results comparable with other risk assessments in NPSD*	4	1				80%
8c	3e	*Can RM within NPSD be described as being reliable*	5					100%
8d	3e	*Did RM contribute to increased efficiency within NPSD*	4	1				80%
ISO 31000 Principle 6: Risk Management is based on the best available information								
9a	3f	*Were RM within NPSD based on sufficient available information*	3	2				60%
9b	*3f*	*Were RM inputs based on a wide variety of sources*	3	2				60%
9c	*3f*	*Did RM consider limitations inherent to the sources of information*	2	2	1			0%
ISO 31000 Principle 7: Risk Management is tailored								
10a	3g	*Were the RM process tailored to the requirements of NPSD*	4	1				80%
10b	3g	*Did RM consider any of the following*						
10b1		External context: Such as competitors, customers	5					100%
10b2		Internal context: Compliance to internal policies and processes	5					100%
10b3		Risk profile (appetite)	2	2	1			0%
ISO 31000 Principle 8: Risk Management takes human and cultural factors into account								
11a	3h	*Did RM consider human factors and culture that can facilitate or hinder the achievement of objectives within NPSD*	1	1	3			60%
11b	3h	*To what extent do you think that the RM processes considers the following factors in terms of:*						
11b1		The capabilities of key NPSD resources	1	4				80%

#	P	Question	5	4	3	2	1	Consensus %
11b2		• Leadership capabilities	1	3	1			60%
11b3		• Communication	2	3				60%
ISO 31000 Principle 8: Risk Management is transparent and inclusive								
12	3i	*Could RM within NPSD be considered as transparent and inclusive*	5					100%
13	3i	*Did RM within NPSD allow for the appropriate and timely involvement of stakeholders during the RM process*	5					100%
14	3i	*Did RM processes within NPSD allow for the appropriate and timely involvement of decision-makers in the process*	5					100%
15	3i	*Did RM allow alternative views to be considered when determining risk criteria*	4	1				80%
ISO 31000 Principle 9: Risk Management is dynamic, iterative and responsive to change								
16	3j	*Did RM within NPSD continuously responds to change*	4	1				80%
17	3j	*Did the leadership (executives) clearly promote RM within NPSD within Organisation*	3	2				60%
18	3j	*Was ownership of risks readily accepted within NPSD teams*	3	2				60%
ISO 31000 Principle 10: Risk Management facilitates continual improvement								
19	3k	*Did the maturity of the RM processes improve*	4	1				80%
20	3k	*Was the RM processes monitored to ensure that they work effectively*	3	2				60%
21	3k	*Did RM within NPSD assisted to continually improve Organisation?*	4	1				80%
Evaluation of research question								
22		*Did RM succeed in reducing risk during NPSD*	5					100%
23		*Did RM succeed in ensuring effective risk mitigation in NPSD*	5					100%
24		*Was the RM framework effective in ensuring risk mitigation in NPSD*	5					100%
25		*Was the risk supporting processes effective in ensuring risk mitigation in NPSD*	5					100%
26		*Did RM succeed in embedding RM within NPSD for Organisation Consumer products*	5					100%
27		*Did RM succeed in embedding RM within NPSD for Organisation Business products*	3	1	1			60%
28		*Did RM succeed in embedding RM within NPSD for Organisation Financial service products?*	3	1	1			60%
29		*Did RM succeed in embedding RM within NPSD within other Opco's in Africa*		1	3	1		60%
30		*Did RM succeed in embedding RM within other projects within Organisation?*		3	1	1		60%

13.3. Operational Risk Assesment Results

Table 41: Operational Risk Assessment Results Summary

Key areas of risk	What went well?	What could be improved?	Recommendations
Project Management			
NPSD processes are not adhered with or bypassed Project managers do not have required skills	There were several very good project managers that correlated directly to more successful products	No structured formal project management approach is followed Insufficient scope	Implementation of a formal project management framework Risk management should be part of project

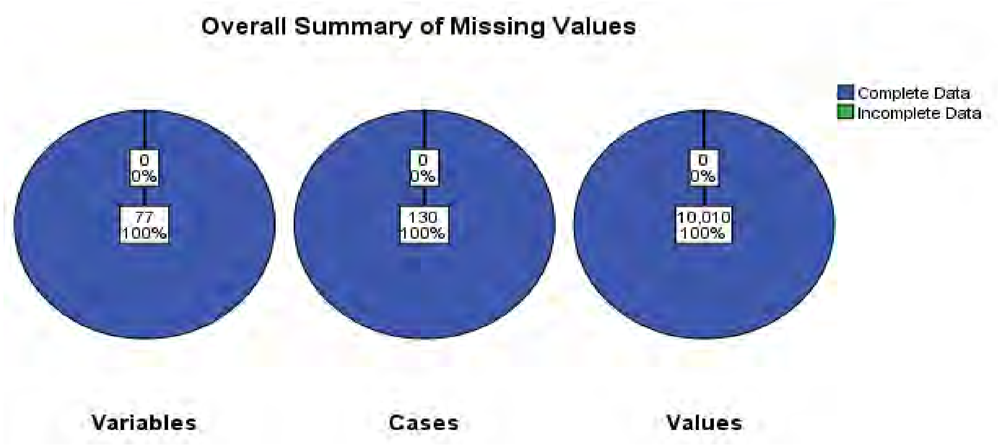
Key areas of risk	What went well?	What could be improved?	Recommendations
Lack of best practice project management methodology are being followed Project manager lacks authority to execute their roles	Several examples of good project management activities were listed such as scope management New project management tools has been implemented that should result in improvements	management Project performance indicators do not exist Quality assurance is not implemented Insufficient acceptance of accountability and responsibility for their projects by Project Managers	Implementation and adherence to a best practice NPSD process
Third Party Management			
Inadequate management of vendors and performance had a negative impact on success of products Insufficient due diligence during selection of the right vendors to perform the work Contractual obligations and SLA's not in place	Using existing and trusted vendors that understood the organisation's internal systems and processes, resulted in faster implementation and troubleshooting of problems	Too much reliance on third party vendors Third party vendors afforded too much control Third parties entrenchment in processes to continue contracts IP being held external to the organisation Inadequate formal third party management processes in place Criteria for appointment of third parties should be improved Clear allocation of responsibilities between third parties and the organisation	NPSD selection of vendors must follow approved process with due diligence procedures Adequate management via contracts and SLA's and penalties for non-delivery Verification of accountabilities and responsibilities I contracts between vendors and organisation Handover and training processes to improve knowledge retention from vendor to organisation
Technical Implementation			
Inadequate and insufficient new product and service development functional specification (time spend on refining the requirements rather than development) Lack of robust end-to-end testing Technology by third party vendors unable to support the P&S	Technical delivery improved in last year due to adherence to technical business processes such as change and release management Using technical project managers from technology teams to assist project managers resulted in improved technology delivery	Early technical feasibility should be established by earlier involvement of Technology functions Technology should not commence with development until the product requirements have been clearly defined Specification freezing should be introduced and clear change control processes should be followed No bypassing of formal NPSD process For products that require speedy 'time to market' delivery special fast tracked processes should	Ensuring that NPSD functional specification is of sufficient quality before it is handed to technical team Ensuring robust end-to-end testing Conducting a feasibility analysis to ensure that the technical solution can support the critical features and capabilities that is required by the product or service. Provide a dedicated technology team to focus on advanced product development. Strong technical cross-functional team to work on reduced time to market projects Implementation of stage/gate

Key areas of risk	What went well?	What could be improved?	Recommendations
		be designed and adhered with No agreement to unrealistic timeline pressures by technology team Improve knowledge management by learning from past mistakes	processes
Product Performance			
Lack of ownership by product managers Performance targets of products not reaches due to inadequate marketing Products launched with defects that are negatively impacting on the customer.	Successful products were led by product managers who took responsibility and actively monitored product performance during development as well as implementation Product managers who accepted responsibility for their products had better performing products and were more likely to address risks and provide mitigating controls	Product managers who failed to take responsibility and attributed poor product performance on external factors and technical teams. Not retaining knowledge when product managers leave the organisation Inadequate definition of product specifications as product managers do not understand their own product Monitor product objectives Some products lack customer focus Some product managers do not understand the business rules associated with products	Clear accountability, responsibility and ownership should be displayed by product managers Implementation of Knowledge base Monitoring of product performance after implementation Conducting post-implementation reviews to learn and improve future products
Revenue Assurance			
Revenue leakages resulted due to - Products launched prematurely to being technical ready - Changes in configuration in other systems supporting the product or service - Business rules not implemented - Fraud incidences online, scams and zero-rating - Stolen promotional items - Information security vulnerabilities	Consultation with the fraud team Validation of elements of the product Consultation with risk team	Protection of sensitivity of data Better testing procedures Documentation of minimum standards Business rules changed without consultation with risk team Mitigating controls not implemented	Ensure that mandatory controls are implemented during testing Proper change request procedures Involvement of revenue assurance risk specialists Abiding by internal information security policies and procedures Adherence to NPSD process
Business Rules			

Key areas of risk	What went well?	What could be improved?	Recommendations
Products and services with changing business rules Implementation of incorrect business rules Complex business rules that confuse customers Insufficient understanding of impact of changing the business rules	Where there were proper planning and business rules were clear at the beginning of the project, products were implemented with greater speed and worked more effectively	Customer and regulatory impact on business rules need to be assessed Consultation with technical teams to determine impact Product managers do not understand the business rules Business rules conflicted with T&Cs Non-conformity of business rules across similar products and services	Business rules to be maintained in central knowledge base All business rules should be clearly documented Evaluate customer impact of business rules Product managers must have a better understanding of their products
Customer Front Line support			
Complex business rules lead to insufficient support by front-line staff Errors on products and services flooded the call centres Customers who do not understand the business rules Customer dissatisfaction with products lead to venting in public platforms and media	Customer front-line support is involved in all products and services which is launched via the formal NPSD process Where insufficient training was not provided due to time constraints, processes such as 'over-the-shoulder' training were provided	Better portfolio management to ensure that sufficient planning and training can be provided Customer Frontline support is still not advised of all customer-impacting initiatives. Promotions seemed to be especially problematic.	Clear escalation path between customer front-line support and product manager should exist Customer complaints to be provided to product manager Following formal NPSD processes for all products and services Better portfolio management

13.4. Quantative Analysis

The overall summaryof missing values indicate that there was 77 questions and 130 respondents with no incomplete data are cleaning of the dataset.



13.5. Frequeny Analysis

The central location measures, dispersion and skewness are indicated below.

		Gender	B2BB2C	Group	Subgroup	1	2	3	4	5	6
N	Valid	130	130	130	130	130	130	130	130	130	130
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		1,71	1,79	3,33	9,47	2,66	3,11	2,83	2,86	2,78	2,93
Median		2,00	2,00	4,00	10,00	2,00	3,00	2,00	3,00	3,00	3,00
Mode		1	2	4	10	2	4	2	2	2	3
Std. Deviation		,731	,407	,976	3,732	,977	1,129	1,079	1,010	,975	,950
Variance		,534	,166	,952	13,925	,954	1,275	1,165	1,019	,950	,902
Skewness		,518	-1,458	-1,014	-,734	,524	-,248	,381	,237	,208	,030
Std. Error of Skewness		,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
Sum		222	233	433	1231	346	404	368	372	361	381

Continued

7	8	9	10	11	12	13	14	15	16
130	130	130	130	130	130	130	130	130	130
0	0	0	0	0	0	0	0	0	0
2,55	2,32	2,55	2,39	2,62	2,50	2,63	2,89	2,92	2,39
2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	3,00	2,00

2	2	2	2	2	2	2	2	2	3
1,114	,950	,872	,992	,893	1,006	1,028	1,087	1,192	,742
1,242	,903	,761	,984	,797	1,012	1,056	1,182	1,420	,550
,633	,852	,438	,594	,376	,905	,707	,107	,067	-,201
,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
331	302	332	311	340	325	342	376	380	311

Continued

17	18	19	20	21	22	23	24	25	26
130	130	130	130	130	130	130	130	130	130
0	0	0	0	0	0	0	0	0	0
2,71	2,92	2,72	2,48	2,76	3,03	2,58	2,35	2,96	2,75
3,00	3,00	3,00	2,00	3,00	3,00	2,00	2,00	3,00	2,00
2	2	3	2	2	3	2	2	2	2
,927	,977	,780	,934	1,033	,988	1,003	,986	1,144	1,073
,860	,955	,608	,872	1,067	,976	1,006	,972	1,309	1,152
,499	,105	,249	,358	,280	,036	,605	1,079	,045	,486
,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
352	380	353	322	359	394	335	305	385	357

Continued

27	28	29	30	31	32	33	34	35	36
130	130	130	130	130	130	130	130	130	130
0	0	0	0	0	0	0	0	0	0
2,79	2,92	2,88	2,87	2,69	2,65	2,77	3,07	3,16	2,98
3,00	3,00	3,00	3,00	2,00	2,00	3,00	3,00	3,00	3,00
3	2	2	2	2	2	2	3	4	3
,929	,993	1,024	1,030	1,070	1,017	1,053	,942	1,070	,968
,864	,986	1,049	1,060	1,145	1,034	1,109	,887	1,144	,937
,133	,204	,279	,137	,296	,381	,436	,200	-,097	,151
,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
363	380	375	373	350	345	360	399	411	387

Continued

37	38	39	40	41	42	43	44	45	46
130	130	130	130	130	130	130	130	130	130
0	0	0	0	0	0	0	0	0	0
2,93	2,79	3,47	2,48	2,82	2,33	2,82	2,99	2,98	2,35

3,00	2,00	4,00	2,00	3,00	2,00	3,00	3,00	3,00	2,00
2	2	4	2	3	2	2	3	3	2
1,122	1,173	1,028	1,013	,927	,741	1,007	1,000	1,015	,921
1,259	1,375	1,057	1,027	,860	,549	1,015	1,000	1,030	,848
,305	,384	-,264	,472	,184	-,038	,133	-,268	-,044	,584
,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
381	363	451	322	367	303	367	389	387	305

Continued

47	48	49	50	51	52	53	54	55	C56
130	130	130	130	130	130	130	130	130	130
0	0	0	0	0	0	0	0	0	0
2,55	2,58	2,78	2,56	2,35	2,72	2,75	2,99	2,35	2,29
2,00	3,00	3,00	3,00	2,00	2,50	3,00	3,00	2,00	2,00
2	3	3	3	2	2	3	3	2	2
1,012	,833	,967	,726	,725	,966	,847	,902	,834	,792
1,025	,694	,934	,527	,525	,934	,718	,814	,696	,627
,555	,339	,411	-,094	,338	,339	,358	-,113	,882	,758
,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
331	336	361	333	306	353	357	389	306	298

Continued

57	58	59	60	61	62	63	64	65	66
130	130	130	130	130	130	130	130	130	130
0	0	0	0	0	0	0	0	0	0
2,43	2,91	2,86	2,48	2,32	2,58	2,76	2,48	2,67	2,92
2,00	3,00	3,00	2,00	2,00	2,00	3,00	2,00	2,00	3,00
2	3	2	2	2	2	2	2	2	3
,825	1,007	1,098	,942	,882	1,033	1,033	1,122	1,007	1,042
,681	1,015	1,205	,887	,779	1,068	1,067	1,259	1,014	1,086
,645	,141	,315	,582	1,035	,797	,280	,724	,474	,171
,212	,212	,212	,212	,212	,212	,212	,212	,212	,212
316	378	372	323	302	335	359	323	347	379

Continued

67	68	69	70	71	72	73
130	130	130	130	130	130	130
0	0	0	0	0	0	0

2,43	2,57	2,62	2,55	2,72	2,72	2,78
2,00	2,00	3,00	2,00	2,00	2,00	3,00
2	2	3	2	2	2	2
,980	,906	,883	1,065	1,136	1,064	1,134
,960	,821	,779	1,134	1,290	1,132	1,287
,849	,458	,065	,797	,549	,419	,305
,212	,212	,212	,212	,212	,212	,212
316	334	341	331	353	354	362

13.6.Frequency Tables

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	59	45,4	45,4	45,4
	2	50	38,5	38,5	83,8
	3	21	16,2	16,2	100,0
	Total	130	100,0	100,0	

B2BB2C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	27	20,8	20,8	20,8
	2	103	79,2	79,2	100,0
	Total	130	100,0	100,0	

Group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	29	22,3	22,3	26,9
	3	11	8,5	8,5	35,4
	4	84	64,6	64,6	100,0
	Total	130	100,0	100,0	

Subgroup

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	,8	,8	,8
	2	12	9,2	9,2	10,0
	3	2	1,5	1,5	11,5
	4	8	6,2	6,2	17,7

		Frequency	Percent	Valid Percent	Cumulative Percent
	5	2	1,5	1,5	19,2
	6	1	,8	,8	20,0
	7	1	,8	,8	20,8
	8	8	6,2	6,2	26,9
	9	1	,8	,8	27,7
	10	50	38,5	38,5	66,2
	11	14	10,8	10,8	76,9
	12	2	1,5	1,5	78,5
	13	1	,8	,8	79,2
	14	24	18,5	18,5	97,7
	15	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Competitor actions were adequately monitored and responded to

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	5,4	5,4	5,4
	2	67	51,5	51,5	56,9
	3	22	16,9	16,9	73,8
	4	31	23,8	23,8	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

New products were launched before competitors could launch comparable P&Ss

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	37	28,5	28,5	36,2
	3	21	16,2	16,2	52,3
	4	53	40,8	40,8	93,1
	5	9	6,9	6,9	100,0
	Total	130	100,0	100,0	

Products provided clear competitive advantages

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	5,4	5,4	5,4
	2	59	45,4	45,4	50,8
	3	21	16,2	16,2	66,9
	4	35	26,9	26,9	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

The target markets were clearly defined using convincing research data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	53	40,8	40,8	45,4
	3	29	22,3	22,3	67,7
	4	37	28,5	28,5	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

The product specifications met customer standards and demands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,2	6,2	6,2
	2	52	40,0	40,0	46,2
	3	34	26,2	26,2	72,3
	4	33	25,4	25,4	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Customers were convinced that they received value for money

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	41	31,5	31,5	36,2
	3	43	33,1	33,1	69,2
	4	36	27,7	27,7	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Organisation launched innovative products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	16	12,3	12,3	12,3
	2	69	53,1	53,1	65,4
	3	9	6,9	6,9	72,3
	4	30	23,1	23,1	95,4
	5	6	4,6	4,6	100,0
	Total	130	100,0	100,0	

Legal and regulatory restrictions were adequately anticipated

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	20	15,4	15,4	15,4

		Frequency	Percent	Valid Percent	Cumulative Percent
	2	68	52,3	52,3	67,7
	3	26	20,0	20,0	87,7
	4	12	9,2	9,2	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Appropriate contract arrangements with suppliers were settled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	55	42,3	42,3	50,8
	3	48	36,9	36,9	87,7
	4	13	10,0	10,0	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

A good awareness existed of legislation and regulations that impacts on P&Ss

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	22	16,9	16,9	16,9
	2	57	43,8	43,8	60,8
	3	33	25,4	25,4	86,2
	4	14	10,8	10,8	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Support of key opinion formers for the products were assured

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	57	43,8	43,8	50,8
	3	41	31,5	31,5	82,3
	4	21	16,2	16,2	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

The business models were generally clearly defined

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	75	57,7	57,7	66,2
	3	18	13,8	13,8	80,0
	4	20	15,4	15,4	95,4
	5	6	4,6	4,6	100,0

	Total	130	100,0	100,0	

The business model would succeed in generating profitable revenue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	63	48,5	48,5	56,2
	3	30	23,1	23,1	79,2
	4	19	14,6	14,6	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

Accountabilities for risks were clearly defined between different parties

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	47	36,2	36,2	43,8
	3	27	20,8	20,8	64,6
	4	39	30,0	30,0	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

Leadership was effective to ensure that sufficient support and resources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	13	10,0	10,0	10,0
	2	48	36,9	36,9	46,9
	3	15	11,5	11,5	58,5
	4	44	33,8	33,8	92,3
	5	10	7,7	7,7	100,0
	Total	130	100,0	100,0	

Org were well protected against any IPR and trademark infringements

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	11,5	11,5	11,5
	2	54	41,5	41,5	53,1
	3	56	43,1	43,1	96,2
	4	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Past experiences with third party suppliers were positive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6

	2	58	44,6	44,6	49,2
	3	38	29,2	29,2	78,5
	4	24	18,5	18,5	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Third party suppliers were reliable in delivering according to requirements

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	44	33,8	33,8	38,5
	3	39	30,0	30,0	68,5
	4	36	27,7	27,7	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Effective due diligences were conducted on vendors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	3,8	3,8	3,8
	2	46	35,4	35,4	39,2
	3	62	47,7	47,7	86,9
	4	15	11,5	11,5	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

New products were effectively communicated to trade partners

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	11,5	11,5	11,5
	2	63	48,5	48,5	60,0
	3	27	20,8	20,8	80,8
	4	25	19,2	19,2	100,0
	Total	130	100,0	100,0	

Customer support in the delivery channels were adequately tested and measured

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	49	37,7	37,7	46,2
	3	36	27,7	27,7	73,8
	4	28	21,5	21,5	95,4
	5	6	4,6	4,6	100,0

	Total	130	100,0	100,0	

Customer support in the distribution channels were of high quality

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	35	26,9	26,9	31,5
	3	46	35,4	35,4	66,9
	4	35	26,9	26,9	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

Products helps to achieve most of Org five business strategies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	63	48,5	48,5	57,7
	3	28	21,5	21,5	79,2
	4	22	16,9	16,9	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Org internal policies and procedures are adhered with

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	16	12,3	12,3	12,3
	2	80	61,5	61,5	73,8
	3	12	9,2	9,2	83,1
	4	17	13,1	13,1	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

All business rules applicable to the product were known and easy to find

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	48	36,9	36,9	44,6
	3	18	13,8	13,8	58,5
	4	45	34,6	34,6	93,1
	5	9	6,9	6,9	100,0
	Total	130	100,0	100,0	

The overall impact of business rules were assessed

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	56	43,1	43,1	50,8
	3	30	23,1	23,1	73,8
	4	25	19,2	19,2	93,1
	5	9	6,9	6,9	100,0
	Total	130	100,0	100,0	

Knowledge of customers price sensitivity existed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,2	6,2	6,2
	2	45	34,6	34,6	40,8
	3	46	35,4	35,4	76,2
	4	28	21,5	21,5	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Existing business processes performed optimally

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	3,1	3,1	3,1
	2	52	40,0	40,0	43,1
	3	29	22,3	22,3	65,4
	4	40	30,8	30,8	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Processes were monitored to ensure that they work effectively

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	51	39,2	39,2	43,8
	3	32	24,6	24,6	68,5
	4	34	26,2	26,2	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

Processes that did not function as intended were redesigned

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	45	34,6	34,6	41,5
	3	36	27,7	27,7	69,2
	4	34	26,2	26,2	95,4

	5	6	4,6	4,6	100,0
	Total	130	100,0	100,0	

Customer Care requirements are sufficiently addressed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	14	10,8	10,8	10,8
	2	53	40,8	40,8	51,5
	3	27	20,8	20,8	72,3
	4	31	23,8	23,8	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

CC have sufficient access to info to sufficiently service customers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	57	43,8	43,8	53,1
	3	29	22,3	22,3	75,4
	4	28	21,5	21,5	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Agents are well trained to support products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	55	42,3	42,3	49,2
	3	31	23,8	23,8	73,1
	4	27	20,8	20,8	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

Sales projections or uptake figures for the products were realistic

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1,5	1,5	1,5
	2	39	30,0	30,0	31,5
	3	45	34,6	34,6	66,2
	4	36	27,7	27,7	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

Only the most financially viable products were implemented

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	5,4	5,4	5,4
	2	31	23,8	23,8	29,2
	3	39	30,0	30,0	59,2
	4	40	30,8	30,8	90,0
	5	13	10,0	10,0	100,0
	Total	130	100,0	100,0	

Estimated profit margins were based on convincing research data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4,6	4,6	4,6
	2	36	27,7	27,7	32,3
	3	51	39,2	39,2	71,5
	4	29	22,3	22,3	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

Best practices were followed in terms of scope management delivering on time etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,2	6,2	6,2
	2	49	37,7	37,7	43,8
	3	30	23,1	23,1	66,9
	4	30	23,1	23,1	90,0
	5	13	10,0	10,0	100,0
	Total	130	100,0	100,0	

Project teams learned from past experiences

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	13	10,0	10,0	10,0
	2	54	41,5	41,5	51,5
	3	22	16,9	16,9	68,5
	4	29	22,3	22,3	90,8
	5	12	9,2	9,2	100,0
	Total	130	100,0	100,0	

Delays in launching products did not impact on the commercial viability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2,3	2,3	2,3
	2	22	16,9	16,9	19,2

	3	37	28,5	28,5	47,7
	4	47	36,2	36,2	83,8
	5	21	16,2	16,2	100,0
	Total	130	100,0	100,0	

Financial documentation mostly provided a clear picture of the commercial viability of product

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	19	14,6	14,6	14,6
	2	58	44,6	44,6	59,2
	3	28	21,5	21,5	80,8
	4	22	16,9	16,9	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Volume estimates were based on clear and reliable data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	5,4	5,4	5,4
	2	44	33,8	33,8	39,2
	3	48	36,9	36,9	76,2
	4	27	20,8	20,8	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Lodgments complied to Regulatory requirements

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	17	13,1	13,1	13,1
	2	56	43,1	43,1	56,2
	3	55	42,3	42,3	98,5
	4	1	,8	,8	99,2
	5	1	,8	,8	100,0
	Total	130	100,0	100,0	

Product performance in the market was adequately tracked

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	48	36,9	36,9	43,8
	3	34	26,2	26,2	70,0
	4	35	26,9	26,9	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

Remedial actions were applied to underperforming products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	31	23,8	23,8	31,5
	3	43	33,1	33,1	64,6
	4	42	32,3	32,3	96,9
	5	4	3,1	3,1	100,0
	Total	130	100,0	100,0	

New product performance targets were adequately measured

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	34	26,2	26,2	33,1
	3	45	34,6	34,6	67,7
	4	35	26,9	26,9	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

Risk issues were adequately anticipated and mitigated

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	19	14,6	14,6	14,6
	2	67	51,5	51,5	66,2
	3	25	19,2	19,2	85,4
	4	18	13,8	13,8	99,2
	5	1	,8	,8	100,0
	Total	130	100,0	100,0	

Products were adequately assessed for fraud exposures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	11,5	11,5	11,5
	2	59	45,4	45,4	56,9
	3	31	23,8	23,8	80,8
	4	20	15,4	15,4	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Products were adequately assessed to determine exposures for corruption

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	1	10	7,7	7,7	7,7
	2	50	38,5	38,5	46,2
	3	57	43,8	43,8	90,0
	4	10	7,7	7,7	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Products were adequately assessed to determine exposures to revenue leakages

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	43	33,1	33,1	40,0
	3	54	41,5	41,5	81,5
	4	16	12,3	12,3	93,8
	5	8	6,2	6,2	100,0
	Total	130	100,0	100,0	

Products were adequately assessed to determine physical security risks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	47	36,2	36,2	43,1
	3	67	51,5	51,5	94,6
	4	6	4,6	4,6	99,2
	5	1	,8	,8	100,0
	Total	130	100,0	100,0	

Product appealed to generally accepted values e.g. health safety etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	66	50,8	50,8	60,0
	3	47	36,2	36,2	96,2
	4	4	3,1	3,1	99,2
	5	1	,8	,8	100,0
	Total	130	100,0	100,0	

Products were designed with sufficient capacity and scalability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,2	6,2	6,2
	2	57	43,8	43,8	50,0
	3	32	24,6	24,6	74,6

	4	30	23,1	23,1	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Disaster recovery and or BCM were adequately ensured

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	3,8	3,8	3,8
	2	49	37,7	37,7	41,5
	3	53	40,8	40,8	82,3
	4	20	15,4	15,4	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Plans for service recovery of products were documented tested and available

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	5,4	5,4	5,4
	2	27	20,8	20,8	26,2
	3	61	46,9	46,9	73,1
	4	30	23,1	23,1	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Confidential information was adequately secured

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	76	58,5	58,5	67,7
	3	28	21,5	21,5	89,2
	4	12	9,2	9,2	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

Customer privacy issues were adequately anticipated

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	11,5	11,5	11,5
	2	72	55,4	55,4	66,9
	3	35	26,9	26,9	93,8
	4	6	4,6	4,6	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

Products conformed to industry best practices in terms of information security

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	67	51,5	51,5	60,0
	3	39	30,0	30,0	90,0
	4	11	8,5	8,5	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

Service levels were monitored for adherence to timelines quality and maint

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	6,2	6,2	6,2
	2	41	31,5	31,5	37,7
	3	43	33,1	33,1	70,8
	4	31	23,8	23,8	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

SLA's and OLA's relevant to the products were well documented

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	43	33,1	33,1	41,5
	3	41	31,5	31,5	73,1
	4	23	17,7	17,7	90,8
	5	12	9,2	9,2	100,0
	Total	130	100,0	100,0	

Formal processes were followed in terms of change control and release management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	14	10,8	10,8	10,8
	2	63	48,5	48,5	59,2
	3	32	24,6	24,6	83,8
	4	18	13,8	13,8	97,7
	5	3	2,3	2,3	100,0
	Total	130	100,0	100,0	

Products intended functionality were well known and specified

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	13	10,0	10,0	10,0
	2	83	63,8	63,8	73,8

	3	15	11,5	11,5	85,4
	4	17	13,1	13,1	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

Products met the functional requirements

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	71	54,6	54,6	62,3
	3	20	15,4	15,4	77,7
	4	22	16,9	16,9	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

Interactions of products with other systems were well understood

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	53	40,8	40,8	48,5
	3	30	23,1	23,1	71,5
	4	32	24,6	24,6	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Reliable end to end testing was conducted before products launched

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	19	14,6	14,6	14,6
	2	68	52,3	52,3	66,9
	3	11	8,5	8,5	75,4
	4	25	19,2	19,2	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

Adverse performances as a consequence of technology or scripts changes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	55	42,3	42,3	50,8
	3	36	27,7	27,7	78,5
	4	22	16,9	16,9	95,4
	5	6	4,6	4,6	100,0

	Total	130	100,0	100,0	

Consumer appreciation of the product was tested and measured adequately

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	6,9	6,9	6,9
	2	40	30,8	30,8	37,7
	3	43	33,1	33,1	70,8
	4	29	22,3	22,3	93,1
	5	9	6,9	6,9	100,0
	Total	130	100,0	100,0	

Products succeeded in enhancing and supporting Org reputation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	11,5	11,5	11,5
	2	70	53,8	53,8	65,4
	3	24	18,5	18,5	83,8
	4	16	12,3	12,3	96,2
	5	5	3,8	3,8	100,0
	Total	130	100,0	100,0	

Public Relations for products were effective

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7,7	7,7	7,7
	2	61	46,9	46,9	54,6
	3	36	27,7	27,7	82,3
	4	21	16,2	16,2	98,5
	5	2	1,5	1,5	100,0
	Total	130	100,0	100,0	

Possible negative external reactions were effectively anticipated

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	47	36,2	36,2	45,4
	3	50	38,5	38,5	83,8
	4	20	15,4	15,4	99,2
	5	1	,8	,8	100,0
	Total	130	100,0	100,0	

Marketing communication clearly conveyed the benefits and advantages

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	73	56,2	56,2	65,4
	3	14	10,8	10,8	76,2
	4	24	18,5	18,5	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

Advertising of products were effective

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9,2	9,2	9,2
	2	60	46,2	46,2	55,4
	3	22	16,9	16,9	72,3
	4	25	19,2	19,2	91,5
	5	11	8,5	8,5	100,0
	Total	130	100,0	100,0	

Products were communicated successfully to target customers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8,5	8,5	8,5
	2	56	43,1	43,1	51,5
	3	28	21,5	21,5	73,1
	4	28	21,5	21,5	94,6
	5	7	5,4	5,4	100,0
	Total	130	100,0	100,0	

The product is monitored and enhanced to ensure that it continues to function

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	14	10,8	10,8	10,8
	2	48	36,9	36,9	47,7
	3	30	23,1	23,1	70,8
	4	28	21,5	21,5	92,3
	5	10	7,7	7,7	100,0
	Total	130	100,0	100,0	

13.7. Scree Plot

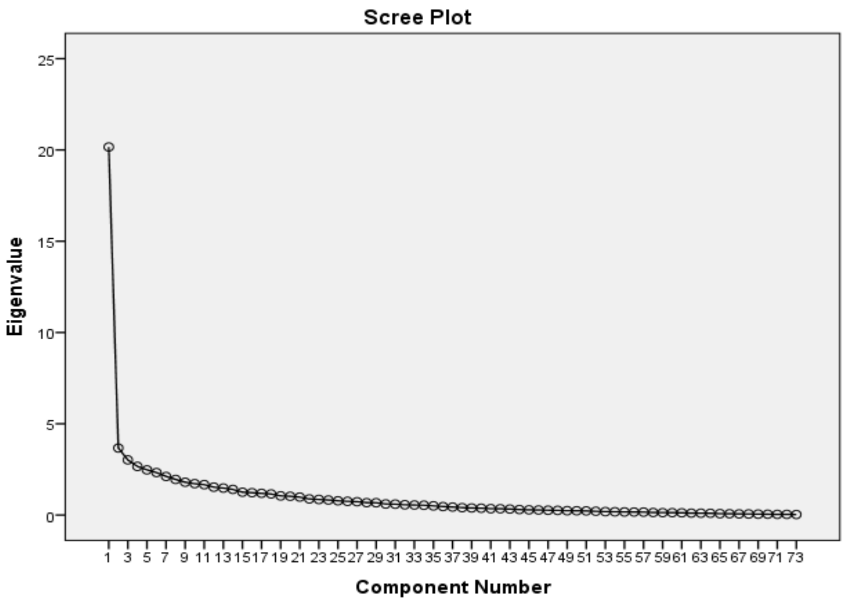


Figure 78: Scree Plot

Factor Analysis

Correlation Matrix[a]

Correlation coefficient has a positive-definite covariance and the determinant is = 5.098

a. Determinant = 5.098E-28

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,787
Bartlett's Test of Sphericity	Approx. Chi-Square	6525,261
	df	2628
	Sig.	0,000

cu

Communalities

	Initial	Extraction
1	1,000	,671
2	1,000	,721
3	1,000	,639
4	1,000	,682
5	1,000	,760
6	1,000	,693
7	1,000	,738
8	1,000	,770
9	1,000	,712
10	1,000	,755
11	1,000	,699

12	1,000	,710
13	1,000	,739
14	1,000	,768
15	1,000	,684
16	1,000	,683
17	1,000	,792
18	1,000	,786
19	1,000	,846
20	1,000	,671
21	1,000	,727
22	1,000	,817
23	1,000	,745
24	1,000	,717
25	1,000	,698
26	1,000	,711
27	1,000	,755
28	1,000	,812
29	1,000	,773
30	1,000	,790
30	1,000	,790
31	1,000	,818
32	1,000	,679
33	1,000	,682
34	1,000	,756
35	1,000	,749
36	1,000	,775
37	1,000	,773
38	1,000	,753
39	1,000	,807
40	1,000	,778
41	1,000	,704
42	1,000	,743
43	1,000	,831
45	1,000	,822
46	1,000	,667
47	1,000	,739
48	1,000	,795
49	1,000	,709
50	1,000	,701
51	1,000	,713
52	1,000	,751
53	1,000	,744
54	1,000	,737
55	1,000	,799
56	1,000	,843
57	1,000	,790
58	1,000	,812
59	1,000	,745
60	1,000	,798
61	1,000	,750
62	1,000	,782
63	1,000	,716
64	1,000	,770
65	1,000	,830
66	1,000	,741
67	1,000	,839
68	1,000	,812
69	1,000	,745
70	1,000	,706

71	1,000	,825
72	1,000	,820
73	1,000	,694

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	20,163	27,620	27,620	20,163	27,620	27,620	3,977	5,448	5,448
2	3,673	5,031	32,651	3,673	5,031	32,651	3,966	5,433	10,881
3	3,018	4,135	36,786	3,018	4,135	36,786	3,692	5,057	15,938
4	2,667	3,654	40,440	2,667	3,654	40,440	3,481	4,769	20,707
5	2,476	3,392	43,832	2,476	3,392	43,832	3,376	4,624	25,331
6	2,328	3,188	47,020	2,328	3,188	47,020	3,290	4,507	29,838
7	2,117	2,900	49,921	2,117	2,900	49,921	3,156	4,323	34,161
8	1,952	2,674	52,595	1,952	2,674	52,595	3,137	4,297	38,458
9	1,799	2,465	55,060	1,799	2,465	55,060	3,035	4,157	42,616
10	1,719	2,355	57,415	1,719	2,355	57,415	2,683	3,676	46,291
11	1,666	2,282	59,696	1,666	2,282	59,696	2,535	3,473	49,764
12	1,529	2,094	61,791	1,529	2,094	61,791	2,499	3,424	53,188
13	1,479	2,027	63,817	1,479	2,027	63,817	2,375	3,253	56,441
14	1,404	1,924	65,741	1,404	1,924	65,741	2,224	3,046	59,488
15	1,252	1,715	67,456	1,252	1,715	67,456	2,151	2,946	62,434
16	1,226	1,680	69,136	1,226	1,680	69,136	2,010	2,753	65,187
17	1,189	1,629	70,765	1,189	1,629	70,765	1,989	2,725	67,912
18	1,156	1,584	72,349	1,156	1,584	72,349	1,925	2,637	70,549
19	1,051	1,440	73,789	1,051	1,440	73,789	1,895	2,596	73,145
20	1,029	1,410	75,199	1,029	1,410	75,199	1,500	2,054	75,199
21	,984	1,348	76,548						
22	,882	1,208	77,756						
23	,855	1,171	78,928						
24	,823	1,128	80,056						
25	,780	1,069	81,125						
26	,751	1,029	82,154						
27	,733	1,004	83,158						
28	,679	,930	84,088						
29	,676	,926	85,013						
30	,607	,831	85,844						
31	,597	,818	86,662						

32	,563	,772	87,434						
33	,549	,751	88,185						
34	,538	,737	88,923						
35	,504	,690	89,613						
36	,466	,638	90,251						
37	,440	,603	90,853						
38	,408	,559	91,413						
39	,391	,535	91,948						
40	,377	,516	92,464						
41	,349	,479	92,943						
42	,345	,473	93,416						
43	,327	,448	93,864						
44	,304	,417	94,281						
45	,284	,389	94,670						
46	,275	,377	95,047						
47	,264	,361	95,408						
48	,258	,353	95,761						
49	,238	,326	96,087						
50	,233	,319	96,406						
51	,227	,311	96,717						
52	,207	,283	97,000						
53	,189	,258	97,258						
54	,180	,246	97,504						
55	,172	,236	97,740						
56	,168	,230	97,969						
57	,162	,222	98,191						
58	,139	,190	98,381						
59	,135	,185	98,566						
60	,132	,181	98,747						
61	,123	,168	98,915						
62	,109	,150	99,065						
63	,102	,140	99,205						
64	,097	,133	99,338						
65	,078	,106	99,445						
66	,073	,101	99,545						
67	,066	,090	99,635						
68	,061	,083	99,718						
69	,052	,072	99,790						
70	,046	,063	99,853						
71	,040	,055	99,907						
72	,037	,051	99,958						
73	,031	,042	100,000						

Extraction Method: Principal Component Analysis.

13.8. B2B / B2C Differences for Regulatory

Table 42: Statistical Differences between B2B and B2C regarding Regulatory responses

B2B B2C Differences for Regulatory : Total responses: 130		N	Mean Rank
Legal and regulatory restrictions are adequately anticipated	B2B	27	65,65
	B2C	103	65,46
Appropriate contract arrangements with suppliers will be settled	B2B	27	71,91
	B2C	103	63,82
A good understanding exist of legislation that impacts on products	B2B	27	71,50
	B2C	103	63,93
The organisation are well protected against any IPR and trademark infringements	B2B	27	62,35
	B2C	103	66,33
The financial assesment provides a clear picture of the commercial viability of the service	B2B	27	53,24
	B2C	103	68,71
Volume estimates for financial and regulatory reporting are based on clear and reliable estimates	B2B	27	58,59
	B2C	103	67,31
The lodgement complies to key stakeholder requirements	B2B	27	67,15
	B2C	103	65,07

13.9. Correlations between Factors

Table 43: Correlations for Factor 1: P&S Performance

#	Factors	p-value	R-value
F2	**Marketing & support risks**	**0.001**	**0.37**
F3	**Customer risks**	**0.005**	**0.32**
F4	Financial risks	0.01	0.28
F5	Legal & Regulatory risks	0.005	0.29
F6	Customer Care risks	0.005	0.26
F7	**Process risks**	**0.0001**	**0.41**
F8	Privacy risks	0.0001	0.23
F9	Technology development risks	0.001	0.26
F10	**Reputational risk**	**0.001**	**0.33**
F11	Information integrity risks	0.05	0.22
F12	Technology performance risks	0.005	0.28
F13	**Quality of service levels risk**	**0.005**	**0.30**
F14	Fraud, Corruption and security risks	0.05	0.21
F15	**Project management risks**	**0.0001**	**0.35**
F16	**Competitor innovation risks**	**0.005**	**0.32**
F17	**Business rules and pricing**	**0.005**	**0.30**

Table 44 - Correlations for Factor 16: Competitor Actions

#	Factors	P-significant	R
F1	Product performance	0.001	0.32
F2	Marketing & support risks	0.01	0.26
F3	Customer risks	0.001	0.34
F4	Financial risks	0.01	0.30
F6	Customer Care risks	0.05	0.23
F7	Process risks	0.05	0.31
F8	Privacy risks	0.05	0.19
F10	Reputational risk	0.01	0.29
F15	Project management risks	0.05	0.35
F17	Business rules and pricing	0.05	0.25

Table 45: Correlations for Factor 3: Customer

#	Factors	P - significant	R	#	Factors	P - significant	R	#	Factors	P - significant	R
F1	Product performance	0.005	0.34	F7	Process risks	0.01	0.22	F17	Business rules and pricing	0.005	0.33
F2	Marketing & support risks	0.05	0.29	F8	Privacy risks	0.01	0.24	F5	Legal, Regulatory risk	0.05	0.27
F4	Financial risks	0.001	0.33	F10	Reputational risk	0.01	0.31	F14	Fraud, Corruption & Security	0.05	0.26
F16	Competition Innovation	0.001	0.34								

Table 46 - Correlations for Factor 15: Project Management

#	Factors	P-significant	R
F1	Product performance	0.001	0.34
F2	Marketing & support	0.05	0.33
F3	Customer	0.05	0.25
F4	Financial risks	0.01	0.26
F5	Legal, Regulatory risk	0.05	0.26
F6	Customer Care risks	0.05	0.27
F7	Process risks	0.05	0.33
F8	Privacy risks	0.05	0.19
F9	Technology Development	0.05	0.29
F10	Reputational risk	0.05	0.27
F11	Technology Availability	0.01	0.31
F12	Service Levels quality	0.01	0.27
F16	Competition Innovation	0.05	0.21

#	Factors	P-significant	R
F17	Business rules and pricing	0.05	0.28

Table 47: Correlations for Factor 4: Finance

#	Factors	P-significant	R
F1	Product performance	0.01	0.28
F2	Marketing & support	0.05	0.27
F3	**Customer**	**0.001**	**0.32**
F5	Legal, Regulatory risk	0.05	0.29
F6	Customer Care risks	0.05	0.24
F9	**Technology Development**	**0.005**	**0.26**
F10	**Reputational risk**	**0.005**	**0.31**
F11	Information Integrity	0.05	0.30
F11	Technology Availability	0.05	0.23
F12	Service Levels quality	0.05	0.20
F16	Competition Innovation	0.01	0.30
F17	**Business rules and pricing**	**0.005**	**0.32**

Table 48: Correlations for Factor 17: Business Rules and Pricing

#	Factors	P-significant	R
F1	**Product performance**	**0.005**	**0.30**
F2	Marketing & support	0.05	0.27
F3	**Customer**	**0.005**	**0.33**
F5	Legal, Regulatory risk	0.01	0.30
F6	Customer Care risks	0.05	0.30
F7	Processes	0.01	0.28
F8	Privacy	0.01	0.23
F9	**Technology Development**	**0.005**	**0.31**
F10	**Reputational risk**	**0.005**	**0.28**
F11	Information Integrity	0.05	0.20
F12	Technology Availability	0.05	0.25
F13	Service Levels quality	0.01	0.26
F14	Fraud, Corruption and Security	0.05	0.22
F15	Project management	0.05	0.25
F16	Competition Innovation	0.01	0.30

Table 49: Correlations for Factor 7 Process

#	Factors	P-significant	R
F1	**Product performance**	**0.00005**	**0.41**

#	Factors	P-significant	R
F2	Marketing & support	0.001	0.33
F3	Customer	0.05	0.27
F6	Customer Care risks	0.005	0.21
F8	**Privacy**	**0.00001**	**0.28**
F9	Technology Development	0.001	0.34
F10	**Reputational risk**	**0.0005**	**0.34**
F12	Technology Availability	0.05	0.29
F13	Service Levels quality	0.05	0.31
F14	Fraud, Corruption & Security	0.05	0.21
F15	**Project Management**	**0.0001**	**0.35**
F16	Competition Innovation	0.01	0.31
F17	Business rules and pricing	0.005	0.33

Table 50: Correlations for Factor 6 Customer Care

#	Factors	P-significant	R
F1	Product performance	0.005	0.26
F2	Marketing & support	0.005	0.32
F3	Customer	0.05	0.26
F4	Financial	0.05	0.24
F5	Legal/Regulatory	0.005	0.29
F7	**Processes**	**0.005**	**0.33**
F8	Privacy	0.005	0.19
F9	Technology Development	0.005	0.25
F10	**Reputational risk**	**0.0005**	**0.33**
F12	Technology Availability	0.005	0.25
F13	**Service Levels quality**	**0.001**	**0.31**
F15	**Project Management**	**0.005**	**0.35**
F16	Competition Innovation	0.005	0.23
F17	**Business rules and pricing**	**0.005**	**0.32**

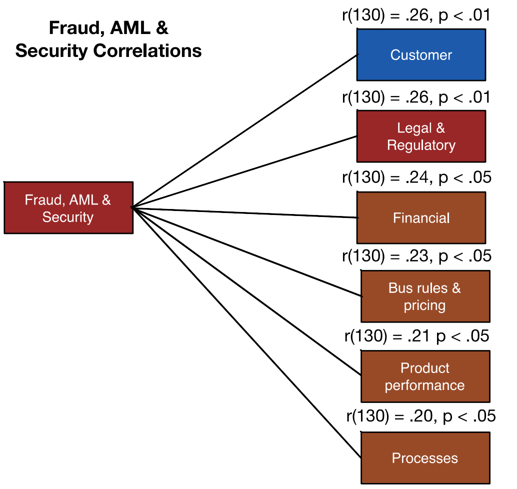
Table 51: Correlations for Factor F9: Technology Development

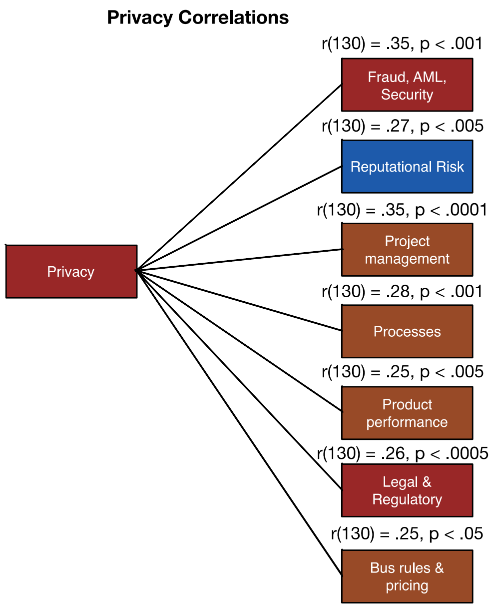
#	Factors	P-significant	R
F1	Product performance	0.01	0.26
F2	Marketing & support risks	0.05	0.29
F3	Customer risks	0.01	0.23
F4	Financial risks	0.005	0.26
F5	Legal & Regulatory risks	0.05	0.20
F6	Customer Care risks	0.05	0.26
F7	Process risks	0.001	0.34

#	Factors	P-significant	R
F8	Privacy risks	0.001	0.18
F10	Reputational risk	0.005	0.33
F12	Technology availability risks	0.05	0.33
F13	Quality of service levels risk	0.005	0.30
F15	Project management risks	0.005	0.35
F16	Competitor innovation risks	0.05	0.21
F17	Business rules and pricing	0.005	0.30

Table 52: Correlations for Technology Availability

#	Factors	P-significant	R
F6	Customer Care risks	0.005	0.27
F12	Technology availability risks	0.05	0.28
F13	Quality of service levels risk	0.005	0.27
F15	Project management risks	0.005	0.35





*

Figure 80: Fraud, AML & Security Correlations

Figure 79: Privacy Correlations

13.10. Additional Graphs

Figure 81: Target Markets Definition

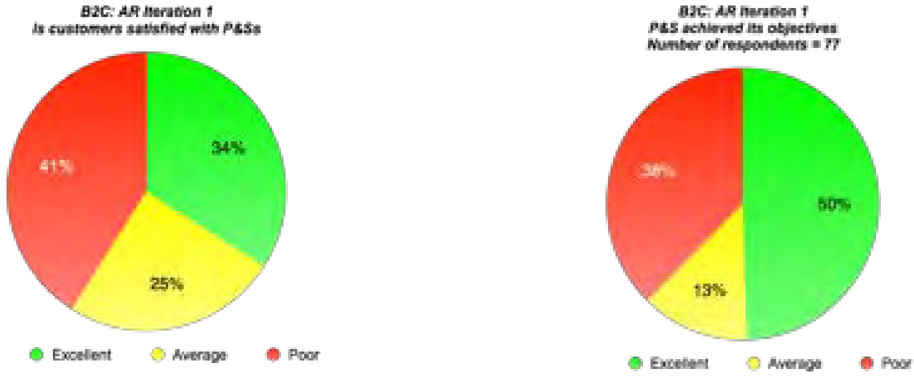


Figure 82: Customer Satisfaction and Meeting Project Objectives, AR Iteration One

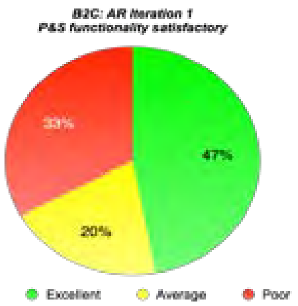


Figure 83: P&S Functionality Satisfactory

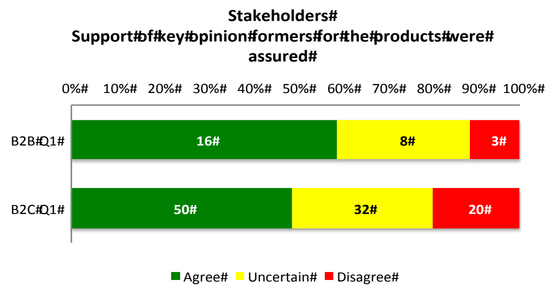


Figure 84: Stakeholder Support

Figure 85: Business Rules Performance

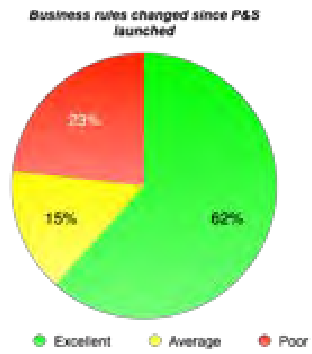


Figure 86: Business Rules Changes

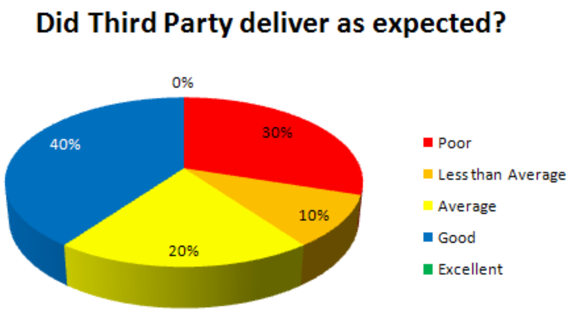


Figure 87: External Provider, AR Iteration One

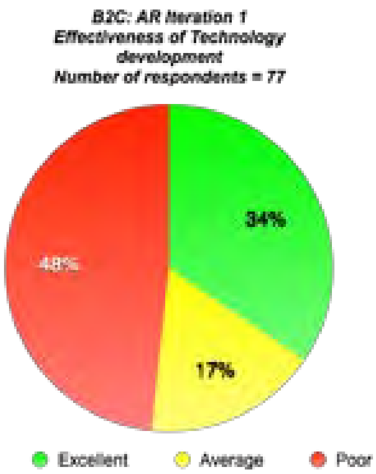


Figure 88: Technology Development Performance, AR Iteration One

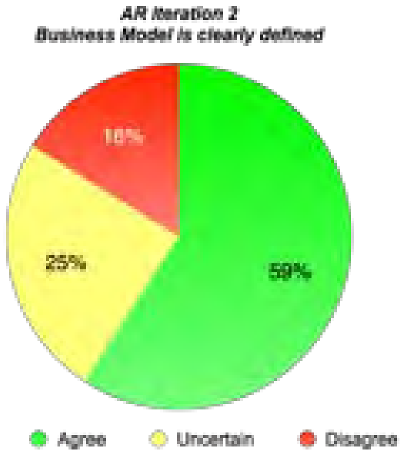


Figure 89: Business Model Defined

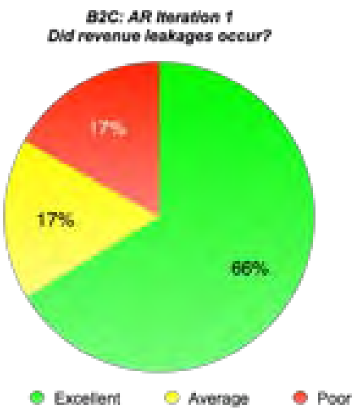


Figure 88: Revenue Leakage Performance, AR Iteration One

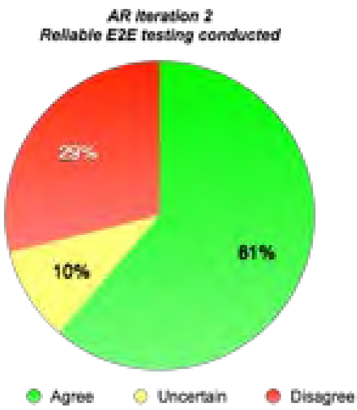


Figure 89: Testing Reliable

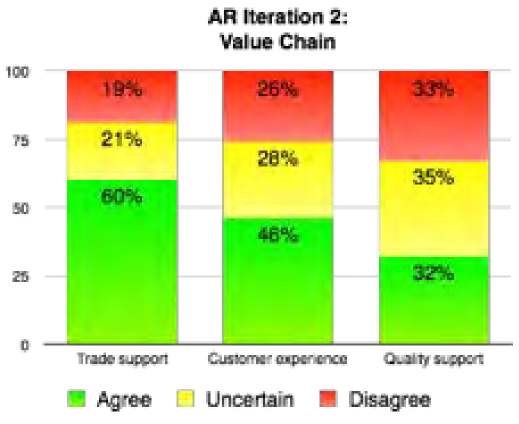


Figure 93: Value Chain Performance

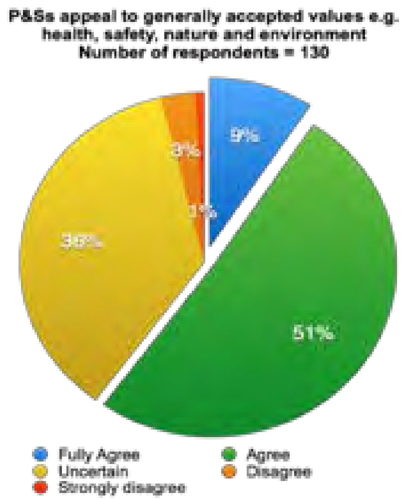


Figure 92: Value Performance

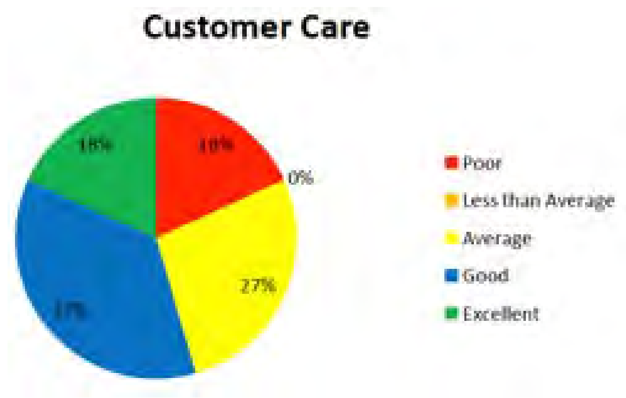


Figure 94: Customer Care, AR Iteration One

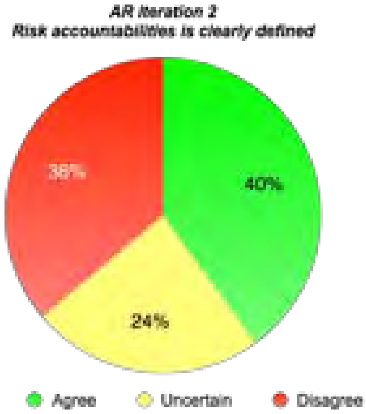


Figure 95: Defined Risk Accountabilities

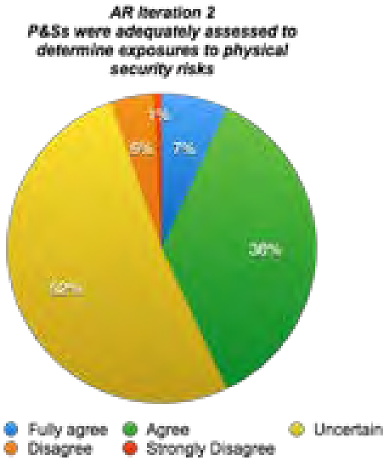


Figure 96: Physical Security Risks

14. Appendix Five: AR Interventions

14.1. Organisational Context

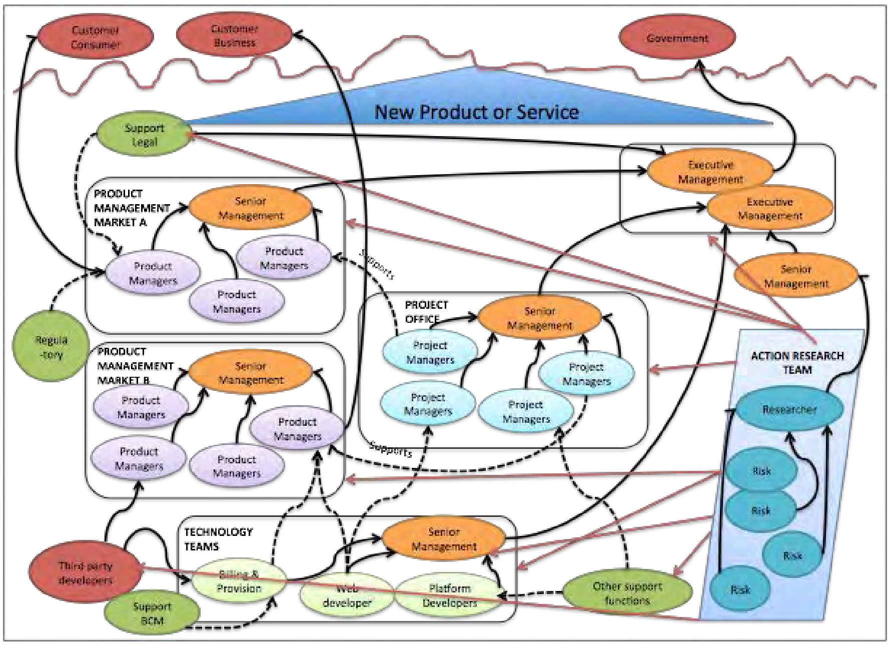


Figure 97: B2C Context AR Iteration One

14.2. Appreciate the Problem Situation

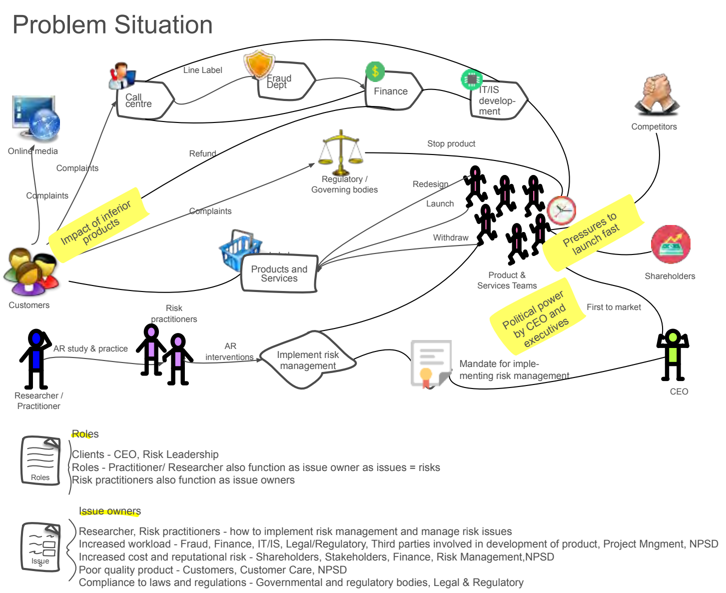


Figure 98: AR iteration 1 – Problem Situation

14.3. CMM for NPSD

Table 53: NPSD CMM - AR iteration 1

Level	Description	Consistent presence of elements across all NPSD projects
Initial	Few processes is defined and success depend on individual effort and the process is ad hoc	– Some documentation exists to describe the P&S but the NPSD process is not well documented. – Project planning did not emphasize prevention of problems in projects. – Some documentation exists regarding the process but it cannot be described as explicit documentation nor is the documented process followed at all times. – Improvement of the NPSD process was not considered or regarded as the responsibility of all project teams. – There was no evidence of efforts to improve the NPD process through 'lessons learned'. – Consistent efforts to prevent problems from occurring could not be noted. – There was no evidence of attempts to control the development process through data on intermediate steps from multiple projects such as stage/gates. – There was no indication if projects were on schedule or budget. – There was no formal review of whether the NPSD outcomes conform well to the predicted expectations.
2 - Repeatable	Disciplined process to track process in terms of stages and gates which can lead to repeated	– The objectives of the NPSD projexts include economic, market and product outcomes. – Instances existed where problems were proactively prevented but it was not the rule and mostly due to the risk team's intervention.

Table 54: NPSD CMM - AR iteration 2

Level 1	Level 2	Level 3
Project management still not optimal and projects are not managed in terms of time and cost	– Post-implementation reviews were conducted but it was not the rule – The NPSD process were followed in most cases but some products were still insufficiently documented – Project managers were still inconsistent in their usage of project management techniques – Cross-functional teams are in place but cannot be considered optimal – A project management tool was implemented for the management of projects which delivered improvements – Financial management processes for monitoring performance of products were well in place – The risks practitioners identify (in conjunction with the NPSD team and different project teams) problems and risks. – Product managers still insufficiently documented some products but this was limited.	– Documented and validated NPSD process is in place with clear stage/gate best practices – Regular portfolio reviews were conducted – Underperforming projects were retracted – Voice of the customer was included as a formalized process

Table 55: NPSD CMM - AR iteration 3

Level 1	Level 2	Level 3	Level 4
Project Mgmt not managed according to cost & timeframes (removed as constraint in AR iteration 1)	The NPSD process was followed but in rare cases product managers use NPSD functional specifications that insufficiently documented some products.	- Documented and validated NPSD process is in place with clear stage/gate best practices - Regular portfolio reviews were conducted - Underperforming projects were retracted - Voice of the customer was included as a formalized process - A project management tool was implemented and is operational - Financial management processes for monitoring performance of products were well in place - The risks practitioners identify (in conjunction with the NPSD team and different project teams) problems and risks. - Project managers were more consistent in their usage of project management techniques - Cross-functional teams are in place and performing well. - Post-implementation reviews were conducted for all major products.	- Quality of deliverables are assessed via formal stage/gate procedures and metrics - Formal portfolio management exist - Multiple strong champions exist for motivation - Underperforming projects are being killed - Voice of the customer is continuously captured - Resource capacity planning, roadmaps and final forecasting exist - Executive and project-level reporting exist

14.4. CMM for Risk Management

Table 56: RM CMM AR - Iteration 1

Level	Description	Consistent presence of elements across all NPSD projects
1- Naive	NPSD unaware of need to manage risks and a lack of structured approach exist. Processes are repetitive and reactive. Little or no attempt to learn from past.	– Some product managers are still unaware of the need for risk management and there is still a lot of resistance to change and tendency to want to continue with the existing way of doing things. – Structured approach in place to respond to new risks but it is not optimal. – There is some attempt to learn from past risks to prepare for future but it is not robust. – No formal risk processes exist. – Lack of risk tools and methodology.
2 - Novice	Experiment with RM through small number of individuals. No formal structured & generic process is in place. Aware of benefits of RM but not gained full benefits.	– Some resources involved in NPSD are aware of the need for risk management. – Good understanding of risk principles and risk language. – Dedicated risk resources exist. – There are some formal processes is in place to provide feedback to P&S's

Table 57: RM CMM AR - Iteration 2

Level 3 - Defined	Level 4 - Managed
– Management support exist for risk management – Lessons are learnt from past projects – Still inward looking within NPSD project levels – Recognition of risk ownership and allocation of risk and responsibility	– Formal risk resources were appointed – High awareness of risks exists – Institutionalized risk process exist – Predictable risks are managed and risk processes are well-institutionalized

Level 3 - Defined	Level 4 - Managed
– Management by NPSD objectives – Formal risk management to identify, evaluate and mitigate risks – Use well established templates and tools for qualitative analysis of risks	– Formal risk awareness training take place

Table 58: RM CMM AR - Iteration 3

Level 1 Ad hoc	Level 2 - Initial	Level 3 - Defined
There is still some evidence of resistance to change especially from new employees that have not previously been exposed to risk management	– Some recognition of the benefits of risk management – Organisational support at project levels is in place – Risk management training is provided – Experimentation on some aspects of risk management process and tools – Partial acceptance of risk management	– Management support exist for risk management – Proactive behavior to risk and threats – Lessons are learnt from past projects – Effective management of predictable risks take place – Still inward looking within NPSD project levels – Recognition of risk ownership and allocation of risk and responsibility – Management by NPSD objectives – Formal risk management to identify, evaluate and mitigate risks – Use well established templates and tools for qualitative analysis of risks

14.5. Sources Informing the P&S Second-Level Constructs.

Table 59: Sources of the P&S Second-Level Constructs

Categories	Definition	Sources
Investors / Stakeholders	Identification of key stakeholders who have a significant influence on the P&S and identify and mitigate potential negative sentiment that could lead to decreased investment.	*Risk incidences:* – Investor agreement prohibited launch of certain categories of P&Ss – Negative sentiment expressed from online channels as key influencer. – Negative press from governing body causing marketing to be withdrawn – Investor influence to launch P&S that are not appropriate to market conditions
PR & Communications	Adequate PR and communications of new P&S releases to stakeholders and having the capability to respond timeously to reputational risks.	*Literature review:* – Internal marketing (Easingwood et al, 1991) *Risk incidences:* – Inconsistencies between internal and external PR messages – Lack of pro-activeness to ensue that media and crisis response communication plans exist to counter negative publicity from high risk products – Lack of involvement of PR during NPSD lifecycle – Inadequate management of quality of deliverables outsourced to media partners
Business Processes	Adequately defined management, operational and support processes to support the P&S and conformance to best practises.	*Risk incidences:* – Lack of ensuring that new processes are developed and existing processes adapted to support the P&S – Insufficient documentation and ownership of processes – Building P&S on weak processes – Existing processes established bottlenecks which lead to insufficient support of the P&S
Financial Management	Adequate financial analysis and management to ensure that sufficient funds exist to meet the	*Literature review:* – Financial analysis and sufficient budget (Gruner et al (1999), Edgett (1991) and Berglund (2007).

Categories	Definition	Sources
	objectives of the P&S.	*Risk incidences:* – Financial viability analyses were insufficient to keep track of market potential and the value of what potential customer will contribute – Lack of consideration of investments in advertising and development that is needed to improve the P&S penetration rate in the market – Lack of budgetary control where actual results are compared with budget to establish deviances – Parameters used for estimation not based on real data with sufficient controls. – Forecasting data not tied to fundamental business drivers – The rationale for choosing estimates are not transparent – The risk involved in using estimates are not analysed
Business Model	Understanding the holistic business logic or business model in terms of the value that the P&S offers to generate profitable and sustainable revenue streams.	*Literature review:* – Business model analysis (Parry et al, 1994; Nordin et al (2011) *Risk incidences:* – Not having a clear idea of the role that different parties will play in the business model – Lack of identification of the parties in the business model – Not establishing the core competencies that is required to execute the business model – Not assigning responsibilities for ownership of risks across the different parties in the business model – Not understanding the network of agreements that should be in place to efficiently commercialize the service
Third Party	Management of the business relationship with third parties to ensure adequate service delivery and continued sustainable support of the P&S during the NPSD but also post-implementation.	*Literature review:* – Third party integration risks (Keizer et al, 2002; Berglund (2007) *Risk incidences:* – Lack of due diligence on vendor to ensure that vendor is competent to perform the work before entering into agreement – Lack of adequate procedures to ensure that vendor has sufficient expertise to support P&S during its lifecycle – Lack of robust information security due diligence on vendor – Lack of clearly allocated responsibilities for liabilities – Vendor not following the prescribed lines of communication
Customer Care	The capability of the call centre to provide optimal service levels and support to the customer.	*Literature review:* – Customer front-line orientation (De Bakker et al, 2010) *Risk incidences:* – Inability to address certain technology aspects of the P&S due to insufficient information – Inadequate training of agents to understand P&S – Inadequate IT support tools to assist agents in resolving customer queries – Insufficient agents available to meet demand – Insufficient IT tools and system to enable agents to self-diagnose and resolve incidence – New information about the P&S is not timeously shared
Business Rules	Clearly defined and transparent business rules and ensuring that the most appropriate pricing strategy is applied.	*Risk incidences:* – Business rules not clear and/or consistent across the value chain – Clear identification of payment models and commission structures to dealers – Business rules do not have integrity – Business rules not maintained in a central repository – The pricing strategy for the P&S is not clearly identified
Internal Compliance	Adherence to internal governance principles, structures, systems, processes, procedures and controls.	*Risk incidences:* – Non compliance or lack of alignment to shareholder policies – Not complying to the NPSD process – Not complying to procurement policies – Not consulting with other functional units who are responsible for web and mobile requirements – Not complying to internal technology security policies

Categories	Definition	Sources
Fraud Management	Consideration and mitigation of potential fraud implications for the P&S. The failure to implement adequate fraud controls could have a significant impact on the product viability and reputation of the organisation.	*Literature review:* – Credit risk (Yong et al 2011) *Risk incidences:* – Fraud on credit card not present – Subscription fraud – Phishing activities – Fraud by external party – Handset subsidy loss – Content fraud – Abuse of free calls – Abuse of business rules – Stolen promotional items – Incentive payable fraud – Lack of data integrated into fraud detection system for monitoring – Mobile commerce fraud – Unauthorised access to data
Revenue Assurance	The exposure of the P&S to potential revenue leakage activities. Revenue Assurance is defined as accurate billing for P&S transactions, in accordance with agreed tariffs and costs.	*Risk incidences:* – Consultation with RA function did not take place to ensure monitoring of P&S – Insufficient controls are in place to timeously detect revenue leakages – P&S are not reconciled against different data sources to timeously detect revenue leakages – Inaccurate or incomplete billing records – Errors in configuration of rating & discount – P&S leading to increased bad debt – Delays in provisioning of the P&S – Bill shock experienced by customers leading to inability to pay debts
Capacity & BCM	Considering the capacity and BCM requirements and vulnerabilities as it relates to the P&S.	*Risk incidences:* – System were not scalable to handle the near-real time requirements of P&S – Network had insufficient capacity to handle volumes of traffic generated by a P&S – BCM plans not considered during NPSD lifecycle – Consultation with BCM department did not take place to ensure that BCM and capacity plans for P&S or supporting systems are up to date – Post launch enhancements to product impacted on capacity requirements which were not considered
SLA/ control & release processes	Conformance to best IT/IS service level management, control and release policies and procedures.	*Risk incidences:* – Service level agreements (SLA's) do not exist – SLA's inadequate documented – SLAs not approved – Inappropriate measures used for P&S – Lack of penalties for lack of adherence to timelines and quality – Lack of following approved change management procedures when making changes to P&S – Vendors implement changes within organisation environment without following approved processes – Access to systems are not controlled – Adherence to release management cycles
Information Security	Protection of data and information and mitigation of potential vulnerabilities.	*Risk incidences:* – Inadequate technology access controls – Not ensuring that confidential information is protected during processing or storing of information – Lack of penetration and vulnerability assessments of P&S platforms – Vulnerability of web-facing applications – Lack of response plans for security breaches

Categories	Definition	Sources
Technical Testing E2E	Adequate testing of the total solution to ensure that it works as defined within the business requirements.	*Literature review:* – Testing (Mishra et al 1996, Mu et al, 2009, Riek 2001) *Risk incidences:* – Testing requirements not clearly document – End-to-end testing not performed – Responsibilities not assigned for tests and results not provided – Testing exclude certain interfaces or systems – No issue log maintained – Not ensuring that all major scenarios are tested.

14.6. Risk List for Competitor and Marketplace

Table 60: Risk List for Competitor and Marketplace

#	Risk items	Source
1	Was a competitive analysis conducted for the P&S?	Incident
2	Do we have an adequate understanding of who our key competitors are for the product?	Incident
3	Do we have a good understanding of what our key competitors do in terms of the products, functions, customer base, pricing, distribution strategies and key business initiatives?	Incident
4	Do competitors frequently introduce new products?	Haverilla (2010)
5	Does a dominant competitor or a monopoly exist within the market for the specific P&S?	Adapted from Haverilla (2010)
6	To what extent are the customers of the competitor satisfied with the competitors' products and services?	Haverilla (2010)
7	How technologically sophisticated are the competitors products in relation to the new product or service?	Adapted from Evanschitzky et al (2012)
8	Does the product or service provide clear competitive advantages?	Keizer *et al* (2002)
9	Can the competitor's products and services be regarded as innovative?	Szymanski *et al* (2001)
10	In the case that a competitive response is expected what would be the expected intensity of the response?	Evanschitzky *et al* (2012)
11	Will the introduction of the new P&S change existing market share positions?	Keizer *et al* (2002)
12	Will the introduction of the new P&S have an impact on market prices?	Keizer *et al* (2002)
13	What is the degree of price competition within the market?	Haverilla (2010)
14	Will the new product be launched before competitors launch a comparable product or service?	Keizer *et al* (2002)
15	To what extent are the competitors customers loyal towards the product?	Haverilla (2010)
16	Are the responses from competitors via the media expected from competitors?	Adapted Keizer *et al* (2002)
17	Do we understand the implications of being a technology leader or follower for the new P&S?	Keizer et al (2002)
18	How will it be ensured that competitor's actions and challenges are adequately monitored?	Adapted Keizer *et al* (2002)
19	How will it be ensured that the competitors' actions can be followed with an adequate response?	Adapted Keizer *et al* (2002)
20	Are the target market clearly defined?	Adapted Keizer *et al* (2002)
21	Does all stakeholders agree on the definition of the target market?	Adapted Keizer *et al* (2002)
22	Are the selected target market based on convincing research data?	Adapted Keizer *et al* (2002)
23	How will delays in launching the product impact on the commercial viability thereof?	Adapted Keizer et al (2002)
24	Are the sales projections for the new product realistic?	Adapted Keizer *et al* (2002)
25	What are the long-term growth market potential expectations?	Adapted Keizer *et al* (2002) and Haverilla (2010)
26	Are there any market restrictions that will impact on the commercial viability of the product?	Adapted Keizer *et al* (2002)
27	Do we have a good understanding of the size of the market?	Haverilla (2010)
28	Will the new product or service have a monopoly in the market?	Haverilla (2010)
29	Do we understand what the weaknesses of the organisation are when compared to competitors?	Incident
30	Do we already have a presence in the market selling existing products and services?	Adapted from Davis, 2002

#	Risk items	Source
31	Do we have sufficient information available about the characteristics of the potential market?	Rubenstein *et al* (1976)
32	Does the market research demonstrate an adequate level of proficiency as applicable to the new product or service?	Song *et al* (1997)
33	Have we defined targeted market segments?	Berry *et al* (1973)
34	Can we adequately service the target market?	Bortree (1991)
35	Can the new product or service be described as offering a differentiated service proposition?	Adapted from Easingwood (1991)
36	Can the market opportunity be easily lost to competitors?	Chen *et al* (2007)
37	Does the product or service offer the threat of cannibalization?	McDermott and O'Connor (2002)
38	In the case of launching a new technology would there be any market resistance to the new technology and how will this be overcome?	McDermott and O'Connor (2002)
39	How will changes in the market be monitored?	Segismundo *et al* (2008)
40	Is the product part of a wide range of current offerings to the market	Nordin *et al* (2011)
41	Are there any potential for conflict in the channel?	Incident
42	Could there be any competitor consolidation that could lead to unhealthy competition?	Incident
43	Can the market research lead to the making of adequate conclusions of the market?	Incident
44	Have the correct tools and techniques been applied for market research?	Incident
45	Is the market research based on reliable and trustworthy data?	Incident
46	Is the assumptions on which the market research has been conducted clearly been identified?	Incident
47	Are market forecasts for the product or service updated in the case of a significant event that occurred in the market?	Incident
48	How is quality ensured in market information provided by third parties?	Incident
49	Is the assumption on which the target market has been based realistic?	Incident
50	Is primary or secondary data used for analysis of the target market and what are the implications?	Incident
51	Did the marketing specialists have sufficient insight into the development of these target markets?	Incident
52	Do we have a good understanding of the customer characteristics as they relate to the target market?	Incident
53	Have we done an accurate assessment of the degree to which the customer will accept the product via customer involvement?	Incident
54	Are their any unique characteristics of the new product or service proposition that would make it attractive or unattractive to the market?	Incident

14.7. Risk Action List Example

Table 61: Risk Action List for Competitor and Marketplace

#	Risk Mitigation Actions	Relation to risk (Table 12)
1	Conduct a competitive analysis that profiles all key competitors.	1, 2, 42
2	Detailed examination of practices of key competitors.	3, 4, 6, 15, 29
3	Establish the type of competition from the competitor such as monopoly, dominant in market and any potential market restrictions	5, 26, 41
4	Identify the technologies that the competitors employ and degree of innovativeness.	7
5	Define the value proposition in terms of competitive advantages	8, 28, 35, 54
6	Understand the extent of innovativeness of competitors products	9
7	Identify the expected customer response and organisations response actions	10, 16, 19
8	Establish the estimated market share positions, growth potential and size of market	11, 25, 27
9	Conduct a competitive pricing analysis	12, 13
10	Determine the time required to launch the product to maintain competitive advantages	14, 17, 23
11	Ensure continuous monitoring of market during product lifecycle development	18, 36, 39, 47
12	Identification of a clear and segmented target market and do we understand the requirements of the market segment	20, 21, 31, 33, 34, 38, 52, 53

#	Risk Mitigation Actions	Relation to risk (Table 12)
13	Ensure that data and assumptions used to identify the target market is accurate and have integrity	22, 24, 32, 43, 44, 45, 46, 48, 49, 50
14	Understand the organisations current involvement in the market and what lessons can be learnt	30, 40, 51
15	Conduct a cost and profitability analysis based on the target market growth and size estimates	37

14.8. Risk Ratings Example

Table 62: Risk Ratings for Competitor and Marketplace

#	Level	Description	CMM and Mandatory Control Requirements
1	NC – Non Compliant	Limited or no competitive analysis was conducted and it is not documented	- Competitive analysis do not contribute to the a detailed understanding of competitive risks; - Only main competitors are noted as a tick box exercise; - Competitor analysis do not contribute to any understanding of the competitors or the market for the P&S; - No anticipation of potential competitor reactions exists.
2	PC – Partially Compliant	Have a limited understanding of competitors and market which could expose organisation to risk	- Basic information about competitors and market are in place but it is not tailored to the unique requirements of the P&S; - The competitor information cannot be considered as contributing towards the success of the P&S. - Only basic estimations of market share and market segment is in place. - Market analysis is conducted on secondary data; - Assumptions and integrity has not been verified. - Limited understanding exists of competitor's possible reactions.
3	LC – Largely Compliant	The organisation has a good understanding of the market and can learn from previous experiences and lessons. Conducted a detailed examination of practices of competitors and have a clear understanding of the estimated market share and growth potential.	- Established relevant information about competitors' products, technologies function, customer base, pricing, distribution strategies, key business initiatives and how frequently the competitor introduces products. - Understanding includes the extent to which customers are satisfied or loyal to the P&Ss of competitors; - Detailed estimations of market share, growth potential and market size are in place; - Good understanding exists of the requirements of the target segment. - The market segment information, assumptions and integrity of data have been verified. - An action plan is in place in anticipation of competitor response.
4	C - Compliant	Have a detailed understanding of the type of competition and reaction that can be expected from competitors. Best practices are used and quality can be considered high.	- All the level 3 components are in place but it can be considered as a best practice. - Indicate a detailed understanding of the organisations perceived weaknesses in relation to competitors. - Ensure continuous monitoring of market during product development lifecycle.

14.9. Post-Implementation Reviews

The criteria that were used to conduct the post-implementation reviews (PIRs) are discussed. There were four different analysis methods applied during PIRs, namely (1) control analysis (2) risk incidence analysis (3) project success analysis and (4) lessons learnt.

Control analysis

The effectiveness of the controls and level of compliance to the recommended and implemented controls are analysed. The four possible levels of compliance: Compliant (C); Largely Compliant (LC); Partially Compliant (PC) and Non-Compliant (NC) relates to the compliance rating as was customised for each category. The objective was to determine the effectiveness of the controls and to some extent validate the compliance ratings.

Risk incidence analysis

The risk incidence analysis contained a summary of the key incidences, which were identified through interviews, and documentation obtained from key project team members. The rating of the incidents took place by using the following classification:

Table 63: Criteria used to prioritise incidences during PIR

#	Level	Description	Action required
1	Concern	The operational, financial and reputational impact the event had on the P&S is high. It would be highly likely that further incidents would result in P&S disruption if not addressed adequately.	Requires urgent management attention in the immediate future to ensure that recommendations are implemented.
2	Cautionary	The operational, financial and reputation impact of the event on the P&S is moderate. It is likely that similar future events might lead to P&S disruption if not adequately managed.	Requires management attention in the medium term. Recommendations should be implemented where necessary.
3	Acceptable	The operational, financial and reputation impact of the event on the P&S is low. It is unlikely that P&S disruption might result.	No formal action is required but recommendations can be considered by management to improve the P&S.

Project Success Analysis

An internal methodology was used to measure the success or failure of a project.

Table 64: Criteria employed to measure success of projects during PIRs

Attribute	Explanation
Cost	Profitability analysis on the P&S is performed. Project is assessed against cost on development from concept to prototype. The profitability analysis considered that development cost must be recovered before the project can be considered profitable.
Quality	Customer satisfaction is assessed against the customer needs and value derived from usage of the P&S. The 21A demand drivers were used to measure successful P&S.
Time/ Project Management	The project is assessed to determine how quickly the P&S made it market against the quality criteria. Time to market should not be at the cost of quality.
Knowledge Management	Development of know-how and the ability to repeat the process for future products in the form of lessons learnt. Process of transforming information and intellectual assets into value. Business processes and assets are measured using the Capability Maturity Model (CMM).

The criteria used to assess the 21A demand drivers were as follows:

Table 65: Criteria used to measure the quality of P&Ss during PIRs

#	Demand Driver	Description
1	**Anything**	Range of benefits that customer can get from the P&S
2	**Anywhere**	Enjoying benefits of P&S wherever the customer want it
3	**Anytime**	When? Maximum 24/7 every week of year
4	**Anyhow**	The number of ways that the P&S benefits might be enjoyed
5	**Affordability**	Both price competitive and within disposable income of customer
6	**Always**	The reliable supply of the P&S
7	**Access**	The ease of accessing the benefits of the P&S
8	**Area**	Coverage of the P&S
9	**Action**	Immediacy with which the benefits of the P&S might be enjoyed
10	**Anonymity**	Confidentiality, security and privacy
11	**Awareness**	How easy it for the customer to become aware of the P&S and how long will the awareness lasts
12	**Attractiveness**	The extent to which the P&S could be personalised to customer needs
13	**Accuracy**	Quality of the product
14	**Affiliation**	Refers to the emotional attachment of the P&S
15	**Attention**	Lack of complexity in getting to enjoy the benefits of the P&S
16	**Automatic**	Lack of repetitive, mundane and numerous steps that must be followed to enjoy the benefits
17	**Aesthetic**	Refers to the physical P&S and the way in which it is presented as well as the physical environment in which it is presented.
18	**Amusement**	How customer is invited (but never forced) to be interested, occupied, entertained laugh or smile.
19	**Administration**	To how much administration is the customer subjected to enjoy the P&S and the extent to which the customer may monitor and control (administrate) the consumption of the P&S
20	**Adaptability**	The extent to which the customer may change the nature and scope of the P&S and the levels of charges (cost) that is applied for changes
21	**Assurance**	The benefits of the P&S are guaranteed and honoured. The organisation will take responsibility in the event of anything going wrong within the guarantee period and beyond.

14.10. Risk Toolkit

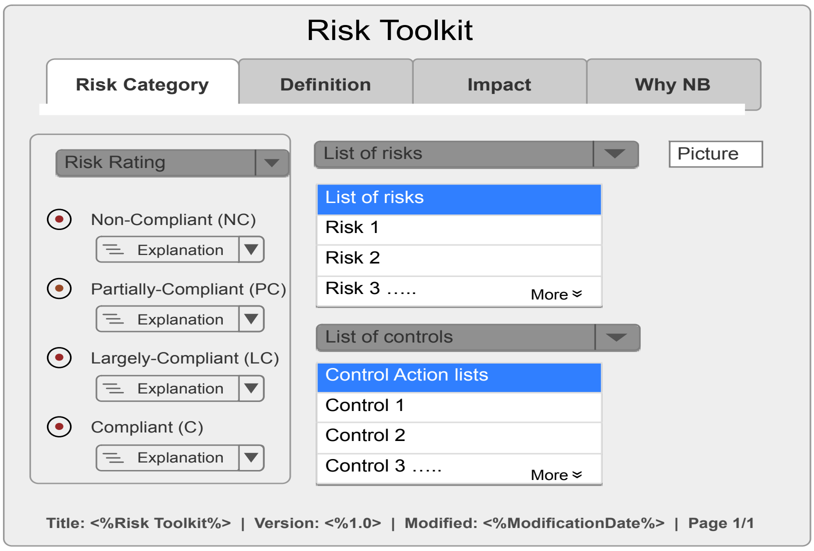


Figure 99: Risk Toolkit

A representation of the risk toolkit is provided as the original toolkit provides organisation identification criteria.

14.11. NPSD Project Prioritisation

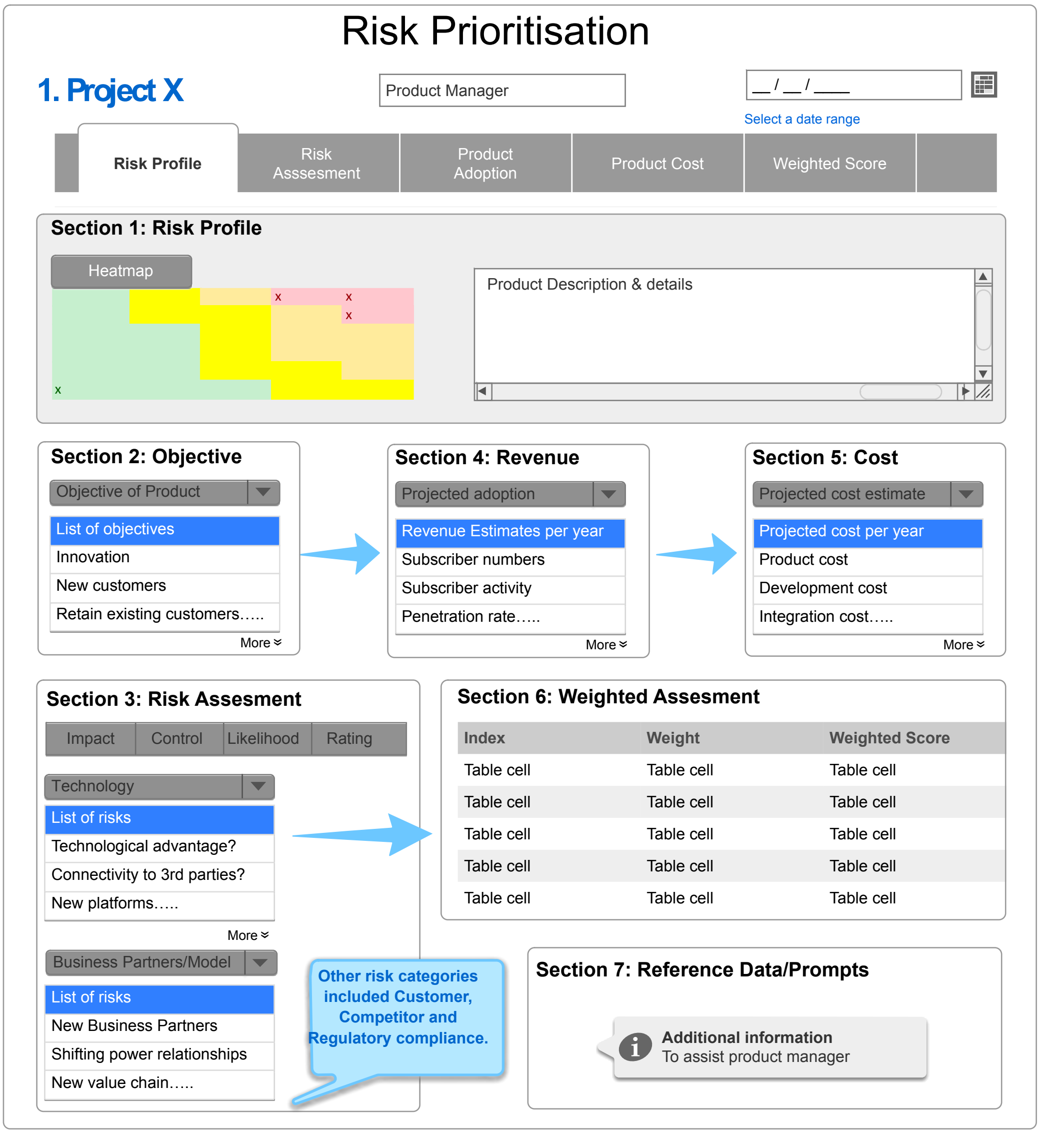


Figure 100: NPSD Project Prioritisation

14.12. IRMF Sources

Table 66: Sources of the IRMF Second-Level Constructs

Second-Level Constructs	Definition	Sources that informed the Second-Level Constructs
Product Management reporting	Reporting requirements defined by the product manager that are timeous, adequate and have integrity to enable the tracking of the products performance during its lifecycle and enable implementation of remedial	*Risk incidences:* – Product managers did not track performance of the product – Reporting is not specified in the functional specification to track how well the product is performing in the market in terms of revenues and profits. – Product managers do not monitor if P&S meet its performance targets as described in the P&S functional description.

Second-Level Constructs	Definition	Sources that informed the Second-Level Constructs
	actions, where required.	– Reporting requirements to track customer complaints from various channels are not implemented.
Value Chain	Evaluation of risks relating to the channels that are used to support the delivery of the P&S to deliver a holistic customer experience.	*Literature review:* – Supply chain and value chain risks (Keizer et al, 2005; Olechowshki et al (2012) *Risk incidences:* – Poor customer experience in distribution channels was rated as the 6th highest customer care query. – Inbound logistics to obtain products from suppliers such as tracking devices are not considered. – Outbound logistics such as ensuring that customers receive products are inadequately considered. – Not defining return processes for physical products that are not working.
Knowledge Management	Utilise knowledge management processes to improve processes, P&S to increase customer satisfaction and revenues	*Literature review:* – Lack of knowledge management (Nader et al, 2010) *Risk incidences:* – Not performing lessons learnt on P&S that are launched – Inadequate lessons learnt or post implementation reviews conducted or not adequately documented – Not utilising the lessons learnt to increase performance of the NPSD teams.
Health, Safety & Social responsibility	Responsible practices towards people, planet and profit (3Ps). Corporate Social Responsibility (CSR) integrates social and environmental concerns into the P&S operations and guides stakeholder interactions on a voluntary basis	*Risk incidences:* – Not adhering to health and safety best practices and exposing third parties or contractors to an unsafe working environment – Not considering the organisations targets for 'going green' to reduce the carbon footprint of 5% reduction per annum – Not considering environmental impact during P&S development – Not advertising the corporate social responsibility projects that are launched by the organisation or integrating it with existing P&S. – Ensuring that diversity are considered during appointment of new vendors or in teams – Not dealing with the highly stressful workplace problems where the demands exceed the NPSD practitioner to cope. – NPSD leadership is not promoting responsible ethical behavior and examples are noted when leadership are not 'walking the talk'. –
Risk Management	Adherence to the Risk Management process and reporting requirements.	*Literature review:* – Risk management processes, structure and practices (Olechowshi et al 2011; Leithhead, 2000) *Risk incidences:* – Product teams do not provide the risk practitioners with feedback on risk assessments within agreed timelines. – Insufficient resources and information is provided to support adequate and detailed risk assessments. – Not monitoring risks and ensuring that clear accountabilities exist for management of risks. – Not implementing controls that were identified by risk practitioners earlier in the NPSD lifecycle. – NPSD practitioners are not responsive to the suggestions of the risk practitioners. – Not ensuring early involvement of the risk practitioners during the NPSD lifecycle.
IPR/Trademarks	Protection of trademarks, patents and Intellectual Property Rights (IPR) associated with the P&S.	*Literature review:* – Intellectual property (Yong et al, 2011; Nader et al (2010) *Risk incidences:* – Copyright infringement on music promotion causing promotion to be

Second-Level Constructs	Definition	Sources that informed the Second-Level Constructs
		stopped – Vendors infringing on trademarks of the organisation and no quick process to resolve the issue exist – Vendors not signing confidentiality agreements to protect the organisations proprietary information – Not verifying that third parties have the necessary patents and IP protection standards in place. – Providing P&S that can lead to online piracy practices.
Physical Security	Physical security risks presented to customers and employees as a result of the P&S.	*Literature review:* – Physical hazards (Mu et al 2009, Wang et al 2010) *Risk incidences:* – Not considering physical security requirements for agents that are required to work with cash. – Physical risks presented to customers due to them using products whereby their locations can be tracked. – Allowing unauthorised people in buildings to gain access to confidential resources and information. – Not considering physical security risks when third parties or NPSD practitioners are required to travel to remote locations. – Insufficient consideration of physical security requirements at big events with large crowds where crowd control need to be exercised. – Not notifying the security division of P&S promotions where customers camp the night to be the first in line for the promotion – Not securing physical assets that are used for promotion or testing leading them to be stolen.
Money Laundering	Exposure of the P&S to potential money laundering activities to conceal the nature, source, location, disposition or movement of the proceeds of unlawful activities.	*Risk incidences:* – P&S allowed electronic transfer of money are vulnerable to potential money laundering activities – Compliance requirements of reporting potential money laundering activities to the Financial Intelligence Centre (FIC). – Any cash transactions should be compliant to anti-money laundering (AML) legislation – Any P&S that allow cross border transfer of money should include AML procedures – Certain financial P&S services such as insurance products need to be reported if frequency and volumes of transactions over a certain threshold is exceeded. – Some popular online-games can be provided where certain functions or tokens are purchased could be supporting money laundering activities. – Criminals can launder money via the purchase of products, airtime, cell phones, online purchases, airtime transfers for cash and via entering promotions. AML procedures to be implemented. – Any P&S that facilitates gambling activities need to be approved by the organisation's Board and shareholders before proceeding with development.
Product Maintenance	The existence of plans and responsibilities to adequately maintain the P&S after implementation.	*Risk incidences:* – Not ensuring that proper processes are followed where functionality are implemented in phases. – Not adequately tracking whether the P&S is working, as it should. – Not assigning clear responsibilities or accountabilities for the different maintenance requirements of P&S. – Not establishing a process to retire P&S.
Financial & Regulatory reporting	Compliance to the Financial and Regulatory reporting requirements in terms of providing accurate and	*Risk incidences:* – Not ensuring that regulatory reports for the lodgment of tariffs are timeously lodged and approved by the key government stakeholders.

Second-Level Constructs	Definition	Sources that informed the Second-Level Constructs
	consistent financial documents and lodgements in a timely manner to governmental stakeholders	– Providing incorrect information in lodgment documentation. – Providing documentation to governmental stakeholders that are not consistent with those that are reported in the P&S functional specification. – Not allowing sufficient time to obtain the necessary approvals within the allocated timeframes. – Product managers do not allow sufficient time for Finance and Regulatory which puts them under pressure and unnecessary subjected to tight deadlines – Having to resubmit and redo documentation due to last minute adjustments of input data.

14.13. B2B Impacts on IRMF

Table 67: B2B factors that stimulates innovation

Key area of risk	B2B impacts	Changes to framework
Organisational strategy	– Overall organisational synergy (De Brentani, 1995). – Different strategic objectives to consider (risk practitioners) – Enabling the organisation to win business with new customers (Raddats et al 2013) – Enable the organisation to sell new products to existing and new customers (Raddats et al 2013). – Strong reputation of organisation will assist the B2B division to succeed due to existing relationships with customers (Raddats et al 2013).	+ Risk list
Portfolio management	– Creation of new products and services to sell to new to new and existing and customers (Raddats et al 2013)	+ Monitor
Competitor / market place	– Stricter on B2B competitor analysis but not so much size of marketplace. – Competition is more aggressive as competitive offerings is similar, so more competition on price as well as introduction of many product and enhancement introductions. – More unique benefits that customers can perceive as superior to competition (De Brentani *et al* 1996; Easingwood *et al* 1991).	+ Monitor
Customer	– More participation of customers during NPSD process. – Consistency with customer values / operating systems. – Understands customer needs and satisfies clearly identified customer/client needs. – More focus on business clients than individual. – Long-term client relationship more important for business clients as it is higher value as well as satisfaction with previous service. Customers loyal to existing service relationships. – Customers more conservative or risk-averse. – More direct customer contact during service development. (De Brentani *et al* 1996; Frambach *et al* 1998). - Decision makers perceive value based on service quality and financial and social relationship marketing programs (Bolton et al, 2013).	+ Monitor
Technology / Innovation	– Sources of ideas for new products and services more technology based, acquiring new technology to support product or service. – Introducing classes of services and technology that is totally new to organisation as well as producing the service and a new competitive environment. – Focus on technology characteristics such as quality, user-friendly and fast. Require more technology to deliver equipment. – Highly innovative service where organisation is known as innovator rather than follower.	+ Monitor + Framework dimension

Key area of risk	B2B impacts	Changes to framework
	(De Brentani *et al* 1996; Easingwood *et al* 1991).	
Regulatory / Legal	Different regulations to consider (risk practitioners)	+ Risk list
Investors / Stakeholders	Different stakeholders to consider (risk practitioners)	+ Risk list
IPR / trademarks	Unsure of impact (risk practitioners)	+ Monitor
Third party & value chain	Service expertise important and highly skilled experts in producing and creating the service (De Brentani *et al* 1996). Different value chain environment to consider (risk practitioners) - Partnering with other manufacturers (Windahl et al 2004)	+ Monitor & risk lists
Policy compliance	– Development process should ensure good communication amongst functional areas. – Adequate involvement of employees during planning designs and launch. (De Brentani *et al* 1996).	+ Monitor
Business model	Respond to demand cycle variations and using organisations excess or off-season capacity. (De Brentani *et al* 1996).	+ Monitor
Org structure, management & resources	Top management creating a highly supportive innovation environment. (De Brentani *et al* 1996).	+ Monitor
Business rules	More intense price competition? (De Brentani *et al* 1996).	+ Monitor
Business process	Different support processes to consider (risk practitioners)	+ Risk list
Customer Care Front- line staff	– Highly skilled front line staff that performs as experts and can executes judgmental tasks. – Better service experience than competitors (De Brentani *et al* 1996).	+ Monitor
Financial management	– Financial resources analysis, require more capital equipment to deliver service – In-depth financial analysis precede design stage (De Brentani *et al* 1996).	+ Monitor
Project Management	– Project management dominated by marketing, – Formal post-launch evaluation procedure (De Brentani *et al* 1996).	+ Monitor
Financial and Regulatory reporting	Unsure (risk practitioners)	+ Monitor
Product management reporting	Unsure (risk practitioners)	+ Monitor
Risk management	Unsure (risk practitioners)	+ Monitor
Fraud	Unsure (risk practitioners)	+ Monitor
Revenue assurance	Unsure (risk practitioners)	+ Monitor
Security	Unsure (risk practitioners)	+ Monitor
Health, Safety & Social Responsibility	Unsure (risk practitioners)	+ Monitor
Technology Capacity BCM	Probably more important in B2B environment (risk practitioners)	+ Monitor
Information Security	Probably more important in B2B environment (risk practitioners)	+ Monitor
SLA / Control & Release	Probably more important in B2B environment (risk practitioners)	+ Monitor
Technical Solution Design	– More experts require developing the service. – Service design is more customized. – Detailed design using 'drawing board' approach, – Fit with current delivery system. – Standardisation of the behind-the-scenes technology development process (De Brentani *et al* 1996). - The ability to deliver multi-vendor-solutions (Raddats et al 2010)	+ Monitor
Technical testing End-to-end testing	Different testing environment (risk practitioners)	+ Monitor
PR/Communications	Marketing of service to frontline personnel (De Brentani *et al* 1996).	+ Monitor
Marketing & Sales	Marketing second-level construct updated to marketing and sales and sales plays a much bigger role in NPSD during B2B services, rather than B2C services. – Incorporate in design in-depth marketing study. – Documented and detailed market launch program.	+ Monitor

Key area of risk	B2B impacts	Changes to framework
	– Formal promotional market launch rather than a word-of-mouth promotion. – Sales and promotional capabilities and resources very important for relationship building. (De Brentani *et al* 1996).	
Product Maintenance	Probably more important (risk practitioners)	+ Monitor

14.14. Incidence Register for a Project

A specific P&S is used as an example of a typical incident log associated with a service. The service was subjected to many problems and many first line support queries were logged over a year period. An overview of the type of incidents is shown in below. Information identifying the P&S and/or the organisation was obscured for confidentiality reasons.

Table 68: Incident Register

ID	Category	Incident	Description	Affected parties	P&S affected	Priority	Resolution activity
53	System error	Duplicate records existed in mediation system	Customers transferred airtime once and recipients received airtime twice	Customers with unintended transfers and lack of airtime to make calls	Service X	High / financial impact	Customer compensated, reprocessing module corrected
54	System error	The USSD platform suffered from scalability problems	Unexpected high volumes of transactions due to fraud and software errors	Customers, systems	Service X	High, number of customer complaints	USSD error corrected and BCM implemented
55	System error	Provisioning of customers for service	Some customers were not provisioned for service and had to request activation. During migrations between packages provisioning for service was lost.	Contract customers, customer care, systems	Service X	High, due to number of complaints	Provisioning system corrected
56	System error	Prepaid platform ATT counter error	The counter did not count number of transactions and customers could transfer more than they were allowed to according to business rules.	Organisation	Service X	High, revenue leakage	Prepaid platform corrected
57	Business rule	Forfeit rule if no activity on system	Due to error 4, customers could transfer all of their available airtime and transactions were not indicated as usage. It appeared as dormant subscribers and did not receive monthly airtime benefits	Customers, Customer Care	Service X	High, due to volumes of complaints	Due to volumes of complaints it was difficult to establish validity and all complaining customers were refunded, business rule was changed, systems were updated
58	Business	Initially all	Postpaid customers	Postpaid	Service	Critical due to	Business rule was

ID	Category	Incident	Description	Affected parties	P&S affected	Priority	Resolution activity
	rule	subscribers were automatically subscribed to ATT service and this was changed to only prepaid customers	had to request subscription to the service and could only subscribe via their service provider due to fraud	customers	X	fraud exposure	changed, customers refunded, systems updated
59	Business rule	Customers not allowed to transfer from starter packs	Business rules was updated so that airtime originating from starter packs could not be transferred as the org needed to pay commission payments to service providers for selling starter packs which induced financial losses	Organisation	Service X	Medium, revenue leakage for organisation	Business rule was changed and commission payment rule was changed, systems was updated
60	Business rule	Transfer of top up monthly subscription amounts was disallowed	Business rule change so Top Up subscribers could not transfer all their available free airtime value	Organisation, customers	Service X	Low as main impact was only seen in 6 months when customers were deactivated for not being active	Business rule was changed, systems updated
61	Business rule	Customers could previously transfer any percentage of their recharge.	Business rule changed to reflect that only 50% can be transferred to ensure that subscriber still use SIM card.	Customers	Service X	Medium, for impact could only be seen in 6 months	Systems updated with business rule change
62	Customer complaints	Systems was not operational and transactions unsuccessful	Refer to system errors 1-4 and customer care were not notified of errors timeously	Customers	Service X	Medium due to volume of complaints to customer care	System errors corrected and customer care notified of errors
63	Customer complaints	Customers experience finger trouble	Customers entered the wrong MSISDN and transferred airtime to the incorrect recipient	Customers	Service X	Low, due to volume of complaints	Customers referred to T&Cs and not refunded
64	Customer complaints	Children mischief	Children were transferring parents airtime without consent	Customers	Service X	Low, due to volume of complaints	Customers referred to T&Cs and not refunded
65	Customer complaints	Wrong channel errors	Errors originated from banking channels	Customers	Service X	Low, due to volume of complaints	Errors from banks corrected and systems updated
66	Fraud	Corporates with least cost routers were defrauded	Fraudsters would provision least cost routers without corporates being aware and transfer airtime	Corporates, organisation	Service X	High, due to cost of fraud	Fraud investigations and corporates refunded
67	Fraud	Combination of	Several postpaid	Organisation	Service	High, due to	Fraud investigations

ID	Category	Incident	Description	Affected parties	P&S affected	Priority	Resolution activity
		subscription fraud and system error lead to fraud losses	customers partook in a game, which entitled winning free airtime. An error on the USSD system allowed customers to play the game without being billed. The winnings were distributed to a number of prepaid accounts. The players defaulted on their subscription payments.		X	cost of fraud	
68	Social engineering	Website scams fake website using organisational logo	Fraudsters would create web pages stating that customers could enter a competition or the organisation had an error and if they enter the ATT code they will receive free airtime, which was deposited in the fraudsters SIM	Customers	Service X	Low, small number of customers and small amounts	Short code was decommissioned, Websites closed down, criminal cases pursued, in case of minors stern warning was issued, customer communications issued
69	Social engineering	Chat room scams	Victims were deceived into sending the ATT USSD code to receive a picture of a new chat room friend, unintentionally sending airtime.	Customers	Service X	Low, small number of customers and small amounts	The particular short code was decommissioned, customer communications issued, airtime was retrieved and criminal cases open
70	Money laundering	Compliance to FICA Act	Some prepaid SIMs deposited large amounts of airtime, which could be used to launder money where ill-received funds could be sold to others.	Organisation	Service X	High, due to possible non-compliance	Reporting in accordance with FICA
71	Revenue assurance	Customer package splitting	Customers signed up for 24 month contracts to obtain free phone and sell free airtime by transferring it	Organisation	Service X	High due to revenue losses	Resolved with business rule changes

14.15. Risk Prioritisation AR Iteration 2

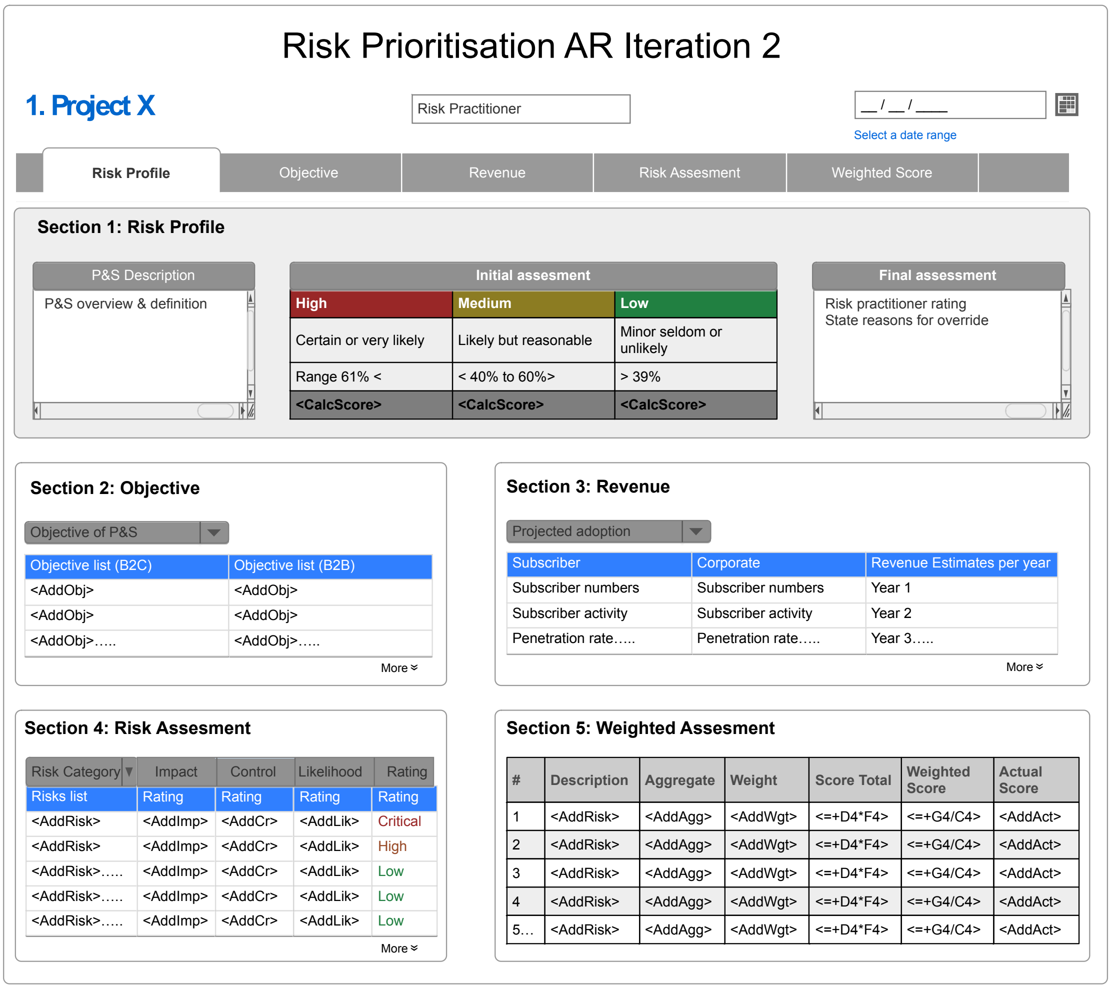


Figure 101: Risk Prioritisation: AR Iteration 2

14.16. P&S Portfolio Category Risk

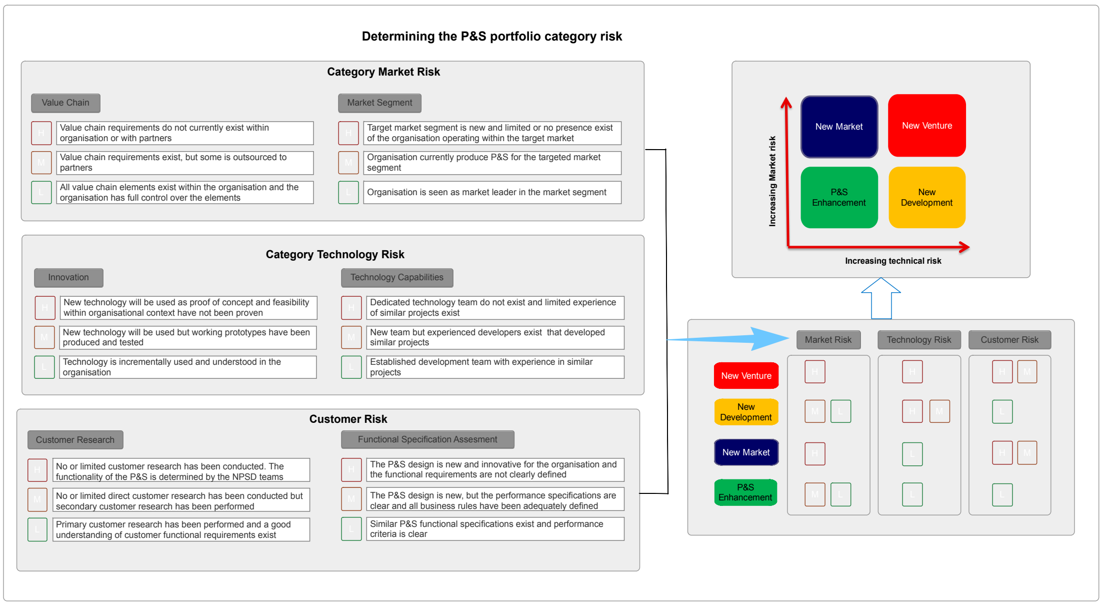


Figure 102: Product & Service Portfolio Category Risk

A scoring model for determining P&S portfolio categories are presented below.

Table 69: Determining P&S portfolio categories

Market		Technology risks		Customer risk		Scores	Results
Value chain	Market segment	Innovation	Technology capabilities	Customer research	Functional specification Assesment		
Weight 10%	***Weight 15%***	***Weight 25%***	***Weight 25%***	***Weight 15%***	***Weight 10%***	100%	
High (10)	High (15)	High (25)	High (25)	Medium (7.5)	High (10)	83.5	New venture *Score from 70 and up*
Low (1)	Medium (7.5)	High (25)	High (25)	Low (1)	Medium (5)	64.5	New development *Score from 50 to 70*
High (10)	High (15)	Medium (12.5)	Low (1)	Medium (7.5)	Low (1)	47	New market *Score from 30 to 50*
Low (1)	Low (1)	Low (1)	Low (1)	High (15)	Medium (5)	24	Enhancement *Score from zero to 30*

The scores and weighted scores are indicated above. The outcome will assist in identifying the P&S portfolio category risk. The weighted score is mainly utilised to provide more weight to the technology development category as less questions informs this category.

14.17. Innovation and Risk Framework: AR Iteration Two

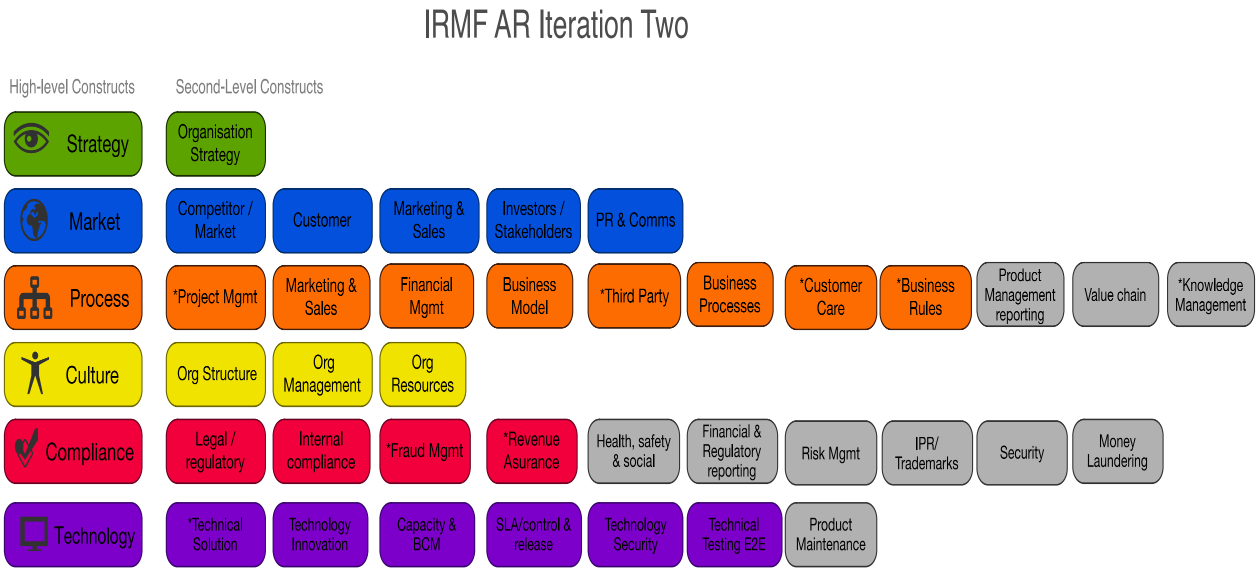


Figure 103: Innovation and Risk Management Framework, AR Iteration Two

The categories indicated with an asterisk are those that have been reviewed as a results of the lessons learnt and been updated accordingly.

1.32 IRMF AR Iteration Three

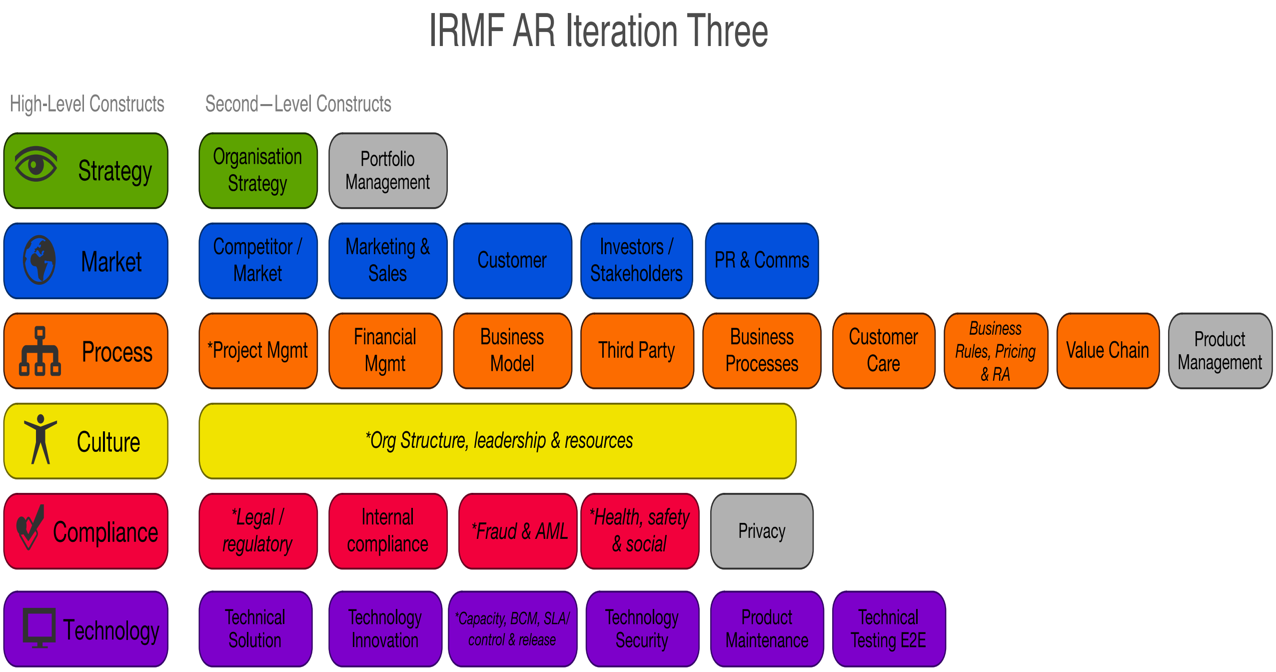


Figure 104: Innovation and Risk Management Framework, AR Iteration Three

The grey blocks show newly added categories

The *asterisk and italic writing show consolidated categories

14.18. AR Iteration 3: CMM Navigator Model

Table 70: CMM NPSD Navigator Model

Definition	Level 1 – Ad hoc	Level 2 - Initial	Level 3 - Defined	Level 4 - Managed	Level 5 - Optimising
General	The organisation has limited awareness of the need for RM Lack of RM culture Limited structural approaches exist to deal with uncertainty Lack of understanding of RM principles Limited executive-level support The benefits of RM is not recognized RM is performed reactively Limited investment in RM such as budget, training, education and resources invested	Some recognition of the RM benefits RM policy is defined RM is supported at project level RM processes and methodology is developed RM training is provided RM takes place on selected projects Experimentation of RM processes and tools	RM objectives is aligned with those of the organisation Relationships with stakeholders are built and maintained RM framework are reviewed Defined and integrated RM processes exist RM is communicated to the organisation A formal RM system exist Proactive RM takes place Lessons are learnt from past projects Predictable and known risks are effectively managed Focus is predominantly still on project and function level	Formal appointment of RM resources Clearly defined responsibilities for RM Risk sharing and education takes place across functional boundaries Some double-loop learning takes place Institutional arrangements (such as contracts, SLA's, T&Cs are reviewed by RM) Risk processes is institutionalized Predicable risk is adequately managed as well as some emerging risks Focus on working with development and planning departments High risk awareness exist	RM is used by the organisation to gain a competitive advantage Emphasis is on positive RM or opportunity RM Double-loop learning is optimally implemented Cross-collaboration, multi-learning and inter-organisational project risk management takes place Stakeholders as affected parties are involved in RM processes Strategic RM planning takes place Strategic alliances is developed, institutional arrangements and partnerships with external stakeholders Both predictable and emergent risks are well managed.
People, Organisation & Leadership	Lack of senior management support and involvement Project success depends on individual efforts Resistance to change exist	The skills, experience and competencies of resources are reviewed and actions plans are implemented to grow and maintain skill sets Information training sessions are being held The internal context of the organisation in terms of legal,	The risk team members function reasonably well as a team Risk management training is still informal The organisation is at an overall level aware of the need for risk	A culture of risk by design is cultivated Strong teamwork exist within the risk teams that are extended to external parties Formal and continuous risk management training takes place	Strong risk awareness culture exist with proactive approach to risk and opportunity management in project leadership teams Risk information is actively used Prior experiences is analysed to gain

Definition	Level 1 – Ad hoc	Level 2 - Initial	Level 3 - Defined	Level 4 - Managed	Level 5 - Optimising
	Limited learning takes place from previous projects in preparation for future projects A lack of awareness for the need to manage risks or uncertainties Risk management is limited to individuals with insufficient risk management experience Risk management takes place in functional silos	governance, structure, roles and accountabilities as well as organisational culture) is understood. Risk management is still only partial accepted. Risk accountabilities and responsibilities for risk are intermittently assigned. The risk management resources do not function as a coherent team Repetitive work is well performed Risk management still functions as coordinator rather than being actively involved in projects Clear roles and responsibilities are assigned within the risk management team. Regular meetings take place to review and monitor risks.	management Recognition exist for ownership and allocation of risk and responsibilities Risk management on a project level are still task-oriented but oriented towards delivery of the project objectives Stakeholder education takes place Cross functional structures has been implemented to ensure cross-functional risk teams Emphasis on team work and collaborations takes place A sense of risk ownership is being created for both internal and external risk resources.	for project teams The organisation is strongly project driven A strong risk awareness culture exist at executive levels The organisational processes is flexible and willingness exist to adapt to change The leadership and management style is adaptive.	competitive advantages The organisation has a strong project driven culture that is dynamic, energetic and flexible The risk teams have strong negotiation skills and display the ability to influence other parties Organisation learning is a priority to facilitate innovation and generate new ideas. Leadership and management style can be described as enlightened.
Process	No formal risk management process or practice are available No risk management data is collected or analysed No project lessons are documented or analysed Lack of risk management tool exist	The risk management processes are informally defined The risks are seldom systematically identified or analysed Risk data are fragmented and not consistently collected Simple templates and spreadsheet tools are used to support risk management activities	Formal risk management planning and control processes are established and applied Formal risk management processes exist to identify, evaluate and mitigate risks Real-time monitoring of project risks takes place using a defined model A formal project database is	Risk management is consistent and systematically applied across project portfolio's Specific methodologies are used for specialised projects which is incorporated within the generic risk management framework. Methods are defined to ensure that risk management performance is measured and	Both project and risk management data is quantitatively analysed, measured and stored. KPIs are defined and aligned to the strategic objectives of the organisation Risk management processes and continuously improved and performance optimized A partnership network exist external vendors and contractors to form risk management

Definition	Level 1 – Ad hoc	Level 2 - Initial	Level 3 - Defined	Level 4 - Managed	Level 5 - Optimising
			maintained The tools, templates and software tools used for quantitative analysis is well established	reported Integration exist with project management data and processes Post-project reviews are conducted and lessons learnt are captured Sophisticated software simulation tools are used for qualitative analysis	coalitions Good relationships with governance structures and executive authorities are leveraged Goodwill are cultivated with communities Risk management processes are integrated into project management processes Sophisticated tools exist to allow both quantitative and qualitative analysis ensuring consistent and uniform interpretation of risks across the organisation
Technology	Basic and narrow range technology are utilised Rudimentary risk assessments are being conducted on ad hoc projects	Mid-level proven technology is utilised Mid-range risk assessments takes place on bigger projects	More advanced but proven technology is utilised for risk assessments Risk assessments takes place on complex projects	Advanced but proven technology are utilised Risk assessments on complex projects with multiple systems and integration aspects are conducted	Risk assessments are conducted on advanced and innovative technology projects Risk assessments are conducted on large scale projects with multiple complex systems and interfaces Risk assessments takes place on complex projects with multiple risks

14.19. Macro-Economic Surveys as Input to Risk Lists

Labels	Green	Purple	Blue	Orange	Yellow
Explanation of Colour coding	Directly related to Innovation and /or introduction of NPSD	Regulatory	Financial risks	Technology and Infrastructure risks	Resource skills and human capital

Table 71: Example of Macro-economic global risks surveys

#	Conference Board CEO Challenges (2013)	PwC Annual Global CEO Survey (2015)	WEF Insight report – Global risks 2015	Global Risk Perception survey (2014) in terms of likelihood	PwC – 17th Annual Macro risk CEO survey (2014)	IRMSA (2015) Macro-risks in SA Likelihood
1	Human Capital	Over-regulation	Fiscal crisis in key economies	Interstate conflict	Availability of key skills	Corruption
2	Operational excellence	Availability of key skills	Failure of major financial mechanisms or institution	Extreme weather events	Bribery and corruption	Unemployment
3	Innovation (R&D)	Fiscal deficit & debt burden	Liquidity crisis	Failure of national governance	Uncertain or volatile economic growth	Infrastructure
4	Customer Relationships	Geo-political uncertainty	Oil price shock to global economy	State collapse or crisis	Exchange rate volatility	Political and Social instability
5	Global political /economic risks	Rising taxes	Prolonged neglect of critical infrastructure & its development needs	Unemployment or underemployment	Social unrest	Organised crime
6	Government regulation	Cyber threats	Greater incidence of environmentally related events	Natural catastrophes	Over-regulation	Cyber attacks
7	Global expansion	Consumer behaviours	Water crisis	Failure of climate-change adaptation	Lack of stability in capital markets	Financial mechanism
8	Corporate brand & reputation	Social instability	Failure of climate-change mitigation & adaptation	Water crisis	Government response to fiscal deficit & debt burden	Income disparity
9	Sustainability	Speed of technological change	Major esclation in organised crime & illicit trade	Data fraud or theft	Energy & raw material costs	Urbanisation
10	Trust in business	New market entrants	Large-scale terrorist attacks	Cyber attacks	Protectionist tendencies of national govts.	Data fraud
11			Violent inter-state conflict with regional consequences		Increasing tax burden	
12			Escalation of economic and resource		Inflation	

#	Conference Board CEO Challenges (2013)	PwC Annual Global CEO Survey (2015)	WEF Insight report – Global risks 2015	Global Risk Perception survey (2014) in terms of likelihood	PwC – 17th Annual Macro risk CEO survey (2014)	IRMSA (2015) Macro-risks in SA Likelihood
			nationisation			
13			Food crisis		New market entrants	
14			Pandemic outbreak		Changes to consumer spending & behaviour	
15			Profound political and societal instability		Inability to finance growth	
16			Breakdown of critical information infrastructure and networks		Inadequacy of basic infrastructure	
17			Escalation is large-scale cyber attacks		Supply chain disruption	
18			Massive incident of data fraud / theft		Improve the country's infrastructure	
19			Mismanaged urbanisation		Create a skilled labour force	

15. Appendix Six: Design Science

15.1. Risk Dashboard Problem Formulation

Table 72: Requirements of ISO 31000 for Risk Dashboard

Phase	Explanation
Communication and consultation	The dashboard should facilitate consultation with various stakeholders to make informed risk decisions as well as understand the impact of these decisions.
Establish the context	The external and internal environment in which the risk dashboard is presented should be considered to ensure alignment with objectives, processes, structure and strategy of the organisation. The context of the dashboard within the overall risk management process should be understood as well as the context of the P&S within which risk will be evaluated.
Risk identification	The dashboard should be based on a comprehensive risk universe from which risks should be identified that impact on the objectives of the P&S even if the source of risk is not under the control of the organisation.
Risk analysis	The causes and sources of risks should be considered as well as the consequences and likelihood.
Risk evaluation	The risk should be evaluated to determine the priorities that are required during the treatment of the risk. Only the highest priority risks needed to be highlighted in the risk dashboard.
Risk treatment	The dashboard should present risk treatment options for managing the risks.
Monitoring and review	The dashboard should make reference to effective and efficient implementation of controls, lessons learnt from events and monitoring processes.

15.2. DS Literature Risk Dashboard Review

The literature review that supports the development of the risk dashboard as DS artefact is subsequently discussed. Since the literature review mainly focus on innovation and risk, the researcher reviewed additional literature that could form the foundation for the development of the risk dashboard. The rest of this section describes the literature review that informed the dashboard development.

Markus *et al* (2002) developed a design theory for systems that support emergent knowledge processes (EKPs). Markus *et al* (2002, p.179) define EKPs as ‘organisational activity patterns’ that simultaneously display the following three characteristics” “an emergent process of deliberations with no best structure or sequence; requirements for knowledge that are complex (both general and situational), distributed across people, and evolving dynamically; and an actor set that is unpredictable in terms of job roles or prior knowledge”. NPD is an example of an EKP (Markus *et al* 2002).

As EKPs do not follow structured or semi-structured decision-making processes it has a unique requirement that cannot be effectively supported by familiar classes of systems like EIS. NPSD processes are firstly characterized as ‘emergent processes’ where Markus *et al* (2002) explains, “problem interpretations, deliberations and actions unfold unpredictably”. Secondly the users of the systems is also largely unknown as it is difficult to predict *who*, *why* and *how* users will be called upon to deliberate. The type of users is often high-level professionals and technical personnel who display a high degree of work autonomy and could resist standard routines that do not fit their style of working. It is therefore not possible for the designer to conduct a detailed requirements analysis as the professional might only infrequently utilise the tool, if at all.

The third factor that characterize 'emergent processes' are information requirements. Information requirements for emergent processes present four main challenges: (1) Information is difficult to obtain as the required information is presented in documents that are improperly indexed and stored; (2) Information is challenging to capture or share as the type of knowledge that is required is 'tacit, not explicit'; (3) Information cannot easily be numerically represented as the content contains a high-level of expert knowledge which can only be represented by text, cases or if-then-rules. Additionally the information needs to be understandable to non-expert users that are not familiar with jargon; (4) Knowledge could also be incomplete as it is distributed across many different resources in the organisation.

The challenges are explained below:

- ***Emergent process***: NPSD development is an emergent process even though a structured NPSD process can be followed. The deliberations and interpretations of the problem are largely dependent on who will attend the stage/gate meeting. For instance if the CRO attend the meeting, the discussion could potentially focus on compliance risks. If predominantly market professionals attend, they were likely to be concerned about marketing aspects. Similarly if the organisation is facing fierce competition at that stage, the highest priority will be to get the P&S to the market as quickly as possible. All of these considerations need to be considered in the risk dashboard.

- ***Users:*** The users who attend the stage/gate meetings are unpredictable. The responsible executives could not be able to attend a meeting and invite other representatives by forwarding meeting invites. Additionally the organisation restructures continuously. The one-week the senior executive will be responsible for marketing and the next week he is tasked with NPSD. One meeting will be attended by a number of high-level executives whilst only junior personnel will attend the next meeting. In the case that senior executives are present the junior employees will sometimes be reluctant to raise risks relating to their area. It is therefore the task of the risk professionals to ensure that these risks are presented.

- ***Information requirements:*** The same difficulties that Markus *et al* (2002) mention in terms of information requirements for 'emergent processes' are present for the development of the risk dashboard prototype. Information is difficult to find as it is stored in several documents including email communications and it is not always clear what the latest version or status is. Information is often of a 'tacit' nature, contains expert knowledge and is difficult to present. As so many different users are involved in NPSD, knowledge is distributed across many functional areas in the organisation, which can mean that information are contained in silos and are not shared.

The main IT requirements for EKPs according to Markus *et al* (2002) can then be summarized as (1) Inability to define specific user roles, not can it rely on training or motivational aspects to promote usage (2) Requirement to accommodate knowledge bases that are complex and evolving (3) The process that the EKP needs to support are unstructured and changes frequently.

Markus *et al* (2002) subsequently developed the EKP support system design and development principles that will be considered during the development of the risk dashboard prototype. The 6 principles are design for (1) customer engagement; (2) design for knowledge translation; (3) off-line action; (4) Integration of knowledge; (5) provide guidance; and lastly (6) componentise. The design of the dashboard will consider these 6 principles.

Further research was conducted to determine EIS principles for design. Marx *et al* (2011) provided six principles for designing EIS prototypes using a DS approach as follows: (1) Information model need to be comprehensive (2) Reduce information overload; (3) Interface must be easy to use; (4) A flexible architecture and data model; (4) Apply proper information management principles to ensure more accurate and consistent information (5) Use standard dashboard prototypes. The researcher felt that some of these principles could be useful to the development of the dashboard.

Immaneni *et al* (2004) developed a key risk indicator methodology that can be used for the successful implementation of KRIs using a structured six-step approach that uses Six Sigma tools. The steps were (1) Identify existing metrics (2) asses gaps (3) improve metrics (4) validate and determine trigger levels (5) design dashboard and (6) establish control plan. The methodology follows a traditional risk management approach of identifying metrics by interviewing subject matter experts.

The researcher also investigated risk literature for dashboard design. Eppler *et al* (2009) developed a systematic framework for risk visualizing in risk management which answers question of *why*, *what*, for *whom*, *when* and *how* and which kinds of risks and risk related information (*what*) should be visualized. This is demonstrated with the means of Figure , which is adapted from Eppler *et al* (2009) and subsequently discussed:

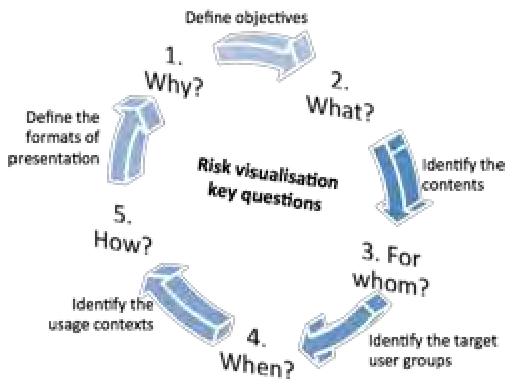


Figure 105: Key questions for risk visualisation framework (adapted from Eppler *et al* 2009).

1. *Why?* The objectives of the risk visualization should contain reference to a typical risk management process, including the framework and the risk management process.

2. *What?* Identification of the contents of risk visualisation based on which decisions need to be made and whether detailed information or overall patterns of information should be presented.

3. *For whom?* Identification of the different stakeholders and how they can benefit from the process.

4. *When?* Identify the specific contexts within which the risks will be presented as well as the main purposes and constraints.

5. *How?* Identification of the methods of risk visualization such as charts, qualitative or conceptual diagrams with the objective to encourage 'open and intense dialogues about risks'.

Eppler *et al* (2009) advises that risk visualization should be guided by clear rules and criteria to "minimise the change of misuse, misinterpretation, manipulation or ambiguity".

The researcher additionally researched best practices for dashboard development. Some of the newer research is added in this section. Table 73 provides risk dashboard guidelines based on principles in Gestalt theory as well as other guidelines by researchers. Gestalt theory explains how humans organise information and perceive patterns to understand it. This is useful information to apply in dashboard design as Few (2013) states that two of the biggest challenges during the design of dashboards is to consider (1) how to make most important data stand out and (2) how to arrange volumes of disparate in a sensible way that conveys the intended meaning to the audience.

Table 6 provides an overview of the major principles that could be used as guidelines during the dashboard design.

Table 73: Risk Dashboard Guidelines

Principles	Guidelines
***Proximity**	Bigger items are perceived to be more important and they attract more attention (Eppler *et al* 2009, Ware, 2004) Items in the centre of a graphic is more important than those on the periphery (Eppler *et al* 2009)
***Similarity**	Items place closed together are perceived to be similar or part of the same group (Eppler *et a*l 2009) Represent the same items with the same symbols and color and different things with other colors (Eppler *et al* 2009)
Simplicity	Do not overload diagram and eliminate unnecessary elements (Eppler *et al* 2009) Include graphics as it communicates information more efficiently and dashboard should fit on single screen (Few, 2006)
Value	The visualization should add value, by making risk easier to understand or asses and avoid unessential elements (Eppler *et al* 2009)
***Closure**	If the users is faced with visual stimuli that can be ambiguous in meaning users are more likely to perceive forms that are open, incomplete and unusual as closed, complete and regular (Few, 2006).
***Continuity**	Objects that are aligned or appear to continue appear to belong together (Card *et al* 1999: Few, 2006)
Enclosure	Objects belonging together can be shown as enclosed by either a border or a different background color (Few, 2013).
Connection	Objects can be perceived to be connected if a they are connected by a line (Few, 2013)

* Gestalt theory principles.

16. Appendix 7: Privacy

16.1. Data Protection in South Africa

Data protection affords a person legal protection when his or her personal information is processed by another person or institution, in a manner that can lead to privacy violations (unauthorised collection and disclosure of personal information) and identity theft (fraud). More than thirty countries worldwide have information protection statutes and the number is growing steadily. In the United Kingdom (Data Protection Act, 1998); Canada (Privacy Act 1983 and Personal Information Protection and Electronic Documents Act, 2000), Australia (Privacy Act, 1988 and The Privacy Amendment (Private Sector) Act 2000), New Zealand (Privacy Act 1993) and most European countries have data protection laws implemented.

In the old apartheid system South Africa, prior to 1996, 'privacy' received very little attention by the South African law. The right to privacy is protected in the South African Constitution where section 14 of the Bill of Rights of the South African Constitution, grants South African individuals the right to privacy, stated as "Everyone has the right to privacy, which includes the right not to have the privacy of their communications infringed".

After the Bill of Rights further legislation protecting privacy was fairly limited. The Regulation of Interception of Communication and Provision of Communication-related Information Act 70 of 2002 prohibits attempts at interception of communications whilst ensuring that telecommunication providers create critical databases that contain 5 years of archived information as well as the ability to intercept real-time communications. The Promotion of Access to Information Act 2 of 2000 (PROATIA) provides individuals with the right of access to records owned by a private or public body in order to exercise or assert their rights. The Financial Intelligence Centre Act, Act No. 38 of 2001 and the Financial Advisory and Intermediary Services Act protect personal financial information. The National Health Act protects personal medical information from unauthorised use or disclosure.

Act No. 25, 2002 Electronic Communications and Transactions Act (ECT Act) was passed in august 2002. The objective of the Act was to facilitate consumer and business use of electronic commerce by increasing customer confidence that they will be treated fairly and that their personal information will be safeguarded. The Act specifies consumer rights in terms of access to 18 specific pieces of information that is provided by the organisation, reviewing, correction and withdrawing from transaction, the right to transact with a secure website, right to cooling off period, receiving ordered products within 30 days of the transaction and regulations regarding unsolicited marketing. Although Chapter XIII dealt with the protection of personal information in electronic format, the principles were voluntary and very few organisations subscribed to the principles however South African common law developed to such an extent that data protection was recognised (Buys Inc. Attorneys, 2006).

Other laws and reports that deal with the protection of privacy include the King I (1994), II (2002) III (2009) Report on Corporate Governance that stipulates that the company board is responsible for safeguarding company assets and compliance with applicable laws and regulations. South African law, doctrine of 'vicarious liability': Employers are liable for the acts of their employees when performed during the course and scope of employment which means that organisations could be liable if workers' defame, harass or invade the privacy of customers. The Consumer Protection Act, No. 68 of 2008 (CPA) is intended to promote a fair, accessible and sustainable marketplace for consumer P&S. It provides standards to protect customers, prohibit unfair marketing and business practices. The CPA affords South African consumers with eight rights of which the second right is the 'right to privacy'. CPA's right to privacy specifically refers to the right to restrict unwanted direct marketing and unsolicited correspondence and to discontinue receipt of direct marketing at any time. It also establishes the right to disclosure of information where contracts need to be easily understandable. Despite these and developments in common laws, South Africa still lacked clear data protection principles similar to those provided for in EU Data Protection Directives (Buys Inc. Attorneys, 2006).

Benefits existed to early compliance with PoPI. Consumer confidence is increased as PoPI promotes transparency regarding what information is gathered and how it is processed. Database reliability will be increased, as PoPI requires that a minimum amount of data be captured, that it should be accurate and removing data that is no longer necessary. Reduce risk of non-compliance can be reduced by taking reasonable steps to protect personal information and reducing the risk of data breaches and the associated negative impact on public relations. So there were some opportunities that the risk practitioners also needed to consider.

16.2. Privacy

Overviews of the particular privacy challenges that are faced within the NPSD environment are presented. Table 7 demonstrates some of the privacy risks that the individual faces. The researcher adopted Smith's et al. (1996) literature review utilising the privacy dimensions and descriptions and supplemented it with an example as indicated below.

Table 74: Adapted from Smith et al (1996) literature review of privacy dimensions

Dimension	Description	Example
Collection	Collection of extensive amounts of personally identifiable data and storage within databases	Data is collected that is not necessary for the fulfilment of the service such as demographic gender data.
Unauthorised secondary use (internal)	Concern that information is collected from individuals for one purpose but used for a secondary purpose (internally within the	'Sugging' is a practice where data are collected for research only to be used later for marketing purposes.

Dimension	Description	Example
	organisation) without authorisation from the individuals.	
Unauthorised secondary use (external)	Concern that information is collected for one purpose but is used for another secondary purpose after disclosure to an external party (not the collecting organisation)	Sale of PI for 'mailing lists' for direct marketing
Improper access	Concern that data about individuals are readily available to people not properly authorised to view or work this data	People within the organisation who are able to access information contravening organisational policies such as an employee that moved from one department to another still having access to unauthorised information due to the access of the previous system not being revoked.
Errors	Concern that protections against deliberate and accidental errors in personal data are inadequate.	Reluctance to delete old data leading to incorrect information displaying on bills or erroneously billing the wrong subscriber
Reduced judgment (tangential)	Concern that automation of decision-making (application of formula's and rules) processes may be excessive and that mechanisms for decoupling from automated decision processes (reverting to human controls) may be inadequate	Analysing data to detect fraud patterns and automatically suspending service without giving the subscriber the opportunity to verify that it is not fraud.
Combining data (tangential)	Concern that personal data in disparate databases may be combined into larger databases creating a 'mosaic effect'	Providing free vouchers via an online environment and combining it with browsing information as well as usage information from the shop where the voucher is redeemed.

16.3. Model for Information Privacy

Previously privacy discussions were restricted within the domain that exists between the organisation and the customer (Cheung *et al* 2005). This is however not the case anymore, as information privacy is expanded to include several different parties which interacts within 'networks of relationships' (Conger *et al* 2013). This expanded privacy model adapted from Conger *et al* (2013) as showed in Figure 16, serves as a good foundation for discussion of the organisation's privacy milieu. The four main elements or parties central to the privacy discussion (as showed in Figure 106) are subsequently discussed.

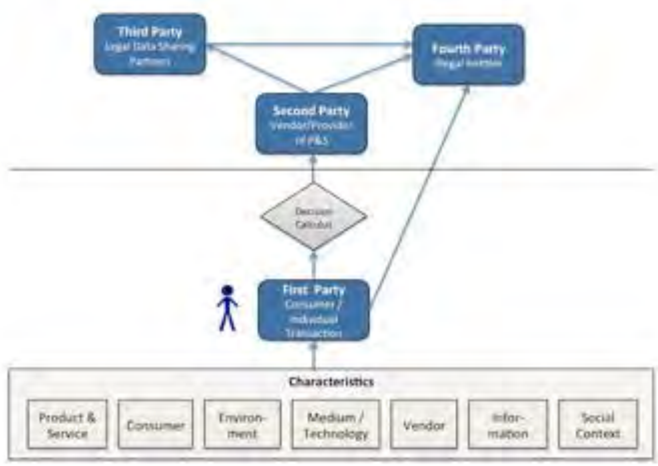


Figure 106: Expanded privacy model (Slightly adapted from Conger et al. 2013)

First parties: The first parties are the individuals with the personal information (PI) that are considering engaging with a known second party (the organisation) who is providing the P&S. The first party conduct an assessment of whether the information requested is reasonable which makes the individual willing to forsake a level of privacy to obtain the benefits of the P&S (Pratt et al 2009). These are indicated by Conger *et al* (2013) as the 'decision calculus' based on the criteria indicated in Figure 16 that includes the characteristics of the P&S, the consumer, the environment, the medium etc. Xu *et al* (2013) refer to the context sensitivity of privacy, stating that the following questions should be applied: " 'for whom' and 'from whom', 'about what' 'for what reasons', 'under what conditions' and 'for what kinds of social roles and relationships'. The first party individual will modify the 'decision calculus' if he or she becomes aware that the organisation is sharing information with other parties or that additional identifying information (like 'click streams') is collected (Tsai *et al* 2011).

Second parties: These are the vendors, providers and organisations that provide the P&S at a specified price. The individual assumes that PI that are collected relate only to the business transaction but often data is collected during the transaction and combined with other data to enable the building of a consumption history, which might even be used for discriminatory practices, such as denial of insurance (Conger *et al* 2013). The difference between history and profile information is that a profile infers behavior on psychographic and demographic trends whilst history discloses actual life activities (Conger *et al* 2013). One of the characteristics that influence the first party's decision to provide PI is the type of medium. Emerging technologies like RFID, GPS, nano-technologies and bio-organisms pose major threats to privacy due to what the OECD (2007) term as their "ubiquity, invisibility, invasiveness, collectability of heretofore uncollectible information, programmability and wireless network accessibility".

Third parties: The organisation will also share data with third parties. The first scenario is where data is made available to a legal third party to ensure that the P&S is fulfilled. The second scenario is where data is made available to a third party not to fulfill the obligations of the transaction but specifically for profiling and marketing purposes, which can also be bounded with a legal agreement. The third scenario is where data is gathered without the permission of the individual such as tracking of click streams, which are aggregated with other lifestyle type information (Tsai *et al* 2011). The fourth scenario is where data is shared in compliance with other laws and regulations as with government agencies for matters of national security. The main paradox is maintaining a balance between the individual's right to privacy and the organisations imperative to guarantee economic growth by utilising the data to obtain a better understanding of their customers (Conger *et al* 2013).

Fourth parties: Fourth parties include illegal entities such as hackers, criminals and third party employees who violate company policies. Another key trend that is impacting on privacy is 'hacktivism', hacking fused with activism (Conger *et al* 2012). Fourth party risks should not only consider illegal entities but also data loss that could occur due to poor information security management. An example is Sony who lost over 100 million consumer records during hacks that took place 40 times since 2002. The effectiveness of preventative approaches to reduce privacy threats and protect PI is still unclear (Xu *et al* 2013). Preventative approaches include implementation of technological controls, organisational access and use policies, implementation of privacy-enhancing technologies.

16.4. Requirements of PoPI

The purpose of PoPI is to protect the constitutional right to privacy of South Africans by safeguarding personal information when processed by a responsible party. A responsible party means a public or private organisation or individual who determines the purpose and means of processing personal information (PI).

What is personal information according to PoPI? PI excludes information about an individual who has been diseased for more than 20 years but includes (but is not limited to) the following types of information as explained below.

Table 75: What is Personal Information (PI) according to PoPI

Provision	Explanation	Practical application of the legal definitions (Buys Inc. Attorneys, 2006)
Demographic Information	Race, gender, sex, pregnancy, marital status, national, ethnic or social origin, colour, sexual orientation, age, physical or mental health, well being, disability, religion, conscience, belief, culture, language and birth of the person	Birth certificate, marriage certificate, ID document, driver's license
Historic information	Information that relates to education, medical, financial, criminal or employment history of a person	Matric certificate, academic marks, CV, academic achievements, qualifications; Health status, HIV status and medical
Contact details	Any identifying number, symbol, email address, physical address, telephone number, location information, online identifier or a particular assigned to the person (such as an MSISDN which is a cellphone number).	ID number, voter registration number; Home and work address (postal en street); Email address, IM address, Skype username, telephone number and fax number; Bank account number; credit card number; usernames and passwords.
Biometric information	The biometric information of the person	Fingerprint recognition, voice biometrics, blood type
Private correspondence	Personal opinions views and preferences of the person; correspondence that is of a private or confidential nature or further correspondence that would reveal the contents of the original correspondence. The views or opinions of another individual about the person. The name of the person if it appears with other PI relating to the person (such as a second contact in the case of an emergency).	Private emails, IM messages, telephone calls

The responsible party (RP) ensures that PI is processed lawfully and in a reasonable manner that does not infringe on the privacy of the data subject. The data subject (DS) is a person to whom the personal information relates. Once PI is collected, some type of processing occurs. In terms of PoPI, information processing is described as any operation or activity (whether or not by automatic means) that uses personal information (PI) including collection, receipt, recording, organisation, collation, storage, updating, modification, retrieval, alteration, consultation, use, dissemination by means of transmission, distribution or making available in any other form, merging, linking, blocking, degradation, erasure or destruction.

There are 8 major principles that are introduced by the PoPI Act. These principles directly relate to the OECD eight principles on the protection of privacy (Department of Communications, 2000), namely use limitation, purpose specification, processing, information quality, openness principle, individual participation, accountability and security safeguards. These concepts are explained in Table 76.

Table 76: PoPI Major Principles

Principles	Explanation
Use Limitation	PI should not be disclosed or used for any other purpose other than originally specified, except with the consent of the data subject or by the authority of law. Limit processing as much as possible and only process as much information is needed and retains it for no longer than necessary.
Purpose Specification	Data should be collected by lawful and fair means, with the consent of the data subject. The purpose for the collection of data should be specified at time of collection. The purpose for which is information is processed should be specified and PI can only be processed for a specific purpose.
Processing	The original purpose of processing information should be considered before passing on information or conducting any further processing activities.
Information Quality	PI should be relevant to the purpose for which it is used and should be accurate, complete, relevant and up to date.
Openness Principle	Clear communication should be provided regarding why the information is dealt with and who sees it.
Individual Participation	An individual has the right to find out what data exist about him or her and change the data. The data subject should be permitted to participate and access their PI and request updates and changes.
Accountability	The party that determines the purpose and means of processing is ultimately responsible. The organisation should be held accountable for compliance with these principles.
Security Safeguards	Take reasonable measure to protect the PI and ensure that good technology security practices are applied. PI should be secured against risk of loss, unauthorised access, destruction, use modification and disclosure.

In addition to these principles, PoPI states a number of requirements. Only those that could impact on P&S are listed below in Table 8 as shown in the Appendix. Table 8 does not contain all of the requirements of PoPI as there would be as many as a 1000 requirements stipulated in the PoPI Act. The provision, explanation and the specific requirement as it relates to the P&S are indicated in Table 77.

Table 77: Requirements of PoPI

Number	Provision	Explanation	Requirements for P&S
1	*Lawfully*	PI must be processed lawfully and reasonably so as not to infringe on privacy of data subject	Compliance to laws and regulations
2	*Minimality*	PI must be processed for the purpose for which it is collected and be adequate, relevant and not excessive	PI must be used specifically for the P&S
3	*Consent*	PI may only be processed if the data subject consents to processing If processing is necessary in terms of a contract Processing is obligated by law imposed on responsible party Processing protects a legitimate interest of the DS Processing is necessary for pursuing the legitimate interest of the RP or the third party to whom the information is supplied RP must bear the burden of proof for the data subject consent	Customer must consent to processing or it must be due to contractual obligation or compliance or protecting the legitimate interest of the RP. Consent must be recorded in IT systems.

Number	Provision	Explanation	Requirements for P&S
4	*Justification*	The DS might withdraw consent	Effective opt-out mechanism
5	*Objection*	A DS might object at any time to the processing of PI To receive direct marketing communications In the case of an objection the RP may no longer process the information	P&S division process to deal with objections linked to Org overall process
6	*Collection directly from data subject*	PI must be collected directly from the DS, except if such data is a public record or has been deliberately made public by the data subject Collection from another source would not prejudice the DS legitimate interests such as in the interest of law enforcement or another public body or to maintain the legitimate interest of the RP or a third party to whom the information is supplied	PI must be collected from the DS or if provided by another source, evaluated whether it would prejudice the DS interests
7	*Purpose specification*	PI must be collected for a specific purpose which is explicitly defined and the DS must be aware of the purpose of collection of information Purpose must relate to function or activity of responsible party	The purpose of collection should relate to the specific P&S and purpose should be advised to PI
8	*Retention*	PI must not be retained any longer than is necessary for achieving the purpose for which information is collected and processed Records of PI can be retained for historical, statistical or research purpose if the RP has established appropriate safeguards against the records being used for another purpose The RP that has used a record to make a decision about a data subject must retain the record as required by law or code of conduct or for a reasonable period, which will allow the data subject to request access to the record. The responsible party must delete or de-identify the record after it is no longer authorised to keep it.	Establish purpose and retention period and technology security safeguards. Records must be deleted or de-identified in a manner that prevents reconstruction.
9	*Restriction*	The RP must restrict processing of PI: - If accuracy is contested by the data subject for a period that will allow the responsible party to verify the information - If data subject request to transmit the personal data into another automated processing system - Data subject can request the restriction of its use PI must only be processed for purposes of proof such as consent Responsible party must restrict processing if information is no longer needed and data subject contest accuracy and the data subject must be notified before restriction is lifted	Queries by data subjects need to be effectively addressed and corrected
10	*Further processing*	Further processing of information must be compatible with the purpose for which it was collected by considering: - The relationship between the purpose for which the information was collected and the purpose of further processing of information - The nature of information concerned - Any consequences of further processing for the data subject - The manner in which information is collected - Contractual rights and obligations between parties Further processing can be used for historical, statistical or research purposes solely for these purposes and will not be published in identifiable form	Purpose of collection and processing should reconcile
11	*Information quality*	RP must take reasonable practical steps to ensure that PI is complete, accurate, not misleading and updated where necessary The responsible party must consider the purpose for which PI is collected or processed	Ensure information accuracy
12	*Openness: Documentation*	Responsible party in terms of Promotion of Access to Information Act (PROATIA) must maintain documentation.	Ensure compliance to PROATIA
13	*Openness:*	RP must take reasonable practical steps to ensure that the DS is	Notify the DS of information

Number	Provision	Explanation	Requirements for P&S
	Notification to DS when collecting PI	aware of: - What information is collected - Where information is not collected - The source from which information is collected - The name and address of RP party - Purpose of collection - What information is voluntary or mandatory - The consequences of failure to provide the information - RP intends to transfer the information to a third country or international organisation and the level of protection afforded by the 3rd country or international organisation. - Any further information such as the recipient or category of recipients, nature or category of information. - Existence of the right to access, object and rectify the information collected and log a complaint to the Information Regulatory Notify the DS before information is collected of collection, source and reason and laws that govern collection. Notification is not necessary if data is used for historical, statistical or research purposes or if the DS cannot be identified.	collection practices and cross border data transfer
14	*Security safeguards: Ensuring integrity and confidentiality of PI*	RP must take appropriate, reasonable technical and organisational measures to prevent: - Unlawful access and processing of PI - Loss, damage or unauthorised destruction of PI RP must take reasonable measures to - Identify reasonably foreseeable internal and external risks - Establish and maintain appropriate safeguards against the risks identified - Regularly verify that safeguards are effectively implemented - Regular update of safeguards in response to new risks or deficiencies in previously implemented safeguards. RP must conform to generally accepted IS security practices and procedures or professional rules and regulations	Build in technology security safeguards
15	*Security safeguards: Information processed by operator*	An operator that processes PI on behalf of the PI must: - Only process information with authorisation and knowledge of RP - That PI should be treated as confidential and cannot be disclosed	Identify operators that process information and establish compliance
16	*Security safeguards: Security measures by operator*	The RP must in terms of a written contract ensure that operator maintain security safeguards to ensure integrity and confidentiality of PI The operator must notify the RP immediately where there are reasonable ground to believe that unauthorised access to PI has taken place	Ensure operators comply to technology security safeguards
17	*Security safeguards: Notification of security compromises*	Where there are reasonable ground to believe that unauthorised access to PI has taken place, the RP must notify the: - Regulator - The data subject unless the identity of the DS could not be established The notification must be made as soon as possible considering the law enforcement agency (LEA) requirements and measures to restore the integrity of the RP information system and may only be delayed on request of a law enforcement agency The notification to DS must be in writing and communicated in one of the following ways: - Mailed to DS last known physical or postal address - Sent by email to DS last known email address - Placed in a prominent position on website of responsible party - Published in news media	Process and documentation for notification to Regulatory, LEA, DS and public (website). Content should be specific. A process should be implemented in P&S that link to the overall organisation processes.

Number	Provision	Explanation	Requirements for P&S
		- As directed by Regulator The notification must provide sufficient information to allow the DS to take proactive measures against the potential consequences: - A description of the possible consequences of the security compromise - A description of the measures that the RP intends to take or has taken to address the security compromise - Recommendation to DS with regard to measure to be taken by data subject to mitigate impact of security compromise - If known, the identify of the unauthorised person who may have accessed the information The Regulator may direct a RP to publicise the compromise in a specified manner if the Regulatory has reasonable ground to believe that such publicity would protect a data subject affected by the compromise.	
18	*Data subject participation:* **Access to PI**	A data subject who provide adequate proof of identity has the right to: - request the RP to confirm, free of charge whether or not the RP holds PI about the DS - Request the record or description of the PI - All third parties or categories of third parties who have or had access to the information The information should be provided within a reasonable time, at a prescribed fee, in a reasonable manner and format, in a form that is generally understandable The RP must advise DS of their right to correct information In case of the RP charging a fee, a written estimate of the fee must be provided, a deposit can be paid for all or part of the fee	P&S organisation must be able to handle DS requests for access to information
19	*Data subject participation: Correction of PI*	A DS may request a RP to: - Correct or delete PI that is inaccurate, irrelevant, excessive, out of date, incomplete, misleading or obtained unlawfully - Destroy or delete a record which the RP is no longer authorized to use (if the purpose expired) The RP must as soon as reasonably practical correct, destroy or delete the information and provide the DS with credible evidence in support of this information If agreement cannot be reached, the DS can request that the information is labeled that a correction has been requested but has not been made. The manner of access is regulated in terms of section 23 of the PROATIA Act.	P&S organisation must be able to correct or delete PI that is inaccurate or unauthorised
20	*Special PI: prohibited & general authorisation*	A RP may not process PI (unless consent has been given and processing is for historical, statistical or research purposes which will not impact on the individual's right to privacy) or it is required by law unless - Religious and philosophical beliefs may be processed by the spiritual or religious organisations - Race or ethnic origin may be processed unless it is essential to comply with laws designed to protect or advance persons or categories of persons - Trade union membership may be processed by a trade union but not be supplied to third parties without consent of data subject - Political persuasion may be processed by an organisation of an institution founded on political purposes but not supplied to third parties without consent. - Health or sex life may be processed by medical professionals, healthcare institutions, insurance companies, schools, public or private body that manage the care of a child. Information may only be processed	P&S should take additional precautions when special PI is requested and the P&S that deals with these types of information need to be re-assessed.

Number	Provision	Explanation	Requirements for P&S
		- subject to an obligation of confidentiality established by a written agreement. - Criminal behaviour or biometric information may be processed by LEA	
21	*Special PI: Children*	Prohibition on processing of PI of children do not apply if processing: - Is carried out with the prior consent of the a competent person - Is required by law - For historical, statistical or research purposes that serve a public interest and sufficient guarantees are provided to ensure that processing do not adversely impact on the privacy of the child The Regulatory might impose that the RP must provide means to review the PI and refuse further processing and provide notice regarding the nature of PI of children that is processed, how and particulars about processing practices. The RP should refrain from encouraging the child to disclose more PI about themselves that is reasonably necessary given the purpose and establish reasonable procedures to protect the integrity and confidentiality of PI collected from children.	Prior consent of a competent person should be obtained if children's PI is processed
22	*Information officer*	Duties and responsibilities of Information Officer is to encourage compliance to lawful processing, deal with requests made by body pursuant to act and working with the Regulator in terms of investigations. Deputy information officers might be appointed and delegated to for this task. Information Officer must be registered and appoint deputy information officers	A deputy information officer should be appointed in P&S organisation
23	*Prior authorisation*	RP must obtain prior authorisation to process: - Any unique identifiers of DS for a purpose other than was intended at collection; - Linking information together with information processed by other responsible parties - Process info on criminal behaviour or unlawful conduct on behalf of third parties - Process info for the purposes of credit reporting - Transfer special personal information or personal information of children to a third party in a foreign country that does not provide an adequate level of protection for the processing of PI A RP must obtain prior authorisation only once, except if processing departs from what has been authorized. RP must notify the Regulatory if processing is subject to prior authorisation and may not carry on processing until the Regulator has provided notification within 4 weeks and if a detailed investigation is conducted it must not exceed 13 weeks. If a RP has not received the Regulator's decision within prescribed timeframes may presume a decision in favor and continue with processing.	Additional authorisation is required for consolidating information from other sources or transfer of children information to a foreign country
24	*Code of conduct*	The Regulator might issue a code of conduct for an industry, that will be published in the Gazette and procedure for dealing with complaints	P&S need to adhere to code of conduct
25	*Direct marketing by unsolicited electronic communications*	The processing of personal info for the purpose of direct marketing by any means of electronic communications is prohibited unless: - has given consent to the processing - is a customer of the RP - the customer who has nor previously withheld consent only once to request consent A RP may only process the info of a customer for direct marketing: - if the contact details were obtained in the context of the sale of a P&S - For the purpose of direct marketing of the RP own similar P&S	For marketing purposes only similar P&S can be marketed but DS should be allowed to opt-out of marketing (with contact details)

Number	Provision	Explanation	Requirements for P&S
		- If the DS are given a reasonable opportunity to object , easily and free of charge. Any communication for the purpose of direct marketing must contain: - details of the identity of the sender on whose behalf the communication has been sent - An address or other contact details to which the recipient may send a request for communication to cease	
26	*Directories*	A DS who is subscribed to a printed or electronic directory must be informed free of charge before the information is enclosed in the directory, about the purpose of the directory and any further use to which the directory may possibly be utilised. DS must be able to object or request confirmation. This does not apply to directories that were printed off-line before PoPI.	Establish if P&S have directory service type products and impact
27	*Automated decision making*	DS might not be subject to a decision which has legal consequences or impact on him or her substantially, based solely on the basis of automated processing of PI including performance at work, creditworthiness, reliability, location, health, personal preferences or conduct, unless governed by law and unless an opportunity is provided to the DS to make alternative representations and provide the DS with sufficient information describing the underlying logic of the automated processing	Establish if any automated decision-making take place and what underlying logic is
28	*Transborder Information Flows*	A RP in the Republic may not transfer PI to a third party who is in a foreign country unless - the third party who is the recipient is subject to a law, binding corporate rules which provides an adequate level of protection - Effectively uphold principles for reasonable processing of information that is substantially similar to conditions for lawful processing of PI - The DS consents to transfer - The transfer is necessary for the performance of a contract between the DS and RP - The transfer is to the benefit of the DS and it would not be reasonably practical to obtain consent and if it were practical consent would likely be given Binding corporate rules means PI processing policies which is adhered to by the responsible party or operator within that same group of undertakings in a foreign country	Information that is transferred to shareholder and other operators need to be assessed.
29	*Complaints*	Any person may submit a complaint to the regulatory that can be addressed in a number of actions but also lead to the issue of warrants	Advise NPSD organisation

Then the principles and requirements of PoPI were translated into a set of requirements for implementation in NPSD. Some of the implementation checklist requirements was sourced from Werksman (2012) but expanded by the researcher to fit the requirements of the organisation. The PoPI Act prescribes *what* should be provided but not *how* so the purpose of Table 78 are to map PoPI requirements as stated in Table 77: Requirements of PoPI into an implementation checklist.

Table 78: Implementation Checklist for PoPI

Implementation checklist (Werksman, 2012)	Explanation	Source
**Compliance to laws and regulations*	Determine the overlap between PoPI and other laws like NCA, CPA, PAIA, and record retention laws and future codes of conducts issued by the Regulator	1, 12, 24
Audit the processes used to	The integrity and safekeeping of PI should be considered if under the control of P&S and	8

Implementation checklist (Werksman, 2012)	Explanation	Source
collect, record, store, disseminate and destroy PI	the necessary steps must be taken to prevent information from being lost, damaged or unlawfully accessed.	
Define the purpose of information gathering and processing	PI must be collected for a specific, explicitly defined and lawful purpose that is related to a function or activity of the organisation concerned	2, 7, 20
Limit the processing parameters	The processing must be lawful and PI may only be processed if it is adequate, relevant and not excessive given the purpose for which it is processed. It must also be collected directly from the DS except if a public record.	6, 9, 20
Take steps to notify the data subject	The individual whose information is being processed has the right to know this is being done and why. The data subject must be told the name and address of the company processing the information. In addition, he or she must be informed whether the provision of the information is voluntary or mandatory.	3, 4, 13, 23, 26, 27
Check the rationale for any further processing	If information is received via a third party for further processing this further processing must be compatible with the purpose for which the data was initially collected.	10
Ensure information quality	The information must be complete, accurate, up to date and not misleading	11
Notify the Information Protection regulator	When PoPI is enacted and the Regulator is established, the Regulatory will have to be notified of actions taken by the organisation as well as information breaches. Information officer and deputy information officers to be appointed.	17, 22, 23
Accommodate data subject requests	Data subjects can make requests free of charge such as the identity of all third parties who have had access to their information and a record of the information.	5, 18, 19
Retain records for specific periods	PI must be destroyed, deleted or de-identified as soon as the purpose for collecting the information has been achieved. However, a record of the information must be retained if an organisation has used it to make a decision about the data subject. The record must be kept for a period long enough to allow the data subject to request access to it	
Cross border data transfer	Restrictions exist on the sending of PI out of SA and the transfer of PI back into SA. The applicable restrictions will depend on the laws of the country to whom the data is transferred or from where the data is returned.	28
**Technology IS/IT*	Opt-in and opt-out for consent and withdrawal of consent for a particular P&S or for direct marketing. Proof of consent need to be maintained by the organisation. Build consent for competent persons that act as guardians of children. Reasonable and appropriate technical and organisational measures to be instituted to protect against unlawful access and processing of PI as well as loss, damage or unauthorised destruction. Conduct risk assessments and generally accepted IS security practices and procedures.	3, 4, 5, 14
**Operators*	Contractual obligations of operators that process information on behalf of RP to only process information with authorisation and knowledge and treating PI as confidential. It must be a written contract that ensure that minimum safeguards exist to ensure integrity and confidentiality of PI and the operator must inform the RP immediately if there are reasonable grounds where unauthorised access to PI has taken place	15, 16
**Special PI*	Processing of special PI only if consent is given or in the case of children is carried out with prior consent of competent person and then information processing should be limited	20, 21
**Direct marketing*	If consent or marketing of similar P&S only once, must have opt-out	25

- Added by researcher.

16.5. Policy Compliance to PoPI

Table 79 provides an overview of the organisations existing policies and compliance elements as it relates to NPSD that should be evaluated and updated to accommodate PoPI.

Table 79: PoPI Policy Compliance

Policies / Principles	Contractual consent	Data privacy	Records Management	Operator contracts	**Employee awareness	P & S T&Cs	Website privacy policy	IT Security policies	IT Security controls	#Technology & Policy Audits
Use limitation	☐	☐	☐	☐	☐	☐	☐			☐
Purpose specification	☐	☐	☐	☐	☐	☐	☐			☐
Processing	☐	☐	☐	☐	☐	☐	☐			☐
Information Quality		☐	☐	☐	☐		☐	☐	☐	☐
Openness	☐	☐	☐	☐	☐	☐	☐			☐
*Accountability	☐	☐	☐	☐	☐		☐	☐	☐	☐
Technology safeguards		☐		☐	☐		☐	☐	☐	☐
Individual Participation	☐	☐	☐	☐	☐	☐	☐			☐

Additions to Principles:

* Added accountability to principles as PoPI indicates that the organisation that determines the purpose and means of processing is ultimately responsible for all privacy compliance elements.

Additions to Policies:

** ‘Employee awareness’ was added to policy compliance. Employee awareness is key preventative element as the Verizon data breach report (2013) found that insider-driven data breach incidents has increased since 2009 by 14% and seven out of ten security incidents were caused by insider carelessness, though the intent was not necessarily malicious (Parizo, 2013). It is for this reason that the researcher included employee awareness as part of PoPI compliance.

Technology and policy audits were also added as COBIT (2003) states that auditing is required to ensure that information maintains its integrity. Audits utilise policies as baselines from which to perform audits (Fraser, 1997). It is important to demonstrate adherence to the prescribed security policies as PoPI refers to a total governance framework to protect PI.

16.6. PoPI Matrix for Treatment of Personal Information

Table 80: PoPI matrix for collection and processing of Personal Information

TYPES OF PI	PERSONAL INFORMATION PROCESSING ACTIVITIES									
	Collection		Processing							
	Collection	Record transactions	Profiling of service	Data mining	Marketing / campaigns	Marketing non-related service	Distribution to external party	Profiling by third party	Merging	Cross-border transport
PURPOSE FOR COLLECTION AND PROCESSING Consider the purpose for which information is collected and whether processing is compatible to purpose for collection										
Purpose	PI essential to provide service / communicate via SMS / Big data	Improve org / Identify analyse service faults/ Record transactions for billing purposes	Improve P&S & identify target markets / identify known patterns & percentages	Trends analysis / explore trends / under-stand buying power and demo-graphics	Advertise similar P&S than the one's the customer is already using	Obtain new customers	3rd party deliver P&S Big data profiling org	3rd party profile PI Profiling by third party	Under-stand demo-graphics better / improve service	Delivery of service Delivery of profiling and process-sing of info
Pre- Requirements	Consider PoPI 8 principles, T&Cs, privacy policy, contract	Consider PoPI 8 principles, T&Cs, privacy policy	Communicate purpose, T&Cs, privacy policy	Communicate purpose, T&Cs, privacy policy	Opt-out of marketing free of charge, T&Cs, privacy policy	Only if opted in to a marketing DB	Contract / PI clauses/ PI due diligence, T&Cs, privacy policy	Contract / PI clauses/ PI due diligence, T&Cs, privacy policy	Communicate upfront and purpose / opt-out, T&Cs, privacy policy	Communicate country protect-tion level, T&Cs, privacy policy
PERMISSION MATRIX Consider which types of permission will be suitable for the service, considering the type of service, data, information protection activities, operators involved in NPSD process as well as transborder flow of data										
Social media	Opt-in, Commu-nicate purpose	Opt-in, Commu-nicate purpose	T&Cs, privacy policy	T&Cs, privacy policy	T&Cs, privacy policy	T&Cs, privacy policy	Commu-nicate upfront / opt-out	Commu-nicate upfront / opt-out	Commu-nicate upfront / opt-out	Commu-nicate upfront / opt-out
Demographic	Opt-in, Commu-nicate purpose	Opt-in, Commu-nicate purpose	T&Cs, privacy policy	T&Cs, privacy policy	T&Cs / Opt-out of marke-ting	Opt-in to marke-ting DB / Opt-out / contact once	Commu-nicate upfront / opt-out	Commu-nicate upfront Opt-out	Commu-nicate upfront Opt-out	Commu-nicate upfront / opt-out
Browsing group	Opt-in, Commu-nicate purpose	Opt-in, Commu-nicate purpose	T&Cs, privacy policy	N/a Person not iden-tified / T&Cs	N/a Person not iden-tified / T&Cs	N/a Person not iden-tified / T&Cs	Commu-nicate upfront / opt-out	Commu-nicate upfront Opt-out	Commu-nicate upfront Opt-out	Commu-nicate upfront / opt-out

TYPES OF PI	PERSONAL INFORMATION PROCESSING ACTIVITIES									
	Collection		Processing							
	Collection	Record transactions	Profiling of service	Data mining	Marketing / campaigns	Marketing non-related service	Distribution to external party	Profiling by third party	Merging	Cross-border transport
Browsing individual	Opt-in, Commu-nicate purpose	T&Cs, privacy policy	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Opt-in to marke-ting DB / Opt-out / contact once	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out,	Commu-nicate upfront / opt-out
Location	Opt-in, Commu-nicate purpose	T&Cs, privacy policy	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Opt-in to marke-ting DB / Opt-out / contact once	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Opt-in, Commu-nicate / Opt-out	Commu-nicate upfront / opt-out
Children	Prior consent by guardian or competent person / advise nature of PI collected and processed		PROHIBITION ON FURTHER COLLECTION OF INFORMATION Prior consent by guardian or competent person for any profiling Inform nature of processing and disclosure to third parties and cross-border flows Marketing – obtain consent and full disclosure of marketing activities							
Sensitive PI	DO NOT COLLECT / PROHIBITED (Includes religious / philosophical / race / ethnics /health / sex life) Unless acting as processor on behalf of organisation allowed to collect and process (subject to an obligation) Can be processor to medical professionals, religious institutions etc.									

16.7. Cloud Computing Privacy Concerns

PoPI specifies that reasonable and appropriate technical and organisation measures should be instituted to protect information against unlawful access and process of Personal Information (PI) as well as loss, damage or unauthorised destructions. The next section provides an overview of what risk assessments can be conducted and what are generally accepted IS security practices and procedures related to cloud computing.

Security issues related to Cloud

Cloud computing are increasingly becoming more popular, but considered to be exposed to many security risks (Zissis *et al* 2012, CSA, 2009). Until these risks are better understood, many organisations are withholding engagement of cloud computing (Viega, 2009). This section will try and clarify the security challenges that are faced by cloud computing solutions. Firstly a background needs to be provided of the complexity of security risks in cloud computing. This is illustrated with the assistance of Figure 107. Figure 107 is slightly adapted from Subashini *et al* (2011) who used National Institute of Standards and Technology (NIST) visual model of cloud computing definition as basis to explain the risks associated with cloud computing (NIST 500-292, 2011). Starting at the bottom of Figure 20, four deployment models exist for cloud computing solutions as explained by Zissis *et al* (2012):

- *Private cloud*: The cloud is implemented for the purpose of the organisation, managed by the organisation or a third party and the cloud infrastructure is based on or off the premise of the organisation.

- *Community cloud*: A specific community of organisations with shared interests shares the infrastructure, which may be managed by the organisations or a third party. The cloud infrastructure could be based on or off the premise of the organisation.

- *Public cloud*: The cloud infrastructure is owned by an organisation that sells cloud services to the general public or to other businesses.

- *Hybrid cloud*: Combines two or more of the abovementioned deployment models that are bound by proprietary technologies but remain distinct entities.

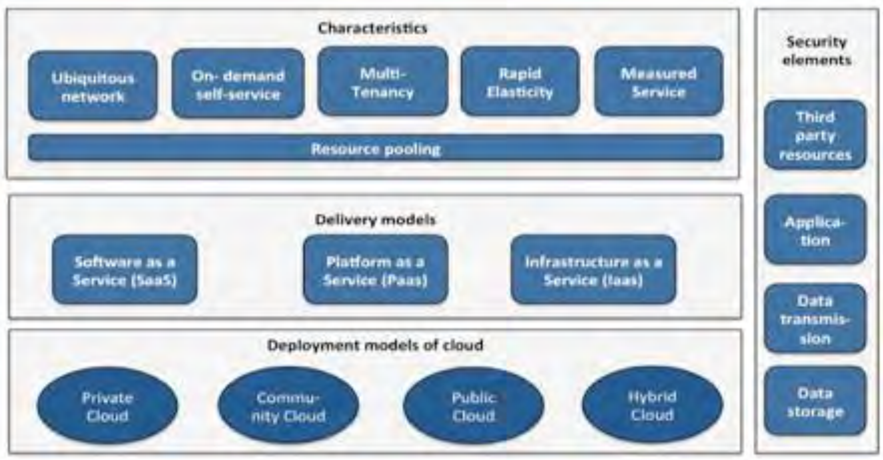


Figure 107: Cloud security (Adapted from Subashni et al. 2011)

The organisations that are being studied provide public B2B cloud services. Three delivery models are utilised by which different types of services are delivered, namely SaaS, PaaS and IaaS and is explained by Subashini et al (2011) as follows:

- *SaaS:* Software as a Service (SaaS) delivers software applications such as ERM solutions via the Web are remotely hosted by the organisation and made available to customers on demand.

- *IaaS:* Infrastructure as a Service (IaaS) delivers computer infrastructure, storage and networking services as a fully outsourced service via the installation of a virtual server on the IaaS provider infrastructure, whilst the user of IaaS still need to manage the applications, operating systems, middleware and data.

- *PaaS:* Platform as a Service (PaaS) delivers an integrated developer environment, which developers can build and enhance applications without having to manage the underlying services. The PaaS providers manage the operating systems, middleware, servers, storage and networking whilst the users manage the applications and data.

The delivery models discussed above have certain characteristics such as ubiquitous network, measured service, rapid elasticity and on-demand self-service. The type of deployment model would determine the unique security aspects associated with the service but generally include data storage security, data transmission application security and third party resource security concerns (Subashini *et al* 2011). The specific security challenges of cloud computing is explained in Table 81 below.

Table 81: Risk items relating to Cloud computing

Security challenge	Description	Threats
Confidentiality	Only authorized parties or systems should have access to protected data	More points of access due to the increased number of parties, devices and applications
Multitenancy	Resource sharing including memory, programs, networks and data	Users are separated at a virtual level but share the same hardware which can lead to breaches in data confidentiality
Data Remanence	Residual representation of data that has been erased	Due to lack of hardware separation, data remanence could lead to exposure of private data unwillingly or maliciously where a user can claim a large amount of disk space and scavenge for sensitive data
Data confidentiality	Protection user account from theft to control access to objects, memory, software etc.	Lack of strong authentication can lead to unauthorised access to users account leading to privacy breaches
Software confidentiality	Trust that specific applications or processes will securely manage users data	Unauthorised software access might occur due to exploitation of an application vulnerability or lack of strong identification.
Privacy	Protection of person information in line with the legal framework within which the organisation operate	Data can be stored across borders which could potentially conflict with various legal requirements where the user need to where personal data is stored at all times
Data Integrity	Assets should only be modified by authorized parties in authorized ways and protected from deletion, modification or fabrication	Authorisation mechanism should ensure that only authenticated users have access to secure resources and the levels of access should be determined to minimise threats of sophisticated insider attacks on data attributes.
Software integrity	Protection of software from unauthorised intentional or unintentional deletion, modification, theft or fabrication.	Disgruntled employees may modify programs to fail when or users might get unauthorised access of Application Programming interfaces (APIs) to alter or delete data.
Hardware and network integrity	Protection of the underlying hardware or communications network from theft, modification and fabrication.	Protection against unauthorised access and disgruntled employees
Availability	The accessibility and usability of a system upon demand by an authorized entity	The system must be able to continue if some of the components fail such as hardware and communication network

Some of the security requirements that need to be in place for Cloud computing is compiled by predominantly using Zissis et al (2012) framework but validated from work conducted by other researcher such as (Mansfield-Devine *et al* 2008; Wang *et al* 2010, Itani *et al* 2009).

Best security practices for cloud security are established by various organisations including Cloud Security Alliance (CSA) (2011), Open Web Application Security Project (OWASP) (2013) and the

Open Grid Forum (2014). It is also important to consider good corporate governance best practices in information security management as prescribed by COBIT (2000), ISO/IEC 17799 (2000). All of these technical and operational measures to protect cloud-computing solutions were updated in the risk framework as part of technology security risk assessments.

Privacy guidelines

The starting point for evaluation privacy is conducting a privacy risk assessment (Clarke, 1999). From the various guidelines provided by various organisations such as the U.K. Information Commissioner's Office (ICO, 2007) and the Office of the Australian Federal Privacy Commissioner (OFPC, 2006) a set of privacy guidelines was developed. The privacy guidelines are shown below in Table 17 and the relation to cloud computing is demonstrated.

Table 82: Privacy Guidelines

#	Privacy guidelines	Relation to Cloud computing
1	Does the new P&S apply information technology that have potential to impact on privacy	Cloud computing has substantial repercussions for the privacy of personal information as well as confidentiality of business and governmental information (Subashini *et al* 2011).
2	Does the new P&S use new identifiers, re-use existing identifiers, intrusive identification, identity authentication or identity management processes?	Cloud computing use identity management processes and in the case that cloud service is used for storage and analysis of sales data such as salesforce.com (Pearson *et al* 2009).
3	Does the new P&S convert transactions conducted anonymously into identified transactions?	During disclosure of some types and categories of information, confidentiality and privacy rights may change the obligations (Subashini *et al* 2011).
4	Does the new P&S involve multiple organisations as oursourced service providers or business partners?	Yes cloud computing use third party providers and can exist in many variations such as personal health record websites, storage sties, video sites etc. (Subashini *et al* 2011).
5	Does the new P&S involve new or significantly changed processing of personal data that is of concern to individuals?	Cloud computing can handle sensitive personal data such as those of minors and racial questions as the personal information of a business, government agency or an individual is stored in the cloud (Subashini *et al* 2011).
6	Does the new P&S involve new of significantly changed handling of a considerable amount of personal data of each individual in the database	Cloud computing can handle data from health care and insurance profiles and the location of the information may impact on the privacy obligations during storage and processing of information (Subashini *et al* 2011).
7	If yes, above does the new P&S provide sufficient justification for the processing of personal information and are these justifications published?	Cloud computing contracts and privacy policies to be reviewed as laws could oblige a cloud provider to provide records to law enforcement agencies (Subashini *et al* 2011).
8	Does the new P&S involve new or significantly changed handling of personal data about a large number of individuals?	Cloud computing can process data about a large number of individuals and whether the collection of data is carried out in an appropriate manner (Svantesson *et al* 2010).
9	If yes, above, does the P&S involve new or changed data collection policies or practices that may be unclear or intrusive?	The status of information in the cloud make it difficult to asses the privacy and confidentiality protections that is available (Subashini *et al* 2011)
10	Does the new P&S involve new or significantly changed consolidation, inter-linking, cross-referencing or matching of personal data from multiple sources	Not likely that this will be part of cloud computing. Is the collection of data carried out in an appropriate manner? (Svantesson *et al* 2010)
11	Does the new P&S involve disclosure of personal information to third parties that are no subject to comparable privacy regulation	Use of third parties and the terms service as established by the cloud provider (Subashini *et al* 2011).
12	Does the new P&S involve new or changed data quality assurance processes and standards that may be unclear or unsatisfactory?	Would depend on the characterization of the activity as communication or storage and whether information is content or non-content (Subashini *et al* 2011).
13	Does the new P&S involve new or changed data	Depends on the terms of service and disclosure to law enforcement

#	Privacy guidelines	Relation to Cloud computing
	security arrangement that could be unclear or unsatisfactory?	agencies as per law (Subashini *et al* 2011)
14	Does the new P&S involve new or changed data access or disclosure arrangements that may be unclear or permissive?	Depends on the terms of service and disclosure to law enforcement agencies as per law (Subashini *et al* 2011). Can data be deliverately or accidentally disclosed? (Ryan, 2011).
15	Does the new P&S involve new or changed data retention arrangements that could be unclear or permissive?	Depends on the terms of service and disclosure to law enforcement agencies as per law (Subashini *et al* 2011). How long the data will be retained (Svantesson *et al* 2010)
16	Does the new P&S involve changing the medium of disclosure for publicly available information that means that personal data can more easily be accessed?	Depends on the terms of service and disclosure to law enforcement agencies as per law (Subashini *et al* 2011)
17	Does the P&S comply with all relevant laws and regulations?	Compliance to laws and regulations.

An evaluation of the privacy guidelines revealed the following areas that needed to be expanded in terms of PoPI that was not included in the privacy assessment:

- Making suitable arrangements for the data subject to access and correct the data (Svantesson *et al* 2010).

- Impact of PoPI on transborder cloud operators and transborder cloud users as data is transferred across jurisdictional borders (Svantesson *et al* 2010). PoPI makes an important distinction between data that are transferred within the organisation across borders and those that are transferred across borders to third parties. When data is transferred within the same organisation privacy principles regulating transborder flows of data might not be applicable (Svantesson *et al* 2010).

- It is also appropriate to provide the users with the consumer policies that govern the cloud computing service which as a minimum include universal terms of service, additional terms, program policies, privacy policy and copyright notices (Svantesson *et al* 2010).

- Customers should be able to verify privacy protection mechanisms through conducting "a secure privacy auditing process of all operations carried out to secure the storage and processing of their sensitive information" (Itani *et al* 2009).

- Make it clear who has control and responsibility for what aspects of security to ensure effective data governance and update the service level agreements (SLA's) accordingly (Mansfield-Devine *et al* 2008).

- Continuous testing preferably by third parties to conduct daily automated vulnerability scans with monthly consultant penetration tests of which the results should be available on demand (Mansfield-Devine *et al* 2008).

Furthermore, the privacy impact assessment should be used at the different stages of the P&S lifecycle as explained by Pearson, 2009 and Cannon (2004) as follows:

- *Initiation:* provide high-level privacy specifications.
- *Planning:* Describe detailed privacy requirements in P&S functional specifications.
- *Development:* Identify problems relating to the proposed privacy solutions and develop alternatives and create privacy policy specification for the developed P&S that is available to end-users.
- *Testing:* Use audit and change control procedures and test privacy protection during backup, fault repair, business continuity and disaster recovery as well as a deployment guide and review document.
- *Decommissioning:* Ensure secure deletion and disposal of personal and sensitive information.

Finally the top six recommended privacy practices that needs to be considered for the technology development teams include minimization of personal information that is sent and stored in the cloud, protection of personal information in the cloud, maximizing user control, allow user choice, specify and limit the purpose of data usage and provide feedback (Pearson, 2009).

Conclusion

Within the cloud environment, many privacy concerns exist such as establishing where the specific places are where processing of data takes place within the cloud and how the service will evolve in future and how to ensure compliance with laws and regulations. Pearson (2009) suggests that the way forward is to ensure that organisations value accountability and assure responsible accountable decision-making when designing cloud solutions.

16.8. Cloud Computing Security Requirements

Table 83: Security requirements related to Cloud computing

Service	Security requirements	Threats	Security tests and controls
SaaS	- Privacy in multitenant environment - Data protection from exposure (remnants) - Access control - Communication protection - Software security - Service availability	- Interception - Modification of data at rest and in transit - Data interruption (deletion) - Privacy breach - Impersonation - Session hijacking - Traffic flow analysis - Exposure in network	• *Verify data security:* - Cross-site scripting (XSS) - Access control weaknesses - OS and SQL injection flaws - Cookie manipulation - Insecure storage - Insecure configuration • *Conduct network security assessments:* - Network penetration and packet analysis - Session management weaknesses - Insecure SSL trust configuration • Data integrity should support ACID

Service	Security requirements	Threats	Security tests and controls
			(atomicity, consistency, isolation and durability) transactions. Ensure *clear data segregation* boundaries on physical and application level and validate data segregation in multi-tenant deployment by performing: - SQL injection flaws - Data validation - Insecure storage Ensure *authentication and authorisation* by delegating authentication process to customer internal LDAP (Lightweight Directory Access Protocol) and Active Directory (AD) so users can gain retain control over the management of their users. *Web application security* to guard against tope ten security risks faced by web applications: - Injection flaws like SQL, OS and LDAP injection - Cross-site scripting - Broken authentication and session management - Insecure direct object references - Cross-site request forgery - Secure misconfiguration - Insecure cryptographic storage - Failure to restrict URL access - Insufficient transport layer protection - Unvalidated redirects and forwards To host merchants that must comply with *PCI DSS,* the SaaS provider must be compliant with PCI DSS (Payment Card Industry – Data Security Standards) Vulnerabilities exist in virtualization - Virtual machine monitor (VMMs) should be root secure where no privilege within the virtualized guest environment should permit interference within the host - Isolation, inspection and interposition properties Availability: - Develop multi-tier architecture supported by load-balanced farm and building resilience and action plans for business continuity (BC) and disaster recovery (DR) - Validate availability by assessing authentication weaknesses and session management weaknesses Backups: - Sensitive data backed-up and strong encryption schemes are used to protect the backup data - Conduct assessments to establish insecure storage and configurations Identity management (IdM) and secure sign-on (SSO) using models of independent IdM stack, credential synchronization or federated IdM. - Authentication weakness analysis - Insecure trust configuration
PaaS **IaaS**	• Access control • Application security • Data security (data in transit, data at rest,	• Programming flaws • Software modification • Software interruption	PaaS: - Secure Enterprise Service Bus (ESB) using a protocol such as Web Service

Service	Security requirements	Threats	Security tests and controls
	remanence) • Cloud management control security • Secure images • Virtual cloud protection • Communication security	(deletion) • Impersonation • Session hijacking • Traffic flow analysis • Exposure in network • Defacement • Connection flooding • DDOS • Impersonation • Disrupting communications	(WS) - Establish the effectiveness of application security programs IaaS: - Several security techniques should be used to achieve maximum trust and security on a cloud resource.
Physical data-center	• Legal, not abusive use of cloud computing • Hardware security • Hardware reliability • Network protection • Network resources protection	• Network attacks • Connection flooding • DDOS • Hardware interruption • Hardware theft • Hardware modification • Misuse of infrastructure • Natural disasters	Outsourced data centre risks is restricted to a readily identifiable location on dedicated servers that are integrated into the organisations network that is masked between firewalls and other gateway boundaries that require intensive intelligence gathering to know that they exist (Mansfield-Devine *et al* 2008).

17. Appendix Eight : Additional Information

17.1. Comparison of New Product Development Methodologies

Table 84: Comparison of NPD Methodologies

Comparison of New Product Development Methodologies					
Booz et al (1982)		Song et al (1998)		Cooper (2008)	
New product strategy	Identification of the functional requirements that the new product should meet	Strategic planning	Assessment of resource requirements, marketing opportunities and strategic directives.	Discovery	Screening of new product ideas
Idea generation	Search for new product ideas	Idea development and screening	Evaluation of solutions to meet strategic objectives	Scoping	Development of the concept
Screening and evaluation	Analysis of ideas against objectives of organisation				
Business Analysis	Detailed analysis of the business viability	Business and market opportunity analysis	Conversion of product idea into customer functional requirements	Build business case	Business analysis and portfolio reviews
Development	Development of the product	Technical development	Developing and testing of the product	Development	Development of the product
Testing	Testing of the product to verify that it works	Product testing	Testing of integrated components such as marketing	Testing and validation	Testing of product and training for readiness for launch
Commer-cialisation	Involving marketing decisions regarding when, where, whom and how to launch	Product commer-cialisation	Implementation of the product launch	Launch	Product launch
				Post-launch review	Measure sales performance and profitability of product

17.2. Stage/Gate Criteria

Table 85: Generic stage/gate criteria of the NPSD process

Stages of NPSD process	Stage/Gate processes	Stage/Gate Criteria
Idea	Gate 1: Idea generation	- Ensure that new ideas for P&S are logged and investigated.
Concept	Gate 2: Concept development	- Development of the conceptual P&S and draft business case for the P&S - High-level identification of technology architecture and technical feasibility - Resource implications
Design (Planning)	Gate 3: Definition	- Development of the functional requirements specification of the P&S with input from various specialist to make the specification

Stages of NPSD process	Stage/Gate processes	Stage/Gate Criteria
		more robust
Development	Gate 4: Development	- The product specification is handed over to the technical teams for development
Testing & Commer-cialisation (Launch)	Gate 4: Testing	- Testing of the final P&S - Finalisation of the commercialisation plans, including marketing and sales plan and communications to the target markets via the different media outlets
Post-implementation Review (Maintain)	Gate 5: Performance Review	- Review whether the P&S objectives was achieved against the stated success criteria

17.3. Service Specific Process

Table 86: Service Design Process (Schreuing and Johnson, 1989a)

Input (internal)		#	Phase		Input (external)
Marketing objectives	→	1.	Formulation of new service objectives and strategy ↓	←	Environmental analysis
Internal sources	→	2.	Idea generation ↓	←	External sources
		3.	Idea screening ↓		
Customer contact personnel	→	4.	Concept Development ↓	←	Prospects
		5.	Concept testing ↓		
Budget development	→	6.	Business analysis ↓	←	Market
		7.	Project Authorisation ↓		
Operational personnel	→	8.	Service design and testing ↓	←	Users
Operational personnel	→	9.	Process and systems design and testing ↓		
		10.	Marketing and program design and testing ↓	←	Users
		11.	Personnel training ↓		
All personnel	→	12.	Service testing and pilot run ↓	←	Users
		13.	Test Marketing ↓	←	Users
		14.	Full-scale lunch ↓		
		15.	Post-launch		

17.4. New Product and Service Development Phases

Table 87: NPSD Phase Terminology applied by the study

Phase	Explanation	NPSD researcher phase	SDLC phase

Phase	Explanation	NPSD researcher phase	SDLC phase
Idea	The stage where a P&S idea is presented as an option to be further investigated during the NPSD lifecycle	- Booz et al (1982) Idea generation - Song et al (1998) idea development and screening - Cooper (2008) Discovery	Planning
Concept	Process of conceptualising the P&S idea and presenting the business case	- Cooper (2008) Concept phase	Analysis
Design	Defining the product design specifications with identification of customer requirements and finalising the business case	- Booz et al (1982) Business analysis - Song et al (1998) Business & marketing opportunity analysis - Cooper (2008) business analysis and portfolio reviews	Design
Develop	Development of the P&S by the technical teams according to the P&S functional specification.	- Booz et al (1982) Development - Song et al (1998) Technical development - Cooper (2008) Development	Development
Implement	Testing of the final P&S and plans to take the product to market, ending in commercialization of the P&S.	- Booz et al (1982) Testing and Commercialisation - Song et al (1998) Product testing and product commercialisation - Cooper (2008) Testing and validation; Launch	Implementation
Maintenance	Maintenance of the P&S to ensure that it continuous working as it should. Monitoring of performance of P&S against its stated objective and performing a post-implementation review (lessons learnt) of the P&S.	- Cooper (2008) Lessons Learnt	Maintenance

17.5. ISO Framework

Table 88: ISO Framework

(A) Risk management principles	(B) Implementation framework	(C) Risk management process
(a) Creates value (b) Integral part of organisational processes (c) Part of decision making (d) Explicitly addresses uncertainty (e) Systematic, structured and timely (f) Based on the best available information (g) Tailored (h) Takes human and cultural factors into consideration (i) Transparent and inclusive (j) Dynamic, iterative and responsible to change (k) Facilitates continual improvement and enhancement of the organisation	(a) Mandate and commitment (b) Design of framework for managing risk (c) Implementing risk management (d) Monitoring and review of the framework (e) Continual improvement of the framework	(a) Communication and consultation (b) Establishing the context (c) Risk identification (d) Risk analysis (e) Risk evaluation (f) Risk treatment (g) Monitoring and review

17.6. The Seven Distinct Processes of ISO 31000

- **Communication and consultation:** Consultation with both internal and external stakeholders should take place. Experts from divergent areas should be consulted and even conflicting views should be considered. Stakeholders should be informed about the basis on which risk decisions were made and the impact of these decisions.

- **Establishing the context:** Four specific areas of establishing context exist, namely external, internal, risk management process and risk criteria, which are explained in the next section of the Appendix, Table 86: ISO 31000 framework Phase 2: Establish the context.

- **Risk identification:** Identify a comprehensive list of sources of risks, impacts, events, causes, consequences and cascading events that could impact on the achievement of objectives, even if the source is not under the control of the organisation.

- **Risk analysis:** Developing a deeper understanding of the risk by consideration of the causes and sources or risks, their consequences and likelihood.

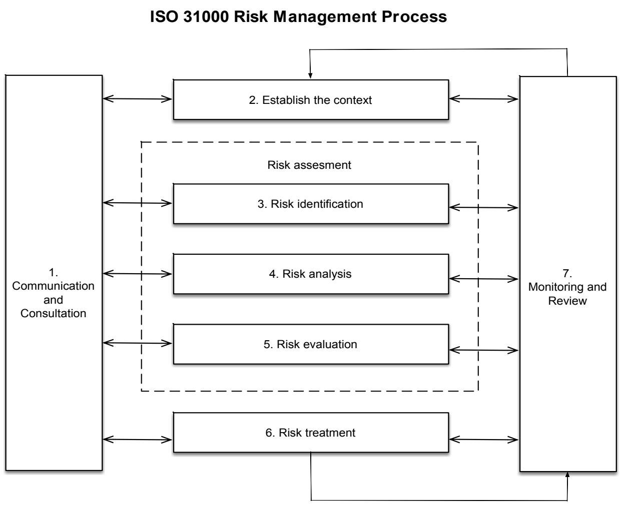


Figure 108: ISO 31000 Risk Management Process

- **Risk evaluation:** Establish priorities regarding which risks needs treatment by comparing the risk analysis using the risk criteria that was established during the context phase.

- **Risk treatment:** Selection and implementation of options to treat risks by considering what tolerable level of residual risks are acceptable. Treatment options might include pursuing risk as an opportunity, avoid the risk by discontinuing the activity that lead to the risk, removing the source of risk, changing the likelihood and/or consequences, sharing the risk with other parties and retaining the risk by informed decision. Selection of risk treatment should balance the cost and effort against the derived benefits. Risk treatment plans should include information on reasons for selection of options, identification of accountable parties for approving and those for implementing, actions, resource requirements, timing an schedule.

- **Monitoring and Review:** Ensure that risks and controls are effective and efficient, lessons are learnt from events, changes in environment are detected and emerging risks are identified. The monitoring and review process interacts with all other processes to ensure that the overall risk management process is monitored.

17.7. ISO framework: Context

Table 89: ISO 31000 framework Phase 2: Establish the Context

Author	External Context	Internal Context	Context of Risk Management process	Context of Risk criteria
What?	External environment in which the organisation seeks to achieve its objectives	Internal environment in which the organisation seeks to achieve its objectives	The activities or part of the organisation where the risk management process is being applied	Identify the context within how risk will be evaluated by specifying the criteria that will be used
Why is it important?	Ensure that the objectives and concerns of external stakeholders is considered	Ensure alignment with the culture, processes, structure and strategy of organisation	Justification of application of risk resources to the area	Ensure consistency with organisations risk policy, values, objectives and resource
Criteria to consider	- Social and cultural, political, legal, regulatory, financial, technological, economic, natural and competitive environment (international, national, regional or local). - Key drivers and trends that impact on org objectives - Relationships, perceptions and values of external stakeholders.	- Objectives of the organisation - Alignment of specific projects to objectives of organisation - Recognition of opportunities - Culture, Information systems, standards, resource capabilities, governance roles and structures	- Define scope, objectives, responsibilities of risk resources - Define the activity and relationship context - Evaluate how performance and effectiveness is evaluated	Define causes, likelihoods, timeframes, the level of tolerable risk and whether combinations of multiple risks should be considered.

17.8. Risk Management Tools and Techniques

Many tools and techniques have been designed for analysing risks. These include interviews, brainstorming, focus groups, risk databases and applications and Monte Carlo analysis. Other methods of risk analysis include loss data as a forward-looking tool, scorecards and control frameworks. These are all considered complex to use as well as costly (Davies, 2005).

Other techniques applied in new product development include the Analytical Hierarchy Process (AHP) and a general form of AHP called the Analytical Network Process (ANP). The AHP is a decision tool that uses pairwise comparisons by integrating multiple qualitative and quantitative measures into a single score that can be utilized to choose between alternatives (Rangone, 1996). AHP follows a strict hierarchical structure and the elements of the structure have to be independent. It is for this reason that Chin et al. (2009) criticizes the AHP for not being suitable in a complex NPD environment that contains many inter-related elements. The ANP partly addressed this criticism as it does not adhere to a strict hierarchical structure but can represent interdependencies among attributes and attribute levels with arrows and arcs (Meade et al, 2002). ANP is however unable to demonstrate influences between elements and is insufficiently flexible to update judgments as and when new information arises during the NPD process (Chin et al, 2009).

Often used in combination with ANP is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). The ideal solution in TOPSIS is selected as the solution with the best crisp performance score, compared to the alternative worst score. TOPSIS receives similar criticism from Chin et al. (2009) as AHP, stating that it can only effectively address problems which are constructed in a strict hierarchical structure.

Other methods for analysing risks suggest the use of creative techniques such as Edward de Bono's Six Thinking Hats and the Delphi technique developed by the US military (Murray-Webster and Simon, 2010). These tools and techniques vary as Skelton et al (2004) state from "very simple to highly complex, from analytical to behavioural, and from quantitative to qualitative". Disillusionment is however emerging as not all techniques work well or apply to all situations (Lansiti et al, 1997; Piney, 2002; Thamhain, 1999).

Engineering risk management techniques have been applied successfully during system design predominately in the Health and Safety field. These include methods such as Hazards (HAZOP) and Anticipatory Failure Determination (AFD). However, these methods work well under conditions where statistically quantifiable assessments can be conducted, such as assessing the reliability of a system (Kaplan et al, 2001). These methods will not be useful to study risk in innovation as decisions depend on conditions of great uncertainty.

Decision Analytic methodologies have been applied to support decision-making under conditions of uncertainty (Howard, 1966). The application of decision analytic methods for support of innovative product development is not encouraged as many risk decisions need to be made during the product development lifecycle due to the sheer number of activities that need to be undertaken. Following a prescriptive approach may lead to 'paralysis by analysis' that can be ill afforded during the fast changing and complex innovation lifecycle (Sarbacker et al, 1997).

Operational risk indicators are measures that seek to identify losses, near losses or potential losses before they happen (Davies, 2005). Indicators are not difficult to use and understand and can be seen as warning lights on the dashboard of a car. Operational risk indicators have the characteristic of being context aware and calibrated. Context awareness refers to the possibility that a specific event could occur owing to warning information that could lead to adverse impacts. Calibration refers to the frequency or severity of the event that exceeds a predetermined threshold. Indicators are usually implemented by using criteria that are measurable, quantifiable, qualified (descriptions of the estimated outcomes) and classifiable (aggregated into groups). One of the advantages of risk indicators is that they create “markers for displaying best practice” (Davies, 2005, page 190).

Haas and Kaiser (2005) recommend that the principal agent theory and game theory can be successfully applied in risk management. Principal Agent theory is built on the notion that conflicts between an agent and principal exist. The theory describes relationships between employees (agent) and senior management (principal) where each can manipulate decisions to ensure favorable outcomes for them, instead of being focused on the best interest of the principal. Game theory simulates scenarios where participants can choose from multiple options to influence each other. These multiplayers games are used to provide support for decision-making and predict the outcome of scenarios. These decision-making tools would however only be applicable to identify cultural and organisational inhibitors and will not be apt to apply across the NPSD lifecycle.

Six Sigma and lean manufacturing, a method that was popularised at the company General Electric, was adopted to improve product quality and reduce product defects. The term Six Sigma refers to six standard deviations in terms of defects from the product, using a ‘defines, measure, analyse, improves, control’ mindset. Six Sigma expanded to focus on solving problems and reducing costs. Whilst Six Sigma has proven its usefulness during the design of physical products, it could not be appropriate for service design or during the early stages of the NPD process. Cooper (2008) states that organisations are inappropriately applying this methodology to the initiation cycle of NPD as “it fails to allow for divergent, creative and right brain behaviour that typifies the fuzzy front end of most firms’ innovation process”.

Project management is micro-processes within the macro NPD processes where the project manager needs to apply project management criteria to ensure that projects within the NPD process are delivered within scope, timelines and budget (Cooper, 1998). Risks related to a project can include scope creep, cost overruns, extension of the project and a failure to satisfy information and organisational requirements. Projects within the NPD cycle can be delivered successfully whilst the overall P&S can lead to reputational damage for the organisation and financial liabilities.

RM in projects according to the project management body of knowledge (PMBOK) defines project risk as an event or uncertain condition that, if it occurs, produces positive or negative effects on at least one aspect of the project such as cost, scope and quality (PMI, 2004). Managing risks in products could follow several approaches such as the RISMAN method for performing risk analysis. The process analyses risks in a cyclical process that is repeated through various iterations during the project lifecycle. The Association of Project Managers (APM, 2000) produced another procedure called the Project Risk Analysis and Management (PRAT) methodology that contains nine steps for risk analysis namely define, focus, identify, structure, ownership, estimate, evaluate, plan and manage. Both qualitative and quantitative techniques for assessing risks can be utilised as well as a wide number of diagrams such as cause and effect, fault trees, event trees and influence diagrams (Van Well-Stam et al, 2004).

McDermott and O'Connor (2002) indicate that radical new innovative projects are more likely not using traditional project management tools and interfaces as uncertainties are too high to accurately predict project time frames, but should allow for "mistakes, discovery of false assumptions using concepts of 'failing forward' and 'probing and learning tools'".

Some researchers use Bayesian networks (BN) to assess risks in NPD (Chin et al, 2009; Tang et al, 2011). A BN model represents human reasoning by quantitatively defining variables and their probabilistic dependencies in a graphical model format (Chin et al, 2009). Tang et al, (2011) utilized a belief rule base (BRB) to investigate customer perception risk (CPR) within the NPD process. The drawback of this approach is that only experts can effectively apply and input the parameters, rules and weights and the outcome is heavily dependent on the quality of information contained within the BRB (Tang et al, 2011).

The Basel Accord defines operational risk as "the risk of loss resulting from inadequate or failed internal processes, people and external events". There are seven operational loss events: (1) internal and external fraud; (2) employment practice and workplace safety; (3) clients, services and business practices; (4) damage to physical assets; (5) business disruption and systems failures and execution, (6) delivery and (7) process management (Basel II, 2004). All of these operational factors directly impact on the delivery of a new service. Operational risk involves a detailed analysis of all the risk factors that could relate to the service. As Fujii (2005, page 178) states "the devil is really in the detail for operational risk management".

Operational risk has many different causes and is subdivided into factors that refer to the following categories of risk:

- Processing risk: The risk of financial losses from failed processing due to mistakes, negligence, accident or fraud by directors, staff and other personnel of the organisation.

- System risk: Risk of financial losses due to system and telecommunication failures, including temporary system- shutdown, -malfunction -hacking and disruption caused by external events.

- Human Resource risks: Risk of financial losses due to the loss of key personnel or failure to maintain staff morale.

- Tangible asset risk: Risk of financial loss or damage to tangible assets from such events as natural disasters or utility accidents.

- Regulatory risks: Refer to the risk of financial losses due to changes in the regulatory environment, including tax systems, accounting systems or regulatory treatment.
- Reputational risk: Risk of financial losses from the adverse impact on the company's reputation among customers or the market due to unfounded rumors.

It is submitted that a comprehensive risk and innovation framework should include operational risk management measures as it directly relates to the development of service and service development.

Tools and techniques that can be utilised to specifically study the NPD process include the stage/gate process, risk diagnosing methodology (RDM), projects in controlled environments (PRINCE2) and quality function deployment (QFD). Cooper's stage/gate processes were already introduced during a review of the innovation literature and will not be discussed here again.

The RDM technique addresses risk at a project, process and product level by assessing risks through successive steps and is applied during the feasibility phase of the P&S with a specific focus on technology, organisation and business risk. Keizer et al (2002) study concluded that the method increased the chances of a successful innovation.

PRINCE2 is a formal project management methodology widely recognized in private sectors (CCTA, 2002). Projects are divided into stages with sub-processes, activities and controls and products have to be completed according to agreed quality standards. Whilst the method improved the success rate of new product development projects, it provided insufficient guidance to project managers on how to manage project risk (Elkington et al, 2002). QFD is a structured management tool that is utilized to obtain an understanding of customer requirements for the product, which is mapped into NPSD design specifications, which are subsequently matched to production requirements and capabilities (Reich et al, 2008). QFD is time-consuming, requires a high level of detail early in the NPD development process and if errors are introduced in one stage these are transferred to successive stages (Rashid et al, 2007).

Structured product definition is another method of addressing risks during innovation management (Wilson, 1993). It focuses on the design stage where the customer requirements are translated into functional requirements that have to be implemented by the product development teams. Structured product definition is just not suitable to provide a holistic end-to-end risk assessment and mitigation methodology for product innovation, as it only focuses on the development stage of the NPSD lifecycle.

17.9. Pragmatism and Interpretivism

The pragmatist will utilise knowledge to initiate actions and change, while the interpretivist will use knowledge to aid understanding (Goldkuhl, 2012b). For the pragmatist, knowledge is necessary while the interpretivist will view knowledge as valuable (Dewy, 1931). The pragmatist not only seeks understanding but also takes it a step further, as knowledge is essential to guide further research interventions and introduce new changes into the study.

Further differences are apparent when considering that the manner in which knowledge is applied, influences the choice of investigation methods. According to Klein et al (1999) the interpretivist will be more likely use field studies to investigate compared to inquiry methods employed by the pragmatist. Here we refer to 'controlled inquiry' with the explicit function of generating transformative knowledge to improve a situation (Dewey, 1938; Goldkuhl, 2012b).

Goldkuhl (2012b) expands on the dissimilarities by noting that interpretivism is 'constructive' in nature, whilst the pragmatist follows the perspective of 'symbolic realism'. Constructivism reflects the desire to comprehend and interpret subjective meanings of actions as 'common-sense experience' (Weber, 1978; Schutz, 1970). The symbolic realist perspective on the other hand, understands that many diverse realities exist and that there is not only one truth.

Disagreement exists with regards to which approach is the best to improve understanding of phenomena. According to Datta et al (2012), the interpretive view allows for a deeper, richer and more detailed understanding than an interpretative view. The reason is that interpretative researchers do not predefine variables but attempts to gain a better understanding of phenomena that emerge via the action cycles and interpret these as knowledge (Olesen et al 1999). However, other scientists disagree. Baskerville et al (2004) argues that pragmatism allows a deeper understanding since 'doing' is better than mere 'understanding' and increased understanding develops by 'doing'. The pragmatist emphasise that actions are socially meaningful since actors are accountable for their actions (Goldkuhl, 2012a).

17.10. Early Origins of AR

AR originated from the study of social illness during World War II. Kurt Lewin (1947) developed AR at the University of Michigan whilst the Tavistock institute developed a similar method, which converged when Lewin joined the institute. Scientists were participating in their own research to study war survivors who suffered from social disorders. The collaboration between scientists and researchers expanded knowledge about how to successfully treat social illnesses. The notion that Lewin was the inventor of AR is disputed by Gstettner and Altrichter who stated that the term AR research was first introduced by Moreno a physician and social scientist who utilised group participation as early as 1913 (McTaggart, 2006).

17.11. Types of Action Research

Baskerville (1999) found many different types of AR approaches exist namely: Canonical, IS prototyping, Soft Systems Methodology, ETHICS, Multiview, Action Science, Participant Observation, Action Learning, Clinical Field work, Process Consultation and Participatory Action Research. Golkuhl (2012) identifies the following approaches as being variants of action research: action science (Argyris et al 1985), action learning (Revans, 1982), interactive research (Lundin et al, 1990), participative case study (Baskerville, 1997), collaborative practice research (Mathiassen, 2002), collaborative management research (Passmore et al, 2008), co-operative inquiry (Heron et al, 2001), clinical inquiry (Schein, 2001), development action inquiry (Torbert, 1999), appreciative inquiry (Ludema et al, 2001), pragmatic-systemic inquiry (Cronen, 2001), practical inquiry (Stevenson, 2005; Goldkuhl, 2008) and pragmatic inquiry (Metcalfe, 2008).

17.12. Iversen et al (2004) Study

Table 90: Correlations between Iversen et al. (2004) study and This Research

Iversen et al (2004)	Objective	This study	Similarities and Differences
Objectives	Managing risks in Software Process Improvement (SPI)	Managing risks in NPSD	Similarity is managing risks, the difference is the context
Research themes	Two themes: SPI and Risk Management	Two themes: NPSD and Risk Management	Similarity is risk management and the difference is SPI.
Research framework	Theory and concepts about SPI and software risk management	Theory and concepts about NPSD and risk management within NPSD	Iversen study has a clear SPI framework that is being followed whilst this study consolidates best practices of NPSD. The similarity is that maturity levels are investigated via CMM.
Real world problem situation	Risk management problems is addressed in SPI teams as they unfold during iterations where researchers and practitioners work in collaboration to improve the organisation's risk management capability as it relates to SPI	Risk management is introduced to NPSD teams and problems is addressed as they unfold during interactions between the collaborators who wants to improve the organisation's risk management capability as it relates to NPSD	The difference is that Iversen *et al* (2004) selected only a few projects whereas this study allowed for a much wider scope. The risk practitioners had to be involved in all of the NPSD projects as risk feedback was to be provided. Iversen *et al* (2004) worked with small groups of 5 to 6 people at a time while the risk practitioners in this study has to work with a multitude of functional areas and ever-changing cross-functional teams. The context of analysis expanded and changed with every cycle for this study but the central objective remained fairly stable.
Episte-mological foundation	Interpretive	Pragmatist	The main difference is that interpretivist focus on understanding how actors in a social group participate and act whilst the pragmatist creates knowledge to implement improvements within the organisation (Goldkuhl, 2012b).
Client framework	The researchers were not part of the organisation	The researcher is also the practitioner within the organisation	The difference is that the researcher has a good grasp of the culture and practices of the organisation, but not the research methodology which was potentially the other way round for Iversen *et al* 2004.

17.13. Data Collection Approach

Table 91: Data Collection (Adapted from Coughlan et al. 2002)

Aspects	How?	Types of data	Examples
Gathering data	Active involvement during daily organisational activities	Data can be categorised as hard or soft data. Hard data is statistics and reporting while soft data is gathered through interviews and observations. The reason why it is called soft data is that is based on perception, which makes it more challenging to interpret.	Soft data were collected such as communication patterns, leadership behaviour, use of power, group roles, norms, elements of culture, ways of problem solving and decision-making as it relates to the research.
Data feedback	The organisation and/or the researcher can gather data and both were able to report on it albeit it for different purposes.	Includes feedback meetings that the AR researcher facilitates. Feedback can also be gathered during organisation-initiated meetings.	The organisation provided statistics regarding the successes of P&S. The researcher gathered data during feedback meetings to asses the success of interventions.
Data analysis	Analysis of data takes places in collaboration between the researcher and the risk practitioner teams. In some cases the innovation practitioners were also involved during the analysis of the data.	The criteria and tools that were used for analysis were discussed and vetted with the client and were associated with achievement of the research objectives.	The various interventions were analysed in collaboration with practitioners. These include the maturity status of the organisation's NPSD process.
Action Planning	Actions were planned in collaboration with the client organisation during the analysis phase of the iteration.	Questions that facilitated the action planning included: What needs to change? In what parts of the organisation? What type of change is required? Whose support is needed and how is commitment build and resistance managed?	The answers to these questions facilitated the development of a strategy and preliminary action plan preceding each of the cycles of AR iterations.
Monitoring	The AR cycles were monitored.	Monitoring of the cycles included what is taking place, how are these steps being performed and what underlying assumptions is still valid.	Monitoring of activities took place regarding what data are gathered, data feedback, data analysis, action planning, taking action and evaluation of the implementation of interventions.

17.14. AR Evaluation Criteria

The dimension of 'conceptual foundation' is subsequently discussed as it conforms to the criteria of this study. The criteria that is used to evaluate this dimension is depicted in Table 93 on a general level and subsequently discussed in more detail as it relates to the specific study. The criteria and not the evaluations are subsequently discussed.

Principle of Foundation

The conceptual foundation refers to the theoretical underpinnings that ground the research, including the research objective, theoretical assumptions, perspectives/traditions and stream of action research used. The criteria are now discussed in more detail as it relates to the specific research conducted.

Table 92: Evaluation of AR: Criteria for establishing the conceptual foundation of the study (adapted and updated from Lau, 1998)

Dimension & Criteria	Classification	Evaluation
Research objective or question	What is the research objective or question?	The aim can be to understand the meaning of social phenomena after intervention or improvement through interventions. The research objective should be stated upfront even if only consists of a broad theme that will be refined during the research. The research must address a genuine practical problem in an immediate situation.
Theoretical assumptions	Is theory, themes or concepts included?	Theories, themes and concepts can be used to interpret the study and provide the philosophical foundations of the study. They could be less well defined at the start of the study and emerge from the AR over time.
Perspective / tradition	What are the underlying research assumptions?	The reporting of the study must be reflective of the paradigm that was chosen by the researcher.
Type of action research	What type of AR is used for the study?	Whilst many different types of AR exist such as participatory, conflict resolution, experiential learning, the reporting of the study must be consistent with the type of AR chosen.
Theoretical assumptions	What theoretical assumptions are used? Are they authentic?	The authenticity of the theories, themes and concepts that are used to interpret and understand the social phenomena under study should be evaluated. This provides the basis from which sense can be made of findings.

The criteria is now discussed in more detail as it relates to the specific research conducted.

- ***Research objective**:* Lau (1999) describes the criteria for evaluating the research objective as conforming to being 'authentic and practical'. *Authenticity* relates to the objective that should reflect a real-world problem that is of interest to the researcher (Checkland, 1991). Chisholm et al (1993) expands on this notion by advising that the objective should also include an expression of the change efforts that would be required to improve the organisational function. Lau (1997) explains that the objective could only consist of a broad theme, which is refined during the research iterations, but it must be stated upfront.

  *T*he notion of *practicality* refers to solving existing business problems and producing practical solutions. Hult et al (1980) introduces the notion of 'immediacy' meaning that the researcher should have the ability to immediately intervene within a problem situation, which validates the notion of practicality of research. Hult et al (1980) also refers to 'dual goals' of (1) solving practical problems in business as well as (2) expanding on scientific knowledge.

- ***Epistemology**:* Lau (1999) questions whether the research is 'explicit' and 'authentic' referring to the philosophical foundations of the research and whether the reporting of the AR study is in line with the reported approach. Checkland (1991) expands on this notion by referring to the extent to which theoretical assumptions and frameworks guide reasoning during iterations to explain accumulated knowledge and experiences.

* ***Suitability of AR type**:* Lau (1999) questions whether the type of action research that is being utilised is clearly identified and whether it is consistently followed. The degree of involvement during the collaboration between the parties is also monitored during the AR iterations. Näslund et al (2004) adds another qualifying criteria, stating that not only should the research type be defended but also AR as a research method.

* ***Theoretical assumptions**:* Lau (1999) added Checkland (1991) question whether the 'theories, themes or concepts' that underpins the study are valid for use during the interpretation of the phenomena under study. Following on Chisholm's et al (1993) these assumptions evolves over time during emergent action research. As Reason et al (2001) states, the AR study should include a 'plurality of knowledge' that is expanded on several levels, serving to extend the understanding of practices and experiences.

AR Evaluation Criteria for Study Design

Study design describes the methodological details of the study, including the background, intended change, research site, participants, data sources, duration, degree of openness, access/exit and presentation. The dimension was created by Lau, (1998) based on criteria defined by Chisholm et al (1993), Checkland (1991) and Lau (1997). What makes this area particular important, is that Baskerville *et al* (1997) found that the design of the study was generally founded to be the part of the AR study that was regarded as most deficient in IS action research publications. The elements of the dimension of 'study design' are subsequently discussed. Table 93 provides an overview of the criteria.

Table 93: Criteria to evaluate the design of the AR study (Adapted and updated from Lau, 1998)

Dimension & Criteria	Classification	Evalation
Background	Is information included regarding the environments that are being studied?	The researcher should provide sufficient understanding of the total social context of the study. This should include background information on the organisation, the nature and extent of the problem and how the participants are coping with the situation.
Intended change	What is the nature and extent of the planned change?	The type of change initiative is dependant on the type of AR. The details may not be defined in advance. The intended intervention can consist of a range of activities but must be appropriate, adequate, and practical with the intention to address the problem that is required by the immediate situation.
Research Site	Is it a single or multiple sites? What is the type and level of organisation involved?	The study may involve one or more sites, organisations or formal structures. It is essential to describe the type and level of organisation to verify whether the intervention is appropriate and adequate to support the study.
Participants	Who are the participants and what is their background?	The profiles of the participants, including background, characteristics, perspectives, culture, roles and expectations within the organisation should be reported as part of the study. The participants must be authentic in the sense that they are impacted by the problem and will benefit from the intended solution.
Data sources	What type of data are collected for the study and how?	The type of data sources can vary from interviews, observations, document reviews, focus groups and surveys. By including different sources of data the interpretation of the data can be confirmed via triangulation techniques. Identify the type of data needs to be identified and how data will be collected and analysed and why these sources of data can be considered as dependable.

Duration	What is the intended length of the study in time duration?	The duration of the study is dependant on the objective of the research, the approach used and the available resources. The more the organisation is exposed to change and the more complex the organisation is and the intervention, the longer it will take to adopt the change and observe the impact. The question that needs to be answered is whether adequate time is allowed for problem diagnosis, action intervention and reflective learning to take place?
Degree of openness	What is the extent of predefined or planned process?	Emergent classical research has fewer associated assumptions and actions that are identified in the early stages. The extent to which the process is open should be justified in terms of rationales why the specific approach was chosen. The question is whether the process is conducted as planned or would it evolve over time. This would enable to determine if the degree of openness is suitable for the specific study.
Access / Exit	What type, level and extent of access to the organisation is intended and is there a defined exit point from the study?	The extent to which trust between the organisation and the researcher should be developed, depends on the researcher involvement within the organisation and the change processes. Access and exit points should be stated in advance but should allow adequate time for the researcher to conduct a comprehensive study.
Presentation style	What is the reporting style? Case report, ethnographic?	Action research can be reported in a number of ways: *exploratory* or *descriptive* if a case study is used, an *emic* view as an insider or *ethnographic* where quotes from participants are used or an *etic* view where an impartial style of narration is used. If the researcher intends to target certain publications, they should adhere to the style required. The dimensions and criteria of the framework provided by Lau (1998) provides sufficient guidance regarding the type of information, that would be meaningful to include.

The criteria are now discussed in more detail as it relates to the specific research conducted.

- ***Background:*** Lau questions the adequacy of the background information and whether this leads to sufficient understanding. Sufficient background information should be provided about the organisation, the problem and how it is being addressed. This information should create an understanding of the significance of the project. Reason et al (2001) informs that the background context could assist in understanding the magnitude of the AR study as well as the extent to which it would lead to new and enduring infrastructures which could assist in validating the sustainability of the project.

- ***Intended change:*** Lau evaluates the identification of the intended change intervention that is required and whether it is adequate to address the specific problem situation. The intervention need not be defined in advanced during an emergent AR study (Chisholm et al, 1993).

- ***Research Site:*** Lau's criteria demands an explanation of the research site and the formal structures that governs it, to ensure that an adequate understanding can be developed with regards to whether the involvement of the researcher is adequate. It is important to convey the extent to which the organisation is involved in the research as well as the type and level of organisation (Lau, 1997; Lau; 1999). Davison (2004) request clarification of the focus of the research in terms of the 'unit of intervention' meaning that identification of the technology and organisational levels needed to be identified.

- ***Participants:*** Identification of the participant's profiles could include information such as 'background, characteristics, perspectives, cultures, roles and expectations' according to Lau (1999). The intent is to establish whether the participants are authentic in terms of benefitting from solving the problem. A further benefit of understanding the participants is that developing relationships can be tracked (Coughlan et al 2000). Development of relationships is an important concern for AR researchers as it shapes understanding of the complex nature of the organisational problem (O'Brian, 2001).

- ***Data Sources:*** The criteria that are used to evaluate data sourced is intended to establish the credibility, dependability and the level of authorisation that is achieved by using these data sources. The data sources and rationale are explained in section x study design.

- ***Duration:*** Davison (2004) requests clarification of the project focus in terms of duration. Lau advised that the length of the iteration should be tracked and evaluation of the duration focus on whether appropriate time is allowed for adequate change as well as action and reflection. The initial estimate was that the study will take over 3 years, but the study took more than five (5) years to complete.

- ***Degree of openness:*** Lau advises that the degree of openness refer to the extent to which the objectives and interventions are defined upfront. Classical AR is more defined while emergent AR has fewer assumptions and predefined actions (Lau, 1999). Davison (2004) requests justification of any deviation from following a traditional cyclical process model (CPM) approach.

- ***Access/Exit:*** Lau (1999) states that the end of the cycle should be specified in terms of clear exit and access points, whilst other AR researchers are not as prescriptive. Johnson (1991) states that preliminary dates set as benchmarks, should be appropriate as it would allow the researcher to negotiate some of the conditions under which the research is conducted (Jonsson, 1991). The objective of exit points according to Checkland (1991), is to allow the researcher sufficient time to review the research and extract lessons learnt which can be related to the research themes (Checkland, 1991). Both the researcher and practitioners should agree that sufficient learning has taken place, which will define the exit points.

- **Reporting style:** The criteria to evaluate a quality and robust AR study should be considered a useful departing point to report on the study (Lau, 1998). The way that the study was reported mostly follows the example of Iversen *et al* (2004) where an impartial style of narration is used. However since interview data is included in the study the research will be expanded with quotes from participants gained during interviews, which refer to ethnographic reporting.

AR Criteria to evaluate the Quality of the Research Process

The 'research process' refers to all the steps that are taken during the action iterations including: diagnosing the problem, design and implementation of interventions and reflective learning (Lau, 1999). The criteria refer to identification of the need, interventions, whether reflective learning takes place, iterative processes and lessons learnt. Each of these criteria is now discussed in more detail as it relates to the specific research problem. Table 94 provides high-level overview of Lau's criteria.

Table 94: Criteria to Evaluate the Research Process (adapted from Lau, 1998)

Dimension & Criteria	Classification	Evaluation
Problem Diagnosis	Is there a practical problem or need identified for the study?	The problem or need should be identified early even if it is quite broadly defined. The problem should evolve during the iteration cycles. The problems need to be genuine, relevant and currently impacting on the participants.
Action Interventions	Are the planned and implemented actions identified?	Once a good understanding exist of the need for the study, interventions should be planned with the assistance of participants. Planning of the interventions could follow a methodology or be ad-hoc and can be refined in successive iterations. The interventions should be appropriate to address the intended problem that needs to be solved by the research. The success or failures of these interventions should be reported in terms of effectiveness.
Reflective Learning	Are the reflections identified and explicit?	Reflection should be a distinct step during the action iterations, which allows the participants to learn from the changes that were implemented. The process of reflecting as well as the content of the reflection should be trustworthy and representative of collective experiences.
Iteration	Are there an iterative process planned as part of the study?	An iterative process is especially important if emergent AR is conducted where the actions is not well defined in the beginning of the research and improvements is made during the iterations. The iterations should in this case be more explicitly defined in terms of the problems that were diagnosed, the interventions that were planned and reflections that took place. The iteration process should be appropriate to allow problem solving and reflective learning.
General Lessons	Are their general lessons to be learnt from the study?	AR should also contribute to new knowledge which can be described as lessons learnt, The type of lessons can be tacit based on the experience of participants or generalised knowledge that can product new theories and concepts.

The criteria are now discussed in more detail as it relates to the specific research problem.

- ***Problem Diagnosis:*** Lau questions whether an authentic practical problem exists and evaluates it in accordance to whether the problem is genuine impacting on the participants of the study and can be addressed by immediate interventions.

- ***Action interventions:*** The actions interventions should be authentic and appropriate to address the research problem and the effectiveness of the intervention should additionally be reported (Lau, 1999). The practical outcomes of the action interventions should be effective meaning that it should lead to improvements in the organisation (Reason *et al* 2001). The kind of interventions may be directive or indirect depending on the extent to which the researcher directs the change (Baskerville, 1999). The type of interventions that is planned for this study includes risk analysis, devising of resolution strategies, and development of risk framework and risk interventions and explained in detail during the AR iterations.

- ***Reflective learning:*** Lau (1999) definition of reflective learning focus on indicators that specify the trustworthiness of the research, which can be signified by collective experiences and whether the feedback are utilised as input for subsequent phases. Davison (2004) also considers collaborative reflection as being essential to reflective learning. He proposes that reflection should consider whether the project was successful in solving the problem, whether the competence of the client was enhanced and whether the project can be considered to be sustainable. In addition to these requirements for reflective research, Näslund et al (2010) presents another dimension to reflective research, namely that it should increase understanding of existing research as well as the process of conducting research. Cronen (2001) supports the notion that such knowledge serves as value input for the development of practical theories. It is the contention of Vries (2007) that not only should theory be analysed during reflection, but that the method of reflection can be based on theory. Yet, another aspect to consider during reflection is advised by Hult et al (1980) that emphasises that reflection should take place on a holistic level. Rather than considering isolated factors, it is important to consider the overall manner in which the interdependencies and dynamics of the system function. Reflection should also consider opposing perspectives between collaborators as advised by Ballantyne (2004). These conflicting perspectives could stimulate the emergence of new research insights.

- ***Cycle description:*** The main objective of having iterations is to increase understanding. Blum (1955) explains that mutual understanding is increased via the collaboration cycles. Lau's criteria focus on whether the iterative process is sufficient to allow learning to take place. It is more important to make provision for sufficient learning to take place during emergent AR rather than better-defined research (Chisholm et al, 1993). Davison (2004) requests that a description of how the CPM passes through the different states of diagnosing, intervention and reflection takes place. Such a description is provided in section x.

- ***General lessons:*** To ensure that the lessons learnt can be considered a new knowledge contribution it should conform to criteria such as being 'credible, transferable, dependable and confirmable' (Lau, 1998. p 168). Validation takes place when multiple measures are applied during interpretation of the data (Jonsson, 1991). Checkland (1991) elucidate that the lessons learnt from the study should conform to the intellectual framework and theoretical assumptions that was earlier specified.

AR Criteria to Evaluate Role Expectations

The roles and expectations of the researcher, study participants and other stakeholders are addressed in this section. Chisholm *et al (*1993) advised that role clarification is of special importance during the following there stages, namely: (1) involvement in planning and conducting the research, (2) involvement in interpreting and communicating the results and (3) learning from the process via discussion and writing. It is necessary to explain the changing roles of the researcher and participants as these roles can change during the action iterations, according to Checkland (1991).

Table 95: Criteria to evaluate role expectations (Lau, 1998)

Dimension & Criteria	Classification	Evaluation
Researcher	What is the role of the researcher?	The researcher could play the role of an expert or leader that provide guidance or a facilitator that collaborates the design, collect and interpret findings. The role of the researcher should conform to the type of AR that is being adopted.
Participants	What is the role of the participants?	For effective change to take place, it is necessary to engage participants during the process. The extent of engagement is dependant on the form of AR that is employed by the action researcher. The role of participants can be on a scale from being in full control of the study, where on the other end of the scale the researcher is in control and facilitate the whole process. The role of the participants should be well defined in terms of how effective the problem are being solved and how they learn from experience.
Competency	What improvement in terms of competencies is planned for participants?	To ensure that change took place, the competency level of participants should change accordingly. This could be in the form of heightened awareness of the problem through reflection and or increased performance. The competency should relate to the original problem.
Ethics	What ethical issues need to be addressed?	The ethical issues pertinent to the problem situation and the organisation should be explicitly addressed and resolved in a satisfactory manner. This could include ethical principles or dealing with controversial subjects or ensuring confidentiality of the organisation as well as the participants when conducting the study as well as reporting the findings.

The evaluation criteria for the dimension focus on the role of the researchers, participants, competencies and ethical concerns that are subsequently discussed in more detail.

- ***Researcher role**:* AR embeds the AR researcher within changing situations and relationships which impacts on the perceived impartiality of the researcher. The researcher is no expected to be totally independent as would be expected from qualitative researchers. Somers *et al* (1994) argues “the classification of an actor divorced from analytic relationally is neither ontologically intelligible nor meaningful”.

  Lau states that the role of researcher should be appropriate and effective in relation to the type of action research that is conducted. The researcher can play a wide variety or roles. The roles can vary according to the iteration stages and can consist of variations of roles such as planner/leader, catalyser/facilitator, teacher/designer, listener/observer/ synthesiser/reporter. The predominant objective of the researcher is to ensure that local leaders are created that understands the methods and can take responsibility for carrying on the process when the researcher leaves. The advantage according to Winter (1987) is that meaningful embedding of the AR method within the organisation should occur so that the process can be maintained when the researcher exists.

- ***Participant role**:* The nature and process of collaboration between participants should be formalised (Winter, 1987). Reason et al (20011) explains that ‘a praxis of relational participation’ should be developed to ‘maximise collaboration’. Lau states that the role of participants should be well defined to ensure that leanings could be developed during the AR iterations that are regarded as authentic, appropriate and effective to solve the problem.

- ***Competency:*** One of the characteristics of a robust AR study according to Hult et al (1980) is that the intervention should enhance the competencies of the actors via a learning process. Increased competencies can be demonstrated through increased awareness of how to address the problem (Lau, 1999).

- ***Ethics****:* Vries (2007) recommends that action researchers should explicitly address ethical considerations during research since Avison et al (2001) discloses that a myriad of ethical concerns could exist. Consideration of ethics is important as Winter (1987) reminds us that AR studies are carried out in real-world environments. An ethical framework should guide expectations and identify issues that may not be disclosed by the study (Hult *et al* 1980; Jonsson 1991). Lau refers to ethical issues as ensuring confidentiality of the organisations and the participants of the study.

  A researcher-client agreement exist, according to which the researcher have the obligations not to divulge commercial sensitive information. Any facts are produced in collaboration with risk practitioners and/or correlated via different sources of information. The final thesis was checked by a member of the organisation to ensure that potential conflicts are addressed before publication.

Additional Criteria

The criteria used by Iversen *et al* (2004) to guide the quality of the research included definition of roles, documentation collection, researcher-client control agreements, establishing the usefulness of the intervention, the use of theory to support the study and how the results of the study can be transferred and adapted to other contexts. All of the criteria used by Iversen et al (2004) have been included in Lau (1998) research criteria, with the exception of 'transferability' of the study to other contexts. This will be introduced as another criterion and subsequently discussed.

- ***Transferability***

Mathiassen (2002) added that it is necessary to ensure that research can also be of practical value external to the organisation that is being studied. Davison (2004) advocates that the implications of the study to related domains should be reflected on as well as the implications for informing theory. Iversen et al (2004) established the following characteristics of research to ensure transferability: (1) Identify areas external to the context of the research where the approach might not be useful (2) Identification of the conditions under which the approach will be appropriate such as time and resources required (3) Identification of how easy it would be to make the approach understandable for others (4) Identification of the skills and capabilities that is required to fulfil the conditions (5) Identification of the general applicability of the approach versus specified approaches to increase usefulness.

Validity of the research, which means the extent to which the research achieves it goals, is a sound criterion to argue for generalisation of research according to Keen (1991). Rapoport, (1970) cautions for restraint when arguing for generalisation of studies when the AR studies are based on a small number of observations, which would not be a relevant concern for this study. Iversen et al. (2004) confirmed that in addition to the criteria stated above transferability could additionally be claimed by relating results to existing bodies of knowledge.

17.15. Peffers et al (2006) Design Science Model

Table 96: Peffers *et al* (2006, pg 91) DS Process Model Influences

Objectives	Archer (1984)	*Takeda et al* (1990)	Eekels and Roozenburg (1991)	Nunumaker et al (1991)	Walls et al (1992)	Rossi et al (2003)	Heyner et al (2004)
Problem identification	Programming data collection	Problem enumeration	Analysis	Construct a conceptual framework	Meta-requirements Kernel theories	Identify a need	Important and relevant problem
Objectives			Requirements				Implicit in relevance
Design and development	Analysis Synthesis Development	Suggestion Development	Synthesis Tentative design proposals	Develop a systems architecture Analyse and design the system Build the system	Design method Meta design	Build	Iterative search process Artefact
Demon-stration			Simulation Conditional prediction	Experiment observe and evaluate the system			
Evaluation		Confirmatory evaluation	Evaluation Decision Definitive design		Testable design process Product hypothesis	Evaluate	Evaluate
Communi-cation	Communi-cation						Communi-cation

17.16. Comparing AR & DS Approaches

Table 97: Similarities between Design Science and Action Research as Adapted from Järvinen (2007)

Criteria	Action Research	Design Science
Assessment of usefulness	Usefulness is established using a people's perspective	Artefacts is assessed via criteria of completeness, simplicity, elegance, easy of use and easy to understand
Deliverables	The product is knowledge which guides interventions and actions	The product is knowledge about the artefacts.
Methods	The two main activities is action taking and evaluation	The two primary activities are building and evaluation
Customer orientation	AR researchers collaborate with clients to solve problems	DS researcher collaborate with clients to develop solutions for problem solving
What is does?	A new system or process is created or modified	DS solves and improves a problem
Researcher orientation	The researcher activity intervenes in the problem situation	The researcher collaborates to achieve an understanding of the problem.
Knowledge development	Both AR and DS generate knowledge, utilise the knowledge and evaluate it during the course of the research.	

17.17. Framework based on ADR & DS Approaches

Table 98: Framework based on ADR and DS approaches

Phase (Peffers *et al* 2007 and Sein *et al* 2011)	Content (Gregor and Hevner, 2013)
Problem Formulation	Problem definition, problem significance, motivation, introduction to key concepts, scope of study. Research questions and objectives, literature review including theories and findings from practice, overview of methods
Design and Development	The research approach that was employed including a description of the artifact at appropriate levels of abstraction to make contributions to knowledge base
Implementation and Evaluation	Evidence of the usefulness of the artifact using criteria such as validity, utility, quality and efficacy. Technical review of the artefact and suitability of design and any adaptations that may be required
Formalisation of learning	Interpretation of results and how this translates to the objectives. This include leanings, comparisons with previous work, limitations, theoretical and practical significance and areas that require further work. Research contributions should be highlighted.

17.18. Cross-functional Research Contribution

Table 99: Cross Functional Research Contribution (expanded from Nambisan, 2003)

Cross-functional research contribution	Contributions over the years	Critical contribution
R&D/ Engineering Management	R&D in NPD, Project management, technical performance, project cost	Innovation Management
Marketing	Market-driven NPD, customer needs identification, marketing plans, fit with market	Voice-of-the-customer, lead user

Cross-functional research contribution	Contributions over the years	Critical contribution
Organization	NPD as an organisational process, team characteristics, internal and external communication, incentives, conflict management, team building, process success	NPD team management, organisational alignment of NPD processes
Strategy	NPD as part of product or organisation strategy, portfolio management, strategic product and technology planning, platform strategy, alliances and networks, strategic alignment of product	Integrate R&D/NPD portfolio with business strategy
OR/MS and Production	NPD as a sequence of development / production steps, process schedule, supplier selection, process performance, modelling optimisation and operational efficiency	Supply chain integration for NPD and design-for-manufacturing
IT	NPD as an IT enabled innovation process, knowledge management, support for collaborative and distributed innovation, integrated process and project management	*Project management, Privacy, Information Security Management, Systems development
Other fields	Regulatory and Legal Risk management	Stakeholder management Contract management Managing of risks in NPSD

17.19. Strategic Orientation

Design of the deliverables for the AR iterations was informed by using Manning (2001) model of 6 abilities that give winners the edge. These areas are phrased as 6 questions to the team to consider:

- **Strategy making:** Do we (as a team) have a good understanding of our challenges and how should we respond to them?
- **Possibility thinking:** Do we think 'out of the box' about what we could do, rather than be restricted by current challenges?
- **Winning stakeholder support:** Do we know who our stakeholders are and how we should gain their support?

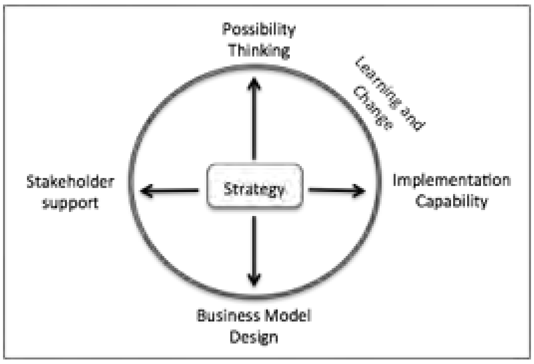


Figure 109: Six Abilities that give winners the edge (Manning, 2001).

- **Business model design:** Have we designed our unit to deliver the results we want?
- **Implementation:** Do we have all the necessary capabilities to meet our objectives and are our practices aligned to the results we expect?

- **Learning and change:** Are we keeping up to date with what is happening in risk and innovation research and do we learn fast enough?

The first order was to agree on a strategic focus, which were delivered as ‘build <the organisations> reputation as a company that launches the best products, services, promotions and campaigns’.

Dimension	Question	Action Research Focus
Strategy	Do we understand our challenges?	The challenges were to ensure that risks are sufficiently managed in NPSD to protect the organisation against reputational risk. The challenge is to integrate risk processes effectively within the NPSD division taken into account the cultural aspects and aversion to RM. An additional challenge was to ensure that the process is effective to improve the way the risk division as well as the NPSD division works.
Possibility thinking	Thinking out of the box	The team agreed on a lofty ideal, which was operationalized as “building the organisation’s reputation as a company that launches the best products, services, promotions and campaigns”. So not only did the team want to implement RM but the impact of RM must improve the way customers perceive the products and services
Stakeholder support	Do we have support of the necessary stakeholders	The team agreed that they have the support of the RM organisation as well as the CEO of the organisation, which is provided in a written mandate. However the support of the executive leadership of the NPSD team were considered to be insufficient. It was also considered necessary to obtain more buy-in from the actual NPSD team members.
Business Model Design	Is the structure of the risk team optimal to address the challenges	The team decided to restructure to have a more efficient focus on addressing the needs of the NPSD team and obtain more information on risks.
Imple-mentation	Is practices and capabilities aligned to achieving the objectives	The answer was no. The team decided that more research is needed in terms of what practices and capabilities is needed and this task was left to the researcher to perform. The team also needed a more efficient way to consolidate and present risk lists and controls. A more efficient process in line with RM practices needed to be found.
Learning & Change	Do we have all the information and do we learn fast enough?	The answer was no. The team needed to conduct more research into best practices of NPSD to have a better understanding of what it will take to ensure that they can work towards the ideal of ensuring that the organisation’s reputation is enhanced as the company who launches the best P&Ss.

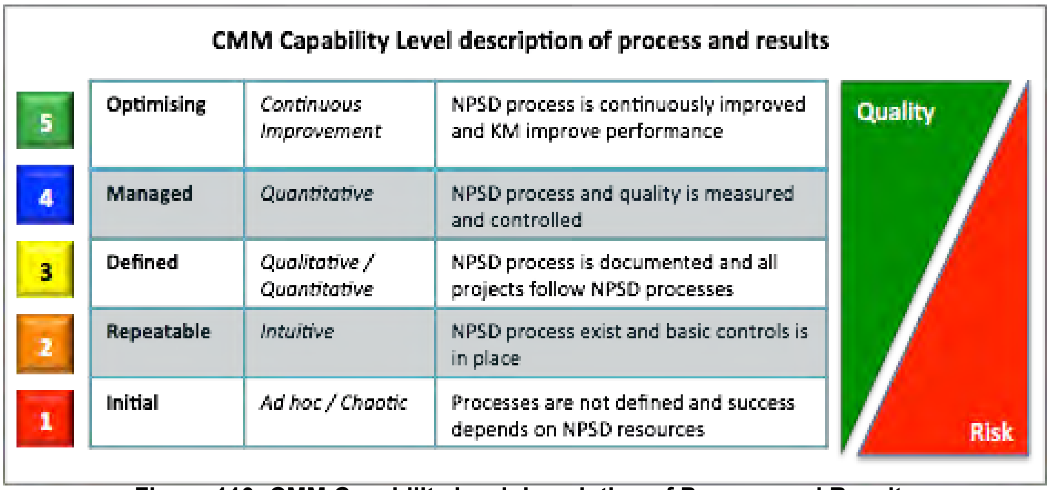
17.20. Risk Challenges and Approaches

Table 100: Brainstorming Exercise Round 2: Risk Challenges and Approaches

Challenges	Categories	Approaches
Risks are not sufficiently considered and mitigated during NPSD lifecycle	NPSD	Develop risk framework
Protect organisation against risks which could damage the reputation as well as impact on the future sustainability of the organisation	NPSD	Develop risk framework
Not having an adequate understanding of NPSD and practices that support development of more successful P&Ss	RM	Include best practices in risk framework
Risk processes are not integrated within NPSD division	RM	Develop risk process
An aversion to RM is experienced from the product managers	Culture	Culture change
Not having an effective RM process to support P&S development	RM	Develop risk process
Not having a clear value proposition to explain the advantages of RM to the NPSD division	RM	Develop risk framework
Insufficient support of RM by NPSD leadership	Culture	Executive mandate & demonstrate value-ad of RM
Insufficient buy-in from all of the members of the NPSD team regarding risk management	Culture	Demonstrate value-ad of RM to NPSD team members

Challenges	Categories	Approaches
The RM team are not optimally structured	RM	Team organisation
Insufficient information is available about risks in NPSD and more research is required	RM	Risk list development
The risk team do not have an aligned vision of what to achieve	RM	Vision / Strategy / Culture
The RM team have insufficient understanding of the underlying causes of risks	RM	Post-implementation reviews
Risk assessment are conducted adhoc and risks assessments do not follow a structure, nor is it consolidated in a manner where learning can take place from previous risk assessments	RM	Risk framework, lists and controls
The NPSD process is complex with many systems and teams involved, exposing P&S to a broad range of risks	NPSD	Risk framework
Constant time pressure experience by NPSD teams to launch P&Ss faster which often means that risks are not adequately considered	NPSD	Culture
Vague P&S descriptions makes it difficult to conduct risk assessments	NPSD	Risk framework
Risk assessments are not tailored to specific categories and types of P&Ss	RM	Risk framework
The RM team are not always informed by product teams of risks relating to P&S	Culture	Embed RM within NPSD environment
Risk assessments are not presented in a structured and easily understandable manner	RM	Risk framework / analysis

17.21. Capability Maturity Model NPD



CMM Capability Level description of process and results

Level			
5	Optimising	*Continuous Improvement*	NPSD process is continuously improved and KM improve performance
4	Managed	*Quantitative*	NPSD process and quality is measured and controlled
3	Defined	*Qualitative / Quantitative*	NPSD process is documented and all projects follow NPSD processes
2	Repeatable	*Intuitive*	NPSD process exist and basic controls is in place
1	Initial	*Ad hoc / Chaotic*	Processes are not defined and success depends on NPSD resources

Figure 110: CMM Capability level description of Process and Results

17.22. Risk Maturity Model

Table 101: Attributes of Hillson (1997) Risk Maturity Model

	Level 1 - Naive	Level 2 - Novice	Level 3 - Normalised	Level 4 - Natural
Definition	- Unaware of the need for risk management. - No structural approach to dealing with uncertainty. - Repetitive and reactive management process. - Little or no attempt to learn from past or to prepare for future	- Experimenting with risk management, through a small number of individuals. - No generic structured approach in place. - Aware of potential benefits of managing risk, but ineffective implementation, not gaining full benefits.	- Management of risk built into routine business processes. - Risk management implemented on most or all projects. - Formalised generic risk process. - Benefits understood at all levels of the organisation, although not always consistently achieved.	- Risk-aware culture with proactive approach to risk management in all aspects of the business. - Active use of risk information to improve business processes and gain competitive advantage. - Emphasis on opportunity management (positive risk)
Culture	- No risk awareness. - Resistant and reluctant to change. - Tendency to continue with existing processes	- Risk process may be viewed as additional overhead with variable benefits. - Risk Management only used on selected projects.	- Accepted policy for risk management. - Benefits recognised and expected. - Prepare to commit resources in order to reap gains.	- Top-down commitment to risk management with leadership by example. - Proactive risk management encouraged and rewarded.
Process	No formal processes	- No generic formal processes, although some specific formal methods may be in use. - Process effectiveness depends heavily on the skills of the in-house risk team and	- Generic processes applied to most projects. - Formal processes incorporated into quality system. - Active allocation and management of risk budget at all levels.	- Risk-based business processes. - Total Risk Management permeating entire business. - Regular refreshing and updating of processes. - Routine risk metrics with constant feedback

	Level 1 - Naive	Level 2 - Novice	Level 3 - Normalised	Level 4 - Natural
		availability of external support	- Limited need for external support.	for improvement.
Experience	- No understanding of risk principles or language	- Limited to individuals who may have had little or no formal training.	- In-house core of expertise, formally trained in basic skills. - Development of specific processes and tools.	- All staff risk-aware and using basic risk skills. - Learning from experience as part of the process. - Regular external training to enhance skills.
Application	- No structured application. - No dedicated resources. - No risk tools.	- Inconsistent application. Variable availability of staff. - Ad hoc collection of tools and methods.	- Routine and consistent application to all projects. - Committed resources. - Integrated set of tools and methods.	- Second-nature, applied to all activities. - Risk-based reporting and decision-making. - State-of-the-art tools and methods.

17.23. Guidelines for Mixed-Method Research

Table 102: Guidelines for Mixed Method Research

Area	Guideline	Author and reviewer considerations
General guidelines	Is the mixed methods approach appropriate for the study?	The research question, objectives and context of the study determine the appropriateness of conducting mixed method research. Seven main purposes exist to conduct mixed-method research according to Venkatesh et al (2013) which includes criteria of: - Complementarity: To gain complementary views about the same phenomena or relationships. - Completeness: To ensure that a complete picture of a phenomenon is obtained. - Developmental: Questions for one strand emerge from the inferences of a previous one. - Expansion: To explain or expand upon the understanding obtained in a previous strand of a study. - Corroboration/confirmation: To assess the credibility of inferences obtained from one approach. - Compensation: To compensate for the weaknesses of one approach by using the other. - Diversity: To obtain divergent views of the same phenomenon.
	Was a strategy for the design of the mixed methods research developed and explained?	The suitability and appropriateness of the strategy are examined in terms of answering the research question. The researcher needs to select appropriate quantitative and qualitative methodologies and decide whether they will conduct parallel or sequential mixed methods research. - Concurrent: Quantitative and qualitative data are collected and analyzed in parallel and merged for a complete understanding of a phenomenon or to compare individual results. - Sequential: Quantitative and qualitative data collection and analyses are implemented in different phases and each is integrated in a separate phase.
	Was a strategy developed and explained for analysing mixed methods research data?	Develop a strategy to analyse mixed methods data that apply similar standards of rigor for both qualitative and quantitative data.
	Was meta-inferences from the mixed methods results drawn?	Researchers should offer meta-inferences or theoretical statements inferrred from a combination of qualitative and quantitative studies as it follows from the research objective and theoretical contributions.

Area	Guideline	Author and reviewer considerations

Validation	Was validation criteria for quantitiative and qualitative research discussed.	Validity criteria for both qualitative and quantitative study pointing to rigor and research quality.
		For quantitative methods:
		- Design validity:
		    o Internal validity: causal relationships between dpeendent and independent variables
		    o External validity: the cause-effect relationships is valid within different contexts
		- Measurement validity:
		    o Reliability: the repeatability of the result
		    o Construct validity: Inferences from the theory
		- Inferential validity:
		    o Statistical conclusion validity: inferences about the correlations between dependent and independent variables.
		
		For qualitative methods:
		- Design validity:
		    o Descriptive validity: accuracy of events reported
		    o Credibility: Results are convincing in the face of alternative explanations
		    o Transferability: Generalisability of research to other contexts
		- Analytical validity:
		    o Theoretical validity: Theory explanation fit to the data
		    o Dependability: Explanation of how changes impacted on study
		    o Consistency: Verifying steps in the qualitative research
		    o Plausability: Fit between findings of the study and the data from which it is derived.
		- Inferential validity:
		    o Interpretive validity: The researcher accurate interpretation of the participants views
		    o Confirmability: Corroborations of results by others

	Was mixed method research terminology used when validation was discussed?	The terminology should be consistently applied. Venkatesh et al (2013) is a proponent of using different ‘nomenclature’ to distinguish between normal qualitative and quantitative research versus mixed-method research. The term ‘inference quality’ is proposed to use to describe validation in mixed-method research and the term ‘data quality’ to refer to reliability of mixed-method research.
	Was the validation of mixed methods findings and meta-inferences discussed.	The validation should be assessed on overall findings and theoretical contribution quality. Researcher need to focus on how the meta-inferences are being validated namely: - Integrative efficacy: inferences are effectively integrated into a theoreticalaly consistent meta-inference - Integrative correspondensce: inferences satisfy the purpose of conducting mixed method research - Inference transferability: inferences are transferable to other contexts The integration of qualitative and quantitative studies providing holistic insights can be done through a process of compare, contrast, infuse, link and blend.

Area	Guideline	Author and reviewer considerations
	Was the validation discussed from a research design point of view?	Asses whether the meta-inferences conforms to the design.
	Was potential threats and remedies discussed?	Discuss the threats that may arise during data collection and analysis

17.24. CATWOE Elements

Table 103: CATWOE Elements (Checkland et al. 2010)

Symbol	Explanation
C	Customers of the transformation process
A	Actors responsible for the transformation processes
T	Transformation process consist of the purposeful activities that is required to fulfil the objectives of the RD
W	Worldviews are the internalized assumptions whereby the actors interpret and make sense of situations
O	Owners of the transformation processes
E	External environmental constraints

17.25. Newness of a DS Artefact

Gregor et al (2013) explains that ‘nothing is really new” and everything is built on some previous idea. The research contribution of a DR artefact can be defined by evaluating the problem maturity and solution maturity. Basic quadrants of Gregor et al (2013) DSR framework are shown in Figure 13. The X-axis indicates Solution Maturity, which reflects the maturity of the problem on a level from high to low. The Y-axis reflects Application Domain maturity that reflects the maturity of artefacts from high to low. The four quadrants is explained as follows:

- *Improvement:* New solution for a known problem.
- *Routine design*: Both the solution and the problem is known.
- *Invention:* New problems and new solutions are invented.
- *Exaptation*: The problem is new but the solution is known or adapted from other fields.

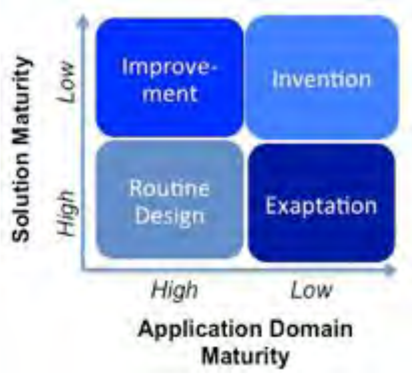


Figure 111: DSR Knowledge Contribution Framework (Adapted from Gregor et al. 2013)

Three of the quadrant offers research contributions in terms of research opportunity and knowledge contribution, namely *inventions*, *exaptations* and *improvements*. *Routine design* offers no major knowledge contribution.

17.26. Framework for Adoption and Success of Dashboards

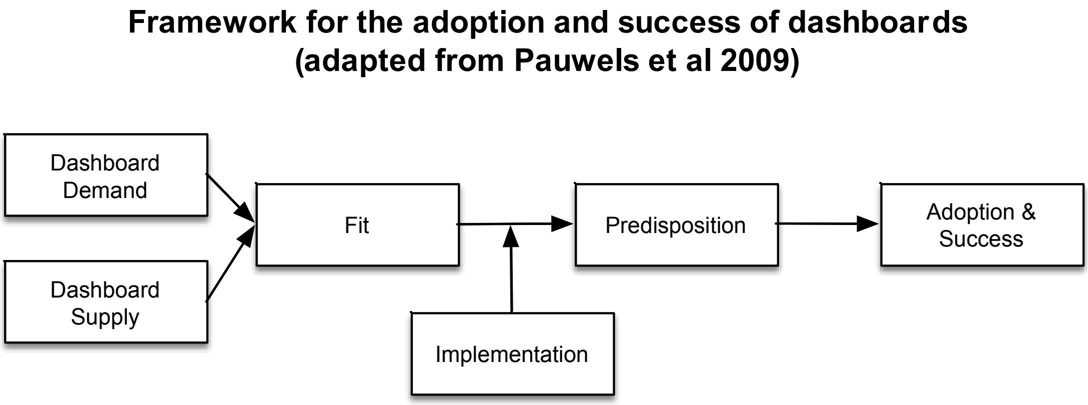


Figure 112: Framework for Adoption of Dashboards

17.27. DS Knowledge Contribution Framework

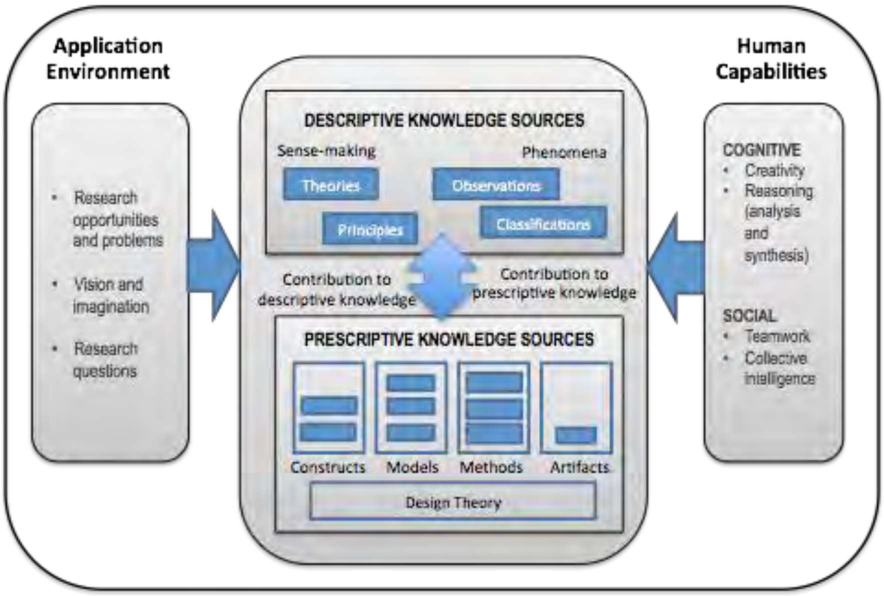


Figure 113: Knowledge Contribution Framework (adapted from Gregor et al. (2013).

17.28. Action Research Approach Followed by this Study

Table 104: Action Research Approach Followed

	Initiating	First Iteration	Second Iteration	Third Iteration	Closing
Timeframes	August 2009 until December 2009	January 2010 until March 2011	April 2011 until March 2012	April 2012 until May 2013	January 2014 Action part closed
Appreciate the problem situation	SSM Checkland et al. 1990 to express problem and develop RDs and model of purposeful activity (R, RR).	Inquiry stages of SSM to guide development of interventions (R, RR).	Inquiry stages of SSM (R, RR).		
Study the literature	Study literature AR, RM & Innovation (RR, RP)	Study literature RM & Innovation (R, RP)	Study literature B2B (R, RP)	Study literature, DS, Privacy, PoPI, Classification models (R, RP)	
Select risk approach	Beckard et al (1997) action planning steps framed the discussion. Delphi method to obtain accommodation of requirements (RR, RP)	The primary objective was to develop a framework and supporting risk processes to guide risk assessments. (RR, RP)	Update IRMF and risk processes from lessons learnt; update of the risk framework and risk processes to cater for B2B P&S; and establishing an improved risk prioritisation	Three deliverables were therefore planned for AR cycle three: (1) streamlining the IRMF; (2) integration of privacy and PoPI compliance within the IRMF and risk	

	Initiating	First Iteration	Second Iteration	Third Iteration	Closing
			strategy so risk practitioners can focus on high-risk P&S. A priority was inclusion of B2B requirements. (RR, RP).	processes; and (3) delivery of a risk intervention during NPSD stage/gate meetings. (RR, RP).	
Develop a risk framework		Dooley et al. (2000) CMM to determine the impact of maturity on project performance in NPD Hilson (1997) RMM to evaluate RM maturity level. (R, RP, RR, PSP)	Dooley et al. (2000) CMM to determine the impact of maturity on project performance in NPD Hilson (1997) RMM to evaluate RM maturity level (R, RP, RR, PSP)	Dooley et al. (2000) CMM to determine the impact of maturity on project performance in NPD Hilson (1997) RMM to evaluate RM maturity level (R, RP, RR, PSP)	
Design a risk process		Risk lists, Risk strategy lists, Post-Implementation Reviews, Incident Database, Overall Project risk classification, Toolkit, risk prioritisation strategy. Performed lessons-learnt on selected projects. (R, RR, RP)	Risk categorisation assessment, update of risk lists, strategies, incidents and framework as well as risk process. (R, RR, RP)	Develop methods to include PoPI compliance and aid development of Privacy second-level construct, Develop method to categorise services into portfolio categories and develop a risk dashboard in addition to update of IRMF. (R, RR, RP)	
Apply the approach		Applied to P&S launched during the AR cycle. (R, RP, RR, PSP)	Applied to P&S launched during the AR cycle. (R, RP, RR, PSP)	Applied to P&S launched during the AR cycle. (RP, RR, PSP)	
Evaluate the experiences		The IRMF and risk lists, risk strategies to be updated. Overall risk classification needed to be expanded, Risk prioritisation strategy to be abandoned and new one to be developed. (R, RP, RR)	The IRMF required removal of some constructs and required others to be added. The risk process was expanded, the risks lists and strategies was updated, the risk prioritisation strategy was too cumbersome and discarded. (R, RP, RR)	The IRMF required removal of some constructs and required others to be added such as privacy second-level construct. (RP, RR)	
Exit		Operational risk questionnaire to establish exposure of org to operational risks, validate the IRMF and address research gaps. 77 interviews for B2C. (R, RP, RR, PSP)	130 interviews with conducted to test the IRMF, Content analysis conducted on top 3 concerns stated by NPSD practitioners by coding according to IRMF Framework (R, RP, RR, PSP)	Develop Yeo et al. (2009) CoPS-RM-CMM multi-level framework specifically for high-value, information-driven technology projects to develop adapted model The adapted model was called the Navigator during exit phase.	

	Initiating	First Iteration	Second Iteration	Third Iteration	Closing
				Develop a generic maturity framework to complement the risk ratings of the individual second-level constructs. (R, RR)	
Assess usefulness					A risk expert survey assessed research question (R, RR)
Elicit research results					Results and Lessons Learnt (R, RR)
Key: R is researcher; RP is researcher-practitioner; RR is risk practitioners; and PSP is NPSD practitioners					

17.29. Maturity Models

There are a number of different types of maturity models that exist (refer to Table x – Appendix). These models all share the same characteristics that that the maturity of a process is defined in accordance to a number of levels (ranging from 3 to 6) and a description of the characteristics at each level. Fraser et al (2002) provided a typology for dividing maturity models into 3 basic groups namely (1) maturity grids, (2) hybrid and Likert- questionnaires and (3) CMM-type models – indicated as approaches in Table 13.

Table 105: A sample of maturity models (adapted from Fraser et al 2002)

Subject & Reference	Maturity Levels						Approach
Quality Management Maturity Grid (Crosby, 1979)		*Level 1* Uncertainty	*Level 2* Awakening	*Level 3* Enlightenmen t	*Level 4* Wisdom	*Level 5* Certainty	Grid, 6 issues, detailed description at each level
R&D Effectiveness Audit (Szakony, 1994)	*Level A* Not recognised	*Level B* Initial efforts	*Level C* Skills	*Level D* Methods	*Level E* Responsibilitie s	*Level F* Continuous improvement	Grid, 10 issues, detailed description at each level
Quality management Process Maturity Grid (Crosby, 1996)		*Level 1* Uncertainty	*Level 2* Regression	*Level 3* Awakening	*Level 4* Enlightenment	*Level 5* Certainty	Grid, 5 issues, caption describing performance at each level
Technical innovation audit (Chiesa *et al* 1986)	0	1	2	3			Grid, 6 areas, 23 issues, detailed description at each level
Product & Cycle Time Excellence (McGrath *et al* 1996)	*Stage 0* Informal	*Stage 1* Functionall y focused project managed	*Stage 2* Cross-functional project managed	*Stage 3* Enterprise wide integration of NPD			Grid, 10 issues, detailed description at each level
Design Maturity Model (Fraser *et al* 2001)		*Level 1* None	*Level 2* Partial	*Level 3* Formal	*Level 4* Culturally embedded		Grid, 5 areas, 21 issues, detailed descriptions and captions
Product & Cycle Time Excellence – Mark 2 – (McGrath *et al* 1992)	*Stage 0* Informal Management	*Stage 1* Functional Excellence	*Stage 2* Project excellence	*Stage 3* Portfolio excellence	*Stage 4* Collaborative		Grid, Revision of earlier model
Collaboration Maturity Model (Fraser *et al* 2002)		*Level 1* None	*Level 2* Partial	*Level 3* Formal	*Level 4* Culturally embedded		Grid, 7 issues, detailed descriptions & captions
Supplier		*Level 1*	*Level 2*	*Level 3*			Grid / Likert

Subject & Reference	Maturity Levels						Approach
Relationship (Macbeth *et al* 1994)		Adversial	Transitional	Partnership			Hybrid, 9 issues, brief description at 3 levels plus 7 point scale
Continuous improvement (CI) in NPD (Caffyn, 1997)		*Level 1* Natural or background CI	*Level 2* Structured CI	*Level 3* Goal orientated CI	*Level 4* Proactive autonomous CI	*Level 5* Full CI capability	Global levels defined, 8 core abilities, 10 key behaviours
ISO 9004 (EN ISO 9004 – 2000)		*Level 1* No formal approach	*Level 2* Reactive approach	*Level 3* Stable formal system approach	*Level 4* Continuous improvement emphasised	*Level 5* Best in class performance	Global levels defined, 5 questions, 11 issues
Project Management Maturity (Dooley *et al* 2001)		1	2	3	4	5	Likert style questionnaire, 15 areas, 85 issues, no description of performance
Software CMM Staged maturity levels (Paulk *et al* 1993)		*Level 1* Initial	*Level 2* Repeatable	*Level 3* Defined	*Level 4* Managed	*Level 5* Optimising	CMM Style
Agility (change proficiency) maturity model (Dove, 1996)		*Level 1* Accidental	*Level 2* Repeatable	*Level 3* Defined	*Level 4* Managed	*Level 5* Mastered	CMM Style
Usability Human Factors Maturity (Earthly, 1998)	*Level X* Unrecognised	*Level A* Recognised	*Level B* Considered	*Level C* Implemented	*Level D* Integrated	*Level E* Institutionalised	CMM Style
CMMI Continuous Capability levels (Shrum, 2000)	*Level 0* Not performed	*Level 1* performed	*Level 2* Managed	*Level 3* Defined	*Level 4* Quantitatively Managed	*Level 5* Optimising	CMM Style
FREE (Collaboration) Capability Agreement Framework (Wognum *et al* 2002)			*Level 2* Repeatable	*Level 3* Defined	*Level 4* Managed	*Level 5* Optimising	CMM Style

Maturity grids are of moderate complexity due to a number of pages of text required to describe each activity, whilst Likert scales (Likert (1932) can be utilised as checklists to analyse the maturity of a process. CMM type models categorises processes according to common characteristics, which describe key practices, but without providing individual descriptions for each activity at each maturity level. The type of models utilised by the sample of maturity models adapted from Fraser *et al* 2002, indicates the type of models and approaches used in Table 1.

<The end>