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Building a model to improve front end project conceptualisation: Introducing the Project Conceptualisation Canvas

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for the degree of

Doctor of Philosophy

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Statement of original authorship

DECLARATION

I, Cordi van Niekerk, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I have not allowed or will not allow anyone to copy any part of this thesis with the intention of passing it off as his or her own work.

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Abstract

Project management has seen significant growth which has been beneficial to academics and practitioners in the field alike. However, the alarming trend of project underperformance continues. This points to an apparent relevance gap in Project Management. One of the areas that has been highlighted as an important area for further study to improve this situation is project front end management. Using Design Science as research methodology, the knowledge contribution of this research is an artefact called, the Project Conceptualisation Canvas. The Project Conceptualisation Canvas represents a process to be followed to ensure that the conceptualisation phases of potential projects are adequately performed. The Project Conceptualisation Canvas was developed using as input the results of the systematic review of literature on the typical challenges that occur during project conceptualisation. The Project Conceptualisation Canvas was evaluated through two sets of focus groups which confirmed that it contributes towards the improvement of project conceptualisation practice. The relevance of the contribution of the Project Conceptualisation Canvas is that it will improve decision making during the project conceptualisation and selection process which will ultimately result into improved project delivery and reduced opportunity cost that results from underperforming projects.

Table of contents

List Tables

List of Figures

Abbreviations and acronyms

Acronym	Meaning
ARPANET	The Advanced Research Projects Agency Network
CFG	Confirmatory Focus Groups
DS	Design Science
DSR	Design Science Research
EFG	Exploratory Focus Groups
FEM	Front End Management
IS	Information Systems
LHC	Large Hadron Collider
MM	Maieutic Machine
PMI	Project Management Institute
PCC	Project Conceptualisation Canvas
VPS	Visual Performable Space

Dedication

Never stop dreaming,

never stop believing,

never give up,

never stop trying, and

never stop learning.

Roy T Bennett

To little Jess, who passed away at two. Your ripple affected the lives of so many of us. It was an awakening; to be present, to challenge the norm, to be bold, to live. This was another adventure that your ripple caused. Love Living Life.

To my beloved children Mieke, Cara, James and Charlie, you inspire me every day in the way you embrace life. Dream big dreams and live your life to the fullest!

To my late parents, I dedicate this to you. Long has the road been since those care free dusty days. I hope I have done you proud.

To God be the glory.

Acknowledgements

I would like to thank the Graduate School of Business of the University of Cape Town (UCT GSB) for affording me the privilege to undertake this PhD journey.

I would especially like to extend a heartfelt thank you to my supervisor, Associate Professor Kosheek Sewchurran for your guidance and support. Thank you for exposing me to different research philosophies and, especially, for being willing to challenge traditional thinking.

I would like to thank the UCT GSB Research Office, Professor Ralph Hamann and Vedantha Singh for the support that was provided during my PhD, specifically for the support to participate in the academic conferences that were so valuable in the shaping of my work.

Thank you to all the people that participated in the focus groups who were willing to make time to participate in this research. Your candour and excitement to participate in this research is greatly valued.

To my wife Lorna, you make me a better person. Thank you for the support and belief in me during this journey. Thank you for making me see the potential and possibilities of our world.

Chapter One: Introduction

Projects are always unique, always exhilarating and never easy. While projects excite me with their potential to enable change, I was becoming disillusioned with the realities of working on projects and, specifically, the rate of project failure. Being involved in projects and with project teams energises me, so how could I use my passion and experience to improve the probability of project success?

I am passionate about projects and I do believe that there has to be a better way of ensuring that projects deliver on expected outcomes. While there are no simple solutions because of the complexity of project challenges, I wanted to dedicate my PhD research to making a contribution towards improving the success rate of projects.

1.1 The profound impact of projects

Over centuries and across industries projects have had a significant impact on civilisations and have been a means of effecting change. The use of projects and programmes (in this research the term 'project' will be used to refer to both) is increasing and the scale of such projects is becoming larger and larger. As a unique, temporary endeavour the purpose of a project is to create a specific product, service or outcome. Given the temporary nature of a project, it has a defined beginning and end in time, has a defined scope it must deliver on and has dedicated resources assigned to it (Shenhar and Dvir, 2007). The value delivered by a project is dependent on how these elements are conceptualised and aligned with the goals envisaged by the context organisation.

The use of projects is not a recent development. Among examples from ancient times are the Great Pyramid of Giza, the Colosseum, the Hanging Gardens of Babylon and the many projects over some 2000 years that resulted in the Great Wall of China.

The impact of projects can be seen in many areas of human interest. Projects have allowed us to change the way we navigate trade routes, for example the Suez Canal and the Panama Canal projects. Projects have enabled significant growth in power supply across the globe with the Three Gorges Dam in China being an example this. Currently the largest hydroelectric power station, its generating capacity is a mammoth 22,500 MW. Projects have brought architectural masterpieces to life and pushed the boundaries of engineering; the Burj Khalifa, at present the world's highest man-made structure at a soaring 829 meters, is but one example.

Projects have allowed us to turn dreams into reality. Among the boldest have been the Apollo missions. On the 20th of July 1969, Apollo 11 succeeded in landing a man on the moon and returned all three astronauts safely on 24 July 1969 (Yenne, 1985). This was the first step to establishing the subsequent NASA's human spaceflight capability and was pivotal in funding the construction of its Johnson Space Centre and Kennedy Space Centre.

Projects have enabled significant advances in scientific research. An example of this is the European Organisation for Nuclear Research (CERN). This complex project established the Large Hadron Collider (LHC), the largest and powerful particle accelerator.

Projects enabled the creation of the Internet. The Advanced Research Projects Agency Network (ARPANET), established a network, funded by the Advanced Research Projects Agency (ARPA). This network was the forerunner of the Internet.

This brief overview shows that many stakeholder groups have benefited from the growth in the use of projects and project management in an increasing number of fields. Arguably, two of the stakeholder groups that have benefited the most

are academics and practitioners working in the field of Project Management. I discuss this next.

1.2 How researchers have benefited from the growth in Project Management

With the growth in project management, so too has there been significant growth in Project Management research. Shenhar and Dvit (2007) provide a brief account of how research has progressed in the field. In the 1960s, the focus of research was on planning and scheduling. Over the next two decades this focus shifted to cost and schedule control, life cycle costing, risk management planning, and later to automated project software. During the 1990s, significant research was done on the human elements of Project Management including team building, leadership and human resources. Post the 2000s, the focus has again shifted and research has focused on the globalisation of projects, strategic project management, contingencies and project typologies.

This increased focus on Project Management research has led it to be recognised in management sciences as an academic field and, more generally, as a system of anticipating and rationalising temporary collective initiatives (Söderlund, 2004; Kwak and Anbari, 2009). New theorising of projects and project teams led to the term known as the Temporary Organisation (Söderlund, 2004; Kwak and Anbari, 2009). This has established parallels between temporary and permanent organisational constructs opening new areas for development for project management research.

Kwak and Anbari (2008) note the explosion of strong interest and popularity in Project Management research publications. The continued growth of project management as a discipline means that there are a variety of emerging focus areas available for research and this has led to the significant increase in project management publications. This growth in project management-related

publications started in the 1980s and the trend is likely to continue (Kwak and Anbari, 2008).

Using the Sciencedirect database as a source, Simion and Popa (2017) confirm the explosion in Project Management publications through their analysis of publications in the period 1999-2017. Their study showed that publications in Project Management increased more than five times, from 10,704 in 1999 to 53,632 in 2017. This trend can be seen in Figure 1 which depicts the number of annual publications on project management over the period 1999-2017.

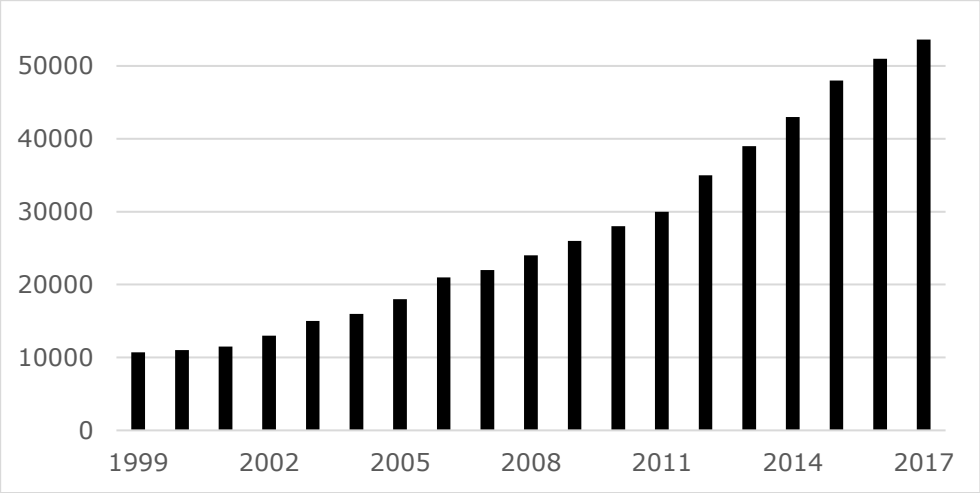


Figure 1: The number of annual publications on project management over the period 1999-2017 (Simion and Popa, 2017)

The Simion and Popa (2017) study further highlights that the share of publications on Project Management, as a percentage of overall publications in management, has increased from 26.74% in 1999 to 36.36% in 2017.

Another study that analysed publications in Project Management was conducted by Abbasi and Jaafari (2018) who analysed journals published on Scopus (Scopus.com) between 1980 and 2017. Abbasi and Jaafari (2018) identified 25,784 publications that contained 'project management' in the title, keywords

or abstracts across a number of fields. The frequency of project management related publications is shown in Figure 2 below.

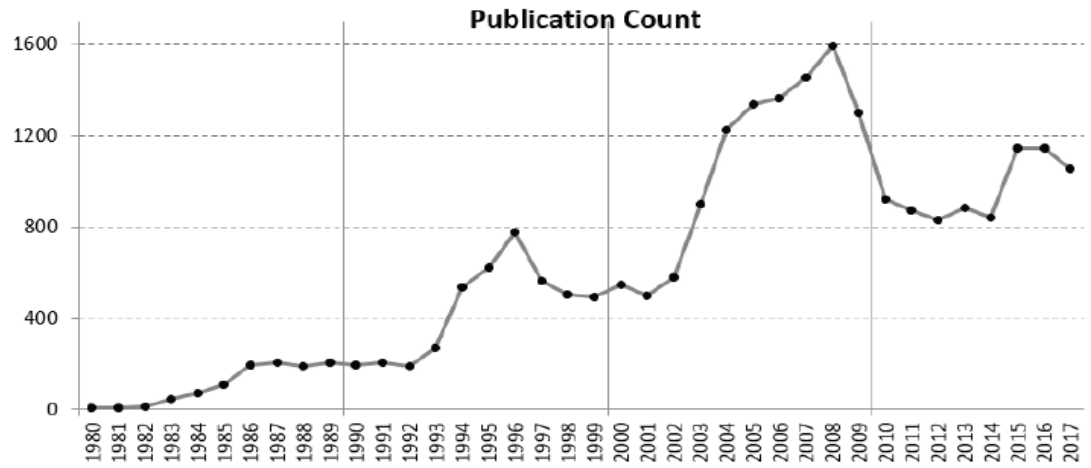


Figure 2: Frequency of published project management related journal papers per year (Abbasi and Jaafari, 2018)

Abbasi and Jaafari (2018) came to a number of interesting conclusions. Firstly, they clarified that Project Management is growing quickly. This is shown by the growth in membership in professional project management bodies and the number of academic publications. Secondly, they analysed the keywords use in the publications and found the range and diversity is broadening which indicates that new developments in project management research. They also commented that project management is now in use across all sectors of the economy where it was predominantly present in the civil and defence industries. Finally, their study found that for countries that are more developed the use of Project Management is different to those that are not. In the former, both the range of applications of Project Management and the range of industries employing Project Management is more diverse.

Researchers that focus on Project Management have benefited through both emerging research areas as well as an increase in the popularity of Project Management. The result has been a significant increase in the number of Project

Management publications. In the next section I look at how practitioners have benefited from the expansion of the use of project management.

1.3 How practitioners have benefited from the growth in Project Management

Practitioners in the field of project management find themselves in the virtuous position where the demand for Project Managers continues to increase steeply. The Project Management Institute (PMI) published the Project Management job growth and talent gap report for 2017 to 2027 (PMI, 2017) highlighting the demand for practitioners. The study reflects on the 2012 analysis where it was anticipated that the number of project-related roles would reach 52.4 million by 2020 (PMI, 2017). By 2016, the number of jobs that relates to projects had already reached 65.9 million, 25% more than anticipated and in a far shorter space of time.

The 2016 PMI report (PMI 2017) reviews 11 countries over five continents and forecasts that a total of 87.7 million project-related roles will be required over the next ten years. This predicts that 2.2 million new project roles will be created per year across these 11 countries which constitutes 33% growth collectively. This is shown below in Figure3.

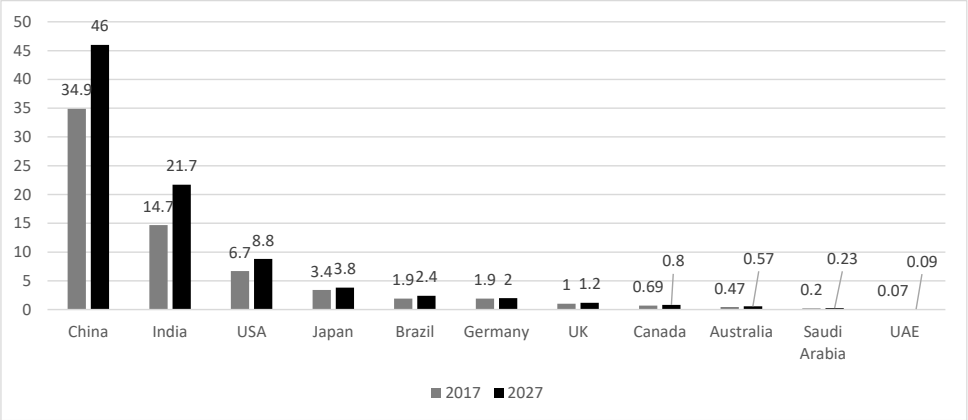


Figure 3: Project role growth outlook (in millions) (PMI 2017)

The report further highlights that, in the USA, project management oriented occupations also carry a wage benefit. Project management orientated occupations earn an 82% premium compared to non-project management orientated occupations. This can be see below in Figure 4.

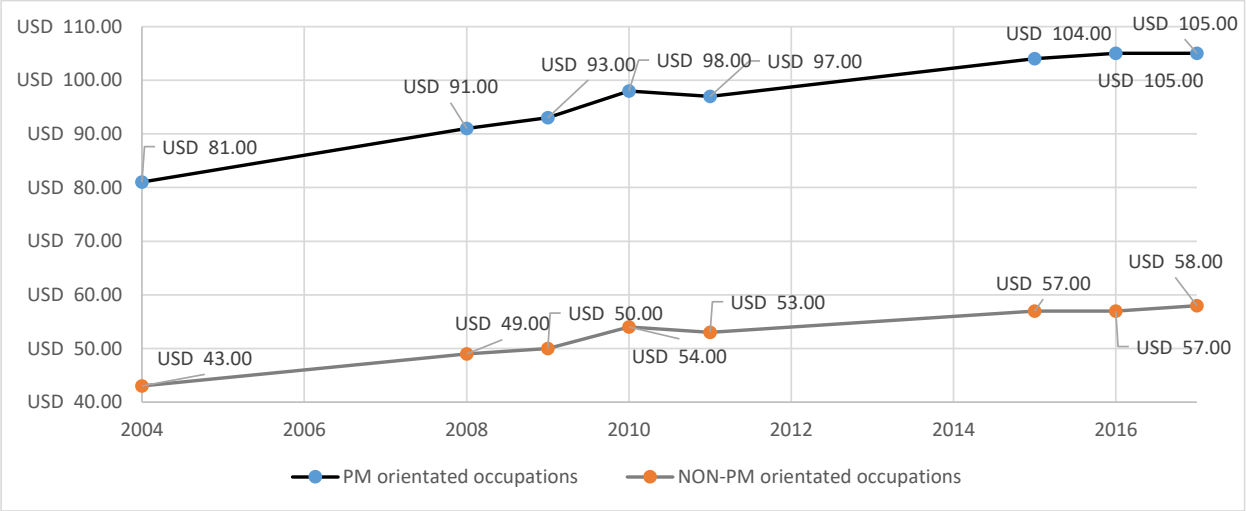


Figure 4: Project orientated vs non-project orientated earnings (PMI 2017)

The growth in the number of roles and the premium on earnings means the field is desirable for current and future practitioners. As one would expect, PMI membership has seen significant growth with membership growing from approximately 334,000 members in 2010 to 445,000 in 2017.

However, while the growth in Project Management as a discipline has resulted in significant benefits for both practitioners and researchers, project performance remains a challenge that must be explored and this will be discussed next.

1.4 The continuing problematic state of project delivery

Given the increase in both research papers in project management as well as the number of practitioners that work in project management, it is worthwhile reflecting on the success rate of projects. Much has been written over the years on the topic of projects failing to deliver on expected outcomes. This alarming

trend of project underperformance still continues (McComb and Smith, 1991; Linberg, 1999; Evans, 2005; Flyvbjerg and Budzier, 2013).

One frequently cited study is the Standish Group Chaos Report (Standish, 1994) which examined the failure rate of software projects. The first report (1994) showed that 31.1% of projects would not make it to completion and would be cancelled and that another 52.7% of projects cost, on average, 189% of the original estimates. The number of projects that were completed on time, on budget and with the intended scope was a mere 16.2%.

The Standish Group released another report in 2015 (Hastie and Wojewoda, 2015). In this report the definition of project success was changed from being on budget, on time, and on target (e.g. scope) to that of on budget, on time, and delivering customer perceived value. This change was made in order to include a measure of customer outcome. As a result, the rate of successful projects decreased by 7% (even though there was in increase in successful project delivery). The report concluded that in 2015, 29% of projects were successful, 52% were challenged and 19% failed outright (Lynch, 2015).

The 2014 edition of the PMI's Pulse of the Profession report (PMI, 2014) contains the results of a survey on project delivery. The participants of the survey included 2428 Project Management Practitioners, 192 Senior Executives and 282 PMO Directors who were consulted on project performance. The results showed that 48% of projects failed to deliver. Of these, 16% were deemed failures and an additional 32% failed on the basis of project budget. The report highlighted that, for every US$1 billion invested, US$122 million was lost as a result of underperforming projects. This was an increase of 12% on the previous year's results.

A sizable study by Budzier and Flyvbjerg (2013) reviewed the performance of 4307 projects with a value of US$85 Billion across 257 organisations and a

variety of industries. They examined the typical performance of projects in terms of cost, schedule and benefits delivered. The results clearly illustrate the problematic state of project delivery in all aspects assessed. Table 1 below summarises the study.

Table 1: Performance against initial project baseline

	Roads	Bridges & Tunnels	Energy	Rail	Dams	IT	Olympics
Cost overrun	20%	34%	36%	45%	90%	107%	179%
Frequency of cost overrun	9 of 10	9 of 10	6 of 10	9 of 10	7 of 10	5 of 10	10 of 10
Schedule overrun	38%	23%	38%	45%	44%	37%	0%
Benefits shortfall	10%	n/a	n/a	-51%	-11%	-29%	n/a
Cost Black Swans	5%	9%	7%	6%	10%	18%	6%
Ø duration (years)	5.5	8	5.3	7.8	8.2	3.3	7

Budzier and Flyvbjerg (2013) also included a Cost Black Swan measure. An event that is known as a Black Swan (Taleb, 2007) has three primary characteristics. Firstly, it is an event that falls outside the boundaries of regular expectation as no previous experience could convincingly point to its possibility. Secondly, the Black Swan factor has an extreme impact, typically negative. Thirdly, as indicated, Black Swan events have an outlier status, our human nature lets us falsely create explanations for such events once occurred, therefore believing that such events are predictable and explainable. The Budzier and Flyvbjerg (2013) results indicate that close to one in five projects in IT turns into a Black Swan. When this occurs, the average cost overrun increases to +614% and the schedule overrun increases to +49%.

Given the vast number of projects that fail to deliver on agreed project delivery baselines (time, cost and outcome) and the resultant opportunity cost, the question must be asked: Why are we not getting better at project management? In this paper I argue that a contributing factor is a relevance gap in Project Management research.

1.5 The relevance gap in the field of Project Management

Traditional research has produced a significant amount of knowledge in management studies. However, a number of authors have raised concerns regarding the relevance of research conducted in management research today, questioning why organisational research is not more widely used in organisations. This is known as the relevance gap (Rynes, Bartunek & Daft, 2001; Beyer and Trice 1982; Hambrick, 1994; Tranfield and Starkey, 1998; Romme, 2003; Daft and Lewin, 1990; van Aken and Romme 2009). This problem is described by van Aken (2004) as management research that is scientifically verified but not relevant for practice, or is practically relevant but not scientifically verified.

The challenge is not new. Tension between Industry and Academia goes back to the nineteenth century when some academics expressed concerns that research collaboration between academia and industry was against the central ethos of universities (Howells, Nedeva & Georghiou, 1998). As this challenge remains unresolved for both academics and practitioners, it is important to understand what causes this dilemma.

Reflecting on the Higher Education Funding Council for England report, Starkey and Madan (2001) highlight some of the challenges that arise when creating a successful knowledge flow between academics and practitioners. They identified three key issues.

Firstly, managers believe that while research is beneficial, many of the research topics are not relevant to them. Secondly, managers do not believe that research contributes specifically to their managerial role; their need is for more specific guidance about best practice and advice that can be applied rather than reflective analysis. Thirdly, user communities are not informed of the results of

research and researchers lack appropriate methods of distributing their findings to a representative sample of practitioners.

Despite the significant growth in the use of project management as a means to affect change, illustrated in the growth of the number of Project Management practitioners, in project management academic activities and in the number of publications, project performance continues to fail to meet expectations. I therefore argue that there is a relevance gap in the field of Project Management research (see Figure 5).

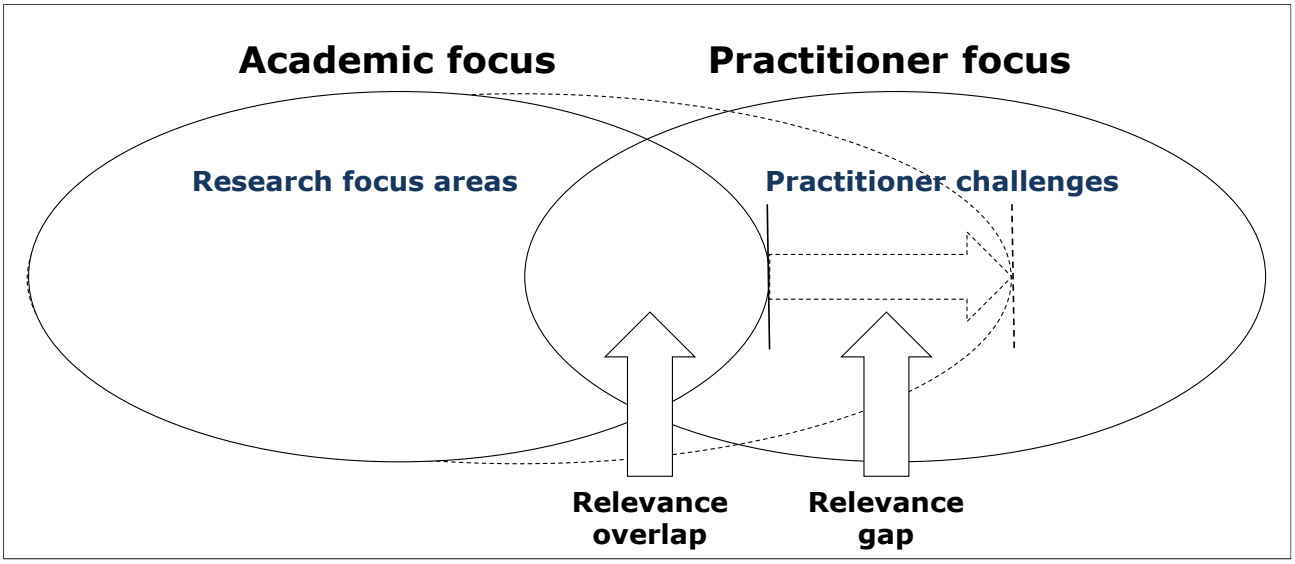


Figure 5: The relevance gap in Project Management (own construct)

Morris (2013) essentially refers to the relevance gap in Project Management when he states that theorists develop theory for other theorists instead of for practitioners to improve their practice. Silva, Moreno Sánchez-Capuchino & Peters (2015) highlight the irony that follows; practitioners are frequently requested to teach on Project Management as a means to share experience and working practice with academia but researchers are seldom invited by companies to test assumptions and for them to share findings.

This sentiment is echoed through the question Alotaibi and Mafimisebi (2016) raise: why should projects fail to achieve objectives if, given all the methods and processes that have been developed, such project management standards, models and strategies are applied in practice?

Authors in management literature believe that this gap between theory and practice must be bridged and seek methods to enable this (Cascio 2007; Hambrick 2007). The concern has been covered in a number of special additions in management journals (Boehme, Ordigoni & Deakins, 2014), for example the Journal of Management Studies (Fincham and Clark, 2009) and Organisation Studies (Jelinek, Romme & Boland, 2008).

The problem of the divide between theory and practice has been attributed to either a knowledge transfer problem or a knowledge production problem (Boehme et al., 2014). In the knowledge transfer problem, which Boehme et al., (2014) call 'lost in translation', practitioners do not implement the practical knowledge derived from research. In the knowledge production problem, which Boehme et al., (2014) call 'lost before translation', research results cannot be connected to, and thus cannot be translated into, practice.

While the debate continues, Nicolai and Seidl (2010) state that the pressure to produce relevant research has increased and that there is a broad agreement that there should be a combination of scientific rigour and relevance (for example Anderson, Herriot and Hodgkinson, 2001).

Boehme et al., (2014) note a third challenge in addressing the relevance gap that Rasche and Behnam (2009) also identify. They claim that research relevance cannot be achieved by directly applying scientific knowledge in practice because scientific knowledge needs to be transformed by the system of practice itself (Boehme et al., 2014). Boehme et al., (2014) argue that this method is in line with Design Science developed by Simon (1969) who asked the

question: ‘Will it work better?’ (Jelinek, Romme & Boland, 2008, p 317). Starkey, Hatchuel & Tempest (2009) argue that this approach can assist with identifying methodologies that lead to design artefacts which improve management practice. My research intention is to design such an artefact.

1.6 The focus area of this research initiative: Project front end management (FEM)

I have been involved in a number of projects where insufficient time and effort were invested in the initial activities of constituting the project. Without exception, these projects failed to deliver on expectations. Although a variety of factors contribute to the continuing underperformance in projects, the project front end is of specific importance and interest to me. This interest has predominately arisen from my many years of business consulting across a variety of projects, making me increasingly aware how crucial this first phase of project management is. Schon (1983) contends that professional practice is seen as 'a process of problem solving’ (p39) and this leads to a disregard for what he terms the ‘problem setting’ (p40). The ‘problem setting’ encompasses the process of discovery, where both the problem and the decisions required are explored and defined. This mirrors the front end of a project where the project definition is uncertain and both the problem and means to solve it need to be defined.

The purpose of this study is focussed on project front end management; to understand the challenges that are experienced during the time before a potential project is formally constituted and to determine what actions can contribute to the improvement of this phase.

1.6.1 The significance of the project front end

A number of authors have argued the importance of project front end management and the need to increase research focus in this area. Williams and Samset (2010) identify many studies that have emphasised the importance of

quality at entry (for example World Bank, 1996; Morris, 2009; Flyvbjerg, Bruzelius & Rothengatter, 2003; Miller and Lessard, 2001; Sewchurran and Petkov, 2007, 2009; Sewchurran and Barron, 2008). Shenhar and Levy (1997) include front end planning and project definition among the key success factors. This is the first focus point among ten dimensions named in their list of project success factors. Kharbanda and Pinto (1996) argue that most, if not all, major failures on projects are caused by insufficient planning, inaccurate planning and unquestioned adherence to initial plans irrespective of how the environment has changed since the plan was established.

When projects fail strategically, such problems can be traced back to those decisions that were made when the initial idea was considered and further developed (Williams and Samset, 2010). As a result, the project front end is essential for a project's success (Williams, Samset & Sunnevåg, 2009).

Of critical importance is the initial choice of project concept, which includes the business case, the technical solution, all the other organisations that are involved and the inter-organisational relationships (Williams and Samset, 2010). This choice on how to execute the front end represents the one key decision that is likely to have the most significant impact on long-term project success or failure (Williams and Samset, 2010).

1.6.2 Inadequate emphasis on the project front end in project management knowledge base and methods

Over the years, a variety of project execution methodologies have been developed to attempt to improve the success of project execution. A number of studies have documented this (for example Charvat, 2003; Arunan, Kumar & Manjula, 2016; Chin, Chan & Yang, 2008; Cockburn, 2000). The scope of this research is not to replicate such studies but rather to illustrate the problem that, neither the literature nor project management practice places adequate focus on the front end phase. In order to illustrate that project front end management

typically does not receive the attention required, the following discussion focuses on the two most widely used certifications in project execution: the Project Management Body of Knowledge (PMBOK) and the Prince2 Methodology.

These two were selected because of the significance they have in the world of projects and their popularity of use across the world (Matos and Lopes, 2013; Karaman and Kurt, 2015). The PMBOK represents the world's most acknowledged knowledge base or guide to project management and Prince2 is one of the most widely used project execution methodologies (Słoniec, 2014; Belica, 2015).

1.6.2.1 The lack of focus on the project front end in the PMBOK

The Project Management Institute (PMI) was started in 1969 with the objective of supporting the project management industry. This primary focus has been setting standards for this practice ever since (Matos and Lopes, 2013). In 1981, the PMI approved the establishment of 'A Guide to the Project Management Body of Knowledge' better known as the PMBOK. The PMBOK was first published in 1987, has since became an international bestseller and in 2013, more than five million copies were in circulation (Matos and Lopes, 2013). The PMBOK is a framework of processes that can be used to initiate, plan and then manage a project through to closure. As such, the PMBOK Guide provides a globally recognised standard and guide for project management professionals. The PMI's certification of Project Management Professionals (PMP) is the world's most popular certification with over 1.2 million certifications held worldwide. Of these, around 833,000 are individuals with an active PMP certification and who belong to 286 chartered chapters based in 210 countries (PMI, 2017).

In the PMBOK, a project is started through the Initiating Process Group. As a result, PMBOK only considers project front end management through the creation of a Business Case and a Project Charter. The PMBOK has been

criticised for not placing enough emphasis on project front end management (Olsson and Samset, 2006) as it does not consider the challenges that occur during this time, exogenous factors, strategy or human factors (Morris, 2000). Edkins et al., (2013) argue that the PMBOK omits to answer questions of what work is required before a project is initiated and who is responsible for such activities. Smyth and Morris (2007) further criticise the PMBOK because it seeks general explanations and solutions for practice, tending to disregard the context of the specific instance of the project being executed. Shenhar and Dvir, (2007) argue that the PMBOK is only fit for situations where complete requirements are available at the start of the project.

Morris (2003) argues that the PMBOK does not address the issues involved in setting up the project objectives as well as the linkages with business performance. He further notes that, for many, these are important issues connected to the successful accomplishment of projects.

Summers and Welch (2015) further claim that the PMBOK applies a narrow boundary, also, that it is clearly describing an output as the end point of a project. Such an approach does not consider the benefits' realisation for the organisation that commissions the project.

I was PMP certified in 2002. Since when I was first involved in project management, the PMBOK held a position of respect in industry, it was widely known and used. As a body of knowledge, it most definitely provides a sound foundation of knowledge in Project Management. As I gained experience I came to agree that the project front end is not adequately presented in the PMBOK. The strength of the PMBOK lies in the life cycle from the point that the project has been initiated and not activities before that point. This, in my experience, is a critical omission.

1.6.2.2 The lack of focus on the project front end in the Prince2 methodology

Prince2, which refers to **Pr**ojects **In C**ontrolled **E**nvironments, was initiated by the Central Computer and Telecommunication Agency (CCTA) in 1989. Today this organisation is known as the Office of Government Commerce (OGC) (Matos and Lopes, 2013). Prince2, first published in 1996, was preceded by Prince which was first published in 1989 and which, in turn, was preceded by PROMPT which was founded by Simpact Systems Ltd. in 1975 (Matos and Lopes, 2013). Prince2 has since gone through two major iterations, in 2009 and 2017.

Prince2 is recognised as a structured project management methodology, where the successful administration and control of a project is ensured through the focus on eight characteristic techniques (Karamitsos, Apostolopoulos & Bugami, 2010). The focus of planning is placed on the final product that is to be delivered by the project through the decomposition of the project into phases (Matos and Lopes, 2013).

The Prince2 Methodology has a process group called 'Starting up a project' (Bentley, 2012). Here the primary deliverable is the Project Brief which contains the following information: project product description, business case outline, project management structure and project approach (Bentley, 2012).

Summers and Welch (2015) argue that Prince2 only covers a small part of the totality of a project and it explicitly excludes the feasibility of a project, as shown in Figure 6.

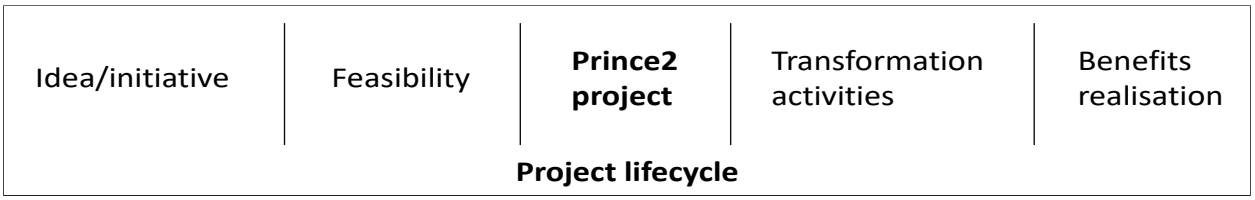


Figure 6: The scope of PRINCE2 in the project lifecycle (Summers and Welch, 2015)

The Prince2 project life cycle sees the solution-generating and feasibility studies as inputs to the project life cycle and therefore does not start with original need (Wideman, 2002). Wideman (2002) further highlights that because the activities relating to solution-generating and feasibility studies are not included in the method, Prince2 assumes that the project is run within the context of a contract (Wideman, 2002).

I was certified in Prince2 in 1999. As Prince2 is a specific methodology, the certification process took a week. While there are some references in Prince2 to the project FEM, very little real guidance is provided in this regard.

As highlighted, neither the PMBOK nor Prince2 place adequate focus on FEM. Neither of these certifications provide adequate guidance on FEM and the deliverables that are included are not sufficient to ensure that appropriate information is generated.

The problem that this discussion on PMBOK and Prince2 illustrates is that project life cycle models, as described in the project management standards today, fail to place adequate emphasis on the origination of projects before the project is formally initiated. A relevance gap thus exists and research is required that will result into more practical guidance on how the situation can be improved.

1.6.2.3 There is a need to develop more practical guidance on how to manage the project front end

Winter, Smith, Morris & Cicmil (2006), in a paper discussing directions for future research in project management, highlight the need to focus on the conceptualisation phase of projects. They argue that project managers have to be skilled at conceptualising and focusing action in the midst of complex practice and that new concepts and approaches are needed to facilitate this activity. This message is echoed by a number of authors (for example Sewchurran and Petkov, 2007, 2009; Sewchurran and Barron, 2008).

Methodologies have been developed to perform project conceptualisation, also known as pre-project planning, project programming, feasibility analysis, schematic design, scope definition, preconstruction planning or conceptual planning (National Research Council, 2002). Some examples of this are Veryzer (1998) who highlights five stages of project conceptualisation that include the following: formulation, preparation, prototyping, design and technical solution.

Another is a four stage approach defined by Nobelius and Trygg (2002) which include: concept generation, concept screening, business development and project planning. Another example is Khurana and Rosenthal (1998) who outline a process that consists of opportunity identification, opportunity assessment, project definition and product concept/project planning. Models like these have been incorporated into program offices and, as a result, into their project planning procedures (National Research Council, 2002).

However, Leyva and Matović (2011) point out that the frameworks provided tend to be conceptual and that such methods do not put enough emphasis on practical execution methods. Samset (2010) also comments that few studies provide a systematic approach on how to identify a range of alternative concepts relevant to a problem, and which ones should be chosen. In a later study, Samset, Andersen & Austeng (2014) provide an analysis of some concept analysis studies and report that, in practice, the search for alternative concepts is often restricted. A common factor identified was that the conceptual analysis of solution concepts occurred too late in the process (Samset et al., 2014).

The result of this is that project front end management does not receive the required attention and there is a lack of appropriate practical guidance on how to execute front end management processes (Samset and Christensen, 2017). A number of authors (for example Morris and Pinto, 2007; Winter et al., 2006; Williams and Samset, 2010; Millán Leyva and Matović, 2012; Samset and Volden, 2016; Ashmore, 1997; Williams, Samset & Edkins, 2019) argue that the

processes at the front end of a project is one of the critical areas where research could provide the most practical benefit. This has led me to my research problem and the resultant research opportunity.

1.6.3 The research opportunity

The primary reason for the importance of the front end is that many of the factors that cause projects to fail originate from decisions that are made in the project's front end phase (Edkins, Geraldi, Morris & Smith, 2013). The project front end provides the most significant opportunity for generating value but, despite its importance, the project front end is often ignored by standard project management methodologies or literature (Edkins et al., 2013). The project front end phase is not adequately covered in literature even though evidence exists that highlights the importance of it (Edkins et al., 2013).

Olsson and Samset (2006) emphasise that a project design based on deliberation and appropriate review has a much increased chance of success than a project based on a less methodical investigation of the realities it faces. Appropriate front end management can reduce risk and improve cost and schedule performance because in this phase the opportunity exists to proactively identify potential problems before negative impacts are experienced (Hamilton and Gibson, 1996). This means, the successful execution of project front end management results in the increased potential for project success (George, Bell & Edward Back, 2008).

1.7 The research question

Given the importance of the project front end, the research question of this study is outlined as follows:

What activities can be performed during project front end management to mitigate the typical challenges that are experienced during this activity?

1.8 Research approach

The research methodology applied is Design Science Research (DSR) which I discuss in more detail in Chapter Two. From a philosophical paradigm perspective, this research is grounded in pragmatism.

Following the Design Science Research Cycle as proposed by van Aken and Romme (2009), this research comprised the following:

1. Choice of field problem to be addressed: The research is positioned by providing the problem statement that lead to this work as well as the research question.

2. Systematic review: I executed a systematic review on the existing knowledge base on the issue being researched.

3. Research synthesis: Solution concepts to be incorporated into the planned artefact were considered.

4. Design proposition: I describe the artefact of this research initiative.

5. Test to develop further: Validation and verification of the artefact being developed.

1.9 Outline of the dissertation

This dissertation consists of eight chapters as outlined below:

Chapter One: Introduction. The chapter reflects on the increasing use of projects and the associated growth in both the number of practitioners as well as the growth of project-related research. Despite this growth, the level of project underperformance is still unacceptably high and an apparent relevance gap that exists in project management is identified. The focus of this study, the project front end (FEM) is introduced. I argue that this is one of the most important

areas to focus on in order to improve the performance of projects. As a result, the research question is situated and identified around this concern and the opportunity it brings to improve project performance.

Chapter Two: Research methodology. I discuss in detail the research methodology of Design Science. The discussion starts with an outline of the theoretical perspectives of pragmatism followed by the background and knowledge contribution of Design Science Research. The discussion then shifts to describe the Design Science Research Cycle, the chosen method of Design Science applied in this research.

Chapter Three: Systematic review (theoretical framework). The chapter begins by contextualising project front end management and briefly discusses the purpose of this phase of potential projects. The key focus is on the results of the systematic review of the typical challenges that occur during the front end management of potential projects. I identify and discuss the eight most significant challenges.

Chapter Four: Research synthesis. The result of the application of the Design Science Research method is the creation of an artefact. The artefact produced in this research is focused on activities during project front end management, a context that is characterised by risk and uncertainty. This chapter discusses the key solution concepts that were identified and incorporated into the artefact in order to generate appropriate information and reduce risks and uncertainty at the outset of a potential project.

Chapter Five: Design proposition. This chapter describes the artefact produced in this research: the Project Conceptualisation Canvas. The discussion of the Project Conceptualisation Canvas describes the primary activities of the artefact. The discussion then covers the various application considerations of the Project Conceptualisation Canvas.

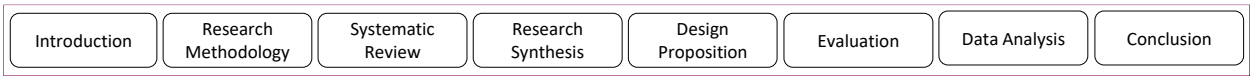
Chapter Six: Evaluation of the research methodology. This chapter describes the evaluation strategy chosen for this research. The Strategic Design Science Research Evaluation Framework, defined by Pries-Heje, Baskerville & Venable (2008), with later revisions by Venable, Pries-Heje & Baskerville (2012) are used as the basis to evaluate the design proposition. After considering the theoretical grounding for the chosen approach, I describe how exploratory and confirmatory focus groups were used to test the development of the artefact and how an illustrative case tested the application of the artefact.

Chapter Seven: Exploration of the research data. I analyse the results of evaluating and applying the artefact. The artefact evaluation indicates how the artefact evolved through the testing cycles. I use an illustrative case to evaluate the application of the artefact. Here the focus of the activity reflects on the assessment criteria which link back to the challenges likely to occur during project conceptualisation activities.

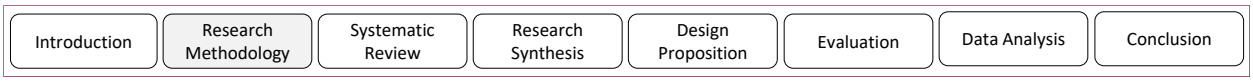
Chapter Eight: Conclusions and recommendations. This chapter concludes this thesis through a reflection of the research initiative using the seven guidelines of Design Science Research as defined by Hevner, Daza, Englund, Kohtz & Fink (2004). This chapter also outlines the limitations of this research and makes specific recommendations regarding avenues for further research.

1.10 Chapter guide

I incorporate a chapter guide to ease the reader's navigation.



Chapter two: Research Methodology



2.1 Introduction

Coming into the PhD journey as a practitioner, it was important to me that my research contribution be beneficial to practitioners. I identified Design Science as a means to achieve this outcome.

The University of Cape Town's Graduate School of Business requires that PhD candidates navigate a robust process of critique and assessment from experts in the chosen field in order to advance to the status of PhD Student. The initial feedback on my chosen research strategy was critical as Design Science is not a mainstream research approach.

I was concerned that Design Science might be perceived as untested or unscientific. I therefore embarked on a journey of exploration of Design Science. This journey has taken me to the University of Warwick in the UK, the University of Iceland in Reykjavik, RMIT University in Melbourne in Australia and ISCTE-IUL in Lisbon in Portugal. I gained confidence in, firstly, using the research method and, secondly, through developing the in-depth understanding I needed to convince others of the strengths of Design Science.

I have found my tribe of pragmatists and today I am an avid supporter of the use of Design Science in management research as it has the potential for knowledge creation which is both scientifically valid and practical in the field.

In this chapter, the philosophical grounding, or basic belief system, of this research will be described through a discussion of the paradigm, ontology, epistemology and methodology selected. The Design Science research methodology will be discussed in detail with a specific focus on the chosen

Design Science method used in this research, the Design Science Research Cycle (van Aken and Romme, 2009).

2.2 Paradigm

A research paradigm describes the underlying philosophical perspectives of groups of people about the research they conduct (Oates, 2006).

Schwandt (2001) defines a paradigm as a world view that is shared, that represents the values and beliefs in a discipline and that guides how problems are solved. The chosen paradigm therefore guides and directs thinking and action in the research initiative. Saunders and Lewis (2009) distinguish between five major philosophies in business and management research. These are: positivism, critical realism, interpretivism, postmodernism and pragmatism. Each research project must select the most appropriate research philosophy for the particular study, as there is no best research philosophy (Tsoukas and Knudsen 2003). Each research philosophy makes specific assumptions around a number of areas. Firstly regarding human knowledge or epistemological assumptions, secondly about the realities encountered in the research or ontological assumptions and thirdly regarding the extent that the values of the researcher influence their research process or axiological assumptions (Saunders and Lewis, 2009). The assumptions made as a result of the selected research methodology shape how the researcher understands his research questions, the methods that are used and how finding should be interpreted (Crotty 1998).

This research uses pragmatism as its paradigm. Pragmatism emphasises that concepts are only relevant where they support action (Kelemen and Rumens 2008). Fundamental to this pragmatist attitude is the search for what might be. Pragmatism therefore sees knowledge as the way to improve action and existence, which are explorations into social and technical potentials and opportunities (Goldkuhl and Sjöström, 2015). A pragmatic approach to research

starts with the identification of a relevant problem to focus on and then the focus shifts to create practical solutions which will be incorporated into future practice (Saunders and Lewis, 2009). Pragmatism therefore means that knowledge should be used in a constructive way to enable change and improvement and not just describe the past as patterns of cause and effect (Goldkuhl and Sjöström, 2015).

The pragmatist objective is to intervene with the objective of constructing an improved, more desirable, world (Goldkuhl and Sjöström, 2015). In pragmatism, a prospective knowledge orientation (the possible) accompanies a normative concern (the desirable) (Goldkuhl and Sjöström, 2015).

Pragmatists know that no single perspective is able to establish the whole picture and that there are many different ways of interpreting the world (Kelemen and Rumens, 2008). Therefore pragmatism embraces the position that there may be multiple realities (Kelemen and Rumens, 2008). In order to advance their research, pragmatists use the methods that enable them to collect reliable, credible and relevant data (Kelemen and Rumens, 2008). Thus, there is no rigid position regarding different methods in pragmatism, but rather, pragmatism adopts a pluralist attitude (Goles and Hirschheim, 2000). The given research purpose and current empirical situation will inform the choice in research methods or method combinations (Goles and Hirschheim, 2000).

In a classic paper, Lovejoy (1908) identified thirteen different kinds of pragmatism. More recently, Goldkuhl (2011) identified three kinds of pragmatism: functional, which is broken into local functional and general functional; referential; and methodological pragmatism.

Functional pragmatism refers to knowledge for action where a knowledge item leads to improved action. The distinction is made between local functional pragmatism, which means that the knowledge contribution is to a specific local

practice, and general functional pragmatism where the knowledge contributes to 'general practice' (Goldkuhl, 2011, p 8). Referential pragmatism is knowledge about actions; knowledge is formulated in terms of actions. Methodological pragmatism is knowledge through action where knowledge is created through action.

This research is grounded in methodological pragmatism. In methodological pragmatism, experimentation is pivotal and the researcher participates in practice in order to explore through his or her own actions or close observations of the actions of others (Goldkuhl, 2011).

The research approach chosen for this research is Design Science, which will be discussed in detail later. A number of authors have associated Design Science with a pragmatic research philosophy (Cole, Purao, Rossi & Sein, 2005; March and Smith 1995; Hevner et al., 2004; Hevner, 2007) and identified a high resonance with methodological pragmatism (Goldkuhl, 2011).

The aim of Design Science Research is the delivery of artefacts. The continual interplay between building the artefact and evaluating the artefact is an essential characteristic of design research; knowledge through making is a basic idea in design research just as it is in methodological pragmatism (Goldkuhl, 2011). Epistemologically this can be called prospective knowledge (knowledge about the possible) (Goldkuhl and Sjöström, 2015).

2.3 Ontology

Ontology is a reflection of the nature of science or the nature of reality. The philosophical orientation of the researcher describes ontologically how facts will be reported on within a field of knowledge (Gilliland, 2014). Perspectives of the ontology in Design Science must be understood and this is discussed next.

Building on Popper (1978), Iivari (2007) proposes an ontology for Design Science which consists of three world views. World One is about material nature (material objects including biology); World Two is about consciousness and mental states (such as mental events and processes); and World Three is about products of human social action (products of the human mind). As the main contribution of Design Science Research, artefacts fall into the World Three category (Iivari, 2007) where the artefact comes into being through a set of social actions conceived by the human mind.

2.4 Epistemology

Epistemology is concerned with the question of how humans can achieve 'true knowledge' (Niehaves, 2007, p 5). It is therefore concerned with how knowledge is targeted, what research methods are used, what knowledge is acquired, constructed and tested, and, finally, how the reliability and rigour of research methods are determined (Gregor, 2006).

Iivari (2007) proposes three categories of knowledge to describe the epistemology of Design Science Research. These are: conceptual, descriptive and prescriptive knowledge. Conceptual knowledge includes conceptual frameworks, classifications and concepts. Descriptive knowledge comprises empirical regularities, theories, observational facts and hypotheses. Finally, prescriptive knowledge is established on design product knowledge including the characteristics of an artefact.

In contrast to this, Kuechler and Vaishnavi (2008) propose a simplified taxonomy consisting of two categories of theories, these being descriptive and prescriptive. Descriptive theories serve as an input to Design Science by suggesting new approaches to problems and originated from social and natural science. Prescriptive theories, on the other hand, provide explicit prescriptions on how something should be executed.

Descriptive knowledge generation is typically theory-driven, focusing on existing situations, whereas prescriptive knowledge creation is field problem-driven and solution-orientated (van Aken, 2005). Another perspective is that of Gibbons et al. (1994) who describe two modes of knowledge creation as being either Mode 1 or Mode 2. Mode 1 knowledge creation is mono-disciplinary and is purely academic in focus. Mode 2 knowledge creation aims to solve complex and relevant problems experienced in the field and is multidisciplinary in nature (van Aken, 2005). Descriptive or Mode 1 and prescriptive or Mode 2 knowledge generation will be discussed in more detail below.

The epistemological perspective of this research is prescriptive in nature with the planned artefact providing an approach to follow during project conceptualisation.

2.5 Research methodology

In this section I discuss Design Science as a research methodology in management research and also highlight why I believe that this method is suitable to use in Project Management research.

In order to improve the relevance of management research, both the process that produces research products and the nature of the products being produced must be considered (van Aken, 2005). Looking at the process, some authors have argued that researchers should embrace Mode 2 knowledge generation methods to bridge the relevance gap. This calls for an increase in the researcher-practitioner approach to enable researchers to get a better understanding of field problems, possible solutions and how to effectively communicate these (van Aken, 2005).

Design Science, a prescriptive or Mode 2 knowledge creation approach, is not seen as a typical approach to management research (van Aken, 2005). There seems to be a general lack of awareness of the potential contribution and

theoretical subtleties that Design Science can offer researchers in a number of disciplines; Project Management is no different. It is believed that the Design Science approach allows researchers to make a holistic theoretical contribution that is suitable for an emergent field (van Aken, 2005). This thinking is outlined below.

Traditionally, management research has been based on explanatory research (Karmann, 2013) with an emphasis on positivist and interpretive research paradigms and methods (Venable, 2011). In explanatory research, the focus of all sciences is to create an understanding of a problem and therefore to describe, explain and possibly predict observable phenomena within their field (Nagel, 1979; Emory, 1985; van Aken and Romme, 2009). The typical research product is a causal model, preferably expressed in quantitative terms (van Aken, 2004). In traditional research, the community's understanding is seen as a valid or true knowledge contribution; the understanding allows one to make predictions of behaviour of some aspect of a phenomenon and the contribution is typically a theory that is seen to be new and valid (true) (Vaishnavi and Kuechler, 2008).

In response to the relevance gap challenge, a number of authors have suggested a synthesis between explanatory and prescriptive research (for example Romme, 2003; Avenier, 2010; Karmann, 2013). Prescriptive research goes further than descriptive research as it also recommends solutions or new ideas or proposals on how to respond to the identified, known problems (Wollman, 2012). The justification for the proposed synergy is described by van Aken (2004, p2) as 'Understanding a problem is only halfway to solving it. The second step is to develop and test (alternative) solutions'. Van Aken (2004) makes clear that this refers to the creation of abstract knowledge which can be used to solve a class of problems and not to solve specific management problems. These are indicated as being in the domain of practitioners.

2.5.1 Background to Design Science

The term 'Design Science' was likely first used in the 1960s in Architecture and Engineering literature by the independent thinker and inventor Buckminster Fuller. He called the 1960s the 'Design Science decade' and argued for the use of 'science, technology and rationalism' to address complex human and environmental challenges (Cross 2001, p 50). Gregory (1966) adapted the term in the context of a 1965 conference on 'The Design Method' (Cross 2001, p 52). Design Science grew most prominently in Architecture and Engineering literature at first, and then extended into Computing Science in the late 1960s and further into Information Systems (IS) research in 1990 (Amrollahi, Ghapanchi & Talaei-Khoei, 2014). In the process it gained traction through published theoretical works, shifting from a paradigm to a research methodology (Peffers, Tuunanen, Rothenberger & Chatterjee, 2007; Cross 2001).

Iivari (2007) states that initially computer scientists used Design Science in broad application but lost sight of it for some 25 years prior to the early 1990s. At this point, there was a renewed focus on Design Science and a number of seminal papers were published (Walls, Widmeyer & Sawy, 1992; Nunamaker, Dennis, Valacich, Vogel & George, 1991). Their focus was on how to perform Design Science Research. Van Aken and Romme (2009) further showed that Design Science had expanded into a number of other fields like education (for example; Barab & Squire, 2004; Kelly, 2003), accounting (for example; Labro and Tuomela, 2003), computer science and information systems (for example; March and Smith, 1995; Hevner et al., 2004). Van Akan (2005) also showed that Design Science has been applied in organisational redesign work (for example; Verweij, 1997). Further examples include design science being used in health care (Bevan, Bate, Maher, & Wells, 2007), construction (for example Hanid, 2014) and operations management (for example Öhman, 2019).

Much of the work on Design Science builds on the work of Herbert Simon who received the Nobel Prize in Economics in 1978 and made significant contributions to the multiple disciplines of artificial intelligence, psychology, organisation science, economics, political sciences (Karmann, 2013). Simon conceived the notion of 'the sciences of the artificial' in 1969 in his book of the same name (Avenier, 2010). Here, Simon (1969, revised 1996) distinguishes between three types of sciences: Formal Sciences such as logic and mathematics, which do not contain empirical evidence; Exploratory Sciences such as physics and chemistry which describe and explain natural phenomena; and, lastly, Design Sciences such as engineering and architecture which create new solutions to existing problems (Karmann, 2013).

Simon (1969, 1996) distinguishes the Natural World from the Artificial World. He argues that the application of natural science to the natural world is appropriate because the main concern is to create a body of knowledge that can explain the natural objects and phenomena in the world. This provides a focus on 'how things are' (Simon, 1969, p 5). Simon (1969, 1996) contrasts this to the World of the Artificial, using the phrase 'artificial' synonymously with 'man-made' (Simon, 1969, p 2). Science in the world of the artificial is concerned with how things ought to be (or can be), and thus focuses attention on the goal-directed and functional outcome, in the form of an artefact, instead of knowledge from the natural science. Simon proposes the 'Science of Design' with a focus on the Creation of the Artificial (Simon, 1969, p 111). 'Sciences of the artificial' is thus a body of knowledge about the design of artificial objects or phenomena which Simon refers to as 'artefacts' that are created to meet specific desired goals (Simon, 1996, p 5).

2.5.2 Knowledge contribution in Design Science

Design Science is a problem-solving research paradigm aimed at developing solutions to relevant problems through the delivery of an artefact (Hevner et al.,

2004). Knowledge contribution in Design Science is achieved through three types of research contributions: the design artefact, foundations and methodologies (Hevner et al., 2004). By far the most significant means of knowledge contribution in Design Science research is the artefact (Hevner et al., 2004) and therefore the focus of this discussion is on artefacts. Artefacts have been referred to in a number of ways such as a technical rule (van Aken, 2004), a design proposition (Denyer, Tranfield & van Aken, 2008) or a means-end proposition (Tanskanen, Holmström, Elfving & Talvitie, 2008).

The contribution to knowledge is seen as the foremost requirement for the publication of research in general (for example Straub, Ang & Evaristo, 1994). Gregor and Hevner (2013) argue that there is generally confusion about how Design Science knowledge relates to general knowledge. They argue that this is why Design Science does not have a more striking influence on research in general.

In Design Science, two camps have developed over the debate on the nature of contributions that use this research method (Gregor and Hevner, 2013). One perspective focuses on design theory (Markus, Majchrzak & Gasser, 2002; Gregor and Jones, 2007) while the other focuses on pragmatic design (Hevner et al., 2004; Nunamaker et al., 1990). The differing focus of knowledge contribution of the two camps has therefore placed the emphasis on either design theory or on the artefact as research contributions.

Gregor and Hevner (2013) argue that the two camps are complementary to each other rather than conflicting. In order to harmonise the two perspectives and ensure that the knowledge contribution of Design Science Research is well articulated, they propose a classification for a Design Science contribution framework which can be seen below in Figure 7.

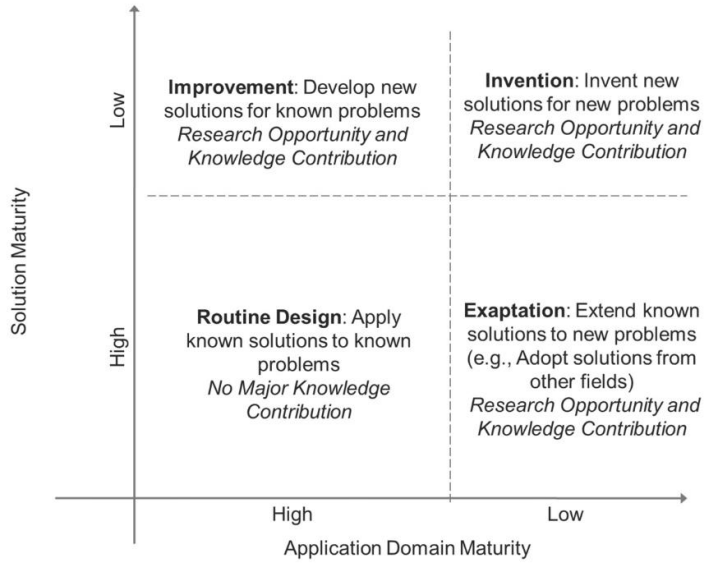


Figure 7: Design Science knowledge contribution framework (Gregor and Hevner, 2013)

Building on Purao's (2002) work, the framework contextualises Design Science Research in terms of both the relevant maturity of the solution and the application domain (the problem). In so doing this framework highlights the type of knowledge contribution that can be made.

A knowledge contribution is classified as either being an invention, an improvement or an expansion of current knowledge. These classifications are differentiated as follows. Inventions have low maturity of both solution and application domain; improvements have low maturity of solution but high maturity of application domain; and expansions have high maturity of solution, but low maturity of application domain.

Based on this classification, routine design is not seen as knowledge contribution as it does not provide a novel contribution to the knowledge base.

The Design Science knowledge contribution framework has been considered a reference framework for evaluating Design Science Research (Woo, Saghafi & Rosales, 2014). It provides the means for a researcher to stake a claim to making a knowledge contribution (Dwivedi, Purao & Straub, 2014).

The knowledge contribution targeted by this research is classified as an *improvement* because the planned artefact introduces a new solution to a known problem. The classification of *improvement* is seen as appropriate because the problem is well understood and described in the literature, but the solution maturity is low and more research is required.

2.5.3 The nature of Design Science artefacts

Artefacts represent the output of Design Science Research; Simon (1969) describes artefacts as representing new *things* for the good of humanity. In this research context, artefacts aim to solve organisational problems that have been identified (Hevner et al., 2004).

Artefacts may take a variety of formats which include methods, constructs, models, instantiations (Hevner et al., 2004), social innovations (van Aken, 2004) or new properties of technical, social and informational resources (Järvinen, 2007). Further, researchers have highlighted that artefacts can take the form of theories as well as of constructions (Gregor and Hevner, 2013). Peffers et al., (2007) summarise the nature of the artefact as any designed object with an embedded solution to an identified and understood research problem.

Artefacts can specifically be described as 'an instruction to perform a finite number of acts in a specific order with a specific aim' (Bunge, 1976, p 132, as cited in van Aken, 2005, p 23), or they can be more generically defined as a 'chunk of general knowledge' (van Aken, 2005, p 23). The rule or proposition consists of three elements: a clear goal, an analysis of the context and the solution concept used to solve the problem (Davies, 2007).

The artefact is typically developed through a two-step approach: defining the technological rule and testing the rule in the intended context of use (van Aken, 2004). The artefact will be adjusted and refined until the desired state results from the researcher's Alpha testing. Third parties should typically perform Beta

testing (Romme, 2003) to validate the wider applicability of the knowledge. Perhaps controversially, it has been suggested that design knowledge forms part of a professional repertoire and should be seen as complementary to traditional scientific knowledge (Holmström, Ketokivi & Hameri, 2009). The use of Design Science is said to be intended for experienced and well-educated individuals who have mastered the body-of-knowledge of their discipline and who therefore have the ability to further develop knowledge in the specific field in which they operate using Design Science (van Aken and Romme, 2012).

Simon (1969) explains that both the outer environment and inner environment influence and constrain the design of the artefact. The outer environment consists of any external forces and effects that act and could have an impact on the artefact. The inner environment represents the components that make up the artefact. The relationship between the inner and outer environment defines the organising considerations of that artefact. Design is the process that creates and brings these outer and inner components together. From an organisational perspective, the artefact represents the adaptive capacity of the organisation (as a system) to its outer environment, resulting in a specific organisation (linkage) to establish an interface with the external environment in order to achieve a specific behaviour (Simon, 1969).

2.5.4 Design Science in Management Research

In 2003 and 2004 a fundamental shift was made in the use of Design Science, both in management literature and in management and organisational research (Reymen et al., 2006). This shift was pioneered by Georges L. Romme and Joan Ernest van Aken, whose seminal papers (Romme 2003; van Aken, 2004) brought Design Science to Organisational Science (Bate, 2007).

The renewed focus on Design Science by Romme (2003) and van Aken (2004) was, in part, a response to the relevance gap debate (Reymen et al., 2006). The

intention was to establish design as one of the primary modes of engaging in research as well as to propose Design Science as a research paradigm that could incorporate both suitable research rigour at the same as being relevant in practice (Romme, 2003).

Van Aken and Romme (2009) defined the Design Science Research Cycle as an approach to Design Science. This is shown in Figure 8 below. In the Design Science Research Cycle one can clearly see the synthesis between explanatory and prescriptive research where the systematic review represents the explanatory perspective and the following steps represent the prescriptive perspective.

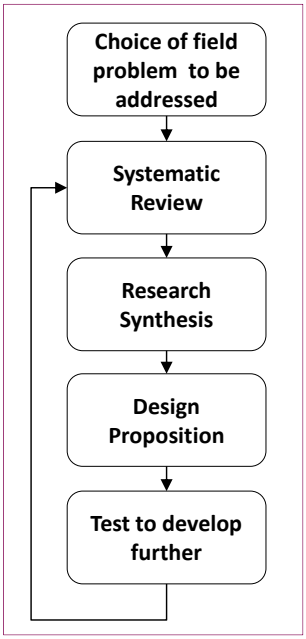


Figure 8: The Design Science research cycle (Van Aken and Romme, 2009)

A brief overview of the process steps describes the intended activities in each step.

Choice of field problem to be addressed. The problem that the research initiative is focused on is clearly articulated in this step.

Systematic review. The focus here is to execute an appropriate review of the existing body of knowledge which impacts the problem being investigated. This will typically take the form of a literature review of the relevant areas that have been identified as relating to the problem being investigated.

Research Synthesis. The focus of the research synthesis process is to produce solution concepts which are directed at the field problem being investigated. The research synthesis can draw on a broad variety of inputs to enable a better understanding of what works and what does not work (Denyer, Tranfield & van Aken, 2008).

Design Proposition. A design proposition is a collection of knowledge, also known as a solution concept, which links an intervention, also called an artefact, with an expected outcome in a certain field of application (Van Aken, 2004). The design proposition puts the solution concept in its target application context (van Aken, 2004). This process delivers two outputs. The first is an artefact which, in essence, represents an expected outcome. The second is a user instruction that outlines the indicators on when to use the artefact and contra-indicators on when not to use the artefact.

The most informative type of design proposition is a field-tested and grounded one (van Aken, 2004). To be field-tested, the artefact must be tested in the intended field of application; being grounded refers to knowing why and through what mechanisms the application of the artefact produces the predicted outcome. Typically, the testing of the design proposition can be done through a variety of methods, discussed later in this paper.

Design, as an inherently iterative and incremental process, provides feedback during the construction phase as to the quality of the design process and the design product under development (van Aken and Romme, 2012). One or more alternative designs will be tested. If the results are unsatisfactory, the artefact

is redesigned and evaluated again until a satisfactory design is achieved (van Aken and Romme, 2012). This iterative approach will improve the understanding of the problem as well as the quality of the artefact being developed (Hevner et al., 2004).

Test to develop further. Claims about artefacts are typically dependent upon performance metrics. In Design Science, criteria must constantly be assessed for appropriateness and effectiveness. The usability, quality and efficiency of a design artefact must be rigorously demonstrated via well-executed evaluation methods. Evaluation criteria form the basis on which to determine how well the artefact works rather than to theorise about why the artefact works (Hevner et al., 2004).

A design artefact is only complete and seen as effective when it meets the requirements and constraints of the problem it was meant to solve. During each type of testing the artefact will be evaluated against explicit criteria which will be defined during the development process. Deviations from expectations, both quantitative and qualitative, should be noted during evaluation (Hevner et al., 2004).

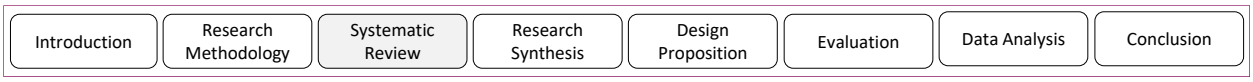
It must also be highlighted that all known methods for data gathering and analysis can be used in Design Science Research. In practice, research strategies tend to be collaborative, case-based and interventionist (Hevner 2004; Van Aken, 2004). Hevner (2007) emphasises the importance of maintaining relevance and rigour in both the construction of the design artefact as well as in the evaluation of the evolving artefact.

2.6 Conclusion

This chapter discussed the research methodology used for this research initiative. The research is based on a pragmatic paradigm. Ontologically, this research falls into Iivari's (2007) World Three classification because the target

artefact is a result of human social action and epistemologically this research initiative is of a prescriptive nature. The research methodology of Design Science was discussed and, more specifically, the discussion explained why the Design Science Research Cycle (van Aken and Romme, 2009) is the specific Design Science method used for this research.

Chapter Three: Systematic review (Theoretical framework)



3.1 Introduction

The field problem in this research relates to the activities that are performed before a project is initiated. My experience and training had led me to believe that there are serious challenges in this domain of project management; highlighted through the discussion on the limited coverage of the project front end in mainstream methodologies. However, to confirm the real nature of the problem in this area of study, the context needs to be clarified and the challenges that are typically experienced must be understood. I found this process very rewarding as it challenged many preconceptions I had about the subject area.

This chapter will start with the definition, boundaries and purpose of project front end management (FEM) followed by a discussion on the importance of this FEM. Next, the key challenges that are typically experienced during project front end management are reviewed.

3.2 Defining project front end management

The set of activities that takes place before a project is formally initiated is known by many names which include: Front-End Engineering Design, Front-End Development, Pre-Project Planning, Front-End Planning, Front-End Loading, Front-End Decision Making, the Fuzzy Front End, Feasibility Analysis, Conceptual Planning, Programming or Schematic Design, Front End Management and Front End Innovation(Koen, 2004; Gibson, Wang, Cho & Pappas, 2006; George et al., 2008; Merrow, 2011; Motta, Quelhas, de Farias Filho, França & Meiriño, 2014; Sarde, Peth, Galli & Katta, 2016). Despite the variety of names, the underlying concepts and meanings are the same and refer to the time, resources and

activities that are dedicated to shaping the future of potential projects (Merrow, 2011). This research uses the term Front End Management (FEM).

Regardless of industry, the project front end is acknowledged to be both a complex and a critical determinant influencing the success of a project (Williams and Samset, 2010; Cano and Lidón, 2011; Merrow, 2011; Edkins, Geraldi, Morris & Smith, 2012). There is a direct relationship between the project planning effort and ultimate project success (Construction Industry Institute, 1995). As an example, Morris (2006) references benchmarking data in the oil and gas industry which showed that effort spent on front end management correlated positively with project performance. However, despite the acknowledged importance of front end management, many authors claim that not enough research has been performed on this topic and further research should be undertaken to improve pre-project activities (Morris, 2005; Leybourne, 2007; Meier, 2008; Williams and Samset, 2010; Morris, 2013). This indicates an opportunity for research into the practices of front end project management to improve project performance (Kähkönen, 1999; Koen et al., 2002; Leyva and Matović, 2012; Edkins et al., 2012; Giles and Cormican, 2014).

3.3 The Boundaries of FEM

The boundary of activities of FEM must be considered in order to understand where it starts and where it ends. A review of definitions showed that the focus of the activities during FEM is broadly similar, as highlighted by two examples. Williams and Samset (2010) see this phase as including those activities between the points when the initial idea is born until the final decision to execute the project is made. Kim and Wilemon (2002) see the boundary of FEM as the time from when an opportunity is considered for the first time to when the idea has developed to the point where it is deemed ready to enter the formal development process. In other words, FEM is completed either when the company makes a formal decision to fund and initiate the project, or when it

decides to stop any further work on the potential project being investigated (Khurana and Rosenthal, 1998; Edkins et al., 2013).

3.4 The Purpose of FEM

Discussions on the purpose of this front end phase include feasibility, incubation, detailed definition of scope to satisfy the business objectives, project definition development and conceptual planning (George et al., 2008). Williams and Samset (2010) cite The World Bank (1996) which summarises the purpose of pre-project activities through the use of the term 'Quality-at-entry'. The term is used to characterise the identification, preparation and appraisal processes that the projects are subjected to upfront to ensure that accepted projects deliver on strategic aims. A review of the literature on the purpose of FEM is summarised into the following six purposes of FEM.

Firstly, clarity must be developed on what the outcome of the planned project will be and how it will support the achievement of the business strategy. The front end begins with the approval by the sponsor(s) to authorise any project expenditure that relates to time, money or any effort to start the development of the project definition. The expectation is that the proposed project will, when ready to do so, be submitted to the sponsor role for full development (Giles and Cormican, 2014).

Projects and programmes are means for effecting strategic change in organisations, intended to create value and deliver benefits. It is therefore crucial to link the various goals that were identified by the sponsor to the way the project (or programme) will be developed. This is probably one of the most important aspects of managing a project (Morris 2009; Samset and Volden, 2016).

A number of management and project management reviews (Crawford, England & Pollack, 2006; Kwak and Anbari, 2009) have shown that the alignment of

projects with their business strategies has received prominence in recent years (Motta et al., 2014). These authors further conducted an extensive review of prominent journal articles and found that FEM was one of the main mechanisms used to ensure project alignment with business strategy.

The second purpose is that clear project goals and objectives must be developed during the project front end. Establishing clear objectives, goals, and delivery strategies during the conceptualisation phase is required to ensure the project is successfully concluded when the intended outcome has been achieved for the project owner (Cleland and Ireland, 2002).

Thirdly, project conceptualisation activities occur during FEM. Samset and Williams (2010) highlight the need to consider the conceptualisation of the project. Akbar and Mandurah (2014) define project conceptualisation as the dynamic process that transforms an idea from its raw form to one where it is amplified, crystallised and connected with an organisation's knowledge system. The result of this process as a concrete and explicit concept (Akbar and Mandurah, 2014).

The fourth purpose involves managing conflicting stakeholder views in order to achieve a harmonised perspective. Project conceptualisation activities provide the intellectual engagement process that enables conflicting stakeholder concerns to be heard (McKenna and Metcalfe, 2013; Motta et al., 2014). This is achieved by means of coordinating a variety of perspectives that exist in a magnitude of forms. Some of these could be: mind-sets, mental models, knowledge structure, schema, prior conception, perspective, world views, lenses, belief structures, maps, cognition and stakeholder viewpoints (Mason and Mitroff, 1981; Westley and Mintzberg, 1989; Walsh, 1995; Jenkins and Johnson, 1997; Samset and Williams, 2010; Novak and Cañas, 2009; Wilhelm and Bort, 2013; McKenna and Metcalfe, 2013).

Fifth, execution readiness and the level of risk involved must be assessed. FEM analyses the risks associated with the project and the specific project execution pathway being defined (Sarde et al., 2016). Principle risks and uncertainties should be identified in the project front end to enable the subsequent management of such risks in the project life cycle (Edkins et al., 2013).

The final purpose of FEM relates to decision-making. The front end must enable decision-making. The importance of selecting the right project to do is seen by some to be as important as managing the project effectively (Williams and Samset, 2010). FEM enables decision-making on whether the project should be executed or not. Sarde et al., (2016) state that the front end process should enable decision-making to facilitate the appropriate allocation of the required resources to support the probability of successful project delivery.

This section has highlighted the purposes of FEM and summarised the rationale for ensuring that the front end receives appropriate attention. The next section will focus on why it is important to focus on FEM.

3.5 The importance of FEM

During the analysis of the literature on FEM, two key themes emerged on why FEM is such an important area to consider in ensuring project success. To establish these themes, a technique that Ryan and Bernard (2003, P94) call 'Cutting and Sorting' was used. In this approach, quotes and expressions are identified when information is analysed, the identified lists are then grouped into themes.

In this study, literature that discussed the project front end, as defined in section 3.2 above was identified. Any mention regarding the importance of project front end management was identified. From here the metatheses were identified which resulted into the two key themes that emerged. The two key themes that emerged will be discussed next.

Firstly, the front end provides the best opportunity to influence project outcomes with the least impact on the project. Secondly, the front end is where objectives and success criteria should be defined because these both guide the rest of the project execution activities and form the basis against which project success is evaluated. The quality of work performed during front end management is therefore of utmost importance (Miller and Lessard, 2000; Flyvbjerg et al., 2003; Meier, 2008; Morris, 2009). These two themes will be discussed next.

3.5.1 Best opportunity to positively influence the project with the least impact

The project front end is arguably the greatest opportunity for value creation. This is because it is seen to have the largest potential for improvements, given the least effort and with the least impact (disruption) possible (Edkins et al., 2012). As a result, a number of authors have argued that FEM is a key factor contributing to overall project success (Gibson et al. 1995; Webster 2004; Smith 2000; Hartman and Ashrafi, 2004; George et al., 2008; Edkins et al., 2012). Decisions made during FEM have the biggest impact on the project lifecycle and, ultimately, the project outcome (Williams and Samset, 2010).

Projects and programmes are unique endeavours and this means that each instance will be exposed to uncertainty in varying amounts (Marshall and Ritchie, 1993). Uncertainty, in this context, is created by a variety of factors ranging from, among others, the situation itself, the application of new concepts and technology and the availability of information (Marshall and Ritchie, 1993). Uncertainty is at the highest when the project is conceived, uncertainty is reduced as relevant information is obtained through the project lifecycle (Samset, 2010). Galbraith (2001) described uncertainty that relates to a project decision as the variance between the information needed to make the decision and the information available at the moment when the decision must be made (Galbraith, 2001).

As information emerges through the project life cycle, uncertainty affecting a project decreases. However, at the same time, the ability to implement amendments without disrupting the project decreases (Samset, 2010). Similarly, the cost of amendments increases as the project progresses (George et al., 2008). Therefore, project uncertainty is at its highest and the cost of amendments at its lowest during the front end phase (von Hippel, 1986; Clark and Wheelright, 1993; Lædre and Hangen, 2001; Williams and Samset, 2010). These dimensions are represented in Figures 9 and 10 below.

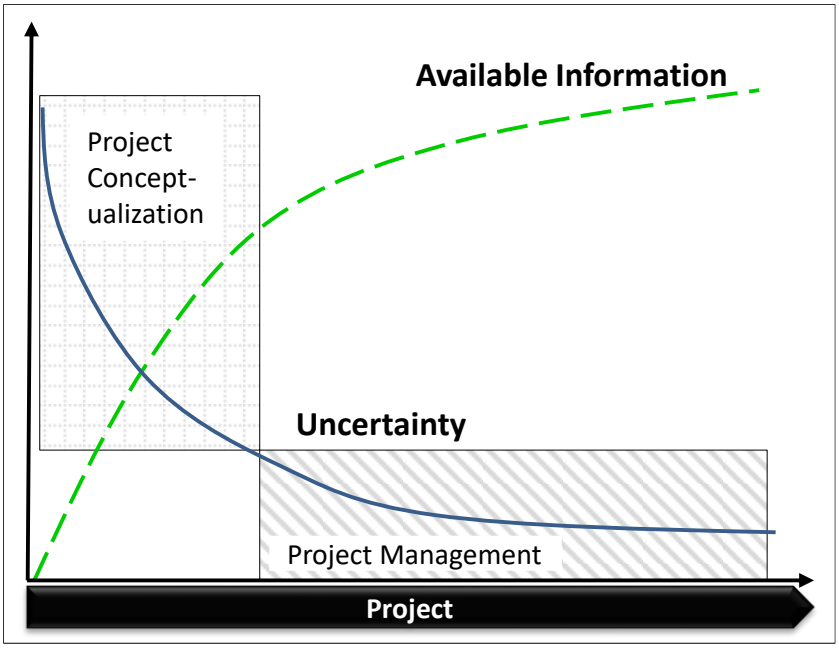


Figure 9: Uncertainty vs available information (Samset and Volden, 2016)

During the project conceptualisation phase, a great deal of information is introduced and decision-makers are required to work with a variety of ideas and strategic solutions to a given strategic challenge or opportunity (Samset, 2010). As soon as a decision is made, the choices that relate to the decision are locked in and as a result any changes that are made after this point, becomes more difficult and more expensive to change agreed positions (Samset, 2010).

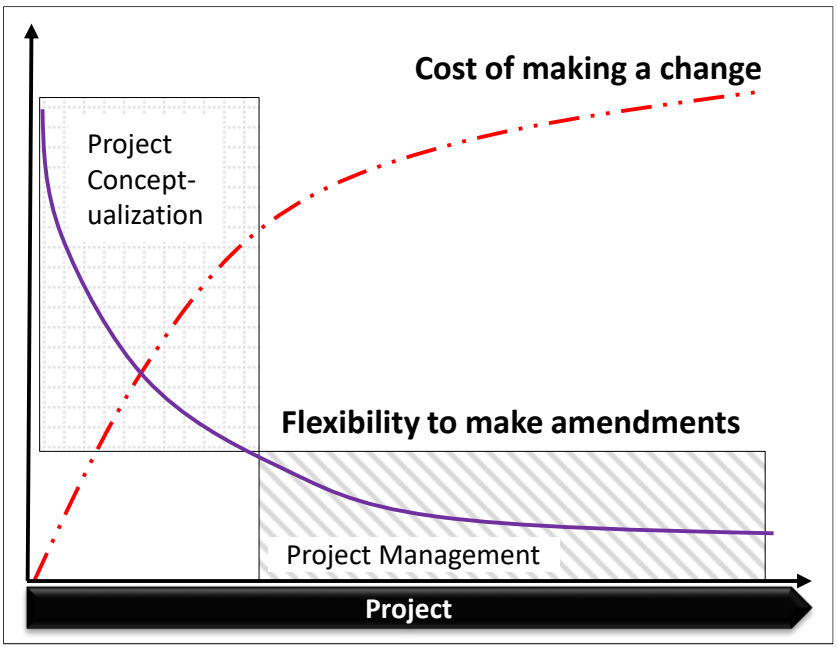


Figure 10: Costs vs flexibility (Samset and Volden, 2016)

Decision-making during initial conceptualisation and planning is therefore a critical determinant of project success.

3.5.2 FEM determines the basis against which project success is measured

The perspective on project success has shifted over the years and, incomprehensible as it may seem, a standardised definition of project success still does not exist (Gilman, 2017). This is found to be true both in project management literature and in the mind-set of the project managers when they execute their projects (Pinto and Slevin, 1988). Pinto and Slevin (1988) further stress that until project management has generally agreed the factors that contribute to or determine project success, attempts to accurately monitor and anticipate project outcomes will be severely limited.

The discussion on what constitutes a successful project is broad. This paper will not provide a full perspective on this topic but rather offer a brief overview.

Success can be measured in a variety of ways and can be based on subjective (easier to measure) and objective (difficult to measure) bases (Freeman and Beale, 1992). Historically, there has been an attempt to define project success in an objective way. Martin Barnes introduced the Iron Triangle of Time, Cost and Quality in 1969 (PM World Today, 2012) as a method for evaluating project success. If the project came in on time, on budget and had the quality that was expected, it was considered a success (Pinto, 1988). Adoption by the Project Management Institute (PMI) meant that this is widely used. The Iron Triangle is seen as an integral part of project management and still remains the core of practitioner training (Atkinson, 1999; Antonacopoulou and Michaelides, 2014).

A number of authors have proposed that a much wider perspective needs to be taken on what project success and failure mean. Samset (2013) calls this the 'project concept' which represents not only the technical solution but also encompasses the entire business case including the perspectives of the various stakeholders. Many authors have proposed that a larger set of criteria, in addition to those of the initial Iron Triangle, be considered when project success is evaluated.

Among these, Samset (2010) refers to tactical and strategic performance criteria. Tactical performance, which essentially deals with project management factors, relates to meeting short term performance targets. Strategic performance, on the other hand, refers to a much broader set of criteria which are focussed on long term performance targets, this focus ensures that the project will deliver a sustainable impact as expected by the project owners. Samset (2010) further argues that a hierarchy of indicators is required to comprehensively assess success; but notes that this can only be achieved if assessments are substantiated by appropriate evidence against the lowest level of the hierarchy.

I believe project success is not as simplistic as the Iron Triangle suggests. Project success measures should include both strategic and tactical criteria, incorporating the view points from many stakeholders. I am therefore aligned with the definition of project success as discussed by Samset and Volden (2016). Samset and Volden (2016) present both tactical and strategic performance indicators, as shown in Figure 11.

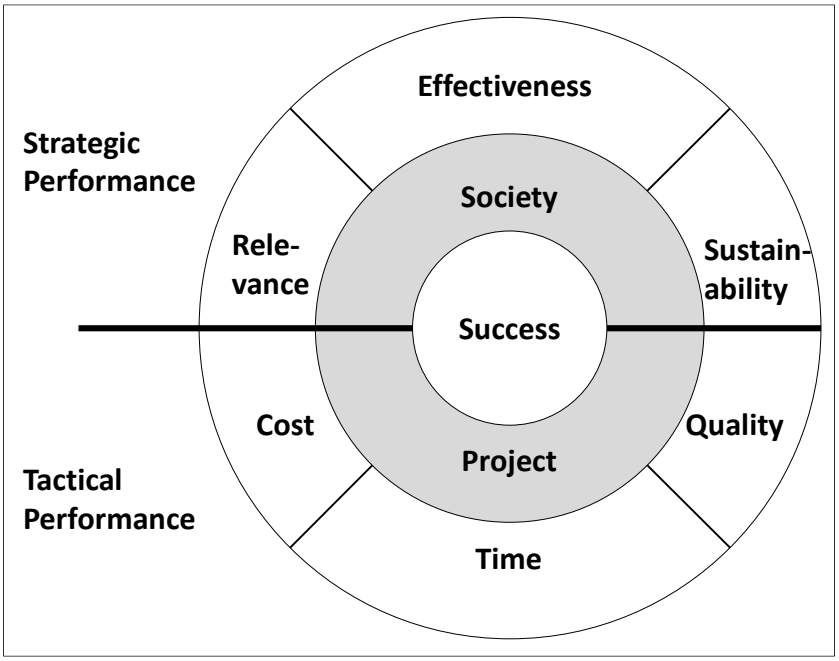


Figure 11: Strategic and tactical performance indicators (Samset and Volden, 2016)

This section on project success shows how the discussion of what constitutes project success has shifted and how it now differs from the traditional approach which looked at project success through the lens of the Iron Triangle. It is thus argued that the basis for evaluating performance of projects should be expanded from the narrow perspective of the Iron Triangle (Samset, 2001; Samset, 2013; Samset and Volden, 2016).

While there still may not be a standard definition of success, project management practitioners should recognise that the most critical factor for

project success is having clear goals and objectives (White and Fortune, 2002; Fortune et. al., 2011). This is important as project quality will be evaluated on the differential between expectations (objectives) and outcomes (McLachlin, 1999; Leyva and Matović, 2012). These goals and objectives are defined during FEM, again highlighting the importance of this research focus.

3.6 Challenges identified in FEM

3.6.1 The process followed to identify key challenges in FEM

As part of this research, a systematic review was undertaken of the typical challenges experienced during project FEM. Khan et al., (2003) defined five steps to conduct a systematic review. The application of these steps is briefly discussed.

Step 1 is framing the question for review. The question to be answered with this systematic review was framed as follows: What are the typical challenges experienced during project front end management?

Step 2 is the identification of relevant work to focus on during the systematic review. The protocol included two focus areas, a number of journals and online databases as well as the key works of a number of prominent authors in the area of project front end management. Online databases and journals included Science Direct, Wiley Online Journals, Taylor & Francis Online, Sage Journals Online, Jstor and Emerald Insights. The prominent authors included were Prof Bent Flyvbjerg, Prof Peter Morris, Prof Knut Samset, Professor Terry Williams and Prof Graham Winch.

Step 3 is to assess the quality of the literature that was identified in Step 2 above. Each of the items identified were reviewed for relevance to the systematic review question identified.

Step 4 is to summarise the evidence. As a result of this systematic review, eight typical challenges that occur during FEM were identified and are discussed below.

Step 5 of the systematic review is to interpret the findings, specifically for any biases that may be present (Khan et al., 2003). Likely the biggest consideration of this literature review is that, as mentioned earlier, FEM is underrepresented in the literature and therefore requires more research.

3.6.2 Challenge one: The benefit of conducting the front end effectively is not appreciated

Edkins et al. (2013) note that even in organisations where projects are used as a core means of operations, the importance of the front end is not appreciated. Even more concerning, the potential that its considered management can make to performance is disregarded. Studies have shown that those projects where more time and resources were invested in upfront project activities stood a better chance of success (Edkins et al., 2013). However, in practice, decisions are not based on appropriate analysis but rather on preconceived ideas of the technical solution (Olsson and Samset, 2006).

Further research has shown that pre-project planning is largely grounded in the traditional perspectives of project management where the predominant focus is on management and control more so than building on the initial ideas that gave life to the project. As a result, Project Management neglects the initial phases of projects and therefore loses part of the value that this early stage has the potential to add (Lædre et al., 2001; William and Samset, 2010; Morris, 2013; Ceelan, 2014).

Some express this challenge by referring to the project front end as ‘fuzzy’ due to its dynamic nature and because it is very difficult to manage (Cooper, 2008; Murphy and Kumar, 1997). Nevertheless, researchers continues to emphasise the need to understand this period of project execution better (Williams and

Samset, 2010; Akbar and Mandurah, 2014; Oliveira and Rozenfled, 2010). When people do not appreciate the value that can be added through appropriate management of the front end, subsequent underinvestment of time and resources ensues, and the front end is often quite messy and poorly structured. The result is that objectives are not clear and different stakeholders have conflicting aims (Morris, 2013).

3.6.3 Challenge two: Collection of relevant knowledge and experience in the pre-project planning phase deserves more attention

FEM covers a wider range of issues than just the choice of method to apply during conceptualisation; the collection of the type and quality of information at the outset of the project also requires attention (Lædre and Hangen, 2001). Lædre and Hangen (2001) identify this as a relevant area for future research, with specific focus on how to establish practical approaches versus sophisticated methods. The latter typically confuses rather than providing clarity for on-the-ground practitioners.

Samset and Volden (2016) point out that people fall into the trap of generating a huge amount of potentially worthless or irrelevant information, which will be interpreted differently by different stakeholders. Additionally, political priorities may change over time. Samset and Volden (2016) further highlight that concepts that are selected early typically survive decision-making, regardless of process. This emphasises the need for appropriate research to assist in developing processes that can identify the most viable concept.

Samset and Volden (2016) elaborate further by claiming that situations typically change rapidly during front end management. This means that detailed information could have limited value over a number of months or even weeks. An appropriate balance must therefore be determined between analysis paralysis (Williams, 2008) and the utility/cost-ratio (Jessen, 2012) where an appropriate

concept may be of more value than perfect information (Samset and Volden, 2016).

3.6.4 Challenge three: Too little time is dedicated to the front end of the project

For a variety of reasons, the project front end is the most important period of a project, but also the one that receives the least attention (NRC, 2001). This lack of focus on FEM in project planning has not changed despite its potential impact on project success; decisions made in the implementation phase are often more marginal than those of the front-end phase (Lædre et al., 2001). The opportunity cost relating to this is significant when one considers that Whelton, Ballard & Tommelein (2003) claim that up to 80% of the project output can be specified in this early phase. Samset and Volden (2016) cite Jordan, Lee & Cawsey (1988) who argue that at least 15% of the allocated resources and time allocated to a projects should be dedicated to the project front end work. Miller and Lessard (2000) suggest this should be as high as 35%. A number of studies have highlighted that more time should be spent on FEM compared to that spent in a typical project (For example: Morris and Hough, 1987; Meier, 2008; Edkins et al., 2013).

This problem is mirrored in the area of project management education. Here the trend is similar when one considers the proportionally smaller amount of time universities and other institutions dedicate to FEM compared to that dedicated to the implementation phase, management of the execution of the project and staying within the bounds of the Iron Triangle (Lædre et al., 2001).

3.6.5 Challenge four: Inadequate use of resources in FEM

A number of authors and research reports find that unacceptable project results are often caused by insufficient resources or the inadequate use of resources in project front end management (Morris and Hough, 1991; Pinto and Kharbanda,

1996; Austeng and Torp 2001; Lædre and Hangen, 2001). Compounding this situation is that the limited resources that are dedicated to this phase are often poorly managed (Khurana and Rosenthal, 1998; Kim and Wilemon, 2002; Giles and Cormican, 2014).

A primary contributing factor in project FEM is that the activities as well as the roles and responsibilities are not well defined. The literature on project management typically deals with the many downstream challenges and issues while roles, responsibilities and actions before the project is initiated are too often ignored (Edkins et al., 2012). As a result, front end project management practices appear inconsistent and confused and there is a lack of clear, effective guidance on this topic.

3.6.6 Challenge five: During project conceptualisation, the problem is not well enough understood, only one solution is considered and typically only by one person

Many projects fall into the trap of Zero Alternative Proceeding (Williams and Samset, 2010) where pre-project activities are reduced or are essentially non-existent. Typically, a single concept is evaluated and accepted without considering alternatives. In many cases, this route is the natural outcome of the choice of one individual's intuition or experience and preference for the chosen solution option (Pinto and Kharbanda, 1996; Williams and Samset, 2010; Whist and Christensen, 2011).

This 'one solution' approach has a number of shortcomings. A major one is that the single option considered is not scrutinised at the same level of detail as happens when a number of solution options are evaluated and compared to each (Olsson and Samset, 2006; Williams and Samset, 2010; Whist and Christensen, 2011).

This situation typically occurs because the preferred concept does not originate from a systematic analysis of the problem or requirement being investigated (Whist and Christensen, 2011). Another challenge is where the initially preferred concept is locked into caused by reinforcing loops, this can occur even when detailed analysis is performed (Williams and Samset, 2010).

This problem occurs despite the fact that the focus of the project front end should be to put enough effort into understanding the underlying problem to justify the existence of the project and provide understanding of the needs that the project is meant to satisfy (Whist and Christensen, 2011). An example of the impact of this problem is described by Genus (1997) reflecting on the Channel Tunnel project between Britain and France, showed that early and inflexible technology choices were one of the core problems.

3.6.7 Challenge six: Inadequate stakeholder alignment

Typically, before a project is started, project stakeholders work under the assumption that they understand the various perspectives and expectations of the parties involved. This implies a shared vision of the expected outcomes of the project, but experience has shown that this is not necessarily the reality in practice (McLachlin, 1999). The project purpose, goals and expected results should be settled in the front end since it is not possible to succeed unless all stakeholder interests are known and aligned before the detailed planning starts (Lædre et al., 2001; Joham, Metcalfe & Sastrowardoyo, 2009).

Winch (2017) points out that development in the area of stakeholder management has always been handled as a stand-alone focus in project management. Even though research interest in this area has picked up since 2005, the issue of stakeholder management still requires significant development. Furthermore, it has been suggested that the project management field has also traditionally only focused on stakeholders who are interested in the

project versus those stakeholders who are affected by the project. Both should be included (Winch, 2017).

Stakeholder management at the front end is further complicated given the temporary nature of the project as an organisation which in itself represents a diverse coalition of interests (Winch, 2014). During the front end, the situation is more challenging since the project has not yet been established.

Other factors that complicate the situation are that projects also tend to be more complex now when multiple cultures are involved and this highlights additional considerations for stakeholder management (Scott and Levitt, 2011). Furthermore, organisations themselves are changing constantly and this affects the people and other organisations with which the project organisation interacts (Bourne and Walker, 2006).

3.6.8 Challenge seven: There is little research on how the business strategy influences the project strategy and, as a result, tactical aspects of projects receive greater attention than those of strategic importance

There is little research exploring how the project sponsor's business strategy influences the project strategy and, more specifically, how the development process of the project strategy is impacted (Edkins et al., 2012). Linked to this point, Gilman (2017) argues that selecting the criteria used to assess success and that will be measured by key stakeholders is seen as the responsibility of the project manager. The result of this challenge, which is understated in project management literature and under-communicated to practitioners, is that tactical aspects of project management tend to receive greater attention than the strategic significance of the project (Andersen et al., 2014).

To illustrate this challenge, one study in Australia showed that despite investment of AUD100 billion over a decade in the State of Victoria, there was no

evidence that it led to an improvement of the strategic goals that were sought (Young, Young, Jordan & O'Connor, 2012). One of the key findings from this study was that the project management approach deployed on the projects was seen to be that of best practice. This highlights the significance of this challenge.

3.6.9 Challenge eight: Focus is mostly placed on technical causes of project failure and not on other root causes

Historically, the majority of literature on the topic of project underperformance has focused on technical causes such as scope creep, poor planning, lack of technical project management skills, rework and imperfect information as the reasons why projects fail (Morris and Hough, 1987; Wachs, 1990; Vanston and Vanston, 2004; Jennings, 2012; Park and Papadopoulou, 2012).

However, the discussion is shifting and a number of authors have identified psychological and political-economic reasons as additional causes that contribute to project underperformance. The authors argue that these causes have a much more severe impact on project performance than technical causes do (Flyvbjerg et al., 2003, 2004; Flyvbjerg and Cowi, 2004). While technical causes do contribute to project underperformance, the authors emphasise that performance data has shown that estimation inaccuracies are significantly non-normal. Despite the amount of research and development in technical approaches of project management models, a significant increase in the publication of books on project management and the increase in qualified project management professionals, the trend of significant underperformance of projects has not changed. While pockets of success may be referenced in some publications (for example: Odeck, 2004; Samset and Volden, 2013), these are typically specific to an industry or type of project. In reality, there is a significant and alarming level of continued project underperformance, due in large part to other root causes being ignored or disregarded.

Political-economic causes, also known as strategic misrepresentation (Flyvbjerg, 2006), stem from political and organisational pressures. Here inaccuracy in establishing delivery baselines is deliberate and the demand for accuracy is simply not there (Flyvbjerg, 2006).

Another factor is a psychological cause, which is also known as optimism bias, which have been present in projects for decades (Brooks, 1975). Optimism bias, an accidental act of self-deception, occurs when individuals predict events in the future more positively than what has actually been experienced on projects in the past (Flyvbjerg, 2004). This theory is supported through research by Kahneman and Tversky (1979).

The effect of optimism bias during the delivery of projects can be explained through what is called the Planning Fallacy. Here cost overruns and benefit shortfalls are incurred due to the overconfidence of practitioners who expect that challenges will not be material or can be mitigated (Lovallo and Kahneman, 2003). When the Planning Fallacy occurs, decisions are made on the basis of delusional optimism and not on the basis of a rational weighting of gains, losses, and probabilities. The Planning Fallacy occurs when benefits are overestimated and costs are underestimated. The result is that projects that should not have been initiated are pursued and these projects are unlikely to come in on budget or on time, or to ever deliver the expected returns (Flyvbjerg, 2007).

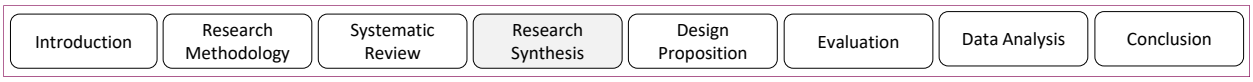
These factors are rarely considered during pre-project planning activities and project conceptualisation. In isolated contexts, certain bodies such as the HM Treasury and the UK Department of Transport (Flyvbjerg and Cowi, 2004) have started using techniques such as reference class forecasting to curb these causes. However, widespread use of these techniques has not been adopted by mainstream project management practice.

3.7 Conclusion

In this chapter, I reviewed the definition, boundaries, purpose and importance of FEM. This chapter also discussed the systematic review that was performed to identify the challenges typically experienced during FEM. As a result, eight specific challenges were discussed. The challenges all relate to the customary emphasis placed on the project when it is underway and the insufficient attention paid to the project in its initial stages.

I believe that if challenges identified in the systematic review can be mitigated during project conceptualisation value can be unlocked. These challenges increase direct project cost and lead to opportunity cost due to the project underperformance that they cause. The root causes of the challenges identified influenced my thinking when framing the initial version of the conceptual artefact that this research will deliver.

Chapter Four: Research Synthesis



4.1 Introduction

My project management education was traditional in the sense that I obtained mainstream certifications and worked on a variety of projects. I saw myself as an experienced Project Manager, well versed in my field. My perspective on project management changed considerably when my life and learning journey resulted in me studying towards a Masters in Major Programme Management at Oxford University. On this intensive programme that spanned two years, shared with a cohort of seasoned veterans in the field, my traditional perspectives on Project Management were challenged.

Specifically, this experience reaffirmed the importance of the project front end and the information required at this stage to set a project up for success. I was introduced to a number of models and frameworks that, while not necessarily mainstream, I believe have the potential to add significant value to project execution.

4.2 The nature of information at the project front end

This chapter focusses on the nature of information that should be generated during FEM activities by presenting the cognitive model of risk and uncertainty in projects. The discussion then moves to the Maieutic Machine as a solution concept which can be incorporated into the artefact being developed in this research.

In the front end phase, because potential projects have not yet been formally given legitimacy, activities are characterised by a high degree of uncertainty and risk. This is, to a large extent, caused by the nature of information that is available, or not available, for use at this stage as well as the level of confidence of the various stakeholders involved in the process. Werner (2012) illustrates

this through the cognitive model of risk and uncertainty in projects, which has been adapted from Winch (2010). This model shows the nature of information available and can be seen below in Figure 12.

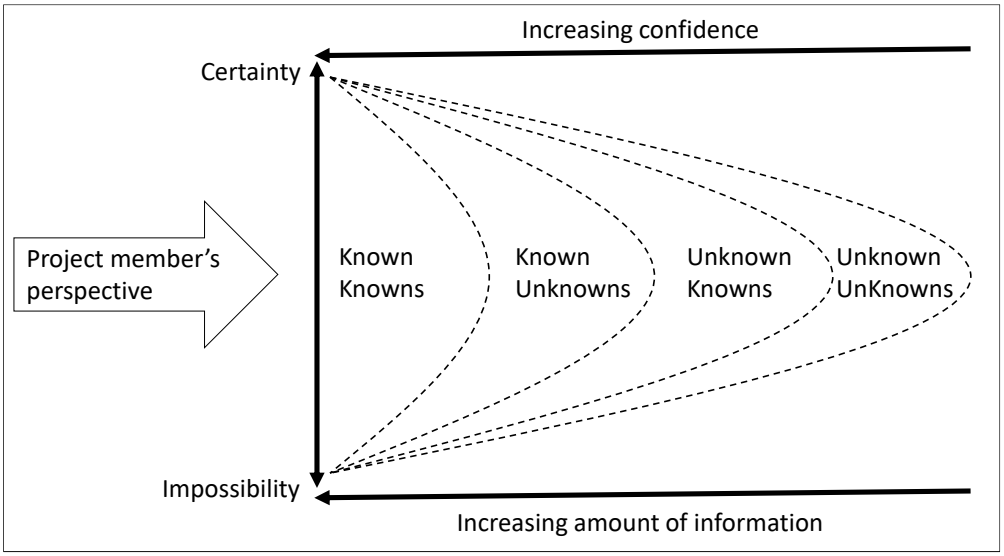


Figure 12: Cognitive model of risk and uncertainty in projects (Winch, 2010)

'Known unknowns' are referred to in project management literature as uncertainty (Loch, Solt & Bailey, 2006; Chapman and Ward, 2003). When some likelihood of occurrence can be assessed, the known unknowns turn into 'known knowns', also called risks in PM literature (Chapman and Ward, 2003). 'Unknown knowns' refer to information that will be available for or within the project but which has not yet been researched or communicated (Cleden, 2009; Werner, 2011). This could also be described as a situation where somebody associated with the project is aware of the risk source and probability but does not share such information with the relevant people (Winch, 2010). 'Unknown unknowns' are events that can impact the project positively or negatively but either cannot be identified or, if identifiable, their likelihood cannot be assessed due to lack of information. This is also referred to as 'unforeseeable uncertainty' (Cleden, 2009; Winch, 2010; Werner, 2011).

The focus of this study was on the generation of appropriate information during the project conceptualisation process in order to increase the level of confidence of the stakeholders involved during the process; thus enabling effective decision-making.

4.3 Generation of appropriate information

The research synthesis step of this dissertation concentrates on identifying solution concepts that can be incorporated into the target artefacts to enable the creation of such information.

4.3.1 The Maieutic Machine

To identify solution concepts that could assist in the generation of appropriate information during project conceptualisation, the typical challenges that are experienced during FEM must be considered. The challenges that were identified showed that not enough time is dedicated to FEM; resources are limited and the typical approach focuses on one possible solution. An appropriate approach is one that would ensure that information is created through a collaborative approach where multiple solutions are considered and appropriately challenged.

During my studies on major programme management, I was introduced to the theoretical framework of the Maieutic Machine (Quattrone, 2011). As I engaged with the concepts of the framework, I grew to appreciate the potential power of the abstract model. Adopting it from the field of accounting and economics, I believe the essence of this framework can provide an appropriate means of extracting relevant information in FEM. This chapter is dedicated to explaining this rationale.

Pfeffer (2013) makes the point that it is not necessarily what we do not know this is the greatest concern, but rather what we incorrectly, *believe we know*, that creates problems. Macintosh and Quattrone (2010) advise caution in interpreting what we read as being true and represented in situations. An

alternative way of extracting information is through the use of rhetorical thinking to find better answers to questions posed (Macintosh and Quattrone, 2010).

A rhetorical approach, also described as a reflective process, is where knowledge is produced through logical reasoning and interrogation (Macintosh and Quattrone, 2010). Macintosh and Quattrone (2010) points out that new insights are created when this approach is followed. The work of Quattrone (2011, 2015, 2016, 2017), in the field of accounting and economics, tests traditional thinking and the common assumptions made regarding transparency. Although the focus of the work is in a different field, it is anticipated that it is also relevant in Project Management. Through his work, Quattrone introduces a theoretical framework called the Maieutic Machine (MM) which provides flexibility in adopting a rhetorical approach (Quattrone, 2011). Maieutic practice is where participants in an inquiry or discussion raise questions and these questions may lead to a greater understanding of the topic in question (Freeman, 2011).

The key strengths of the MM lie in its ability to facilitate an iterative approach, enable clear representation of information created during the execution of the process, to enable appropriate challenges to information presented and to allow a motivating process to ensure successful engagements (Macintosh and Quattrone, 2010). The MM outlines an approach that enables participants in the process to develop solutions to problems relating to definitional, organisational and political situations. Here, knowledge is created through an iterative process of discovery through questioning (Macintosh and Quattrone, 2010). The MM comprises four dimensions as shown in Figure 13 below.

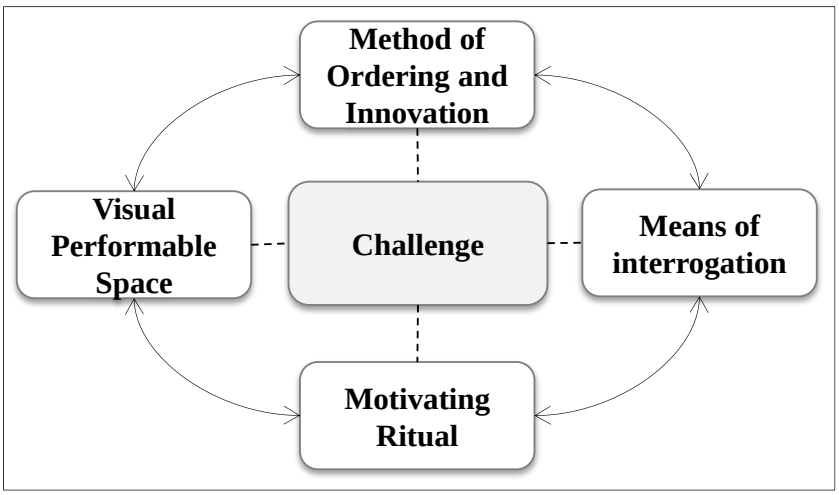


Figure 13: The Maieutic Machine (Macintosh and Quattrone, 2010)

4.3.1.1 Motivating ritual

This focus area is concerned with the way that people that participate in the process are engaged and kept engaged for the duration of the time. The focus here is to establish a guiding light to ensure that participants create a strong affiliation with the processes of the MM and the intended outputs of the process. This process also ensures that the supporting narrative is established to trigger organisational action.

4.3.1.2 Visual Performable Space (VPS)

The focus of the VPS is to establish a creative space. Here information can be engaged and classified and strategy can be formulated. The VPS enables the process where qualitative information such as strategic imperatives, perspectives and objectives can be translated into quantitative information such as targets and measures. The intent of the VPS is therefore to invent new solutions to problems.

4.3.1.3 Method of ordering and innovation

The focus of this this function is twofold, firstly to order the information that is created during the MM process and secondly to analyse the information that has

been created to identify possible innovation that may be considered not previously considered. The information that are made available through multiple possible representations allows for concepts to be made more concrete. No specific guidelines are established for any representations which provides flexibility in a variety of possible applications.

4.3.1.4 Means of interrogation

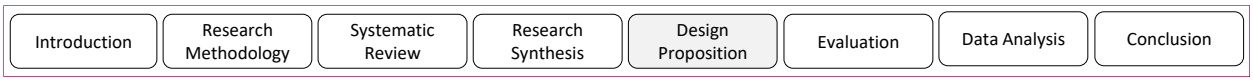
The focus of this activity is on reflection and inquiry of what has been achieved delivered through the process. The process of interrogation as another catalyst for the creation of knowledge, this is achieved by asking questions that opens possibilities for new options to be considered or alternative paths to be taken.

The interrogation process also assists in the process for participants to buy-into the outputs of the MM process as any challenge can be made on information created. This process also enables mediation between participants and potentially conflicting ideas.

4.4 Conclusion

This chapter discussed the nature of information that is generated during project conceptualisation. The discussion then outlined the focus of the research synthesis as identifying concepts that could be incorporated into the planned artefact in order to enable the creation of essential information during project conceptualisation. Appropriate consideration must be given to these concepts to confirm that they will assist in mitigating the identified challenges. The Maieutic Machine (Busco and Quattrone, 2009) was discussed as a concept that could assist in the generation of appropriate information to reduce risk and uncertainty.

Chapter Five: Design proposition



5.1 Introduction

The research contribution of my dissertation is to establish an alternative approach to more effectively conceptualise projects. I call this artefact the Project Conceptualisation Canvas (PCC). Project conceptualisation is a creative process and as projects are unique, the canvas represents the ability to have freedom to design within appropriate guidelines. The PCC represents a new and unique approach to project conceptualisation and aims to fill some of the gap that currently exists in the literature.

This chapter will explain the PCC by describing its construct through the decomposition of the artefact into three levels of detail and the nature of the information available at each level. The chapter concludes with a discussion on the application of the PCC with reference to the application continuum which is shown in Figure 18 in this chapter.

5.2 Constructing the PCC

The concept of the Maieutic Machine, as discussed in the previous chapter, forms an integral part of the PCC. The naming conventions used in the PCC have been changed to ensure that the framework is relevant to the context. Specifically, the names of the four quadrants of the MM have been adapted as follows: the Motivating Rituals is now called Motivating Practices, the Visual Performable Space now named The Incubator, the Method of Ordering and Innovation now called Ordering Information and finally the last quadrant called Means of Interrogation named Means of Interrogation and Innovation. However, the essence of the Maieutic Machine, the iterative approach and use of rhetoric questioning, is fundamental to the PCC.

The initial version of the PCC was rudimentary based on elements incorporated as a result of the research synthesis and my own experience in the area of study. Through multiple iterations of development, using the Design Science research approach, the PCC developed into the artefact described in this chapter. Please see Appendix A: The evolution of the PCC which shows how the PCC evolved from the initial iteration to the final version. The following two chapters then describe both the evaluation and the development of the artefact in more detail.

The PCC evolved through multiple development iterations and it is therefore anticipated that PCC will further evolve and develop as it is used.

5.3 The decomposition of the PCC

The PCC is decomposed into three layers which are shown below in Figure 14. This decomposition is then discussed in detail.

5.3.1 Level 1: The construct of the Project Conceptualisation Canvas

At Level 1, the PCC consists of three phases: preparation, conceptualisation and close-out. In conjunction with these three phases, change management activities take place to support the effective execution of the intended outcomes of each phase. The PCC is preceded by pre-PCC activities that ensure that the PCC is initiated in an appropriate manner. Post-PCC activities then ensure that, in the event that the potential project is approved, the project conceptualisation baseline is adhered to during project execution.

The conceptualisation phase consists of twelve primary activities: Pre-PCC Activities; Preparation Activities; and Understanding the problem/opportunity. The next four primary activities are housed in the Conceptualisation Flywheel and include Motivating Practices; the Incubator; Ordering Information as well as means of Interrogation and Innovation. The Conceptualisation Flywheel is concluded by the primary activity of Exit the Conceptualisation Flywheel. The

remaining primary activities are Structuring the Temporary Organisation; PCC Decision-Making, Change Management and Post-PCC Actdivities. In order to simplify the navigation of the PCC, the PCC Navigation Framework is shown in Appendix B.

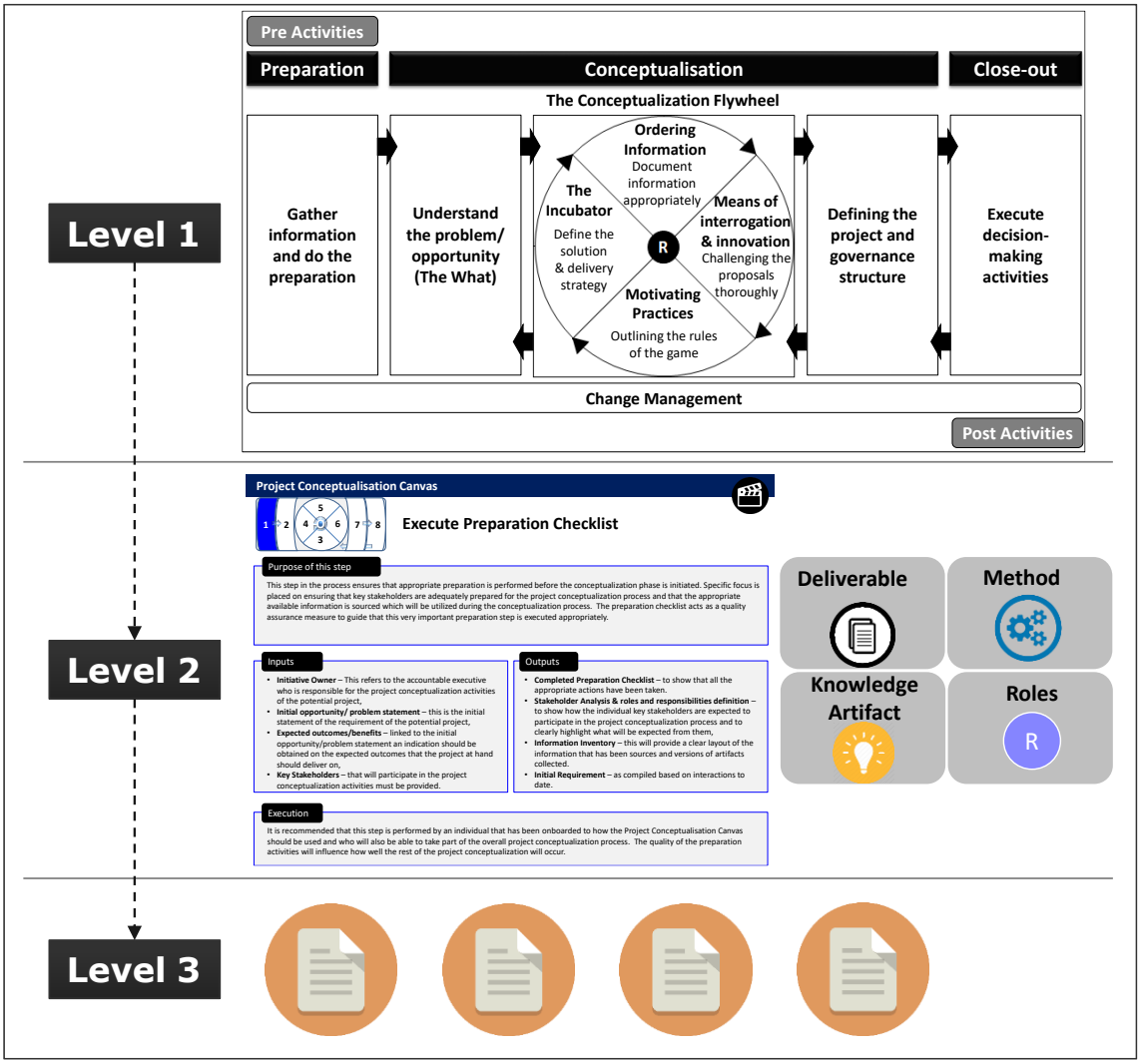


Figure 14: The decomposition of the artefact of this study the PCC

5.3.2 Level 2: The description of the project conceptualisation canvas

At the second level, additional information is provided that will assist in the execution of each of the primary activities of the PCC. Each primary activity is described through an activity specification. Additional information is provided regarding deliverables, the roles required to execute the activities and the

methods and the knowledge artefacts needed to support the execution of the activity. The elements that form Level 2 are discussed next.

5.3.2.1 Activity specifications

Each of the primary activities discussed at Level 1 is described in more detail at Level 2 through an activity specification. In total there are twelve activity specifications. An example of the specification can be seen in Figure 15 below.

The activity specification consists of four primary components: the purpose statement, inputs, outputs and activity execution notes. The purpose statement describes the intended outcome of the activity and how it contributes to the intended outcome of the PCC as a whole. The inputs are shown to ensure that the appropriate entry criteria are met to support the successful completion of the activity. The outputs are shown and act as the exit criteria of the activity. These must be delivered to ensure the successful completion of the activity. The outputs are described by highlighting the purpose of the deliverable, the information that must be incorporated in the deliverable and any execution notes if applicable. A detailed listing of the outputs or deliverables produced by the PCC is presented in Appendix C. The activity specifications as well as the output specifications are discussed in detail in later in this chapter.

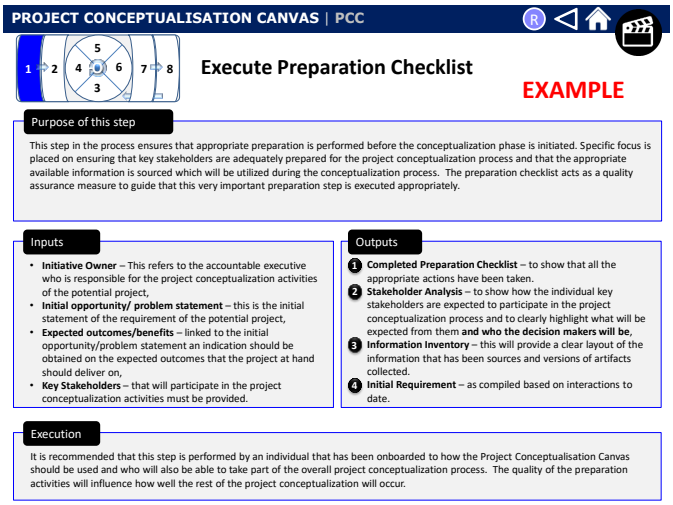


Figure 15: Example of a PCC activity specification

5.3.2.2 Methods

The focus on methods is to incorporate, as far as possible, known methods into the PCC. The method specifications aim to introduce the suggested methods and emphasise what is required to support the successful execution of such methods. An example here is the Fishbone diagram which is positioned as a method to be used to determine the problem or opportunity statement of the potential project. The Fishbone diagram is a widely used method to determine cause and effect and as a result is recommended. The use of the Fishbone diagram must be seen as guidance and other methods could also be used to achieve this outcome.

The specific methods proposed in the PCC are intended as guidelines. Alternative methods that would achieve similar outcomes could also be considered when instantiated in a specific organisational context.

5.3.2.3 Knowledge artefacts

Knowledge artefacts represent information that can be used to assist in the delivery of the activity where it is referenced. Knowledge artefacts aim to provide guidelines and considerations on how to incorporate such knowledge into the execution of primary activities. The knowledge artefacts that are positioned in the PCC aim to add to the depth of the process and to highlight specific considerations that need to be taken into account while executing each activity of the PCC.

5.3.2.4 Roles

The roles that are required for the execution of the PCC are identified. Each role is described through a role definition which highlights the specific responsibilities that the role has in the execution of the PCC. Each role is also contextualised, explaining where it will be required in the PCC lifecycle.

5.3.3 Level 3: Describing the deliverables of the PCC

The third level of the PCC is dedicated to draft deliverable templates that relate to the deliverables that were indicated as outputs in the primary activity specifications. These draft templates will be completed when the PCC is implemented.

5.4 The PCC Level 1 and Level 2 descriptions

The PCC consists of twelve primary activities which are highlighted in Figure 16 below. Each of the primary activities will be described through the following: firstly a Level 1 overview of the activity is provided. This is followed, at Level 2, by a description of each activity specification with an outline of the inputs, the role players that are involved with as well as the primary activities they are responsible for and finally a description of the outputs of the primary activity.

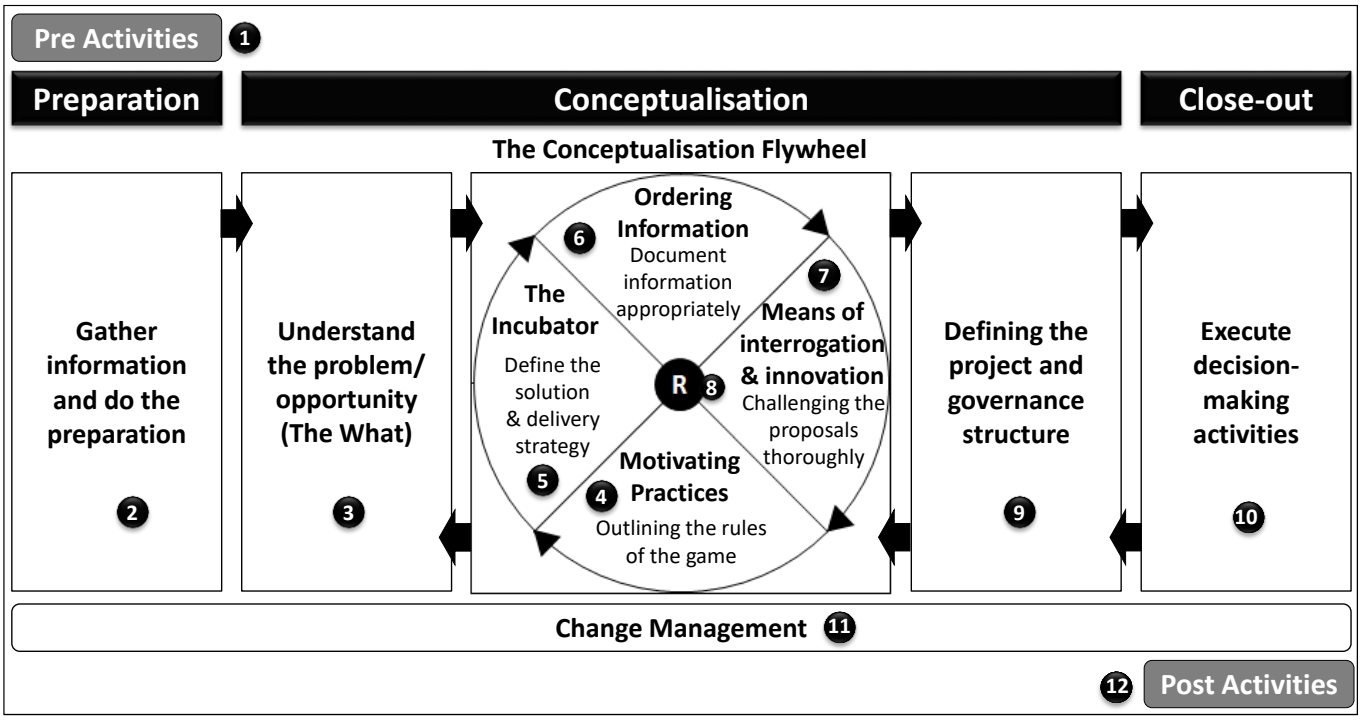


Figure 16: The PCC Level 1

5.4.1 Pre-PCC Activities

5.4.1.1 Level 1 overview

This activity ensures that the environmental factors required to support the execution of the PCC have been addressed. The execution of the PCC requires investment. It must therefore be determined at the outset of the potential project whether the investment of executing the PCC is warranted. In deciding whether the PCC is to be executed, the level of detail at which it should be executed must also be determined. The PCC can be executed at three levels: a light touch approach at Level 1; a mid-level at Level 2; or the full process at Level 3 (see Fig 17 below). During the pre-activities, the Business Sponsor must approve the investment required to execute the PCC.

5.4.1.2 Activity specification

The activity specification of the Pre-PCC activities is shown in Figure 17 below indicating the purpose, inputs and outputs of the primary activity.

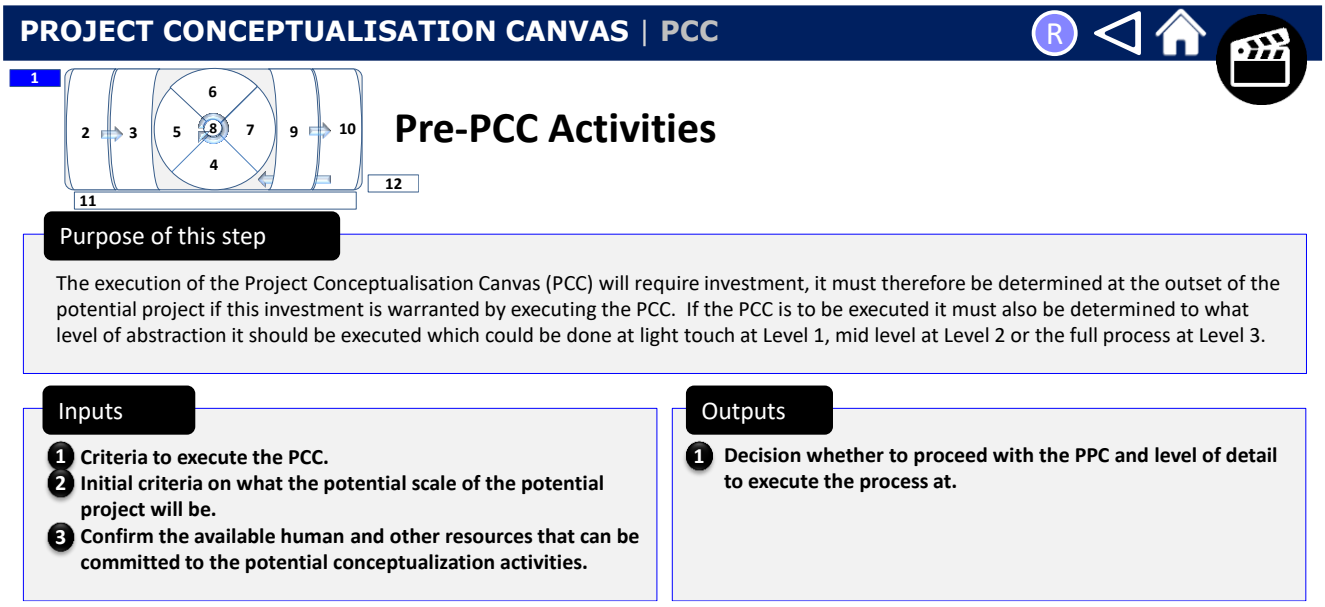


Figure 17: Pre-PCC Activities

5.4.1.1 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Criteria to execute the PCC.	From Business Rules
2	Initial criteria on what the potential scale of the potential project will be.	From Business Sponsor
3	Confirm the available human and other resources that can be committed to the potential conceptualisation activities.	From Business Sponsor

5.4.1.2 Activity role players and primary activities

The primary role players in this activity are the Business Sponsor, the Conceptualisation Process Convener and the Business Owner.

The Business Sponsor is responsible for this primary activity and initiates the Pre-PCC Activities by providing the required inputs to the Business Owner and Conceptualisation Process Convener. This Convenor will then execute a process to confirm whether the delivery parameters of the potential project fall within the standard criteria that the organisation has agreed will trigger the PCC process. The parameters are typically focussed on the size of the potential investment, the potential benefits that the potential project will deliver and the impact on all resources in the organisation.

As projects differ from each other in a number of ways, most specifically in terms of size and complexity, the same investment in time and resources will not be warranted during project conceptualisation activities. As a result, the PCC can be executed at three levels where Level 1 refers to a light touch application for small projects and Level 3 would represent the full PCC process for larger, more complex projects. This continuum of application of the PCC that outlines the three options is shown in Figure 18 below.

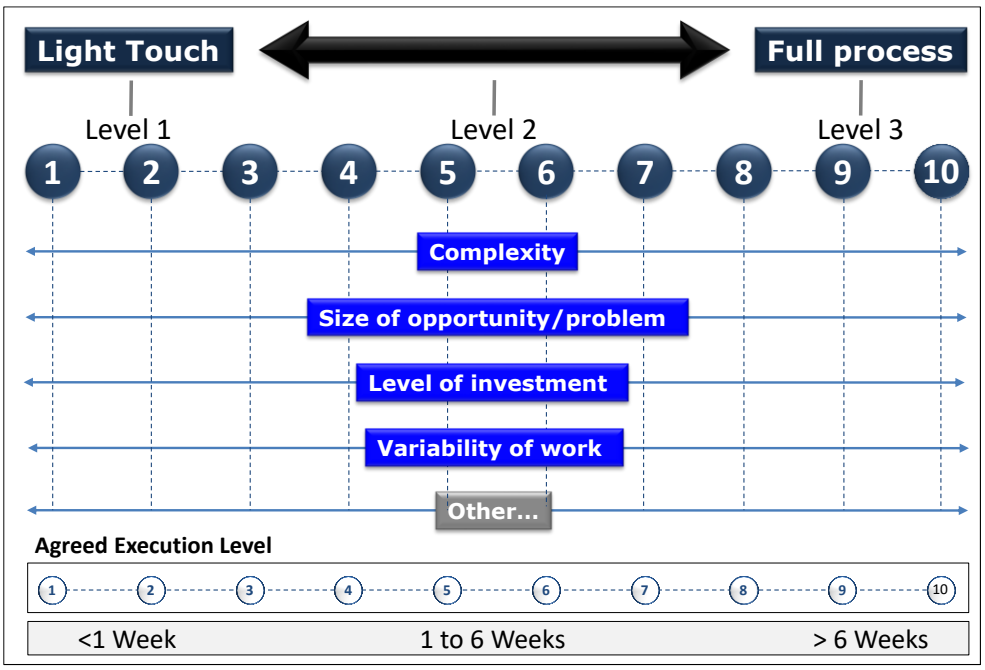


Figure 18: The PCC application continuum

The PCC application continuum outlines the process followed to determine which level will be appropriate for the potential project. The basis for determining the appropriate level is dependent on the review of a number of factors which need to be considered and rated. The rating of each factor will determine the appropriate level; for example, complexity will be rated on a scale between one and ten. The average rating across the factors will be used as the indicator of the level at which the PCC should be applied. The PCC application continuum specifies a number of factors for review. These include complexity, size of the potential project, level of investment required and variability in terms of scope of work. The PCC application continuum can be adjusted to better suit the application context in two ways. Firstly each factor can be altered to make it more specific to the organisation to which it applies so the identified factors are seen as a starting point. Secondly, additional factors could also be added or suggested factors removed as suits the organisation.

It must be noted that the final decision about which level the PCC should be executed at will be agreed between the Sponsor of the potential project and the Conceptualisation Process Convener. An initial decision taken regarding the level of detail at which the PCC will be executed will also be reviewed once more information becomes available.

5.4.1.3 Activity outputs

The following outputs are produced by this primary activity:

Description	Focus	
Output | Decision whether to proceed with the PPC and level of detail to execute		**Ref | 1.1**
A decision must be taken whether the PCC should be executed for the potential project and, if approved, at what level of detail should be executed.	The decision will be based on a number of factors that must be considered given the conditions of the potential project and the organisation where the PCC is being executed.	

5.4.2 Preparation Phase in the PCC

5.4.2.1 Level 1 overview

The preparation phase aims to ensure that the overall project conceptualisation process is initiated in a way that maximizes the chance of successful completion of the end-to-end process. The purpose of this primary activity is twofold. Firstly, during preparation, the initial information on the requirements of the problem/opportunity that the potential project presents has to be obtained. At this stage, it is more important to obtain the information than to deliberate over the quality or completeness of such information. Secondly, the appropriate stakeholders to be involved during the project conceptualisation process need to be identified and on-boarded to the conceptualisation process.

5.4.2.2 Activity specification

The activity specification of the Preparation Phase activity is shown in Figure 19 below illustrating the purpose, inputs, outputs and execution notes of the primary activity.

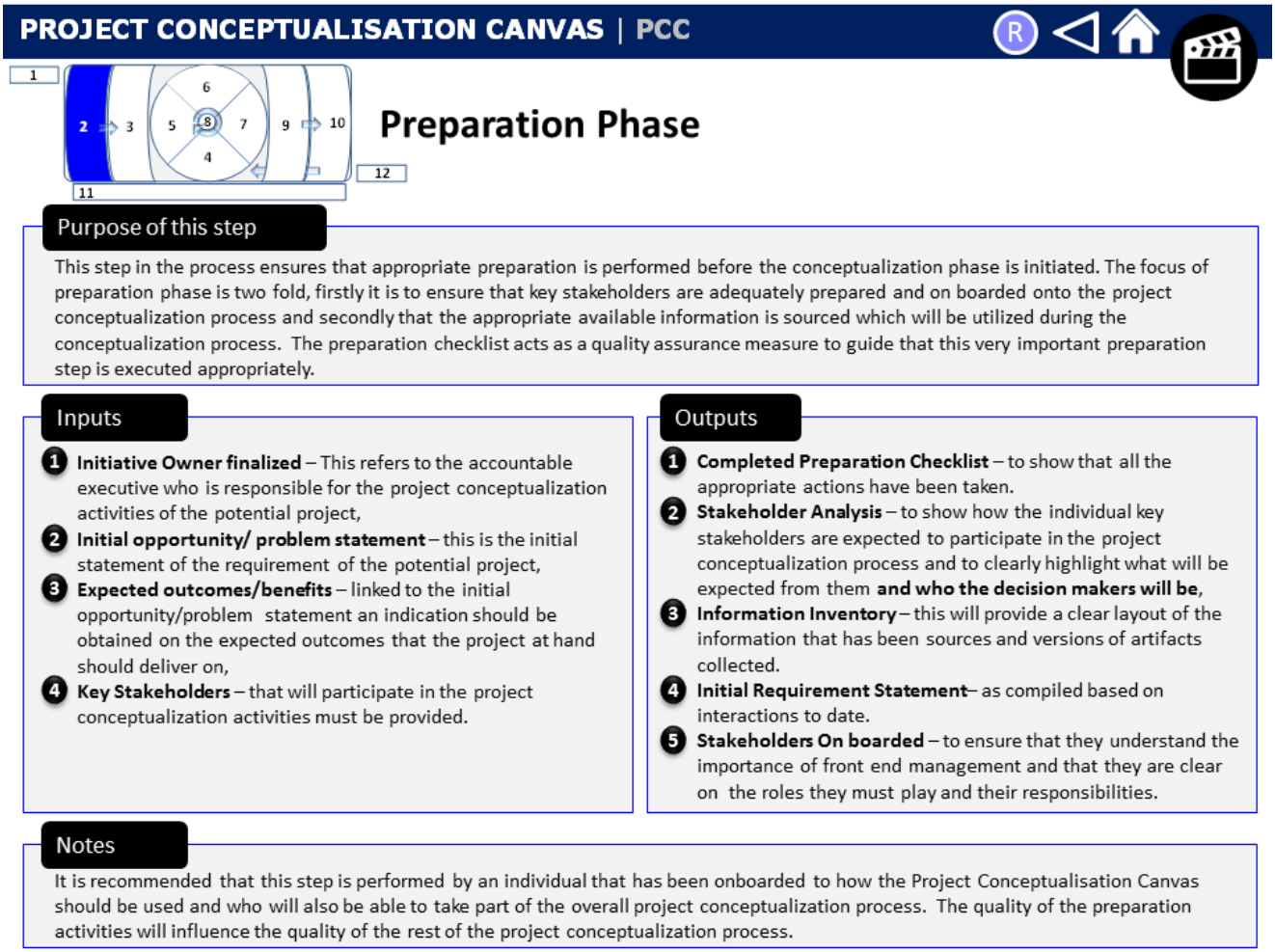


Figure 19: Preparation Phase in the PCC

5.4.2.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Initiative Owner finalised	From Business Sponsor
2	Initial opportunity/ problem statement	From Business Sponsor

Ref	Input	Source
3	Expected outcomes/benefits	From Business Sponsor
4	Key Stakeholders	From Business Sponsor

5.4.2.4 Activity role players and primary activities

The primary role players in this activity are the Business Sponsor, the Business Owner, the Conceptualisation Process Convener and the Conceptualisation Administrator.

The Conceptualisation Process Convener is responsible for this process. The Conceptualisation Administrator will be appointed and will be responsible for maintaining the Preparation Checklist and establishing the Information Inventory. The Business Sponsor and Business Owner will identify all the stakeholders required to participate in the process and the Conceptualisation Process Convener will ensure that they are effectively on-boarded to the process. The Conceptualisation Process Convener will ensure that the current requirements are sourced.

5.4.2.5 Activity outputs

The following outputs are produced by this primary activity:

Description	Focus	
Output | Stakeholder Analysis		**Ref | 2.1**
A stakeholder analysis must be completed to confirm the individuals who should be involved during the project conceptualisation process.	This document will contain the organisational chart of the permanent organisation in which the potential project will be executed with high-level role descriptions. Description of key stakeholders with specific reference to: level of influence in the organisation; what is required from the individual; risks if they are not engaged and do not participate; preferred communication method; alternatives in case unable to attend a session for example. Identification of the stakeholders who must participate in the various phases of the project conceptualisation process.	

Output | Information Inventory	Ref | 2.2
The Information Inventory is to be completed to ensure that all the available information at the outset of the conceptualisation process is sourced, consolidated and indexed to ensure that the project conceptualisation activities can proceed as effectively as possible.	Inventory of documents sourced. Inventory of all other artefacts sourced. Inventory of information that was required but could not be obtained.
Output | Preparation Checklist	**Ref | 2.3**
The Preparation Checklist is to be completed before the preparation phase can be completed. The preparation checklist outlines the required activities as well as the essential information that must be obtained during the preparation phase. The successful completion of this activity will signal the start of the conceptualisation phase of the Project Conceptualisation Canvas (PCC).	Confirmation of the Business Owner and Conceptualisation Lead that have been filled. Identification of the key stakeholders that must participate in the conceptualisation process as well as their roles and responsibilities. Confirmation that the initial information regarding the opportunity/challenge that the potential project is to address has been obtained. Confirmation that all the stakeholders have been on boarded to the PCC process and that they are aligned on the expectations during project conceptualisation. Confirmation on who is required to approve each of the PCC deliverables.
Output | Initial Requirement Statement	**Ref | 2.4**
The Initial Requirement Statement represents the initial perspective on the purpose of the potential project that the PCC is focused on. The Initial Requirement Statement can take on many different formats and is typically high level in nature. It could also have some conflicting opinions on the exact outcomes to be achieved by the proposed project. All available information, even if conflicting, should be collated into this deliverable.	**Background**: provides context on what lead to the opportunity/problem being identified. **Opportunity/Problem Statement:** the high-level statement that currently exist on the area of focus. **Objectives & Deliverables:** what is currently understood to deliver on the opportunity/problem statement. **Specific inclusions and exclusions:** any areas that at the outset of the process need to be included or excluded. **List of supporting information:** refers to information inventory. **Stakeholder information:** refers to stakeholder analysis.

Output | Initial Requirement Statement (continued)		Ref | 2.4
	Resource commitment to execute project conceptualisation process:to indicate which resources have been committed to ensure that the PCC process can be executed.	
Output | Stakeholders On-boarded		**Ref | 2.5**
It is of utmost importance that the participants of the PCC are on-boarded appropriately before the execution activities commence.	**Importance of project front end management:** to ensure that participants understand the importance of the activity that is about to commence. Participants are provided with the rationale for executing the PCC. This process includes an outline of the process and why the different primary activities are executed. **Clarity on the roles they will play and the responsibilities of each role:** in order to ensure that each person involved in the execution of the PCC is clear on their responsibilities, each person is taken through the activities that they will be responsible for and when they are expected to be executed.	

5.4.3 Opportunity/problem analysis and definition in the PCC

5.4.3.1 Level 1 overview

The conceptualisation process starts with an analysis of the problem or opportunity that will be addressed by the potential project. This primary activity therefore ensures that there is absolute clarity about the exact scope or focus of the potential initiative. The recommended process to follow is that of Cause and Effect but alternative methods could also be used to achieve the intended outcome. This activity will produce the Baselined Requirement as primary input into the Conceptualisation Fly-wheel.

5.4.3.2 Activity specification

The activity specification of the opportunity/problem analysis and definition activity is shown in Figure 20. This indicates the purpose, inputs, outputs and execution notes of the primary activity.

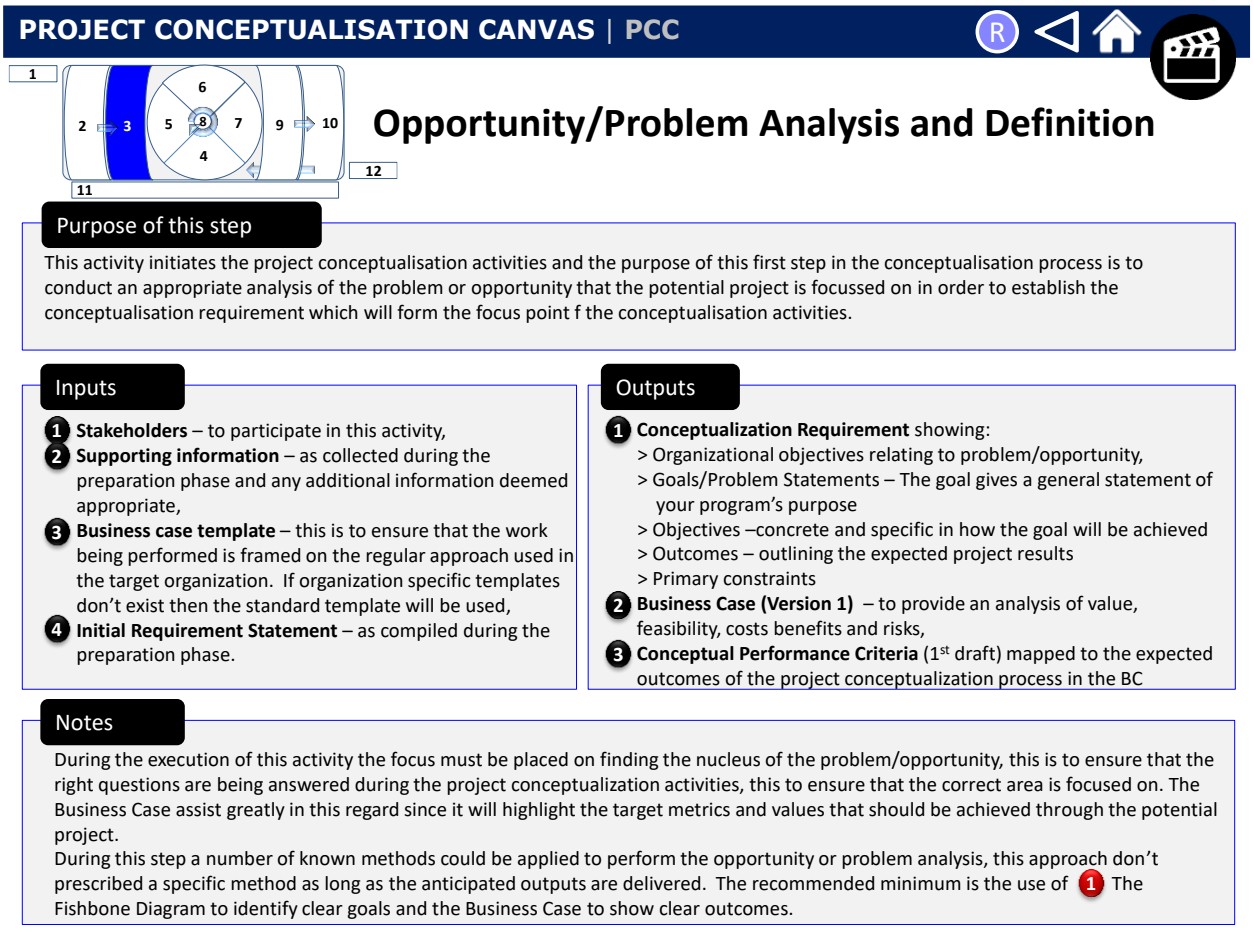


Figure 20: Opportunity/problem Analysis and Definition

5.4.3.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input & reference	Source
1	Stakeholders (2.1)	From Preparation Phase
2	Supporting information (2.2)	From Preparation Phase
3	Business case template	From PCC template library
4	Initial Requirement Statement (2.4)	From Preparation Phase

5.4.3.4 Activity role players and primary activities

The primary role players in this activity are the Business Owner, the Conceptualisation Lead, the Conceptualisation Administrator, the Conceptualisation Team Member and the Conceptualisation Specialist.

To start this activity, the Business Owner and Conceptualisation Lead must ensure that the team is assembled and ready to execute the PCC. The chosen problem/opportunity analysis technique will be executed and should result in the Conceptualisation Requirement. The first draft of both the Business Case and the related Conceptual Performance Criteria must be established. Ideally, there should be no uncertainty about the intended outcomes of the potential project at the end of this process.

5.4.3.5 Activity outputs

The following outputs are produced by this primary activity:

Description	**Focus**
Output | Conceptualisation Requirement	**Ref | 3.1**
The Conceptualisation Requirement constitutes the set of requirements needed to form the basis of the project conceptualisation process. The objective is to present clear, complete and concise definitions of the requirements so that they are unambiguous and easily understood.	**Summary Business Requirements:** covering Background, Opportunity/Problem Statement. **Link to business strategy**: provide clear links to the business strategy that the identified requirements will support. **Goals, Objectives and Outcomes:** to be achieved by the potential project. **Scope Inclusions (with resultant deliverables) and exclusions:** this section must highlight priorities, constraints and dependencies. **Supporting information:** the list of documents/artefacts that can be taken into the project conceptualisation process to support a detailed analysis of the work at hand. **Specific assumptions**: must be highlighted. **Potential risks:** what must be considered during the conceptualisation process.

Output | Conceptualisation Requirement (continued)	Ref | 3.1
	Resource commitments to the conceptualisation process: specifically any additional resource capacity that was flagged during this step of the process that was overlooked in the initial stakeholder analysis. **Additional stakeholder information**: specifically any additional stakeholders that were identified who need to be included in the conceptualisation process. **Sign-off of the Conceptual Requirements Document:** to ensure alignment of key stakeholders on the scope of the potential project.
Output | Business Case (Version 1)	**Ref | 3.2**
The first version of the Business Case contains the initial information before detailed conceptualisation activities have been executed.	**Purpose:** summary of the purpose of the business case and the need to be satisfied through the initiative. **Value:** establish clear links between the business strategy and the outcomes that will be achieved through this initiative. **Audience:** the stakeholders that will be responsible for decision making on this initiative as well as their roles in the process. **Benefits:** initial expectations on business benefits that must be realized through the potential project. **Costs:** initial perspectives on costs associated with the potential project. Specifically at this stage the focus is on identifying categories of costs that must be considered. **Risks:** associated with the potential project.
Output | Conceptual performance criteria (1st draft)	**Ref | 3.3**
Identify the performance criteria which should be mapped to the expected outcomes of the potential project. The criteria that are identified will ultimately be used to assess project performance.	**Effectiveness metrics:** measuring the level at which the project objectives are achieved. **Efficiency metrics:** measuring how well the potential project is being delivered.

5.4.4 The Conceptualisation Fly-wheel in the PCC

5.4.4.1 Overview

The Conceptualisation Fly-wheel is an iterative process that consists of four primary activities. These are: Motivating Practice, The Incubator, Ordering Information and, lastly, Means of Interrogation and Innovation.

These four activities are initiated when the opportunity in the problem statement of the potential project is clearly understood. The activities are executed in an iterative manner until exit criteria are met in order to construct the required governance structure to support the potential project. The four components of the conceptualisation flywheel as well as the steps to exit the process will be discussed next.

5.4.4.2 Conceptualisation Fly-wheel Construct

The intention of the Conceptualisation Fly-wheel construct, shown in Figure 21 below, is intended to highlight how the four primary activities relate to each other and the iterative nature of this process. The details of each is described in the primary activity specifications below.

5.4.5 Motivating Practices in the PCC

5.4.5.1 Level 1 overview

The focus of the motivating practices is to make clear what process will be followed to execute the project conceptualisation activities in the specific organisational context to which the process is being applied. This activity, therefore, outlines the planned execution schedule, the participants who will participate in each activity and makes clear the roles and responsibilities of these participants. Motivating practices also outline the process that will be followed to resolve issues during the conceptualisation process. Finally, they ensure that the logistical arrangements to support the planned activities have been agreed and scheduled. The Motivating Practice therefore aims to ensure that the momentum

in project conceptualisation activities is initiated and maintained throughout the overall process.

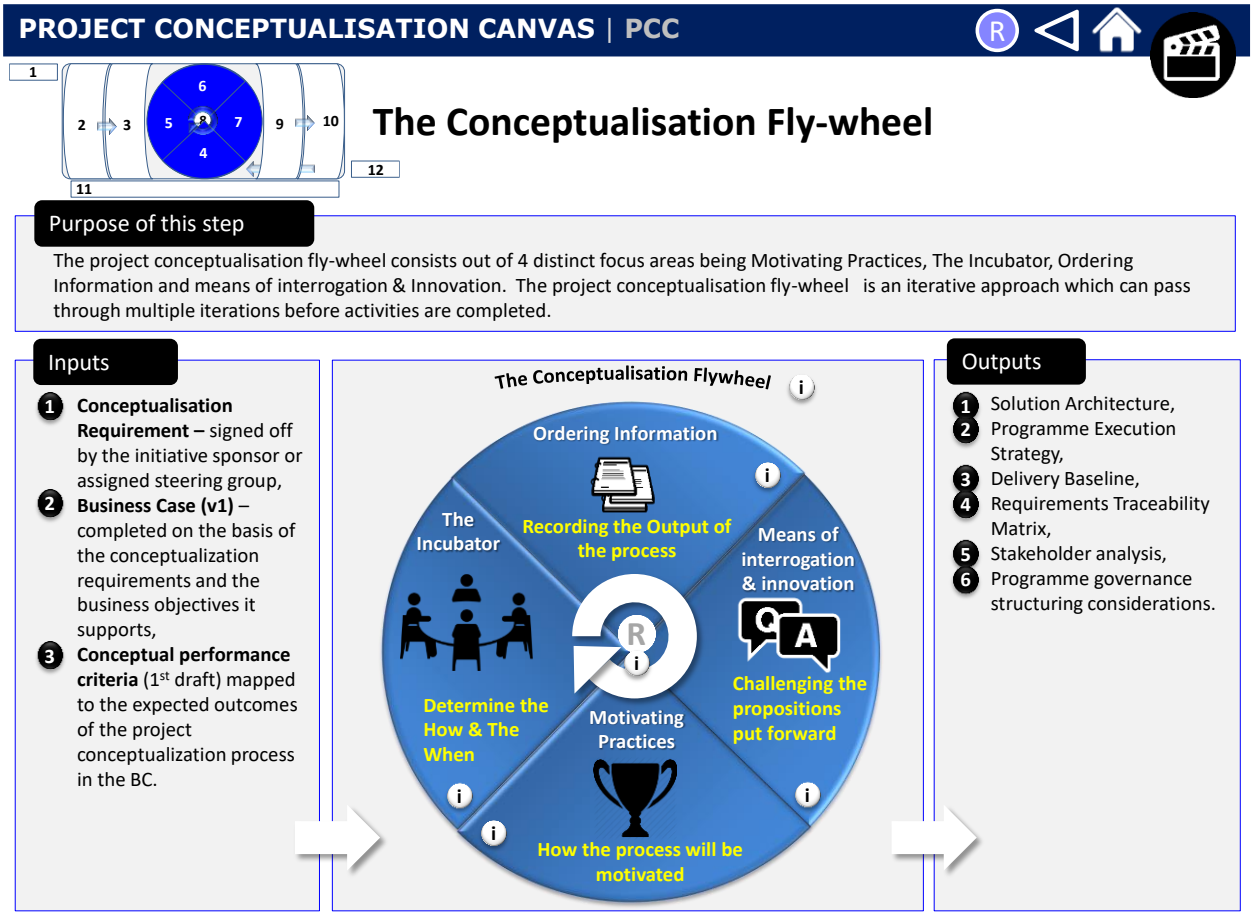


Figure 21: Conceptualisation Fly-wheel construct

5.4.5.2 Activity specification

The activity specification of the Motivating Practices activity is shown in Figure 22 below which illustrates the purpose, inputs, outputs and execution notes of the primary activity.

5.4.5.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Organisational considerations	From Organisational Standards
2	Execution constraints	From Stakeholder Analysis
3	Stakeholder Analysis (2.1)	From Preparation Phase

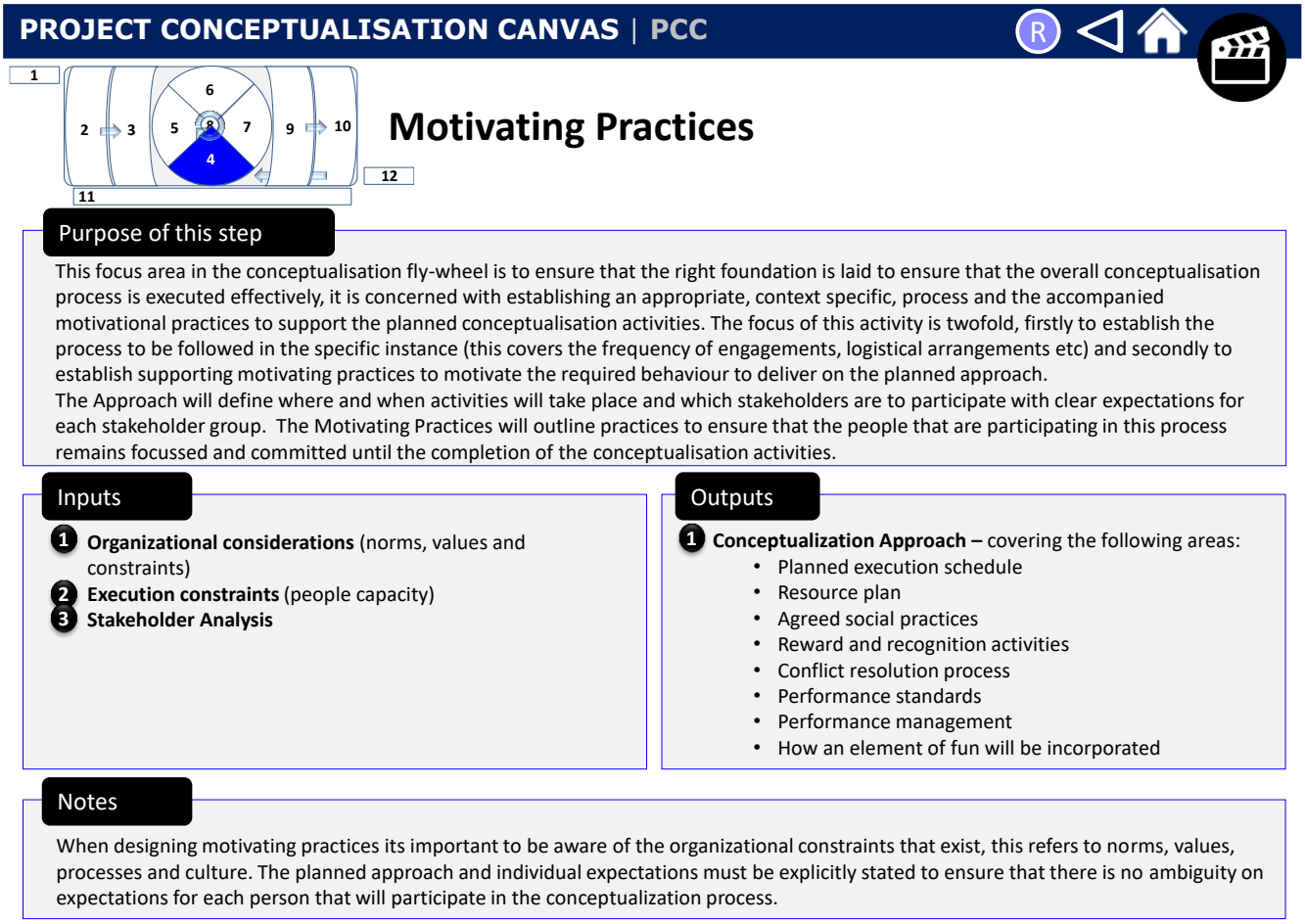


Figure 22: Motivating Practices in the PCC

5.4.5.4 Activity role players and primary activities

The primary role players in this activity are the Business Owner, the Conceptualisation Lead, the Conceptualisation Administrator, the Conceptualisation Team Members and the Conceptualisation Specialist.

The Conceptualisation Lead is responsible for this process. The Conceptualisation Approach is designed by the team to ensure that all participants are able to identify constraints to be considered and to suggest alternatives. Any constraints on the conceptualisation process must be engaged with and mitigated against, as far as possible.

5.4.5.5 Activity outputs

Description	Focus	
Output | Conceptualisation Approach		**Ref | 4.1**
The Conceptualisation Approach outlines the agreed process that will be followed during the project conceptualisation process to ensure that the required resources, both human and other, are secured, enabling successful execution.	**Planned execution schedule**: for the duration of the project conceptualisation process. **Resource plan**: detailed information on who is required for individual activities. **Agreed social practices**: relating to formal and informal engagements for the duration of the conceptualisation process. **Reward and recognition activities**: depending on the scale of the project conceptualisation process specific incentives may be required to motivate behavior. **Conflict resolution process**: to ensure that any issues that may be raised are addressed effectively not to impact the project conceptualisation process. **Performance standards**: relating to the project conceptualisation process to measure performance.	

5.4.6 The Incubator in the PCC

5.4.6.1 Level 1 overview

The next primary activity in the Conceptualisation Fly-wheel is the incubation process which concentrates on two primary focus areas. The first is to execute the activities required to define the solution that should be delivered to satisfy the scope that has been agreed on. The information relating to the target solution will be captured in the Conceptual Solution Design. The second focus area concerns the activities that design the proposed delivery approach that will be followed in order to deliver on the target solution. This information will be captured in the Conceptual Delivery Approach. The incubation process should

ensure that a clear link is maintained between the objectives and the outcomes as defined in the Baselined Requirement and the target solution.

5.4.6.2 Activity specification

The activity specification of The Incubator activity is shown in Figure 23 below which indicates the purpose, inputs, outputs and execution notes of the primary activity.

5.4.6.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Conceptualisation Requirement (3.1)	From Opportunity/Problem Analysis and Definition
2	Business Case (v1) (3.2)	From Opportunity/Problem Analysis and Definition
3	Organisational constraints to be considered	From Organisational Standards
4	Involve external parties as required	From Organisational Procurement
5	Challenges/suggestion from the Means of Interrogation Process (7.1)	From Means of Interrogation and Innovation

5.4.6.4 Activity role players and primary activities

The primary role players in this activity are the Business Owner, the Conceptualisation Lead, the Conceptualisation Administrator, the Conceptualisation Team Members and the Conceptualisation Specialist.

The incubation activities will iterate between the solution design and the execution strategy design until the team have confirmed that all objectives have been met. During this process, any risks and issues will be clearly documented. If required, the Conceptualisation Lead will involve third parties in the process to ensure that the appropriate solution is designed. The incubation process should

identify alternative solutions that can be considered for decision-making and not just a single solution.

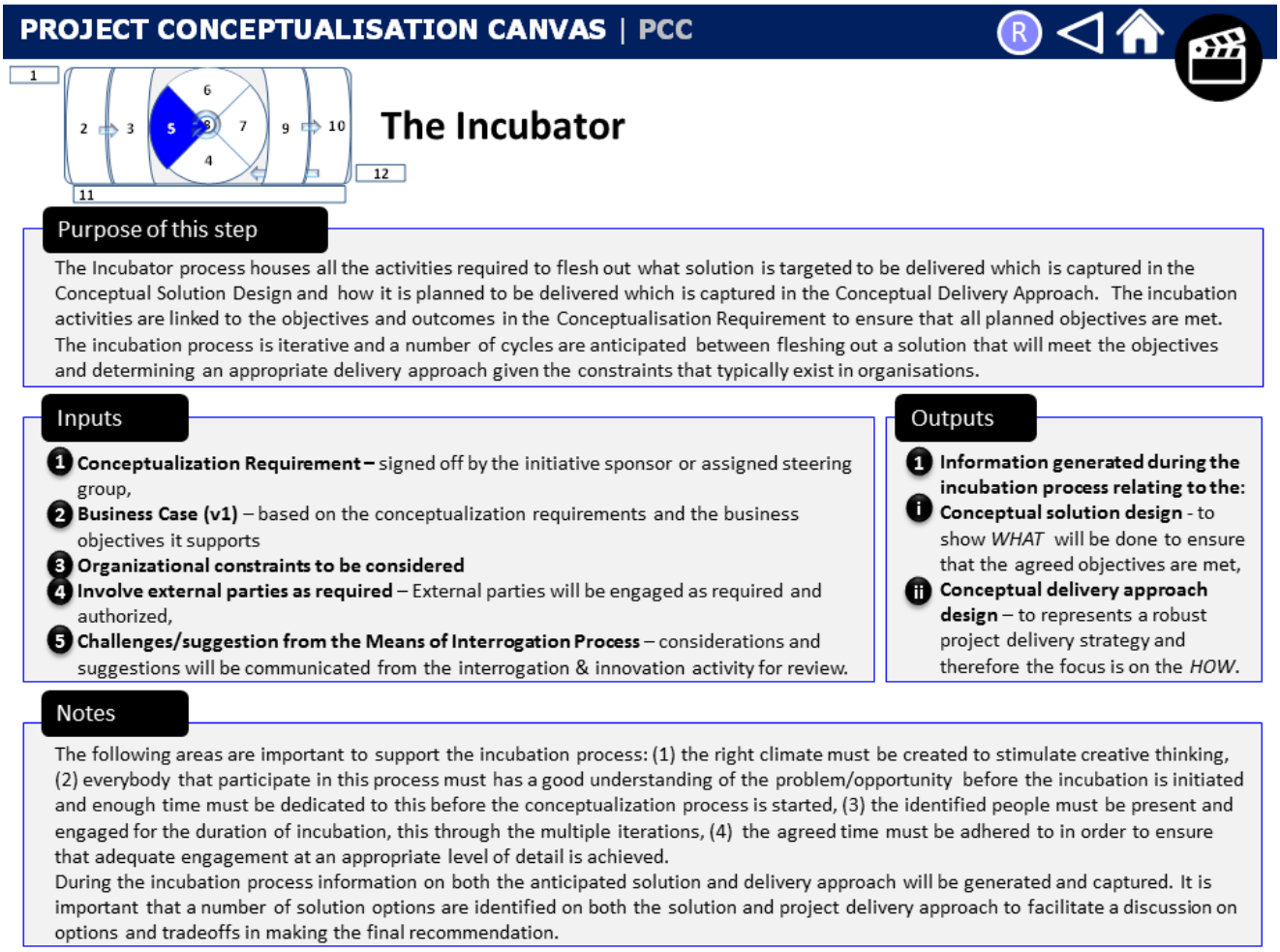


Figure 23: The Incubator in the PCC

Later in the conceptualisation process, the Means of Interrogation and Innovation primary activity will also direct review points to the incubation process that must be considered and adjusted as required. Formal feedback is required on all items that are directed at the incubation process.

5.4.6.5 Activity outputs

Description	Focus	
Output | Information generated during the incubation process		**Ref | 5.1**
The incubation process generates a significant amount of information relating to the proposed solution options, the delivery strategy relating to the proposed solution options and the resultant time and cost implications. This information will get recorded in the Ordering Information activity.	It is of utmost importance that information that is generated through the conceptualisation process is managed appropriately. Focus here is placed on recording the initial information that is generated and then the process to maintain any changes made during subsequent challenges and developments in the conceptualisation process.	

5.4.7 Ordering Information in the PCC

5.4.7.1 Level 1 overview

The information that is generated during the conceptualisation process is transferred to the third focus area: the Ordering Information primary activity. The majority of the information is received from the incubation process but information will also be received from the interrogation and innovation process. The focus of this activity is to ensure that the information that is generated during the incubation process is appropriately recorded and maintained throughout the conceptualisation process.

5.4.7.2 Activity specification

The activity specification of the Ordering Information activity is shown in Figure 24 below which indicates the purpose, inputs, outputs and execution notes of the primary activity.

5.4.7.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Information generated during the incubation process,	From The Incubator

5.4.7.4 Activity role players and primary activities

The primary role players in this activity are the Conceptualisation Lead, the Conceptualisation Administrator, the Conceptualisation Team Members and the Conceptualisation Specialist.

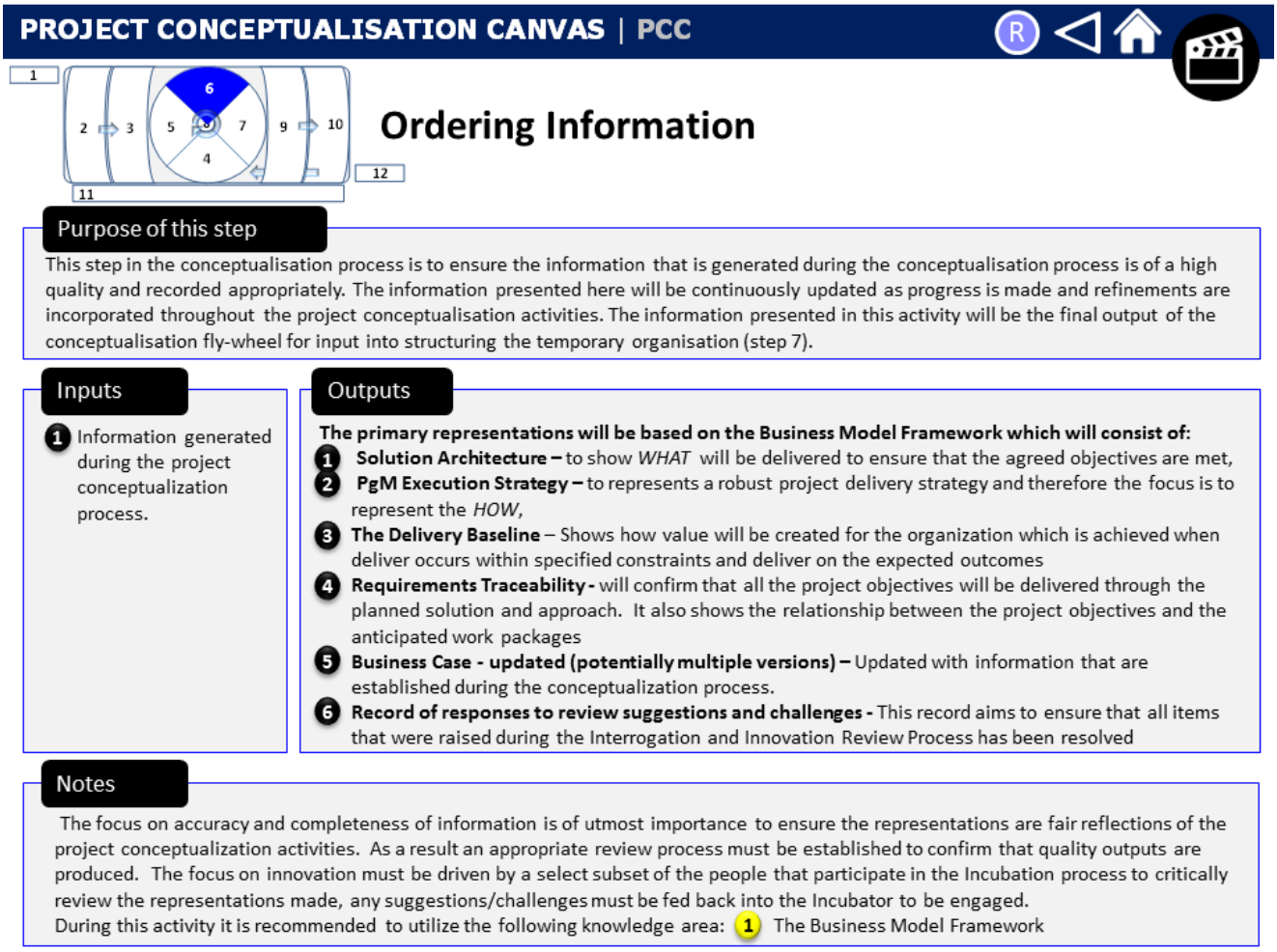


Figure 24: Ordering Information in the PCC

The Conceptualisation Lead is responsible for the activity, the Conceptualisation Administrator for the recording of the information and the Conceptualisation Specialist for the completeness and accuracy of the information represented. Information is recorded and maintained as changes are made through the iterative conceptualisation process.

5.4.7.5 Activity outputs

Description	Focus	
Output | Solution Architecture		**Ref | 6.1**
The Solution Architecture aims to show the proposed solution that will be delivered to meet the identified project objectives.	**Business Requirements:** outline of the business objectives to be met through the project solution.	
	Business Architecture: showing the context that the potential project will operate in and may cover aspects such as delivery information and organisational structure. **Solution Decomposition:** a decomposition of the proposed solution into appropriate detail to show what is required to be delivered on the intended solution. **Assumptions:** made during the conceptualisation process. **Constraints:** of the solution design. **Risks:** associated with the designed solution. **Issues:** regarding the designed solution that must be called out.	
Output | Project Execution Strategy		**Ref | 6.2**
The Project Execution Strategy aims to show the plan that has been constructed to deliver the proposed solution. The programme execution strategy is a roadmap of how the required solution will be turned into reality and will show anticipated time lines, interdependencies and resource requirements.	**Delivery execution strategy**: describing the overall project approach at a high level. **Delivery execution roadmap & schedule**: to outline the delivery approach that has been outlined for the potential project. **Primary deliverables**: to balance the scope of work with the execution plan. **Preliminary project financials:** the initial view on the budget requirements to deliver on the anticipated scope. **Resource requirement**: outline of the resources that will be required to deliver on the potential project. **Risk & issue management**: initial risks and issues that have been identified during the project conceptualisation process.	

Output | Delivery Baseline	Ref | 6.3
The Delivery Baseline is a summary of the benefits that will be delivered, the time this will take and the cost required to enable the delivery.	**Anticipated benefits/outcomes of the PgM**: this includes the benefits' realisation management plan; i.e. the baseline benefits that are expected to be delivered. **The budget that is required for the project**: this includes the baseline budget and the cost management plan. **The anticipated time that the PgM will be delivered in:** an indication of the time required to deliver on the anticipated scope.
Output | Traceability Matrix	**Ref | 6.4**
The purpose of the traceability matrix is to document and manage the business and functional requirements to ensure that they will be delivered in the project scope.	**Business objectives**: list of business objectives as the starting point of the traceability matrix. **Requirements and identification numbers**: the requirements that have been identified and linked to the business objectives in order to confirm that all business objectives have been met in the solution design.
Output | Business Case updated (potentially multiple versions)	**Ref | 6.5**
The initial business case will be updated with information that are established during the conceptualisation process. This may result in multiple updates of the Business Case.	**Value:** updated as required. **Benefits:** updated as required. **Costs:** updated as required. **Risks:** updated as required.
Output | Record of responses to review suggestions and challenges	**Ref | 6.6**
This record aims to ensure that all items that were raised during the Interrogation and Innovation Review Process have been resolved.	**Feedback on challenges and suggestions:** made during the Interrogation and Innovation Review Process.

5.4.8 Means of Interrogation and Innovation in the PCC

5.4.8.1 Level 1 overview

The fourth activity in the Conceptualisation Fly-wheel provides the means to interrogate the proposed solution and proposed delivery approach. A number of specified methods are used to ensure that the approach is complete, that the risks associated to both the proposed solution and proposed delivery approach have been identified and mitigating actions have been identified. This process also makes it possible to identify possible opportunities to suggest innovations

that could be incorporated into the proposed solution as well as into the proposed delivery approach. The Conceptualisation Fly-wheel may go through multiple iterations before the information is progressed to the final step in the conceptualisation process.

5.4.8.2 Activity specification

The activity specification of the Means of Interrogation and Innovation activity is shown in Figure 25 below which indicates the purpose, inputs, outputs and execution notes of the primary activity.

5.4.8.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Solution Architecture (6.1)	From Ordering Information
2	Project Execution Strategy (6.2)	From Ordering Information
3	The Delivery Baseline (6.3)	From Ordering Information
4	Requirements Traceability (6.4)	From Ordering Information
5	Review panel members	From Conceptualisation Sponsor
6	Review checklists	From the PCC library

5.4.8.4 Activity role players and primary activities

The primary role players in this activity are the Conceptualisation Lead, the Proposal Evaluator, the Conceptualisation Administrator, the Conceptualisation Team Members and the Conceptualisation Specialist.

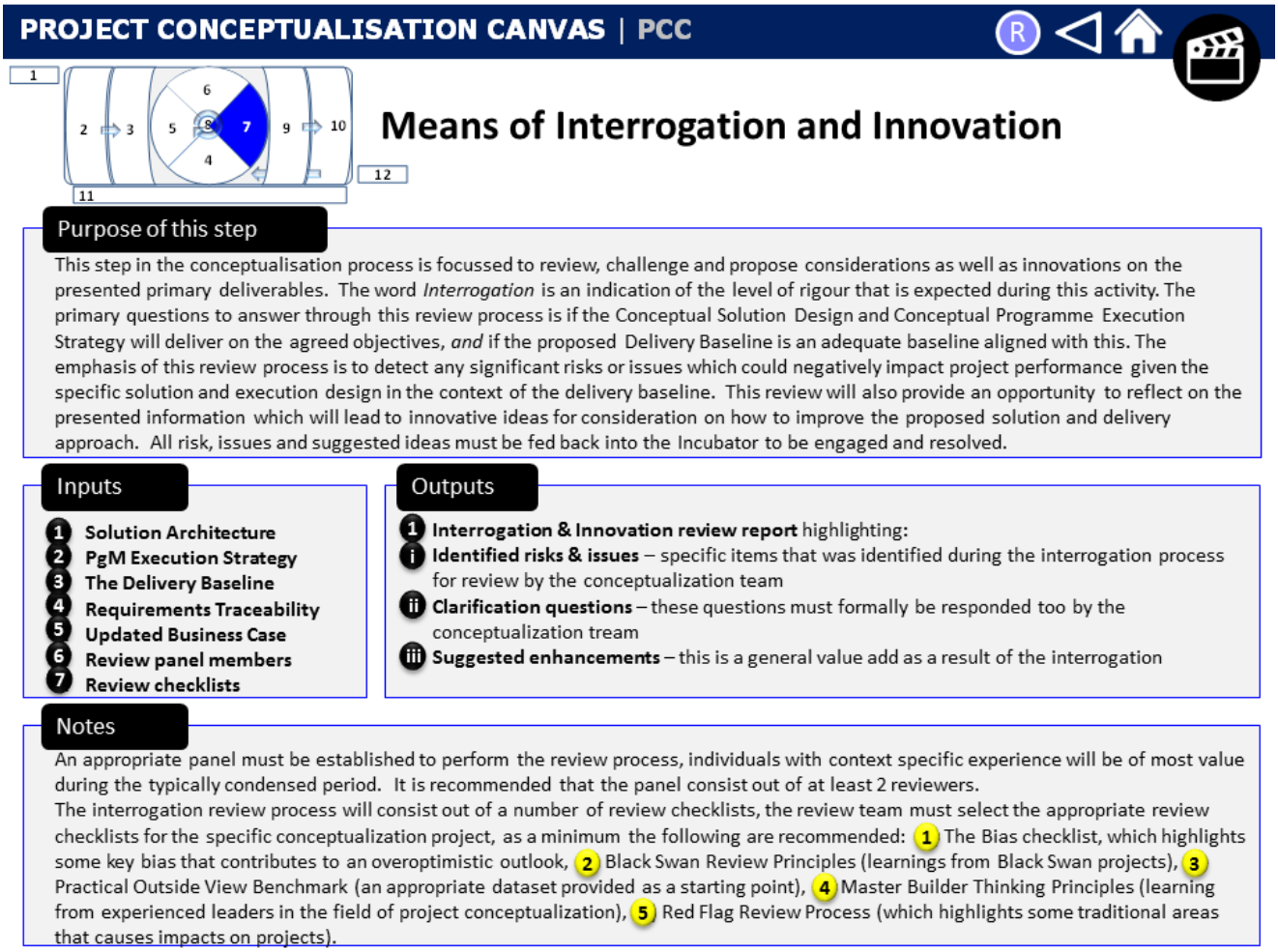


Figure 25: Means of Interrogation and Innovation in the PCC

The Conceptualisation Lead is responsible for the activity and the Proposal Evaluator has to ensure that a robust review of the proposed solution and delivery strategy is performed. The Conceptualisation Lead will convene the activity which will be executed under the supervision of the Proposal Evaluator. The proposed solution and proposed delivery strategy will be challenged using a number of review checklists which contain a diverse set of perspectives. The intention of this activity is quality assurance of the conceptualisation process as well as to identify possible enhancements to the proposed solutions.

5.4.8.5 Activity outputs

Description	Focus	
Output | Interrogation and Innovation Review Report		**Ref | 7/1**
The Interrogation and Innovation Review Report will be produced following the review activity and aims to present the results of the process of reviewing the proposed solution, the intended solution delivery approach and the resultant Delivery Baseline that have been established. The results will consist of potential risks and issues identified as well as suggested enhancements to the planned actions.	**Business case review in the context of the traceability matrix**: this is to ensure that all the aspects of the Business Case have been considered during the conceptualisation process. **Identified risks & issues:** highlights specific risks and issues that were identified during the interrogation process for consideration by the conceptualisation team. **Clarification questions:** questions that were raised by the team that performs the review process. These questions must formally be responded to by the conceptualisation team. **Suggested enhancements:** during the review process any areas that may improve the quality of the solution or project delivery approach are identified, described and communicated to the conceptualisation team for consideration. **Challenges to the business case:** highlight any areas regarding the assumptions made in the business case that are challenged as a result of the solution construct and delivery approach. A number of predefined reviews have been created and feedback must be provided on which have been executed and what the results are of these are reviewed. The predefined reviews are as follows: **Black Swan Review:** as quality assurance checks this review provides information on retrospective reviews of projects that the review team has classified as Black Swans. **Practical Reference Class Review:** this review provides information on a set of projects and the typical performance metrics as an indication of the typical performance of projects. Specific questions must be answered in this context. **Master Builder Review:** this review provides key learnings from experienced execution specialists. These are posed as challenges to the proposed solution design and execution strategy.	

5.4.9 Exit the Conceptualisation Fly-wheel in the PCC

5.4.9.1 Level 1 overview

The four primary activities of the Conceptualisation Fly-wheel can iterate through a number of permutations. However, at some point the conceptualisation team

have to agree to exit this process in order to proceed to the next primary activity.

5.4.9.2 Activity specification

The activity specification of the Exit the Conceptualisation Fly-wheel activity is shown in Figure 26 below which indicates the purpose, inputs and outputs of the primary activity.

5.4.9.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Decision from Conceptualisation Lead to convene the activity	From Ordering Information
2	Record of responses to review suggestions and challenges (6.6)	From Ordering Information
3	Interrogation and Innovation Review Report (7.1)	From Interrogation and Innovation Review

5.4.9.4 Activity role players and primary activities

The primary role players in this activity are the Conceptualisation Lead, the Business Owner, the Proposal Evaluator, the Conceptualisation Administrator, the Conceptualisation Team Members and the Conceptualisation Specialist.

This activity is led by the Conceptualisation Lead who, with the Business Owner and Proposal Evaluator, will make the decision on whether to continue the conceptualisation process or to exit to the next primary activity. The focus is to ensure that the process is complete and that all suggestions and challenges have been closed out by the conceptualisation team.

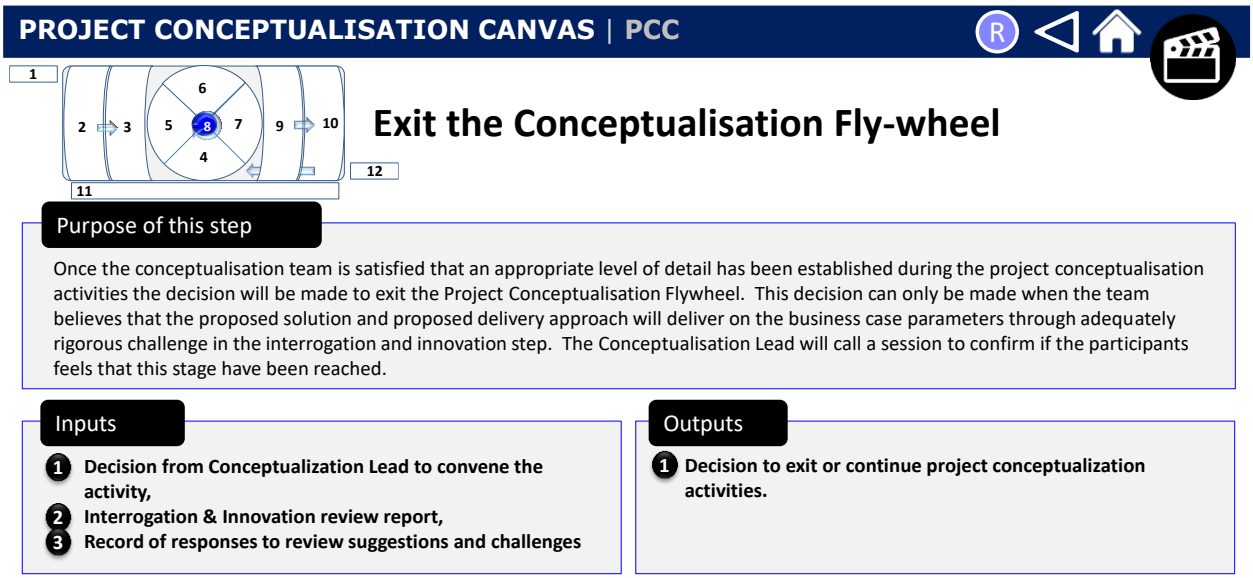


Figure 26: Exit the Conceptualisation Fly-wheel in the PCC

5.4.9.5 Activity outputs

Description	Focus	
Output | Decision to exit or continue project conceptualisation activities		**Ref | 8.1**
This activity is the formal decision to stop activities in the Conceptualisation Fly-wheel and to progress to structuring the temporary organisation.	**Response to the Interrogation and Innovation Review Report:** it must be confirmed that formal feedback has been obtained on the challenges and recommendations that were made as a result of the review. **Documentation baselined:** once the above have been obtained, the documentation produced through the conceptualisation process must be baselined.	

5.4.10 Structuring the Temporary Organisation in the PCC

5.4.10.1 Level 1 overview

The final activity in the conceptualisation phase is to use the information that was generated through the conceptualisation process and to design the proposed governance structure of the potential project. The focus of this activity is to make explicit the anticipated resource capacity (human and other) required to deliver on the proposed project. Special focus is on identifying scarce resources as well as the executive capacity that will be required to govern the overall initiative. This activity should also clearly outline what decision-making functions

and processes are required to ensure effective decision-making at the various levels of the temporary organisation.

Once this activity has been completed, the information established through the conceptualisation process will be packaged in preparation for the decision-making process.

5.4.10.2 Activity specification

The activity specification of the Structuring the Temporary Organisation activity is shown in Figure 26 below which indicates the purpose, inputs, outputs and execution notes of the primary activity.

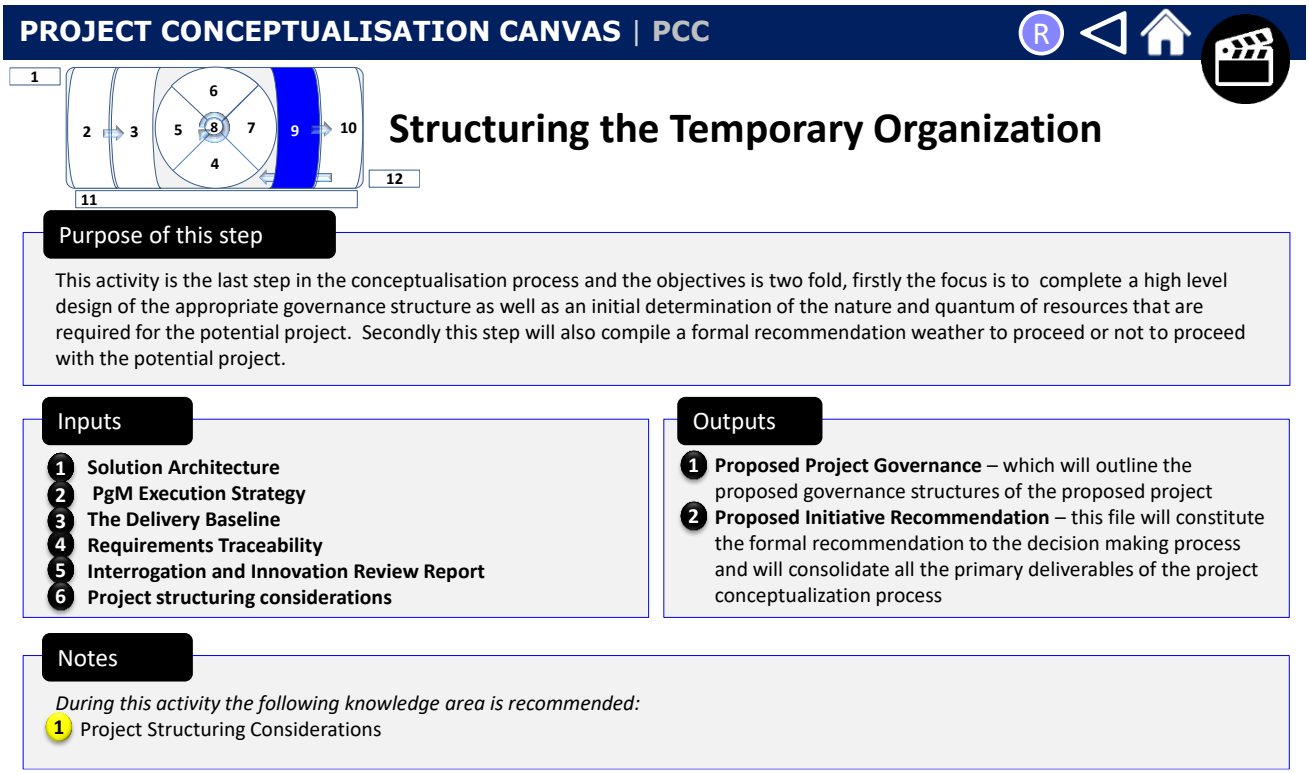


Figure 27: Structuring the Temporary Organisation in the PCC

5.4.10.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Decision to exit or continue project conceptualisation activities (8.1)	From Exit the Conceptualisation Fly-wheel
2	Solution Architecture (6.1)	From Ordering Information
3	PgM Execution Strategy (6.2)	From Ordering Information
4	The Delivery Baseline (6.3)	From Ordering Information
5	Requirements Traceability (6.4)	From Ordering Information
6	Business Case – updated (6.5)	From Ordering Information
7	Interrogation and Innovation Review Report (7.1)	From Interrogation and Innovation Review
8	Project structuring considerations	From PCC Library

5.4.10.4 Activity role players and primary activities

The primary role players in this activity are the Conceptualisation Lead, the Business Owner, the Conceptualisation Administrator, the Conceptualisation Team Members and the Conceptualisation Specialist.

The Conceptualisation Lead is responsible for the activity. The activity starts with a review of the information that has been generated during the conceptualisation process in order to compile the Formal Recommendation. If the objective of the recommendation is to initiate the project, the team will also continue to design the Proposed Project Governance. If there is uncertainty, the Business Owner will make the decision to compile the Proposed Project Governance, or not.

5.4.10.5 Activity outputs

Description	Focus	
Output | Proposed Project Governance		**Ref | 9.1**
If a recommendation is made to continue with the potential project, the activity to create a proposed governance structure will be executed. The proposed project governance outlines information that will assist in the initial formulation of what will be required to effectively govern the potential project.	**Governance committees with terms of references**: the proposed governance committees that should be constituted and the proposed mandates of each made clear. This will include governance on the decision-making approach. **Key roles and responsibilities required**: to indicate the level of involvement required at the various stakeholder groups in the organisation. **Programme organisation (Structure):** an outline of the structure to ensure clarity of reporting lines. **Key stakeholders and stakeholder management plan**: this is required to ensure that capacity requirements have been outlined for the various people that must participate in the project. **Communication strategy**: this should outline the communication channels, preferred mediums and proposed frequency of communications.	
Output | Initiative Recommendation		**Ref | 9.2**
The initiative recommendation constitutes the formal recommendation to the decision-making body as set out when the project conceptualisation process was started.	**Continue/Stop recommendation**: there will be a clear indication whether the conceptualisation team believes that the potential project is to be continued or stopped. **Recommendation supporting rational**: this will outline the arguments on why the recommendation has been made. **Executive summary of the Interrogation and Innovation Review Report**: to provide a perspective from the internal review and the challenges that were highlighted.	

5.4.11 Decision-Making in the PCC

5.4.11.1 Level 1 overview

The next primary activity of the PCC aims to facilitate a formal decision either to proceed with the proposed project, to identify areas that require additional work before the decision can be made or to reject the proposal. The decision-making process can either be executed within the ambit of the PCC, if it is seen as a stand-alone process, or within the structures of the standard organisational decision-making process. This activity is therefore concluded either through a

formal decision or through a formal recommendation to the organisational decision-making process.

5.4.11.2 Activity specification

The activity specification of the Decision-Making activity is shown in Figure 28 below which indicates the purpose, inputs and outputs of the primary activity.

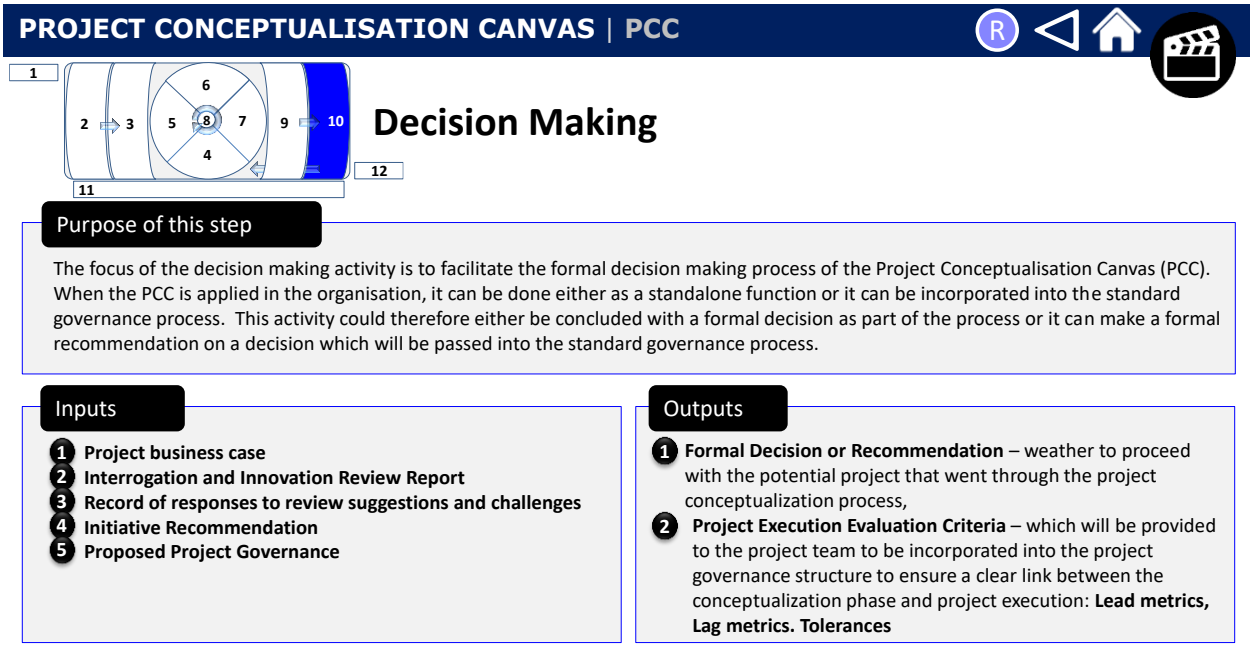


Figure 28: Decision-Making in the PCC

5.4.11.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Business Case – updated (6.5)	From Ordering Information
1	Record of responses to review suggestions and challenges (6.6)	From Ordering Information
3	Interrogation and Innovation Review Report (7.1)	From Interrogation and Innovation Review

Ref	Input	Source
4	Proposed Project Governance (9.1)	From Structuring the Temporary Organisation
5	Initiative Recommendation (9.2)	From Structuring the Temporary Organisation

5.4.11.4 Activity role players and primary activities

The primary role players in this activity are the Conceptualisation Lead, the Business Sponsor, the Business Owner, the Project Decision-Maker and the Conceptualisation Administrator.

The Conceptualisation Lead is responsible for the activity. The Conceptualisation Administrator distributes for review by all members participating in this activity the information that was generated during the Structuring the Temporary Organisation activity. The Conceptualisation Lead must establish if the output of this activity is a final decision or if it will be inputted into a standard organisational process. The Conceptualisation Lead will convene the meeting which will lead to a Formal Decision or Recommendation. This activity should also identify Project Execution Evaluation Criteria that will act as success criteria during project execution.

If the decision-making determines that more activity is required at any stage in the project conceptualisation process this can be requested and the Conceptualisation Lead will revert to the appropriate step and redo the activities to the point of decision-making again.

5.4.11.5 Activity outputs

Description	Focus	
Output | Formal Decision/Recommendation		**Ref | 10.1**
The final conceptualisation decision document captures the decision that was taken during the decision-making process.	**Decision taken**: clear indication whether the decision is to proceed or to reject the proposed project.	

Output | Formal Decision/Recommendation (continued)	Ref | 10.1
This decision can also be communicated as a recommendation to the organisation in the event that the PCC is incorporated into a standard organisational process. This document will also capture any specific conditions or actions that were raised during the evaluation process. In the event that a proposed project is not approved, this document must clearly articulate the reasons for not approving the project.	**Rational for decision**: the reasoning for the decision is to be provided and, specifically, the project business case must be referenced in this rationale. **If approved**: any specific conditions of approval must be provided, any immediate actions that may be required must be outlined and the proposed benefit owners must be identified. **If rejected:** clear reason for the rejection must be provided, an indication must be provided if this position could be revisited in future and if so what would likely trigger such an event.
Output | Project Execution Evaluation Criteria	**Ref | 10.2**
In the event that the potential project is approved, the project execution evaluation criteria must be outlined. This to ensure that the focus is placed on the appropriate areas during project execution.	**Provide evaluation criteria to measure performance**: these should include lead metrics, lag metrics and tolerances. **Benefit tracking instructions**: the link between solution components and benefits must be outlined. This should also include the proposed perspectives of benefit owners and the proposed review points in the project execution cycle and beyond. **Updated business case**: the process must ensure that all relevant information has been incorporated into the final business case.
Output | Business Case updated (potentially multiple versions)	**Ref | 10.3**
The initial business case will be updated with information that is established during the conceptualisation process.	**Value:** updated as required. **Benefits:** updated as required. **Costs:** updated as required. **Risks:** updated as required.

5.4.12 Change Management

5.4.12.1 Level 1 overview

This activity highlights the required change management activities that should be considered by the organisation that will execute the PCC. The purpose of this is to support the adoption of the process. This activity also highlights the change management activities that should be executed as part of the PCC.

5.4.12.2 Activity specification

The activity specification of the Change Management activity is shown in Figure 29 below. This illustrates both the key focus areas to be actioned on an ongoing basis in the organisation where the PCC is executed as well as the focus areas that must be kept in mind while the PCC is being executed.

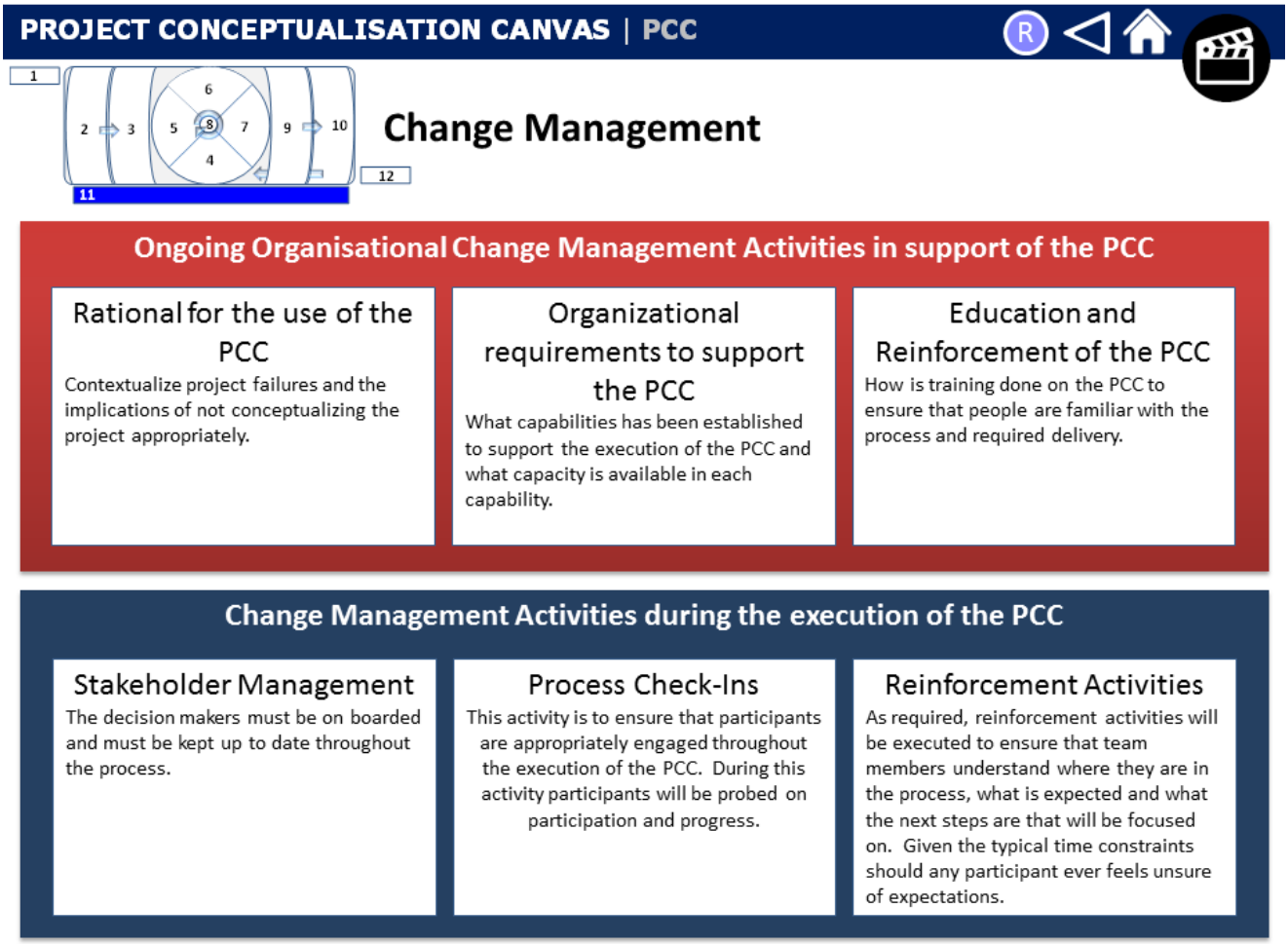


Figure 29: Change Management in the PCC

5.4.12.3 Activity role players and primary activities

All role players participating in the PCC have a responsibility to drive change management activities. Each role is to confirm with the Conceptualisation Lead what is expected from them from a change management perspective for each of the primary activities.

The Change Management focus in the PCC covers two areas. These are the ongoing change management activities in support of the PCC and the change management activities during the execution of the PCC.

The purpose of the ongoing change management activities in support of the PCC is to ensure that the right climate is established in the organisation where the PCC is executed. Here the focus is on communicating the rationale for the use of the PCC, to communicate the capabilities that have been established as necessary to support the PCC and the education as well as the reinforcement activities.

During the execution of the PCC , the focus of the Change Management Activities is to assist the participants who are part of the team that executes the PCC. The emphasis is on stakeholder management to ensure alignment, that process check-ins to confirm activities are progressing as required and that reinforcement activities are directed at specific primary activities.

5.4.12.4 Activity focus areas

Change Management has the following focus areas before and while executing the PCC.

Ref	Focus area	Notes
Ongoing Organisational Change Management Activities in support of the PCC		
1	Rationale for the use of the PCC	Contextualise project failures and the implications of not conceptualising the project appropriately.
2	Organisational requirements to support the PCC.	What capabilities have been established as necessary to support the execution of the PCC and what capacity is available in each capability?
3	Education and Reinforcement of the PCC	How the training is done on the PCC to ensure that people are familiar with the process and required delivery.

Change Management Activities during the execution of the PCC		
4	Stakeholder Management	The decision-makers must be on-boarded and must be kept up to date throughout the process.
5	Process Check-Ins	This activity is to ensure that participants are appropriately engaged throughout the execution of the PCC. During this activity, participants will be probed on participation and progress.
6	Reinforcement Activities	As required, reinforcement activities will be executed to ensure that team members understand where they are in the process, what is expected and what the next steps are to be focused on.

5.4.13 Post-PCC Activities

5.4.13.1 Level 1 overview

The focus of this activity is to ensure that clear links are established between the project conceptualisation activities and the project execution activities. This activity therefore ensures that an appropriate handover process occurs between project conceptualisation and project execution.

5.4.13.2 Activity specification

The activity specification of the Post-PCC Activities is shown in Figure 30 below which indicates the purpose, inputs and outputs of the primary activity.

5.4.13.3 Activity inputs

The following inputs are required to initiate this primary activity:

Ref	Input	Source
1	Formal Decision/Recommendation (10.1)	From Decision-Making
2	Project Execution Evaluation Criteria (10.2)	From Decision-Making
3	Business Case – updated (10.3)	From Decision-Making
4	Proposed Project Governance (9.1)	From Structuring the Temporary Organisation

5.4.13.4 Activity role players and primary activities

The primary role players in this activity are the Conceptualisation Lead and the Conceptualisation Administrator.

The Conceptualisation Lead is responsible for this primary activity. The Conceptualisation Lead must ensure that review points have been identified for the Project Team that will be responsible for the project and also that appropriate instructions and review criteria have been highlighted for each point. The Conceptualisation Lead will ensure that all the information that was generated during the project conceptualisation process is provided to the relevant governance function in the organisation, most likely the Project Management Office.

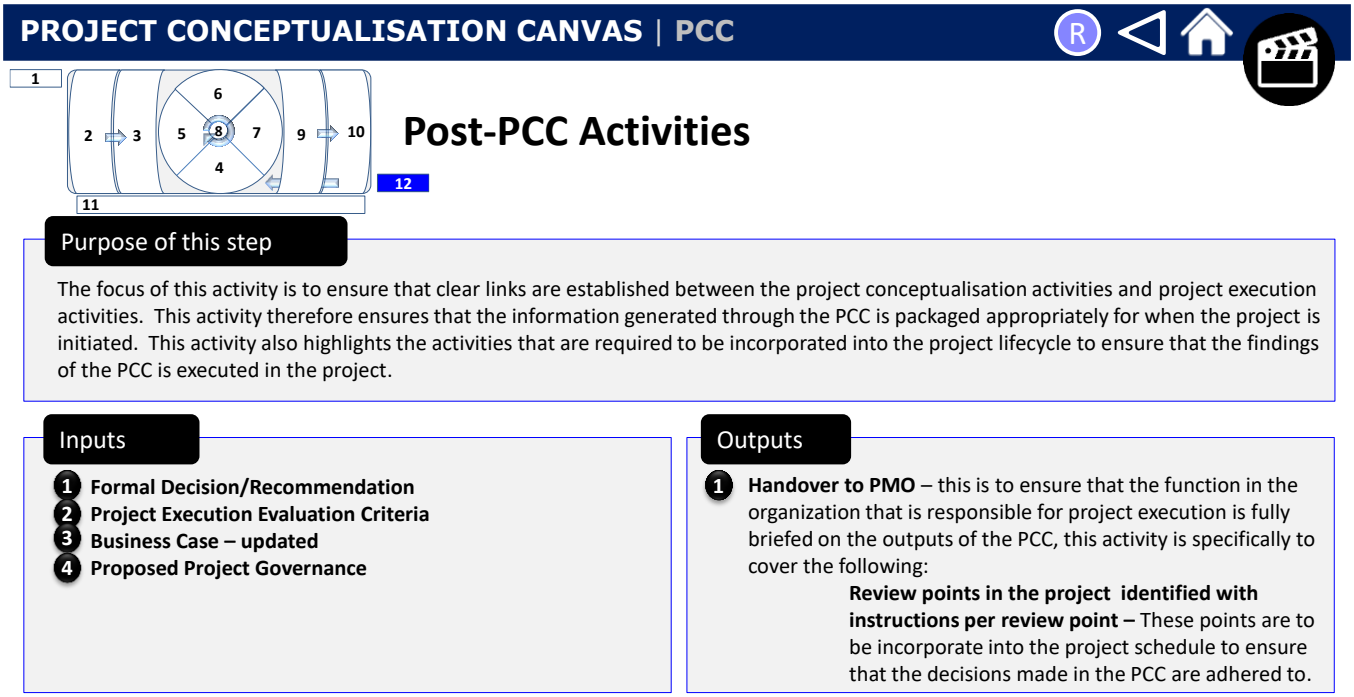


Figure 30: Post-PCC Activities

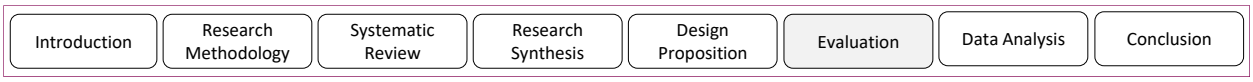
5.4.13.5 Activity outputs

Description	Focus
Output | Handover to PMO	
This is to ensure that the function in the organisation that is responsible for project execution is fully briefed on the project that will be executed in the organisation.	**Callouts to the project team**: specific points that should be communicated to the project team should be identified. This focus is to ensure that any specific nuances have been identified for communication. **Review points in the project identified with instructions per review point:** these points are to be incorporated into the project schedule to ensure that the decisions made in the PCC are adhered to.
Output | Identify the learnings to be incorporated into the PCC	
This activity ensures that the PCC will continue to incorporate learnings from conceptualisation activities that occur for potential projects.	**Identify lessons learned:** this should highlights areas that will add value to the PCC if incorporated. This could take the shape of items to add to the interrogation checklists or any aspect of the process steps.

5.5 Conclusion

This chapter described the Project Conceptualisation Canvas (PCC) which is the artefact delivered in this research. The discussion of the PCC described the primary activities of the artefact. The activity specification, the inputs, role players with consideration of key activities and the outputs of each primary activity of each activity were outlined.

Chapter Six: Evaluation of the methodology



6.1 Introduction

While working on this dissertation, I attended a number of conferences, specifically the British Academy of Management (BAM) in 2017, the European Academy of Management (EURAM) in both 2018 and 2019 and the International Research Network on Organising by Projects (IRNOP) in 2018. At these events I met highly knowledgeable Design Science scholars and conversations with them helped shape my own understanding of the method. My key objective throughout these engagements was to establish an appropriately robust evaluation strategy.

This chapter discusses the approach that was selected to evaluate the design proposition; the PCC. First, the Design Science Research Evaluation Framework (Pries-Heje, Baskerville & Venable (2008) provides a theoretical basis for evaluating in Design Science contributions. This is followed by a discussion on the specific strategy adopted to evaluate the PCC.

6.2 Literature Review

6.2.1 Design Science Research Evaluation Framework

The Strategic Design Science Research Evaluation Framework was defined by Pries-Heje et al., (2008). This framework was created as a basis to provide evaluation strategies and choices for both the design processes and the products that form part of Design Science Research (DSR).

The Strategic DSR Evaluation Framework serves two purposes. Firstly it assists our understanding of unstated evaluation strategies for DSR. Secondly, it helps Design Science researchers build strategies for evaluating their research outcomes, thus ensuring that appropriate rigour is achieved. In crafting the DSR

strategy, the Strategic DSR Evaluation Framework requires choices on three dimensions. These are: when evaluation takes place (Ex Ante or Ex Post); what is evaluated (design process or design product); and how it is evaluated (naturalistic or artificial). These dimensions are illustrated in Figure 31 below then discussed.

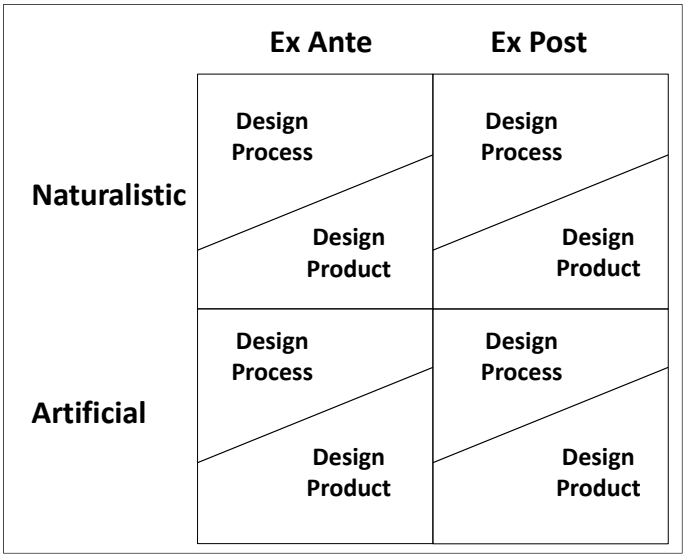


Figure 31: Strategic DSR evaluation framework (Pries-Heje et al., 2008)

The first dimension considers when the artefact will be evaluated, either Ex Ante or Ex Post. Ex Ante evaluation takes place before the artefact is finalised and Ex Post evaluations take place after the artefact has been constructed. In its simplest form, Ex Ante evaluation operates as a cost benefit analysis before potential acquisition and is well developed (Pries-Heje et al., 2008). With DSR, Ex Ante evaluation provides the ability to evaluate the design of an artefact theoretically without actual implementation of the artefact. In other words, the focus of the artefact evaluation is on only the design specification before it is evaluated in practice (Pries-Heje et al., 2008). With Ex Post evaluation, the focus shifts to the evaluation of the developed artefact, where the evaluation occurs through the instantiation of the artefact (Klecun and Cornford, 2005).

The second dimension of the Strategic DSR Evaluation Framework is focussed on how the artefact will be evaluated; this can be in either a naturalistic or an artificial setting (Venable, 2006). Naturalistic evaluation evaluates an artefact in its real environment and therefore in the organisational context where the artefact ultimately will be used (Venable, 2006). Venable (2006) considers naturalistic evaluation to be a critical factor because it is the closest representation of the reality in which an artefact is to be executed. All the complexities of human practice that occur in real organisations are embraced in naturalistic evaluation which relates to real systems, real settings and real people (Sun and Kantor, 2006). Venable (2006) further highlights that naturalistic evaluation is always empirical and may be interpretivist, positivist and/or critical.

Artificial evaluation is executed in an artificial and non-realistic way. The artificial context is created by one or more changes in the evaluation environment through the introduction of either unreal systems, unreal people, or simulated problems (Sun and Kantor, 2006). Artificial evaluation will vary to the extent that the evaluation setting has been adjusted. As a result, evaluation results may not be applicable to real use and it may thus be necessary to incorporate naturalistic approaches (Pries-Heje et al., 2008). Artificial evaluation test the design hypotheses empirically or non-empirically and is nearly always positivist and reductionist (Walls, Widmeyer & El Sawy, 1992).

The third dimension of the Strategic DSR Evaluation Framework focuses on what will be evaluated and therefore what type of artefact is being produced by the research initiative. Venable et al., (2012) describe artefact types based on two variables. The first is whether the archetypes are process or product types and the second is whether they are technical or socio-technical in nature. Product artefacts are diagrams, software and other tools, used to complete a task whereas process artefacts are methods and procedures that guide the person

towards accomplishing the task (Venable et al., 2012). The distinction between technical and socio-technical artefacts refers to the required level of human interaction with the artefact. No human use is required for technical artefacts once instantiated while socio-technical artefacts require humans to interact with them in order to provide their utility. Based on this classification, product artefacts may be either (purely) technical or socio-technical while process artefacts are always socio-technical (Pries-Heje et al., 2008).

6.2.2 The Strategic Design Science Research Evaluation Framework

The Strategic DSR evaluation framework was extended in three ways by Venable, Pries-Heje, & Baskerville (2012).

The extensions made had three purposes. Firstly, they created the DSR Evaluation Strategy Selection Framework as an input into the Strategic DSR Evaluation Framework to ensure that the context of the Design Science project is correctly mapped. Secondly, they created a DSR evaluation method selection framework to establish a clear link between evaluation strategies and relevant evaluation methods. This provides a bridge between the contextual factors relevant to the DSR evaluation and appropriate means (methods) to evaluate the DSR artefacts. Thirdly, a four step process was developed to enable the DSR evaluation design. These three areas will be briefly discussed.

Extension one: ability to map the context of the Design Science project. The DSR Evaluation Strategy Selection Framework allows the context of the Design Science Research project to be closely mapped to the evaluation framework. This is achieved through four contextual aspects. These are: firstly, the different purposes of evaluation in DSR; secondly the characteristics of the subject of evaluation (the evaluand) to be evaluated; thirdly the type of evaluand to be evaluated; and, finally, the balance of the goals in the design of the evaluation of

a DSR project. The DSR Evaluation Strategy Selection Framework (Venable et al., 2012) is shown in Figure 32 below

Extension two: create the DSR evaluation method selection framework. The DSR evaluation method selection framework (Venable et al., 2012) is shown in Figure 33 below. It highlights the choice of evaluation methods depending on the evaluation strategy that has been designed.

Extension three: the creation of the four step process to design the detailed Design Science Research evaluation. The four step process for DSR evaluation consists of the following steps. First it is necessary to establish the context of the evaluation to ensure that the requirements for the evaluation are clear. Secondly the contextual factors (such as the identified goals and artefact properties) must be mapped to one or more of the dimensions and quadrants in the evaluation framework to determine the evaluation strategy for the artefact. Thirdly appropriate evaluation method(s) must be selected that align with the chosen evaluation strategy and, fourthly, the evaluation must be designed in detail to establish the evaluation plan. This is to ensure clarity on how the artefact will be evaluated. The four step process for DSR evaluation can be seen in Figure 34.

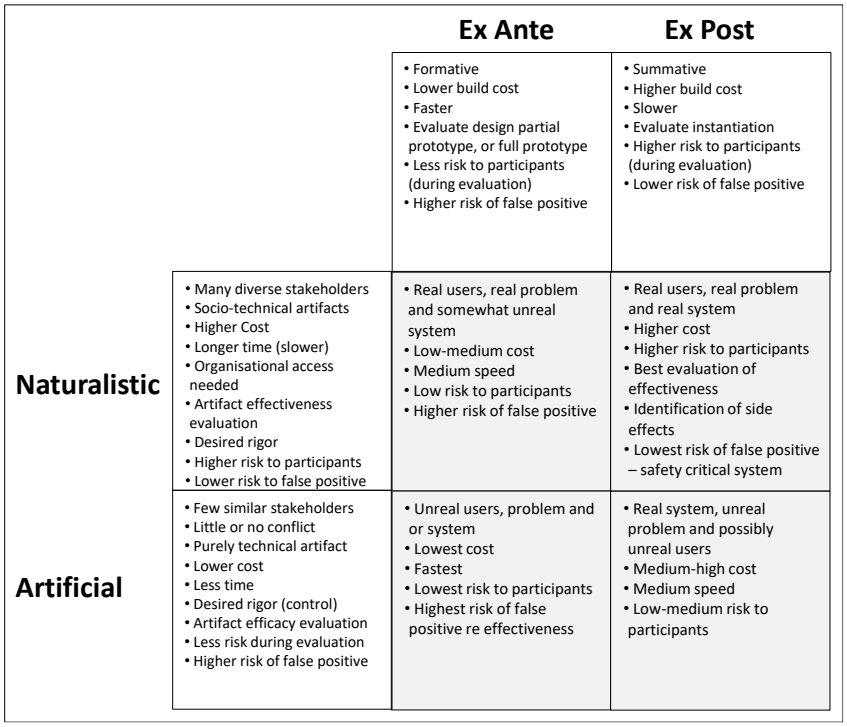


Figure 32: A DSR Evaluation Strategy Selection Framework (Venable et al., 2012)

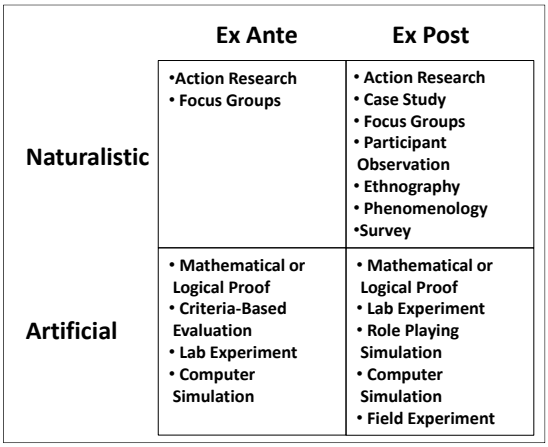


Figure 33: A DSR Evaluation Method Selection Framework (Venable et al., 2012)

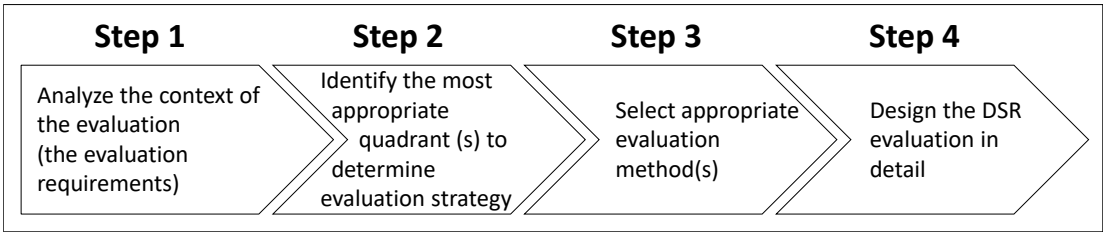


Figure 34: The four step process for DSR evaluation (Venable et al., 2012)

6.3 Evaluation of the PCC

This section describes the evaluation strategy for the PCC. The discussion follows the four step process for DSR evaluation as set out by Venable et al., (2012) and covers the context and requirements of the evaluation, evaluation strategy, selected evaluation methods and detailed evaluation plan.

6.3.1 Context and evaluation requirements

The evaluand or artefact evaluated in this study is the Project Conceptualisation Canvas (PCC). The PCC represents a process to be followed when projects are conceptualised; as a result the artefact is socio-technical in nature. It should also be noted that the PCC is not safety critical.

Evaluation criteria form the basis on which to determine how well the artefact being evaluated performs and not to theorise about or prove anything about why the artefact works (Ardakan and Mohajeri, 2009). Therefore claims that are made about artefacts are dependent upon the chosen performance metrics and performance against such criteria.

During each type of testing the artefact was evaluated against explicit criteria which were further defined during the development process. Deviations from expectations were noted during evaluation. Therefore, the evaluation phase contains an analytic sub-phase in which hypotheses are made about the behaviour of the artefact (Ardakan and Mohajeri, 2009).

The properties evaluated in the PCC relate to the artefact's ability to mitigate the typical challenges experienced during project front end management. As a result, the purpose of the evaluation criteria for the PCC is to confirm to what extent the key challenges that occur during project conceptualisation, as identified through the systematic review in this research, have been mitigated. The properties to be evaluated are shown in Table 2 below.

Table 2: Properties to be evaluated during evaluation phase

#	Challenge identified through systematic review	Evaluation Criteria
1	The benefit of conducting the front end effectively is not appreciated.	Does the PCC ensure that the participants in the process understand the importance of project front end management as a determining factor in ensuring project success? Are the objectives of the front end phase understood?
2	Collection of relevant knowledge and experience in the pre-project planning phase deserves more attention.	Does the PCC ensure that learnings are captured during the execution of FEM and are they fed back into future iterations when the PCC is executed?
3	Too little time is dedicated to the front end of the project.	Does the PCC ensure that adequate time is spent during FEM to understand the project-specific factors in order to produce the best possible delivery baseline for decision-making?
4	Inadequate use of resources in the front end management.	Does the PCC ensure that the roles required during FEM are sufficiently articulated to ensure that the right roles are established and are the associated responsibilities of each role outlined?
5	During project conceptualisation, the problem is not well enough understood, only one solution is considered and typically by only one person.	Does the PCC ensure that the opportunity or problem that led to the potential project is well understood and does the process ensure that more than one solution is considered by multiple people?
6	Inadequate stakeholder alignment.	Does the PCC ensure that different stakeholder perspectives are considered during project conceptualisation and is there a clear focus to ensure stakeholder alignment?

#	Challenge identified through systematic review	Evaluation Criteria
7	There is little research on how the business strategy influences the project strategy and, as a result, tactical aspects of projects receive greater attention than those of strategic importance.	Does the PCC ensure that the link between business strategy and project selection is established and that this is incorporated into the decision-making process?
8	Focus is mostly placed on technical causes of project failure and not on other root causes.	Does the PCC introduce measures to mitigate a number of root causes of project underperformance, specifically optimism bias and strategic misrepresentation?

6.3.2 Evaluation Constraints

One of the guidelines for Design Science Research is that the artefact produced must be rigorously evaluated. This must be performed in the context of the constraints present for the specific artefact being evaluated (Hevner, 2004). Two constraints were identified for this research initiative. These will be discussed briefly with specific reference to how they were addressed.

The first evaluation constraint relates to the risk associated with evaluating an artefact in development in the real world due to the personal and institutional risk carried. At the university I attended, prospective PhD students must navigate a robust process of critique and assessment from experts in the chosen field in order to advance from the status of PhD candidate to PhD student. During this rigorous process, the suitability of the student's research methodology is assessed.

The most significant issue raised related to the potential liability that testing an artefact in development could cause and the researcher had to ensure that the evaluation strategy did not create any personal or institutional liabilities. This

constraint essentially framed the boundaries for the design of the evaluation strategy. As a result, the decision was made to incorporate an illustrative case into the research approach. This approach is in line with the views of Iivari (2007) and Hevner (2007) who call for an Experimental Evaluation approach before the artefact is released for field testing. The illustrative case will be discussed in more detail later in this paper.

The second constraint associated with this research relates to the availability of the people required to participate in the research. In response to this constraint, I expanded the selection scope. Whereas initially the plan was to focus only on individuals who are accountable for final decision-making on potential projects, the criteria were changed to include individuals who participate in the conceptualisation activities and, in particular, the group also included programme managers.

6.3.3 The PCC evaluation strategy

This section starts with an overview of the evaluation strategy for the PCC. As focus groups were used as the primary evaluation method in this dissertation, the use of focus groups as an evaluation method in Design Science is discussed. This is followed by an overview of the typical steps followed for focus group research and an indication is provided of how each step was executed.

A variety of approaches are available to test artefacts (Hevner et al., 2004). Hevner (2007) emphasises the importance of maintaining relevance and rigour in both the construction of the design artefact as well as the evaluation of the evolving artefact. Given the contextual factors highlighted during the analysis above, as well as the requirement to ensure appropriate rigour, the evaluation strategy for the PCC was primarily executed through focus groups.

The evaluation strategy for the PCC is shown in Figure 35 below. The PCC evaluation strategy combined Naturalistic Ex Ante Exploratory Focus Groups and

Naturalistic Ex Post Confirmatory Focus Groups. An illustrative case was used to demonstrate the latter. The evaluation strategy further highlights the quality assurance loops that were planned and then achieved through the iterations of focus groups before the exploratory focus groups progressed to confirmatory focus groups or the confirmatory focus groups were completed.

The chosen evaluation strategy ensured that the artefact itself was tested in a controlled context before its application was evaluated against the selected performance criteria. This evaluation approach ensured that there was no risk of unintended consequences in the real world.

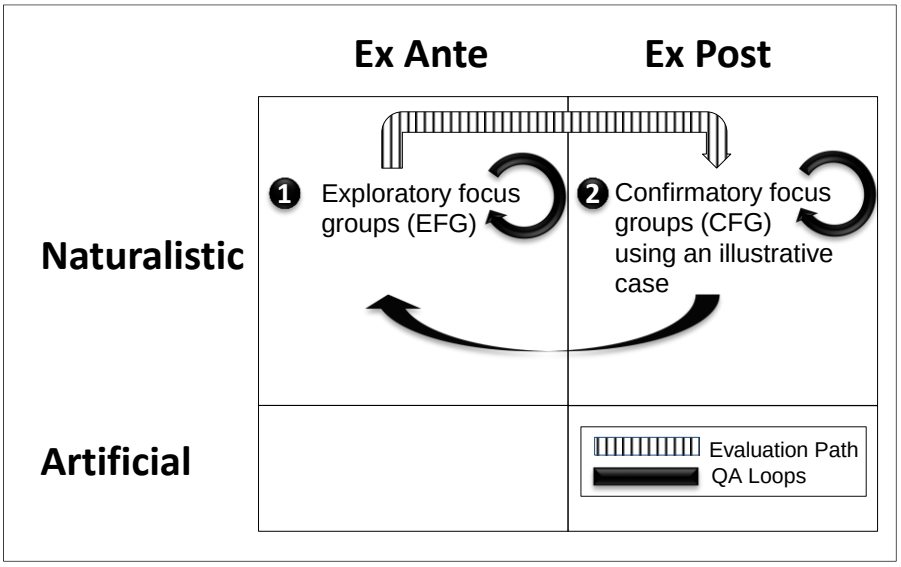


Figure 35: The PCC evaluation strategy

6.3.3.1 Focus groups in Design Science Research

In Design Science Research, focus groups have been used for some time. Some examples are in healthcare (Tremblay, 2007), research on innovation (Brandtner, Helfert, Auinger & Gaubinger, 2015), information technology (Schnall, Rojas, Travers, Brown & Bakken, 2014), research on adopting new research paradigms (van der Merwe, Gerber, Hevner & Naidoo, 2015) and business process research (Nguyen, 2016).

Tremblay, Hevner & Berndt (2010) provide four reasons why a focus group is an appropriate technique for DSR. Firstly, it allows for direct interaction between the researcher and the participants. Secondly a focus group provides the appropriate flexibility to deal with various design ideas. Thirdly it offers rich data on the design and, fourthly, a focus group allows for the acquisition of new ideas that emerge from participants' comments.

Tremblay, Hevner & Berndt, (2010) discuss focus groups playing in role in the process to refine artefacts as well as the evaluation process in Design Science Research. As a result they distinguish between Exploratory Focus Groups (EFG) and Confirmatory Focus Groups (CFG), as shown below in Figure 36.

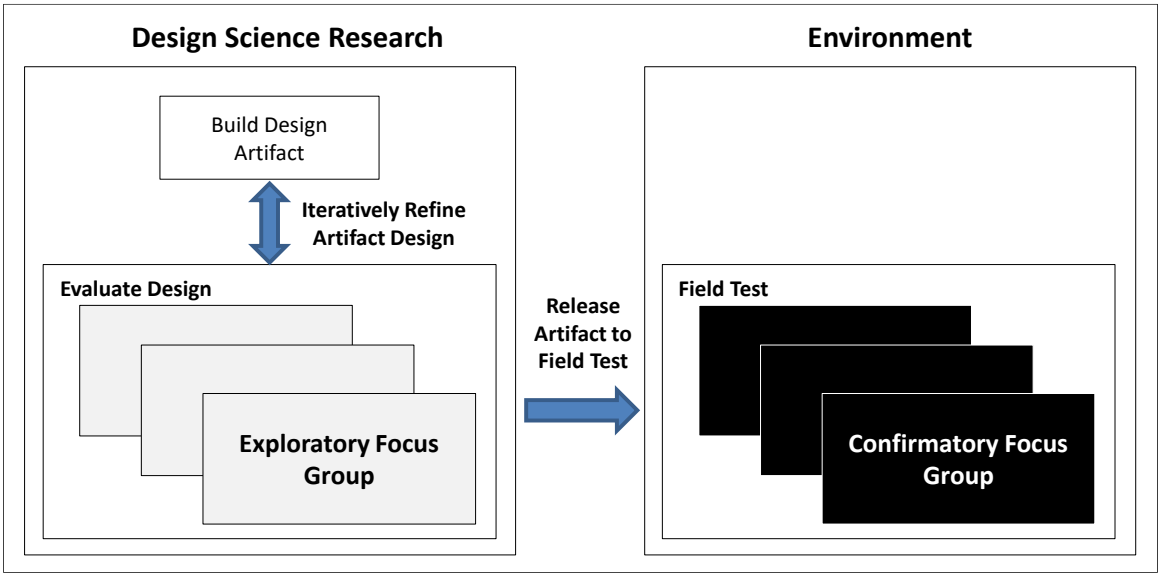


Figure 36: Focus Groups in Design Research (Tremblay, Hevner & Berndt, 2010)

Starting in the context of Naturalistic Ex Ante evaluation, Exploratory Focus Groups play a critical first step in the evaluation process through three key functions as highlighted by Tremblay et al., (2010). Firstly they provide feedback on the artefact design in order to propose improvements. Secondly each exploratory focus group refines the scripts used in subsequent focus groups as well as identifying scripts which will be used in subsequent focus groups. This

ensures that those areas that still require attention are addressed. Thirdly exploratory focus groups is used in the process of shaping the coding scheme used for the analysis and interpretation of field testing. The coding schemes developed here will later be used in the confirmatory focus groups. Focus groups will continue to be used to build and evaluate the coding scheme until it is deemed ready for field testing. Rapid incremental improvements is achieved in artefact design through the use of exploratory focus groups (Tremblay et al., 2010).

Shifting to Naturalistic Ex Post evaluation, here confirmatory focus groups are used to enable the field testing of the design artefact in order to test the utility of the artefact. Rigorous investigation of the artefact requires engaging with multiple confirmatory focus groups so as to provide opportunities for collecting both quantitative and qualitative data. Tremblay et al., (2010) claim that the unit of analysis is at the focus group level; they therefore emphasise that no changes to the interview script or the artefact should be introduced when conducting multiple confirmatory focus groups. This crucial rigour allows for comparison of the results across CFGs to demonstrate and corroborate proof of utility of the artefact (Tremblay et al., 2010).

The way focus groups were used in this study are shown below in Figure 37.

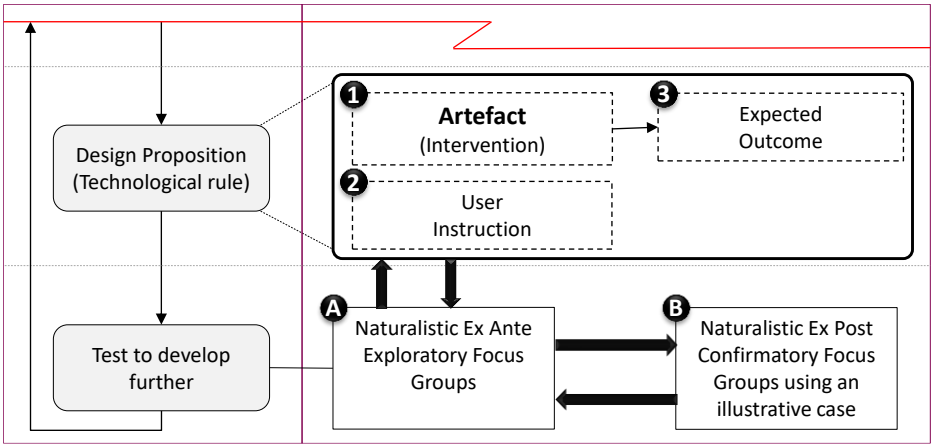


Figure 37: The use of Focus Groups to evaluate the PCC

6.3.3.2 Steps of the Exploratory and Confirmatory Focus Groups and how they were applied in this research initiative

The evaluation methods used in this research initiative were Naturalistic Ex Ante Exploratory Focus Groups and Naturalistic Ex Post Confirmatory Focus Groups. This section outlines the steps followed f the two types of focus groups, as shown in Figure 38 below (Tremblay et al., 2010). Tremblay et al., (2010) outline the basic steps of focus groups: a summary that is noted by a number of authors (for example: Krueger, Reilly & Carsrud 2000; Bloor, 2001; Stewart, Shamdasani & Rook, 2007; Morgan, 1988). Although the steps in the exploratory and confirmatory focus groups are similar, the way they were applied and the intended outcomes differ in each case and this is discussed next.

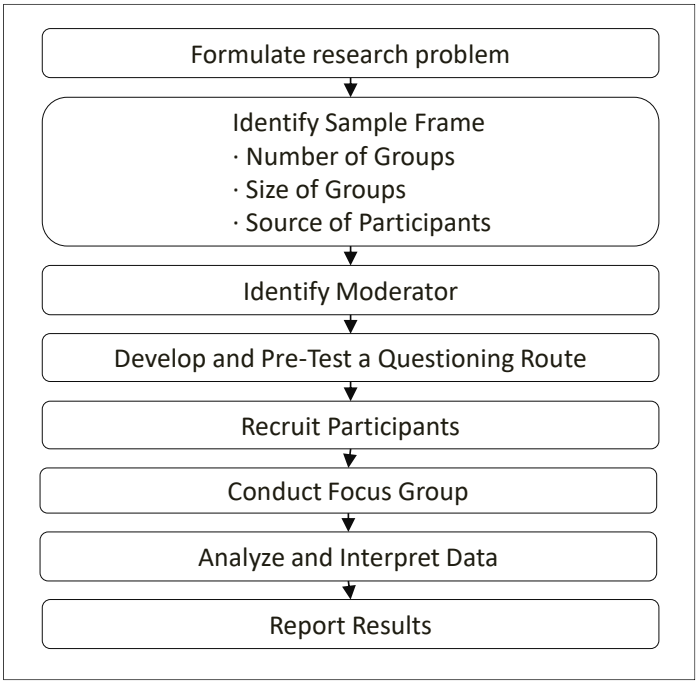


Figure 38: Focus group steps (Tremblay et al., 2010)

Step1: Formulate the research problem and goals of the focus group

Research goals must be clearly defined for the planned focus groups in order to ensure that the context of each focus group have been effectively defined. In two complementing but different research objectives, the initial focus of the

design researcher first focus on the design and incremental improvement of the artefact. This is followed by the evaluation of the utility and efficacy of the artefact (Tremblay et al., 2010).

This is consistent with Hevner (2007) who states that two types of evaluation that occurs during artefact evaluation during a design research project. First, the focus is on refining the design of the artefact through the cycles of build and evaluate. This is followed by the second step of testing the artefact in the field and then releasing it into the application environment. The goals of the Exploratory Focus Groups as well as the Confirmatory Focus Groups as used in this study were as follows:

For Exploratory Focus Groups (EFG):

The primary goal of this set of focus groups was to evaluate the design of the artefact, in this case the PCC, with the objective of improving the design of the artefact. The intention of these focus groups was therefore to identify as many enhancements as possible which could potentially be incorporated into the PCC.

For Confirmatory Focus Groups (CFG):

The primary goal of this set of focus groups was to evaluate the practical application of the PCC. The focus of this evaluation was therefore to obtain feedback from the participants on how well they anticipated that the artefact would mitigate the typical challenges they experience during project FEM. These challenges were identified during the systematic review.

Step 2: Identify sample frame

The sample frame should outline the number of focus groups required, the desired number of participants to target for each focus group and what type of participant to recruit. Although some literature indicates that focus groups

should continue until there are no new learnings (for example Krueger and Casey, 2000), Tremblay et al., (2010) note that this will be challenging to achieve in Design Science. Given the nature of the iterative process, there will always be room to make improvements. Simon (1996) highlighted that there is a point where it is not beneficial to continue with the execution of focus groups so that the process can move forward. Tremblay et al., (2010) points out there is an amount of subjectivity involved from the designers of an artefact in determining when the artefact is complete. Tremblay et al., (2010) outlined the minimum requirements when focus groups are used in a Design Science study. The minimum number of focus groups to be executed is one pilot focus group, followed by at least two exploratory focus groups and then no less than two confirmatory focus groups (Tremblay et al., 2010).

The number of participants per focus group is a key consideration since too many may cause social loafing and too few requires considerable participation (Tremblay et al., 2010). One suggestion is that a minimum of four participants and a maximum of twelve participants to be involved in each focus group (Morgan, 1998). Selection of targeted participants should be based on specific characteristics in line with the artefact being evaluated in order to provide more in-depth insights (Tremblay et al., 2010). Bloor (2001) highlighted that there is a risk in establishing very diverse groups, in the relationship to the topic of interest, may cause data of insufficient depth (Bloor, 2001). It is also recommended that participants are from the relevant application environment for which the artefact is intended. A further recommendation is that the participants for both exploratory focus groups and confirmatory focus groups are from a similar pool so that confirmatory focus groups do, in fact, confirming a final design (Bloor, 2001).

The sample frame of the Exploratory Focus Groups as well as the Confirmatory Focus Groups involved in this study is as follows:

For Exploratory Focus Groups:

For this study, the plan was to run a pilot focus group and conduct a minimum of three exploratory focus groups. At the point of concluding the three focus groups, I would then review the nature of the feedback received from the focus groups to determine if additional sessions would be required. Between five and seven participants were targeted for each of the planned focus groups. The consideration for inviting participants was that they be decision-makers of potential projects. They either had to be responsible for project conceptualisation activities or be Programme Managers who are responsible for the delivery of conceptualised projects.

For Confirmatory Focus Groups:

For this part of the study, two Confirmatory Focus Groups were conducted and five to seven participants were targeted for each session. Similar to the Exploratory Focus Groups, the type of participants targeted had to be individuals responsible for project conceptualisation activities or Programme Managers responsible for the delivery of conceptualised projects.

Step 3: Identify Moderator

The role of the moderator of focus groups is an important one. Krueger et al., (2000) identify five key skills that are required for the person that plays this role. First the moderator must ensure that all participants are respected and must ensure that all participants are provided the opportunity to express their views. Secondly, the moderator must have good communication skills, both verbal and written, to ensure effective focus groups. A third skill is to have the self-discipline to have control over personal views as well as effective listening skills. Fourthly, moderators need to have a friendly, non-confronting style and it would be helpful to introduce some humour into the process and, finally, they have to be able to involve all participants in the conversation. Tremblay et al.,

(2010) expand on this claiming that, for DSR, moderators should also have an appropriately clear understanding of the artefact being produced which will enable the moderator to engage the focus group members during the focus groups.

For both Exploratory and Confirmatory focus groups:

As the researcher I moderated the focus groups in this research. However, as recommended by Tremblay et al., (2010), in order to limit the introduction of personal bias into the process a second observer was identified for each focus group. In the first exploratory and first confirmatory workshop the role of second observer was asked to highlight any deviations from the planned approach. The role was executed by a person that is experienced in focus group facilitation.

Step 4: Develop and pre-test a questioning route

The questioning route outlines the sequence in which questions will be discussed, it therefore represents the focus group agenda. The questioning route must therefore be closely aligned with the research objective as it sets the direction for the group discussion (Stewart et al., 2007). The scale of the questioning route is an important consideration; the maximum number of questions that should be addressed in a two hour session is twelve questions (Stewart et al., 2007; Tremblay et al., 2010). The question route structure should start with the most general questions and then progress to the more specific ones. The discussion topics must also be ordered by their relative importance to the research agenda (Tremblay et al., 2010). The approach is therefore that topics are firstly ordered on the basis of importance and then within each of the topics the identified questions are ordered from being general to the more specific (Tremblay et al., 2010).

In Design Science Research, the starting point of the questioning route should be an explanation of the motivation for developing the artefact. The next step is to provide a broad explanation of the intended scenarios of use, this discussion should also include an outline of the design of the artefact and, finally, training on its use (Tremblay et al., 2010).

The questioning route of the Exploratory Focus Groups as well as Confirmatory Focus Groups in this study was as follows:

For Exploratory Focus Groups:

The concept of the Rolling Interview Guide (Stewart et al., 2007) was used. In this approach a script is established for the first session, but for the subsequent focus group the script is adjusted on the basis of the feedback that was obtained in the first session. This approach allows for the evolution of the artefact over time as more information becomes available, here the researcher discovers more about how the artefact will be used by people (Tremblay et al., 2010). The questioning route for the Exploratory Focus Groups consisted of seven questions which can be seen in Appendix D.

For Confirmatory Focus Groups:

For all confirmatory focus groups, the information guide remains static. No revisions are made between any of the confirmatory focus groups as continuous change will make comparisons between these focus groups difficult and this could compromise the analysis of the results (Stewart et al., 2007). In this research, the questioning route for the Confirmatory Focus Groups consisted of four questions. In addition, a questionnaire containing eight questions, which directly linked back to the evaluation criteria outlined earlier in this dissertation, was completed by the focus group participants. The questionnaire can be seen in Appendix E.

Step 5: Recruit participants

The target participants are those who are familiar with the application environment, in this case project conceptualisation. Typically, participants are not easy to find so the researcher has to consider the conditions that will enable him or her to attract more participants.

For both Exploratory and Confirmatory focus groups:

The target participants for both kinds of workshops were outlined earlier in step 2 above.

Participants were recruited from networks that I, as researcher, have access to. The target number of participants were secured as required and focus groups were conducted in the evenings in order to attract more participants.

Step 6: Conduct the Focus group

The objective should be to make the focus group fun and stimulating for both the participants and the moderator (Stewart et al., 2007). Before the session starts, the required informed consent forms need to be completed. This step should also include any demographic information sheets that are required (Tremblay et al., 2010). Generally, there should be enough space for participants not to feel cramped and the setup should allow for engagement to happen in an unconstrained way. A good approach suggested is for participants to introduce themselves at the outset of the session (Tremblay et al., 2010). It is further recommended that the moderator considers that placement of people in the focus group for more effective engagement, specifically the most assertive and expert participants should be seated in close proximity to the moderator and the most reserved individuals directly across from the moderator (Stewart et al., 2007). Time management is of utmost importance to ensure that all the topics receive appropriate attention. Engagement with a topic should continue until

that topic has been appropriately covered but without getting into discussions that do not relate to the topic (Tremblay et al., 2010).

The Exploratory Focus Groups and Confirmatory Focus Groups plan was as follows:

For Exploratory Focus Groups

No focus group was to run for longer than two hours and all would be conducted in a comfortable setting. Participants would be asked to provide consent that the sessions be voice recorded and a general demographics questionnaire would be completed by each participant.

For Confirmatory Focus Groups

As indicated, the confirmatory focus groups take place in an Ex Post context. This means that the evaluation of the developed artefact occurs through the instantiation of the artefact. To help mitigate the risks mentioned earlier on evaluating the artefact in a real world scenario, the confirmatory focus groups made use of an illustrative scenario (Venable et al., 2012) also referred to as an illustrative case (Johnstone and Venable, 2008).

Illustrative scenarios are described by Peffers et al., (2012, p5) as the "application of an artefact to a synthetic or real-world situation aimed at illustrating suitability or utility of the artefact". This differs from a case study which is described as the "application of an artefact to a real-world situation, evaluating its effect on the real-world situation".

The illustrative scenario allows for the artefact to be validated by experts (Tan, 2010) in order to provide an assessment of feasibility (Weber, 2011). Peffers et al., (2012) further comment that an illustrative scenario can be tailored to a

more ideal context. This ensures that the evaluation is more specifically related to the artefact.

For this research, an end-to-end illustrative scenario was completed using the information of a real case but adapted for the structure of the designed artefact, the PCC.

Step 7: Analyse and interpret data

The goals of the two types of focus groups are different. The exploratory focus groups aim for the incremental improvement of the design of the artefact and the confirmatory focus groups aim to demonstrate the utility of the design. However, the methods for analysing the results could be similar. Tremblay et al., (2010) state that focus groups, similarly to other qualitative research methods, have the same challenge to demonstrate rigour. Stewart et al., (2007) claim that there are a variety of techniques available to perform data analysis, techniques that emphasise the reliability of the observations and results should therefore be selected.

The approach to analysing and interpreting data for the Exploratory Focus Groups and Confirmatory Focus Groups in this study is as follows:

For the Exploratory focus groups

As the emphasis of these focus groups is on the improvement of the PCC, the related focus of the data analysis and interpretation was on the changes to the PCC that were identified as a result of the interaction in each focus group. Of interest here is the trend of enhancements between the focus groups and at what stage the number of potential improvements reduced. Another focus is on the nature of the changes proposed for the PCC.

For the confirmatory focus groups

As the emphasis of these focus groups is on the utility of the PCC, the related focus of the data analysis and interpretation was on the results of the evaluation criteria, as identified. Of specific interest was feedback obtained from participants on the application of the PCC using the illustrative case.

Step 8: Reporting Results

As suggested by Tremblay et al., (2010) and building on King (1998), the reporting of qualitative results can be achieved through structuring an account through the main themes that have been identified, illustrative examples can be incorporated as required. This approach can be further supported through specific points made or quotations from the focus groups.

For both Exploratory and Confirmatory Focus Groups:

For this dissertation the results of both sets of focus groups were incorporated in the final dissertation.

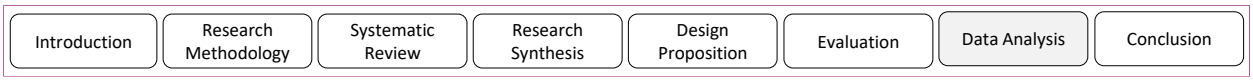
6.4 Conclusion

This chapter described the planned evaluation strategy for the PCC. In a twofold process, it starts by discussing Ex Ante Focus Groups in a Naturalistic Setting and then progresses to Ex Post Focus Groups in a Naturalistic Setting.

In this research, Ex Ante Focus Groups in a Naturalistic Setting was planned, where the literature suggested a pilot focus group and a minimum of three exploratory focus groups. Each of the sessions was to have a minimum of five and a maximum of seven participants. The participants were people who have been involved in project conceptualisation activities and programme managers who are responsible for the delivery of projects.

The Ex Post Focus groups in a Naturalistic Setting, here the literature suggested a minimum of two Exploratory Focus Groups. These focus groups were conducted on the basis of an end-to-end illustrative scenario. Each of the sessions was to have a minimum of five and a maximum of seven participants. The participants consisted of people who have been involved in project conceptualisation activities and programme managers who are responsible for the delivery of projects.

Chapter Seven: Exploration of research data



7.1 Introduction

Focus groups played a significant role in the evaluation process of the artefact. The analysis of the data created by this experience made me reflect on the reality that many project managers are set up to fail because not enough preparation is conducted before a project is initiated. The result is a situation where it does not matter how hard the project team work, the delivery baseline (agreed time and budget for the planned outcome) does not support successful project delivery.

This chapter will discuss the data collected in this research. Data was collected through two sets of focus groups. The first set of focus groups was exploratory and focused on the evaluation and development of the artefact. The second set of focus groups was confirmatory in nature and tested the application of the artefact.

7.2 Ex Ante Focus Groups in a Naturalistic Setting

A pilot focus group and a total of five exploratory focus groups were conducted in order to evaluate the design of the artefact. The pilot focus group highlighted that the questioning route was appropriate but that additional time would be required to execute the focus groups. The feedback from the pilot focus group has not been incorporated into the results.

Typically, the focus groups lasted between one hour and forty-five minutes and two hours. Each focus group was structured in two parts. The first part focused on providing an introduction to the research problem, the resultant research question and justification for the research being undertaken. This first part also included an overview of the artefact, the PCC, by walking through an outline of

the primary activities that it comprises. The second part of the session focused on obtaining feedback from the participants on the artefact presented. This was achieved through a questioning route which consisted of seven questions which were executed in a semi-structured discussion format in order to facilitate discussion on the usability of the artefact.

7.2.1 Outputs of the exploratory focus groups

The value of the exploratory focus groups is clearly highlighted when one considers the number of new enhancements that were made as a result of these focus groups. The five focus groups conducted resulted in fifty-five specific callouts. Callouts refer to specific, new and unique suggestions that were made during the focus groups which led to key changes, or enhancements, that were incorporated into the artefact. Individual callouts, or groupings of callouts where appropriate, generated enhancements to the PCC which were then grouped into enhancement groupings. A new unique enhancement was only be counted once and typically less unique suggestions were made in later focus groups. The breakdown of the number of specific callouts identified per workshop as well as the number of participants is shown below in Figure 39.

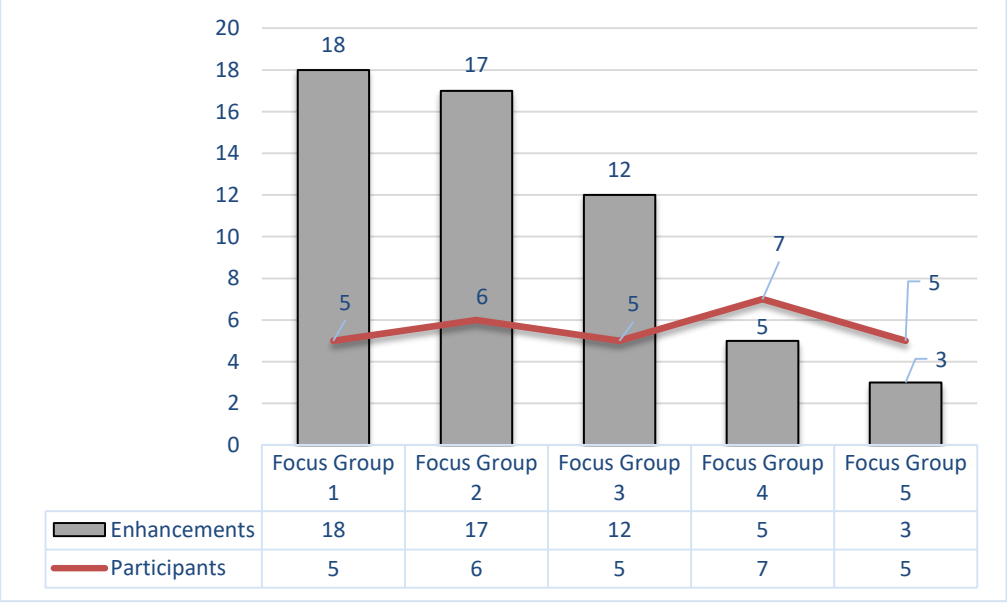


Figure 39: PCC enhancements during the exploratory focus groups

The initial plan was to conduct three exploratory focus groups. However, given the number of callouts that were identified during the third focus group, two additional focus group were added to confirm whether the trend on the number of callouts would continue to reduce. The fifth focus group generated only three unique callouts (compared to 18 in the first focus group) and this was seen as an appropriate point to stop the exploratory workshops.

7.2.2 Key changes made to the PCC as a result of the exploratory focus groups

As indicated, the intention of the exploratory focus groups was to evaluate the artefact, the PCC, in order to improve the effectiveness of the artefact. The enhancements made to the PCC are therefore seen as a positive output of the process.

The fifty-five callouts were grouped into ten significant enhancements. The tenth grouping was to incorporate a number of general enhancements to the artefact. The relationship between the fifty-five callouts and the ten significant enhancement groupings is shown below in Figure 40. The detailed callouts for the key enhancements can also be seen in Appendix F.

The ten significant enhancements to the PCC which resulted from the exploratory focus groups will be discussed next.

7.2.2.1 More appropriate naming of the artefact

Initially the artefact developed by this research was going to be called 'The Solutioneering Model'. This name was intended to indicate the engineering process to be followed when designing the proposed solution as part of the project conceptualisation process: engineering a project solution. However, it became apparent that the name was creating confusion about what the exact focus and the aim of the artefact were. As a result, the name of the artefact was

changed to the Project Conceptualisation Canvas. This naming resonated better with participants thus proving to be more relevant to the intended users.

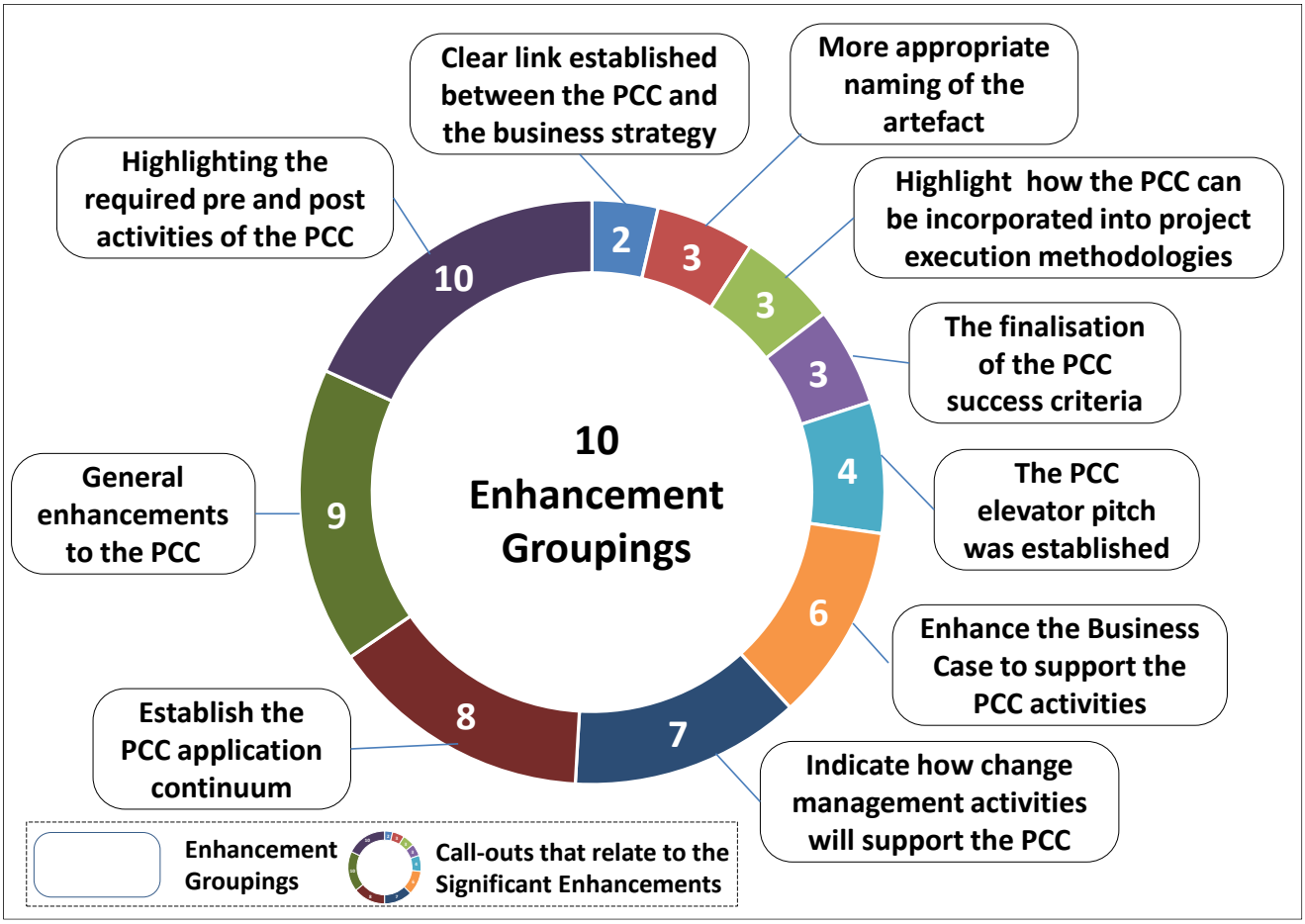


Figure 40: Relationship between the fifty-five call outs and significant enhancement groupings

7.2.2.2 The PCC elevator pitch was established

In the first focus group, it became apparent that an elevator pitch summary statement was required to ensure that participants clearly understood the intention of the PCC. This summary statement was refined throughout the process of the various focus groups and was then finalised as follows: The Project Conceptualisation Canvas represents a process to ensure that the conceptualisation phase of potential projects is adequately performed to enable effective decision-making.

7.2.2.3 The finalisation of the PCC success criteria

Throughout the focus groups process, the success criteria of the PCC were further developed and refined leading to a final set of success criteria. The success criteria ensure that users of the PCC have a clear outline of what must be achieved to ensure a successful completion of the process. The final set of success criteria are as follows:

1. A well-articulated Business Case must be provided. This must include a clear description of the problem or opportunity to be addressed through the potential project.

2. A design of the proposed solution that will support the Business Case must be established. The proposed solution is to be developed through a rigorous process of design and review to the point that it is believed to be complete and feasible. The risks associated with the proposed solution should also be outlined appropriately.

3. The proposed execution strategy must have been validated to deliver on all the components of the proposed solution that have been designed. This construct must also have a clear outline of the resources that will be required to deliver the solution. The risks associated with the proposed delivery approach must also be outlined.

4. The project governance structure required to deliver on the proposed solution must be outlined. This is to ensure that the organisation is clear on what is required to, firstly, establish the proposed project and, secondly, to effectively support the potential project to completion.

5. A facilitated decision is required in order to proceed or to terminate the potential project. This to ensure that there is a firm outcome on the conceptualisation activities.

7.2.2.4 Highlighting the required pre- and post- activities of the PCC

At the outset, the PCC was focussed purely on the process of conceptualisation. However, this was not adequate to ensure successful implementation. To ensure that the PCC is initiated in an effective way, key preparation activities were required to highlight what should be achieved before the PCC is formally initiated. Similarly, in the event that the potential project is approved, a clear set of activities post the execution of the PCC had to be outlined. The post PCC activities are required to ensure that there is no ambiguity during project execution. The pre- and post- activities that were incorporated into the PCC ensure that the execution of the PCC is set up for success and that the resultant outcome of the PCC is effectively incorporated into initiated projects.

7.2.2.5 Indicate how change management activities will support the PCC

The focus on change management activities was lacking in the PCC. As a result, change management activities were highlighted in two specific areas. The first is in the organisation where the PCC will be utilised, to support the use of the PCC, and the second context is during the execution of the PCC. The ongoing change management activities in the organisation should continuously emphasise the rationale and benefits of using the PCC and must also ensure that staff members are effectively on-boarded to the process. Secondly, for the period that the PCC is in process, change management activities must also be executed to support participants during the execution of the PCC process. This to ensure that people understand the rational of the PCC and remain committed to the intended outcome of the PCC.

7.2.2.6 Establish the PCC application continuum

Initially, insufficient consideration was paid to how the PCC would be differently executed for different types of projects and therefore the PCC application

continuum was added. The PCC can be applied to any type of project but as potential projects differ in scale and complexity, each should be assessed to determine to what extent the PCC should be executed. As a starting point, a number of factors have been identified which should be reviewed to assess the potential project. These factors can be elaborated on over time to better suit the context where the PCC is being executed.

The factors identified are: complexity, scale of the project, level of potential investment and variability of the scope of the project. Each factor should be qualitatively assessed on a scale from one (low intensity) to ten (high intensity). The overall execution level is determined from the individual assessments; high intensity will require the full process and low intensity will require a lighter application of the PCC process.

7.2.2.7 Enhance the Business Case to support the PCC activities

A number of standard business case templates are available in a variety of methodologies. The significance of this enhancement is to ensure that the business case is tailored specifically to the context of the PCC. As the Business Case is started early in the PCC process, potential benefit owners must be highlighted at the outset of the process. This will ensure that those individuals who may end up being responsible for project outcomes have an opportunity to contribute to the process.

The business case outcomes should also have a clear link to the solution components proposed through the PCC to ensure that the impact of potential scope changes is understood. This approach should also be extended to indicate how the potential project will fit into the portfolio that exists in the organisation in order to identify possible relationships with other initiatives.

From a process perspective, activities in the Conceptualisation Fly-wheel may challenge assumptions initially made in the business case; they may even

fundamentally challenge the business case in totality. The feedback process must ensure that the business case is maintained throughout the end-to-end conceptualisation process in order to make appropriate decisions against the most current business case.

Finally, clarity was required on when updates to the business case were expected and these had to be incorporated.

7.2.2.8 Clear link established between the PCC and the business strategy

It is of utmost importance that the potential project supports the business strategy of the organisation where it will be executed. The process to ensure that a clear link is maintained between the potential project and the business strategy consists of four activities that have been incorporated into the PCC. Firstly, during pre-PCC activities an entry criterion is whether the potential project supports the business strategy and how significant this position is. Secondly, this link must be outlined in the business case to present a quantified view of how significant the contribution is to the particular strategy. Thirdly, the decision-making process in the PCC must be based on the updated business case and how it supports the business strategy. This final view on the planning assumptions needs to be validated to ensure that the conceptualisation process does not move away from the intended benefits and therefore the strategy. Finally, as part of the post-PCC activities, detail should be provided on how benefits tracking should be done both during and after project execution activities, this is important to ensure that the intended outcome is not 'lost in translation'.

7.2.2.9 Highlight how the PCC can be incorporated into project execution methodologies

Typically, each of the focus groups asked a number of questions about the relationship between the PCC and other mainstream or customised project management methodologies in organisations. As a result, special emphasis was placed on this topic when new participants were introduced to the PCC. Furthermore, a number of representations have been created to show how the PCC could be used with a method such as Prince2 or incorporated with the PMBOK.

As the change management activities support the change process of participants in the process, here the focus is placed on the technical aspects of the project methodology and how the PCC forms a symbiotic relationship with the project execution methodology being used.

7.2.2.10 General enhancements to the PCC

The focus groups' input also resulted in several enhancements that were both diverse and also smaller in comparison with the enhancements that were outlined above. These were grouped into a new category of enhancements and relate to some of the following. Firstly, the role of Conceptual Thinker was added followed by a specific step that clarified the process on how to exit the Conceptualisation Fly-wheel. Time indicators were added to primary activities to provide a sense of how much time would be required. Next, it was clarified that decision makers must be decided at the outset. A final addition was the option of engaging external consultants or vendors in the PCC process as required to ensure that specialist knowledge can be incorporated.

7.2.3 The evolution of the PCC through the exploratory focus groups

As the PCC has evolved through the development process, so the artefact has changed through the process. The first version of the PCC was quite rudimentary and this first version is shown below in Figure 41.

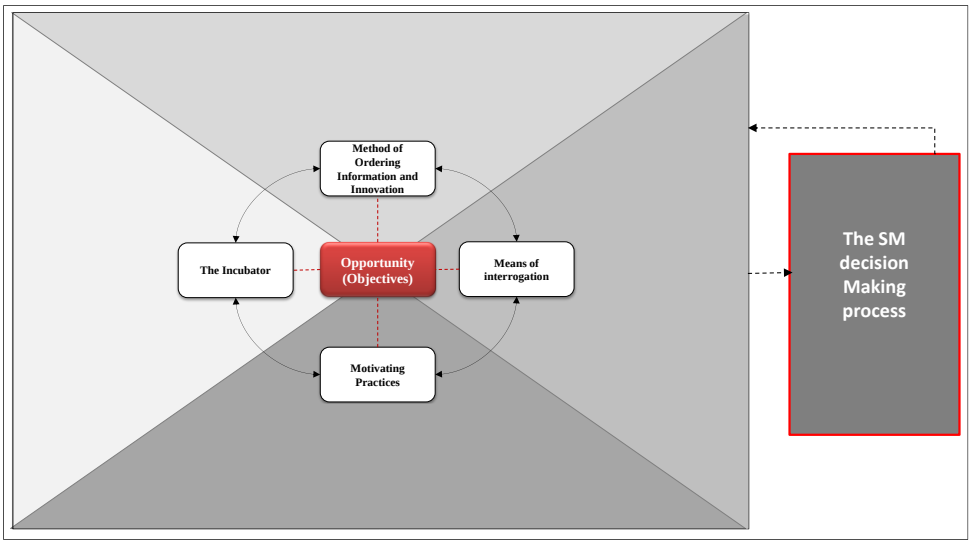


Figure 41: Version one of the PCC

The final version of the PCC is shown below in two perspectives. The first shows the PCC in a basic outline (see Figure 42). The second perspective, which is more creative, is shown in Figure 43.

The biggest transformation to the PCC was seen during the exploratory focus groups process. The aim was to try to visually simplify the artefact as far as possible, hence the drive to create the basic outline. As the author of the artefact, I had to consistently consider how people who are not close to the topic would relate to it and how to ease the process of on-boarding.

The initial version had a strong resemblance to the primary concept that was discussed in the research synthesis in Chapter 4, the Maieutic Machine. Compared to the current version of the PCC, the initial outline primarily

translates to the 'Conceptualisation-flywheel' portion of the current version of the PCC, as well as an indication that decision making is required.

As indicated earlier, the first step was to change the names of the quadrants of the conceptual model to names that are more aligned with the context where it will be used. This was only the start, as is clearly visible in a comparison of the initial and current illustrations of the PCC, as well as the detailed outline in Chapter 5, the activities before and after represents significant enhancements to the PCC. These changes resulted from the evolution process that Design Science facilitates. The essence of the conceptual model, the Maieutic Machine remains in the defined process, but the design science process evolved the Maieutic Machine into a usable instantiation targeted for project conceptualisation. Without a doubt the Maieutic Machine can be instantiated into other specific contexts.

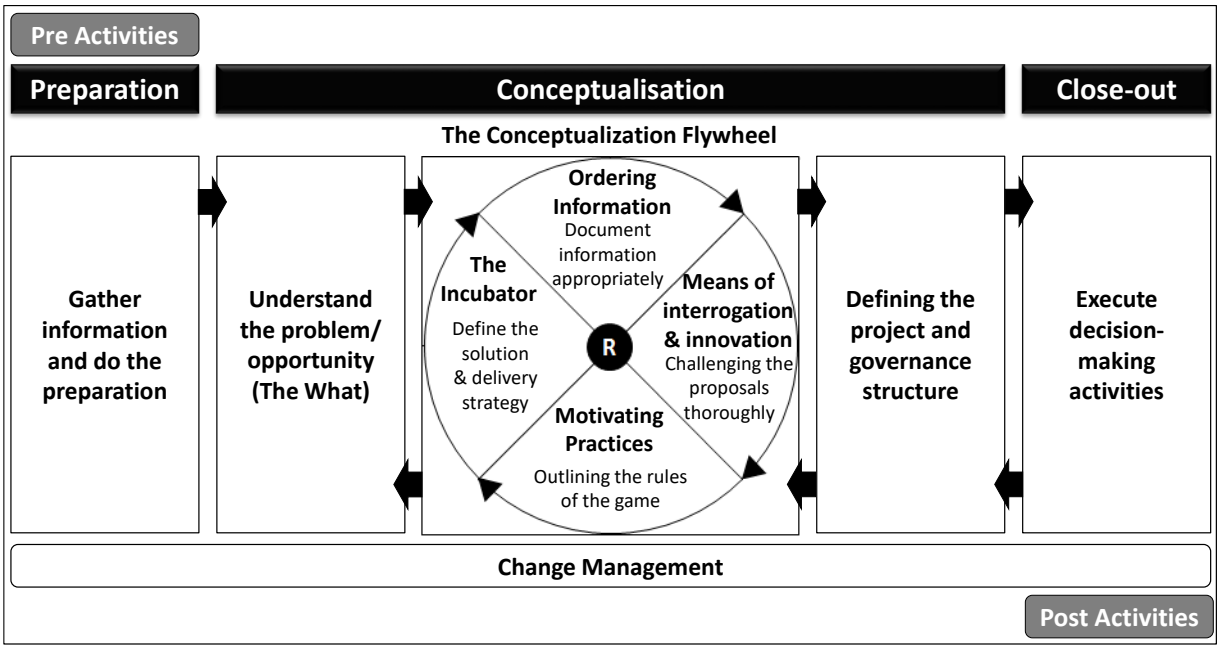


Figure 42: The PCC basic outline

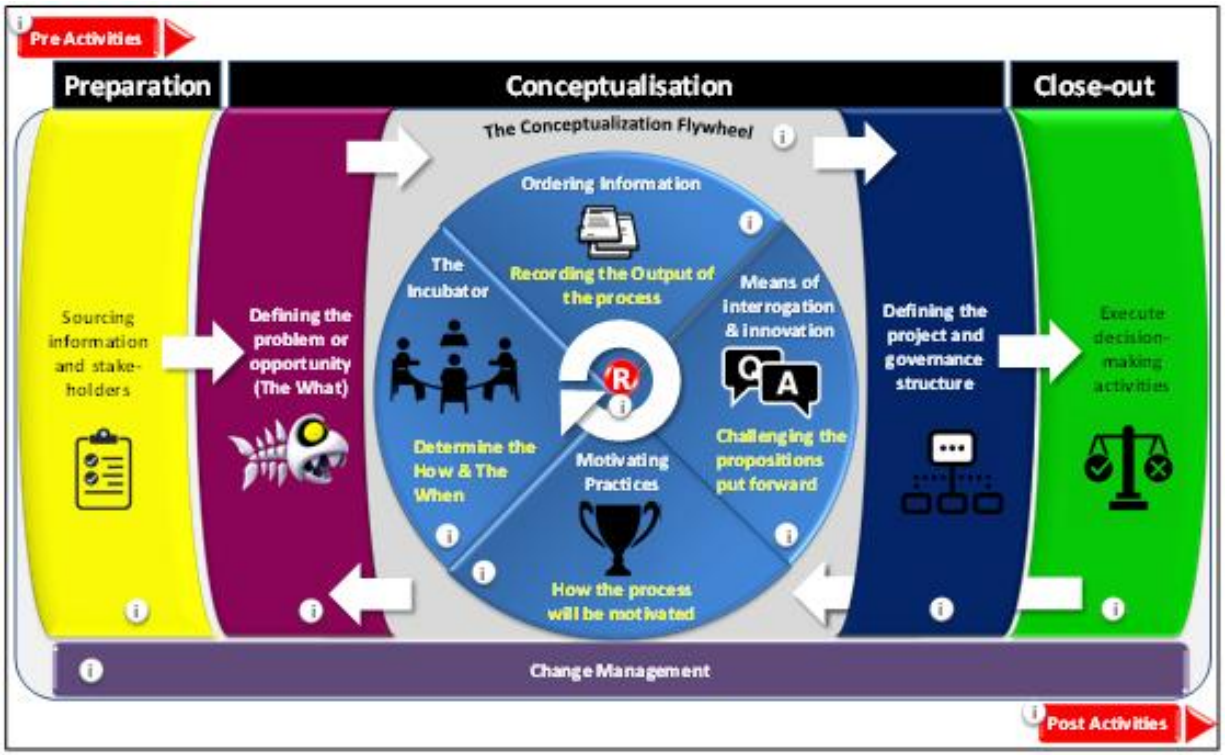


Figure 43: The PCC creative outline

7.3 Ex Post Focus Groups in a Naturalistic Setting

The second set of focus groups in the PCC evaluation strategy was the Ex Post Focus Groups which were conducted in a Naturalistic Setting. The primary consideration in planning these focus groups was the evaluation constraints, discussed earlier in this dissertation. The naturalistic context in these focus groups was established through the use of an illustrative case, a brief outline of which is provided below.

7.3.1 Illustrative case

7.3.1.1 Summary of the illustrative case used in the PCC evaluation

The illustrative case I selected for use during the confirmatory focus groups was a project I inherited at a large financial services institution. This was yet another project that was already 40% over its planned budget and 25% over its planned time. I chose this case as, in hindsight, I could clearly see the mistakes that had been made at the outset of the project. As I had full access to all information

and had gained a deep understanding of the project, I was able to compile a valuable set of project artefacts to support this research.

The scope of the chosen project was to deliver a new application for Financial Advisors. The application manages the full end-to-end financial planning process executed between Financial Planners and their customers. The aim of the application is to facilitate the conversation between the customer and the financial advisor. This process helps the customer identify their personal goals and allows the financial advisor to recommend the type of solutions required to realise these customer goals.

This means that a full needs analysis has to be completed in order to produce a financial plan for the customer. The financial plan specifically covers seven areas of a customer's financial well-being which include: savings and investment planning, education planning, funeral, debt management, life insurance, short-term insurance and retirement planning.

The value chain of the financial plan consists of the following components: personal information, contact information, employment information, financial goals and plans, affordability, existing investment and policy information and, finally, recommendations.

My investigation of this case again confirmed that ultimately, when projects are not conceptualised appropriately, there are no winners. Every party concerned - the sponsor, the owner, the project team, the stakeholder groups either in the host organisation or partner organisations – is compromised when projects underperform.

7.3.1.2 The use of the illustrative case in the Ex Post focus groups

In preparation for the Ex Post focus groups, the PCC was conducted using the illustrative case information. Information was harvested from the actual project

and used to populate all the deliverables highlighted in the PCC in order to visualise the end-to-end process. The result was that the PCC could be demonstrated through the information of an actual project without any risk being introduced into a real life project.

The approach used to execute the Ex Post workshops was as follows. Similar to the Ex Ante focus groups, each Ex Post workshop started with an introduction to the research problem and a high level outline of the PCC. This was then followed by a detailed description of the PCC using the illustrative case. The participants in the focus group were then asked to complete the questionnaire linked to the eight evaluation criteria identified for this study. As soon as the confirmatory focus groups were started, no further enhancements were made to the PCC, similarly, the questioning route remained unchanged and all the Ex-Post focus groups answered the same questions.

7.3.2 Results of evaluation criteria

A total of three Ex Post focus groups were conducted with seventeen participants in the sessions. During the workshops, each participant was asked to complete a questionnaire; the questions in the questionnaire were linked to the eight evaluation criteria identified for this study which are shown in Table 2: Properties to be evaluated during evaluation in Chapter 6. Each participant's questionnaire was averaged out to calculate the result of each workshop and these results were then averaged out to calculate the overall performance of each criterion.

In the questionnaire, each person was asked to rate eight questions linked to the assessment criteria by indicating if they: Strongly Disagree, Disagree, were Neutral, Agree or Strongly Agree with the question being asked. The results of the exploratory focus groups on the evaluating criteria are shown below in Table 3 and are also illustrated below in Figure 44.

Table 3: Results of evaluation criteria in exploratory focus groups

#	Assessment Criteria	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	*Will this process create a better appreciation for the benefit of conducting the project front-end effectively?*	0%	4%	12%	43%	42%
2	*Will this process enable the collection of relevant knowledge and experience in the pre-project phase?*	0%	0%	13%	68%	19%
3	*Will this process ensure that more adequate time is dedicated to the front-end of the project?*	0%	0%	16%	46%	37%
4	*Will this process ensure an effective use of resources in the project front end?*	0%	10%	23%	30%	37%
5	*Will this process ensure that the problem is well understood and that more than one solution is considered by more than one person?*	0%	0%	12%	45%	43%
6	*Will this process ensure that stakeholders are aligned during the front-end of the project?*	0%	5%	21%	58%	15%
7	*Will this process ensure that a clear link remains between the business strategy and the project being delivered?*	0%	9%	14%	56%	21%
8	*Will this process ensure that external perspectives on an appropriate delivery baseline are incorporated into the evaluation of the proposed delivery baseline?*	0%	9%	27%	43%	22%
Grand Total		0%	5%	17%	49%	30%

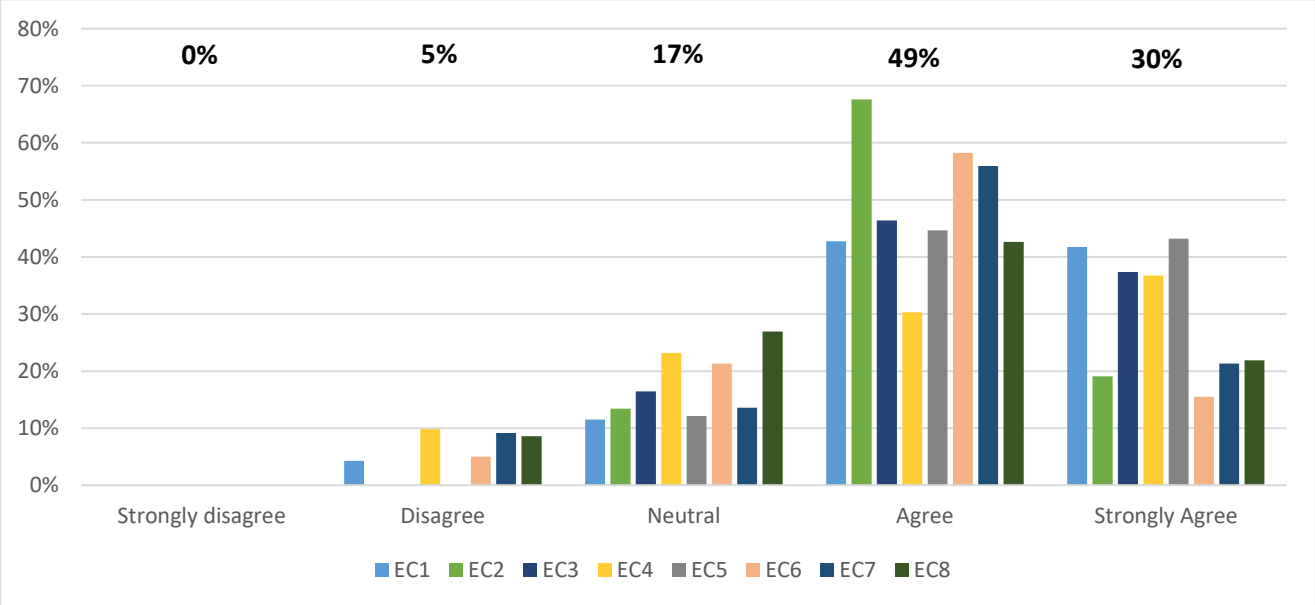


Figure 44: Visualisation of the results of the evaluation criteria in the exploratory focus groups

The feedback from the four workshops indicates that close to half of all responses Agree and thirty percent Strongly Agree that the PCC will have a positive impact on mitigating the typical challenges that occur during project conceptualisation activities. The diagram also shows that seventeen percent was Neutral and five percent disagree that the PCC would have a positive impact.

This is seen as a very positive result for the PCC. The detailed feedback on the eight evaluation criteria is discussed below.

7.3.2.1 Challenge one: The benefit of conducting the front end effectively is not appreciated

The results indicated that 42% of participants Strongly Agree, 43% Agree, 12% were Neutral and 4% disagree that the PCC would enable a better appreciation of the benefit of conducting the project front end effectively.

Since 85% of responses were in the Strongly Agree and Agree categories, participants clearly held the view that, as a result of the PCC, both project participants as well as decision-makers will appreciate the value of FEM activities before a project is initiated. A number of participants indicated that this kind of approach should be incorporated into standard methodologies as a precursor to project execution activities.

An area that specifically received much feedback, was the primary activity of 'Means of Interrogation and Innovation'. Participants felt that the information provided in the check lists provided relevant guidance on the factors to look out for during project conceptualisation activities. The information on the generic reference class also made people more aware how frequently this occurs and the implications of getting project conceptualisation wrong.

To me this made clear that more guidance is required at the outset of a project. I believe this does not happen because there is limited focus on this both during

project management education as well as the limited focus placed on FEM in practice. The focus groups proved to me that the PCC can assist in bridging this current gap.

7.3.2.2 Challenge two: Collection of relevant knowledge and experience in the pre-project planning phase deserves more attention

The results indicated that 19% of participants Strongly Agree, 68% Agree and 13% were Neutral that the PCC will enable the collection of relevant knowledge and experience in the pre-project phase.

With 87% of responses in the Strongly Agree and Agree categories, participants confirmed that the PCC will enable better collection of relevant knowledge and experience during project conceptualisation activities. One of the specific areas highlighted was that of the PCC Review Activity that forms part of the 'Post-PCC Activity' action. The focus on continuously evolving the knowledge contained in the PCC will ensure that future instances of the PCC will benefit from past activity.

The main feedback that led to the Neutral perspective related to the fact that the feedback process and continuous updating of the PCC is dependent on disciplined execution of the activity by staff in the organisation where the PCC is executed.

Initially I was surprised that none of the participants were able to reference an appropriate knowledge base of relevant conceptualisation information or recall a process where the harvesting of useful information had been effectively managed. Once I reflected on this, I had to acknowledge that this is in line with my personal experience of gaining project management expertise. There is very limited guidance on the topic of FEM.

7.3.2.3 Challenge three: Too little time is dedicated to the front-end of the project

The results indicated that 37% of participants Strongly Agree, 46% Agree and 16% were Neutral that the PCC will ensure that adequate time is dedicated to the front end of the project.

With 83% of responses in the Strongly Agree and Agree categories, participants believed that the PCC will ensure that adequate time can be dedicated to project front end management activities; more so than currently occurs in the environments where they work.

Questions were raised around the extent that it is possible to determine how much time will be required to complete the conceptualisation at the outset of the potential project. Participants would typically comment that "there is not funding for this" or "this will take too much time, my sponsor would not accept this". The comment from Jack Bergman, a retired Lieutenant General of the US Military, "There is never enough time to do it right, but there is always enough time to do it over" (Bourne and Walker, 2005) rings true for me here. In my experience, most projects are initiated prematurely and the participant feedback confirmed this trend.

7.3.2.4 Challenge four: Inadequate use of resources in FEM

The results indicated that 37% of participants Strongly Agree, 30% Agree, 23% were Neutral and 10% Disagreed that the PCC would lead to a better appreciation of the benefit of conducting the project front end effectively.

Regarding this challenge, 67% of responses fell in the Strongly Agree and Agree categories. However, 10% of responses fell in the Disagree category, which was the highest across the various questions. Positive feedback was obtained on the

clarity of the roles required to execute on the activity and also on the explicit guidelines on the responsibilities that each role has in the process.

Questions were raised on the ability of the organisation to effectively resource project conceptualisation activities. These arose from comments such as "these roles don't exist in our organisation" and "I don't think our company would create such roles". This factor was positioned as one of the reasons why organisations fail to effectively deliver on this phase.

7.3.2.5 Challenge five: During project conceptualisation, the problem is not well enough understood; only one solution is considered and typically only by one person

The results indicated that 43% of participants Strongly Agree, 45% Agree and 12% were Neutral that the PCC will ensure that the problem is well understood and also that more than one solution is considered by more than one person.

With 88% of responses in the Strongly Agree and Agree category, this challenge scored the highest of all the challenges. The discussion on this topic made me realise again how few people are typically involved during project conceptualisation activities. Often, the urgency to complete work to meet self-imposed deadlines results in the challenges experienced during this phase. Callouts such as "we don't have enough subject matter experts to do this kind of work" and "our organisation embraces 'silver bullet solutions' that never deliver on the intended project outcome" reaffirmed this challenge.

The PCC was commended for the collaborative nature of the activities when delivering on the intended outcomes of the process. Indeed, this was seen as a key strength of the PCC. Another area that received positive feedback was the level of critique built into the review process to ensure that the options considered are challenged. Participants also agreed that this process will ensure that more than one solution option is considered.

7.3.2.6 Challenge six: Inadequate stakeholder alignment

The results indicated that 15% of participants Strongly Agree, 58% Agree, 21% were Neutral and 5% Disagreed that the PCC will ensure that stakeholders are aligned during the front end of the project.

With 73% of responses in the Strongly Agree and Agree categories, participants valued the idea that all stakeholders who should be involved in the process are identified up front and are engaged as required throughout the process. The iterative nature of the PCC ensures that there is opportunity for multiple entry points where stakeholders can get involved in contributing to the output of the PCC.

The PCC process also ensures that contributions from the various stakeholders are evenly incorporated, but also equally challenged. This is made possible through the outside view which is enabled by the interrogation activities.

The feedback relating to the 5% Disagreement relates to comments that, even if the PCC process is followed, there may still be strong voices of dissent that would need to be contended with. Some focus group participants raised the point that no approach would necessarily address this risk.

7.3.2.7 Challenge seven: There is little research on how the business strategy influences the project strategy and as a result tactical aspects of projects receive greater attention than those of strategic importance

The results indicated that 21% of participants Strongly Agree, 56% Agree, 14% were Neutral and 9% disagree that the PCC will ensure that a clear link is established and maintained between the business strategy and the project being delivered.

With 77% of responses in the Strongly Agree and Agree categories, the key strengths that participants pointed out related to the clear link that is established between the business case objectives and the solution components and delivery parameters of time and cost that are needed to ensure that effective trade-offs are understood. The decision-making process is also executed against this clear link between business case, the chosen solution, the delivery baseline that indicates the required approach, cost and time parameters as well as the required governance and resource requirements to deliver the proposed project. The link between the project conceptualisation activities and the post-PCC activities also ensures that the project incorporates the agreed actions.

7.3.2.8 Challenge eight: Focus is mostly placed on technical causes of project failure and not on other root causes

The results indicated that 22% of participants Strongly Agree, 43% Agree, 27% were Neutral and 9% disagree that the PCC will ensure that external perspectives on an appropriate delivery baseline are incorporated into the evaluation of the proposed delivery baseline.

Although the 65% responses in the Strongly Agree and Agree categories constitute the lowest score that was achieved during the evaluation process, they still indicate a favourable outcome. This topic required some positioning and explanation to participants as it is not typically covered in traditional project management literature. The discussions highlight the need to elaborate on more than just technical causes as contributors to project failures. Participants found this interesting and could relate to the how these factors contribute to project failures.

The 36% of result in the Neutral and Disagree category highlight that this topic requires more engagement in order for participants to embrace the impact of other project failure causes. I found this to be typical of the current mainstream

project management certifications and training courses that do not cover this topic appropriately.

7.3.3 Findings

This research produced the following key findings.

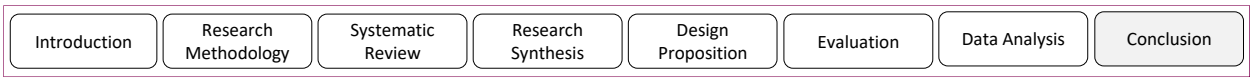
Results confirm that the PCC contributes to mitigating the typical challenges that are experienced during project conceptualisation activities. This is shown through the link between the challenges identified and the positive feedback on the evaluation criteria.

This research has also shown that Design Science could play a significant role in project management research by producing artefacts that will make a contribution to the improvement of practice through rigorous research practice.

7.4 Conclusion

This chapter discussed the data that was collected through the use of exploratory focus groups and confirmatory focus groups. The results of the confirmatory focus groups showed how the PCC has evolved over the period of its development, more importantly it showed how the PCC can be applied in practice as an effective artefact. Further, these results indicate that the PCC will assist in resolving the typical challenges that are experienced during project conceptualisation activities. This result held for all the challenges that were identified.

Chapter Eight: Conclusions and recommendations



8.1 Introduction

Embarking on a PhD journey, especially on a part time basis, is no easy feat. Over the last four years I, have dedicated considerable time to getting to this point: writing the conclusion chapter of this dissertation. I reflect on this journey that has taken me through many highs and lows that can only be appreciated by walking the path. Along this journey I have gained incredible insights into a number of areas and today I have the conviction to stand behind the research approach I followed as well as the work that was produced as a result of it.

8.2 Conclusions of this research

The research question of this dissertation is: What activities can be performed during project front end management to mitigate the typical challenges that are experienced during this activity? This section will show how the research question was answered in this dissertation through the delivery of the Project Conceptualisation Canvas using Design Science Research.

In this chapter I reflect on this through a discussion on the seven guidelines of Design Science Research as defined by Hevner et al., (2004). These authors point out that the seven guidelines were established to assist researchers, reviewers, editors and readers to understand the requirements for effective Design Science Research. They go on to state that for Design Science Research to be complete each of the seven guidelines should be appropriately addressed (Hevner et al., 2004).

8.2.1 Guideline 1: Design as an Artefact

Design Science Research must produce a viable artefact which will address an important organisational problem. This artefact can be in the form of a construct, a model, a method or an instantiation.

This research delivered an artefact, The Project Conceptualisation Canvas (PCC), which represents a process to be followed to ensure that the conceptualisation phase of potential projects is adequately performed. The artefact aims to contribute to the mitigation of the typical challenges experienced during project conceptualisation in order to enable effective decision-making on potential projects.

Over the course of this research, the PCC took on many forms and was refined through multiple iterations to take the form that is presented in this dissertation. I am convinced that the evolution of the PCC will continue as it is adopted in a variety of project contexts and hope that this will be the case. As a resource, a stagnant artefact is in fact a dying artefact.

8.2.2 Guideline 2: Problem Relevance

The objective of Design Science is to develop solutions to important and relevant business problems. A problem can be defined as the difference between a goal state and the current state of a situation.

Through review of a number of studies, this research has shown that the alarming trend of project underperformance continues. One of the contributing factors to this situation is the poor conceptualisation of projects. Through a systematic review, this research has highlighted eight specific challenges that occur during project conceptualisation. The underperformance in projects has far reaching impact and leads to significant opportunity cost.

I have experience of the handshake between pre-project activities and project execution activities. I believe a key contributor to the complexity of effective project conceptualisation is the fact that there is a considerable grey area between pre-project and project, but one which many people treat as black and white and this continues to undermine project success.

8.2.3 Guideline 3: Design Evaluation

The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.

The Project Conceptualisation Canvas was rigorously evaluated within the constraints that were highlighted. The primary constraint identified for this research was not testing the artefact, which is in development, in real-world situations due to the personal and institutional risk carried. The risk of testing an artefact in development was mitigated through the use of an illustrated scenario while executing confirmatory focus groups.

The evaluation strategy followed in this dissertation had two focus areas. Firstly, it focused on evaluation of the artefact before it was finalised, achieved by using Ex Ante exploratory focus groups. In total, five exploratory focus groups were conducted, involving twenty-eight participants. This activity resulted in fifty-five specific callouts which were summarised in ten groupings of enhancements made to the PCC.

Secondly, utilisation of the baseline artefact was evaluated. This was achieved by using Ex Post confirmatory focus groups and an illustrated case. Three confirmatory focus groups were conducted and seventeen participants were involved. The results of these focus groups, linked to the typical challenges that occur during project conceptualisation, were analysed. The results indicated that the PCC will make a positive contribution toward mitigating the typical challenges experienced during the project conceptualisation process.

Defining and executing the evaluation strategy took me considerable time to design and complete. I wanted to be sure that the approach would be appropriately rigorous given the research constraints. I believe this investment of time in focussing on the research design was unavoidable because so few research initiatives in management research have utilised Design Science as the chosen research method.

8.2.4 Guideline 4: Research Contributions

Hevner et al., (2004) emphasise that Design Science Research must provide clear and verifiable contributions through at least one of three ways: the design artefact, the design foundations, and/or the design methodologies. One of these must be part of the research initiative for Design Science Research to be valid. Hevner et al., (2004) further stress that the criteria for assessing the Design Science contribution must focus on representational fidelity and implementability.

The design artefact of this research, the Project Conceptualisation Canvas, provides the main contribution towards mitigating the problems that typically occur during project conceptualisation. Evaluation of the PCC, specifically the approach followed during the confirmatory focus groups, showed that the PCC is implementable through instantiation into specific project instances.

It has been a very rewarding process to experience how the initial, what was to be called the Solutioneering Model, evolved into the Project Conceptualisation Canvas. A key learning was not to be emotionally attached to a specific version of the artefact or specific components in the artefact. Keeping this distance allowed the PCC to change as required through the experiences gained in the process of its design and evaluation.

8.2.5 Guideline 5: Research Rigour

Design Science Research relies upon applying rigorous methods in both the construction and evaluation of the design artefact. Hevner et al., (2004) state that rigour is often assessed by adherence to appropriate data collection and analysis techniques and claims about the performance of artefacts are typically dependant on performance metrics. These metrics must be continuously reviewed for appropriateness.

In the discussion on the research rigour of this dissertation, it is important to reflect on the three main research strategy decisions. These are the Design Science process selected, the use of focus groups as the primary means of evaluation and data collection and, thirdly, the use of an illustrative case to provide a naturalistic setting.

The Design Science Research method used in this initiative was the Design Science Research Cycle (van Aken and Romme, 2009). Both these scholars played a pivotal role in introducing Design Science into Management Research (Reymen et al., 2006; Bate, 2007).

Focus groups constituted the data collection sources used in this research initiative. Choice of this approach was underscored by a key paper by Tremblay, Hevner & Berndt (2010) that outlines how focus groups can be to evaluate and refine artefacts. Hevner, on his own and in collaboration with others, has produced seminal work in Design Science. The focus groups approach in Design Science Research is not new and has been performed in a number of Design Science research initiatives (for example Tremblay, 2007; Brandtner, Helfert, Auinger & Gaubinger, 2015).

Because the primary research constraint was the inability to test the artefact in development, an illustrative case was used to conduct the confirmatory focus groups. This use of an illustrative case in Design Science Research has been

applied in a number of research initiatives (for example Gregory and Muntermann, 2011; Fischer and Gregor, 2011; Islam and Grönlund, 2011; Costa, Soares & Sousa, 2016; Nielsen, Christensen, Heidemann Lassen & Mikkelsen, 2017).

The outline above indicates that the research approach was selected to ensure appropriate rigour.

8.2.6 Guideline 6: Design as a research process

Design Science is fundamentally iterative (Hevner et al., 2004), a process which essentially translates into a generate and test cycle (Simon, 1996). This generate and test cycle refers to the process of finding a solution to a known problem by testing an initial design and evaluating its performance, adjusting the design from the learnings and testing it again. This process continues until the artefact performs effectively. Simon (1996) elaborates further that problem solving involves utilising available means, such as actions and resources, to reach desired ends, i.e. goals. This also highlights the fact that the artefact is designed for a specific context and that it is therefore problem- and environmentally-dependant (Hevner et al., 2004).

The specific context in which the Project Conceptualisation Canvas is to be used is during the conceptualisation process of potential projects. The PCC went through five iterations of exploratory focus groups. Fifty-five specific inputs, which were summarised into ten significant enhancement groupings, were used to refine the artefact. The refinement process took place throughout the exploratory focus groups and consisted of both significant adjustments and smaller refinements. The generate and test cycle that Simon (1996) describes can clearly be seen in this process.

The performance of the artefact was demonstrated through the use of confirmatory focus groups where the results of this process indicated that the artefact performed effectively.

This research process taught me that design is a deliberate process where every adjustment, even the smallest, is motivated by clear justification. The artefact is refined in the way that a wooden carving is finished and polished through multiple cycles of sanding and refining to even out all the small imperfections. A personal challenge was to determine when to stop the iterative process and even though I reached the planned number of iterations, I still felt that the process could continue. A key learning was to make peace with 'good enough' versus 'perfect', I think this is the balance that must be struck using Design Science Research.

8.2.7 Guideline 7: Communication of research

Design Science Research must be presented effectively to both technology-oriented and management-oriented audiences. The communication focus must therefore be appropriately detailed for technology-orientated audiences to enable implementation. This information should include the process of how the artefact was constructed and evaluated to ensure that its execution is repeatable. The focus for management audiences should highlight the resources required to enable the implementation of the artefact as well as the knowledge required to execute it. Hevner et al., (2004) stress that in order to enable both the technology and management audiences, the artefact must be described in appropriate detail.

The PCC has been described through a number of representations to ensure that it is suitable for both management- and technology-orientated audiences. The PCC consists of twelve primary activities and these are described at three levels of abstraction to ensure that clear guidelines have been established. At level

one a high-level summary of each phase is provided. At the second level, each primary activity is described through a detailed activity specification that provides the purpose, inputs, outputs and any execution notes that may be require clarity. The third level is essentially the template layer where draft templates are provided. These form a base for customisation in the context of use. The PCC has also been packaged as a document that can be navigated by both technology and management audiences. The feedback from the confirmatory focus groups indicated that the PCC will be effective at mitigating the typical challenges that are experienced during project conceptualisation. An outline of this is provided in Appendix E.

I found the research process to be a very personal journey. As much as I might try and prevent it, I had an emotional connection to the work that I produced. I had to remind myself multiple times that the chosen means of communicating the PCC should create enough context to ensure that all appropriate information is shared, including tacit knowledge. Similar to the design process, multiple iterations of telling the story helped to refine the communication process and associated communication objects.

8.3 Research contribution

In section 2.5.2 of this dissertation, the knowledge contribution of Design Science is discussed and in Figure 7 the Design Science Contribution Framework is presented. The theoretical contribution of this thesis is the artefact called the Project Conceptualisation Canvas. In line with the Design Science Contribution Framework, this is classified as an improvement.

The Project Conceptualisation Canvas is a method that can be used to assist in the conceptualisation of potential projects by ensuring that decision-makers are provided with appropriate information for their decision-making. The Project Conceptualisation Canvas ensures that the process of conceptualisation is started

in a way that supports effective execution and that the problem or opportunity is well understood with clear objectives that should be met by the potential project. The Project Conceptualisation Canvas further ensures that an iterative process is followed to establish the proposed solution and execution approaches. This process ensures that any recommendation is rigorously challenged to ensure completeness and appropriateness. Further, the process ensures that appropriate governance structures are designed for the potential project.

The Project Conceptualisation Canvas assists in addressing the challenges described in this dissertation that relate to the continued underperformance of projects as a result of poor front end management activities.

In addition, as discussed earlier in this dissertation, the use of Deign Science is not widely used in management research. In the course of the research that was conducted on both the use of Design Science in management research and Project Management, no PhD dissertations were found where Design Science had been used as a research methodology. A further contribution is thus the application of Design Science to this field.

8.4 Publications and conference participation

Throughout this research, conference papers were published in order to gain peer-reviewed feedback on the research on a continuous basis. These are shown below in Table 4.

Table 4: Conference papers and participation

Paper Name	Conference	Focus Area	Authors
Considerations and complexities when contemplating the choice of a Design Science approach for management research.	British Academy of Management (BAM) Conference 2017, Warwick, United Kingdom.	The use of Design Science in management research.	van Niekerk, C; Schorger, D; Sprackett, D; McDonogh, J & Sewchurran, K.

Paper Name	Conference	Focus Area	Authors
Building a model to improve project conceptualisation in order to reduce the occurrence of optimism bias: Introducing the Project Conceptualisation Canvas.	European Academy of Management (EURAM) Doctoral Colloquium 2018, Reykjavik, Iceland.	Present research proposal and progress for critique.	van Niekerk, C; & Sewchurran, K.
In search of truth and utility; the use of Design Science in Project Management.	International Research Network on Organizing by Projects (IRNOP) Conference 2018, Melbourne, Australia.	The use of Design Science in project management research.	van Niekerk, C; & Sewchurran, K.
The perplexed state of project conceptualisation continues. A systematic review on the purpose, activities and challenges of project front end management.	International Research Network on Organizing by Projects (IRNOP) Conference 2018, Melbourne, Australia.	Challenges in project front end Management.	van Niekerk, C; & Sewchurran, K.
The use of Design Science as a research method in Project Management as an approach to bridge the apparent relevance gap that exist in the field.	European Academy of Management (EURAM) Conference 2019, Lisbon, Portugal.	The use of Design Science in project management research.	van Niekerk, C; & Sewchurran, K.

8.5 Recommendations and further research

The following topics are suggested for future research:

- This research was focussed on the conceptualisation of a project or programme using the PCC. Further research is required to assess the

requirements and implications of interdependencies between the conceptualisation processes of related projects.

- This dissertation outlined the PCC application continuum as a basis for deciding at what level of detail it should be executed given the potential project parameters. This thinking must be further enhanced to critically assess the implications of decisions made when deciding at what level of detail the PCC should be executed.

- As positioned in this dissertation, the use of Design Science could play a significant role in contributing to bridging the apparent relevance gap in Project Management. This topic requires further research in order to collect an appropriate amount of data to support this hypothesis.

- The primary constraint of this research was the risk of evaluating an artefact on development on real world projects. The use of focus groups proved to be an effective way of evaluating the artefact. Further research is required on evaluation techniques that establishes a naturalistic setting which, as discussed in this dissertation, ensures the most appropriate evaluation.

8.6 Potential limitations of this research

The following limitations were identified in this research:

- Design Science is not yet widely used in management research, the sources that were incorporated into this research are therefore not as wide as they would have been in fields that are more established.

- In section 1.6.3 above, the research opportunity, it was highlighted that FEM is ignored in most standard project management methodologies and generally underrepresented in literature. The challenges that were

identified in this research should be reviewed as more literature is published on this topic.

8.7 The personal development experience through this PhD journey

As a practitioner, rather than an academic, it took courage to undertake a study of this nature. This process has taught me to persevere and reaching this milestone has given me confidence. I believe it is worthwhile reflecting on my personal experience of this journey.

Socrates claimed that true knowledge exists in knowing that you know nothing (Van Deurzen and Baker, 2018). Throughout the PhD journey I have had the privilege to meet and interact with extremely knowledgeable people, the opportunity to engage with and benefit from so many contributions of brilliant minds. The process made me realise, again, how much I still need to learn. This process has given me comfort in this disposition and I have no doubt I will continue on the journey of discovery.

'Not art and science serve, alone; Patience must in the work be shown' (Goethe, 1969, p101). I enjoy running, I run slowly, but consistently. This year I completed my first Comrades Marathon, an 87km quest, in 11 hours and 45 minutes. During the PhD journey, I similarly had to learn to have patience. The patience to mill thoughts and ideas over in my mind and on paper initially came with great personal resistance. However, this process turned into one of personal satisfaction that I came to enjoy very much.

Dream | Create | Inspire. Gaining an in-depth understanding of Design Science was a process that I am very grateful that I undertook. I have experienced great fulfilment in creating something of substance through this method; the result being the Project Conceptualisation Canvas. I found the process of moulding, shaping and refining a concept, using a sound scientific process, into an artefact very rewarding, and one I am sure to repeat many times in future.

'The best way to predict the future is to create it' (Drucker as cited in Hitt, 1988, p149). I am passionate about the topic of project performance and this can be improved. I believe it is essential to focus on a key interest in a study of this nature. So doing reaffirmed my choice in both career and study.

I am grateful to all those who played a part in affording me this opportunity.

8.8 Concluding remarks

The field of Project Management will continue to enable significant changes in all of the fields it is utilised in. As professionals in the field of Project Management, either with an academic or practitioner focus, we have to work towards achieving better outcomes.

The Project Conceptualisation Canvas represents an alternative process to be used in the field of project management to facilitate the process of project conceptualisation.

The use of Design Science in Project Management research will assist by delivering knowledge contributions with appropriate research rigour that also have value to practitioners.

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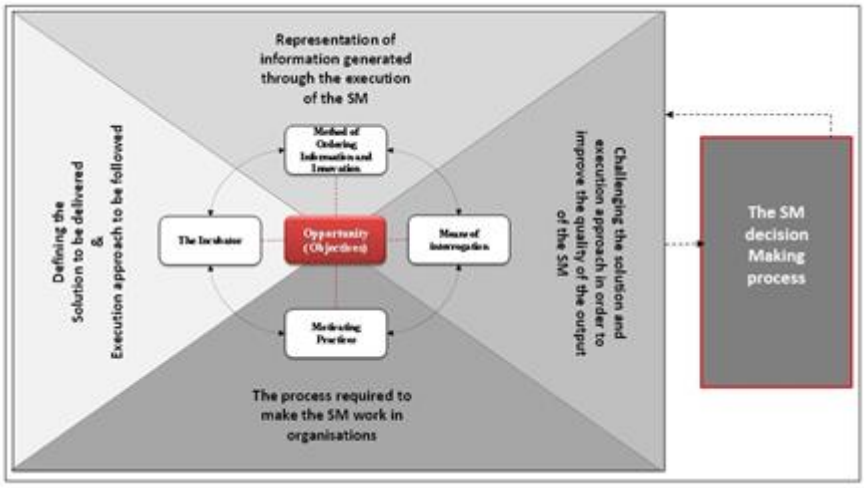
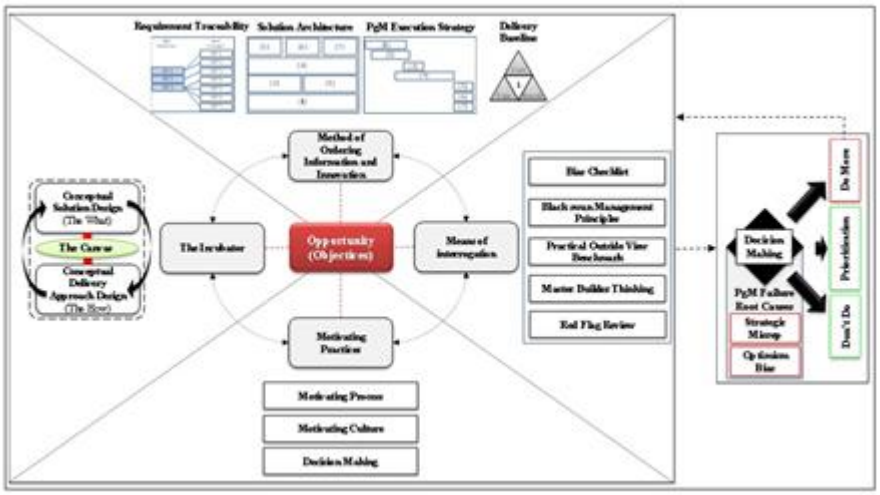
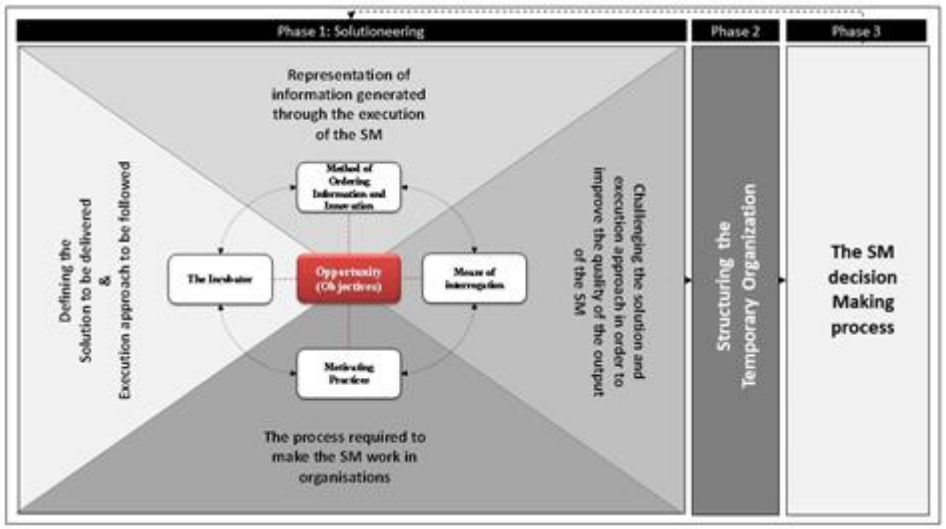
Appendix A: The Evolution of the PCC

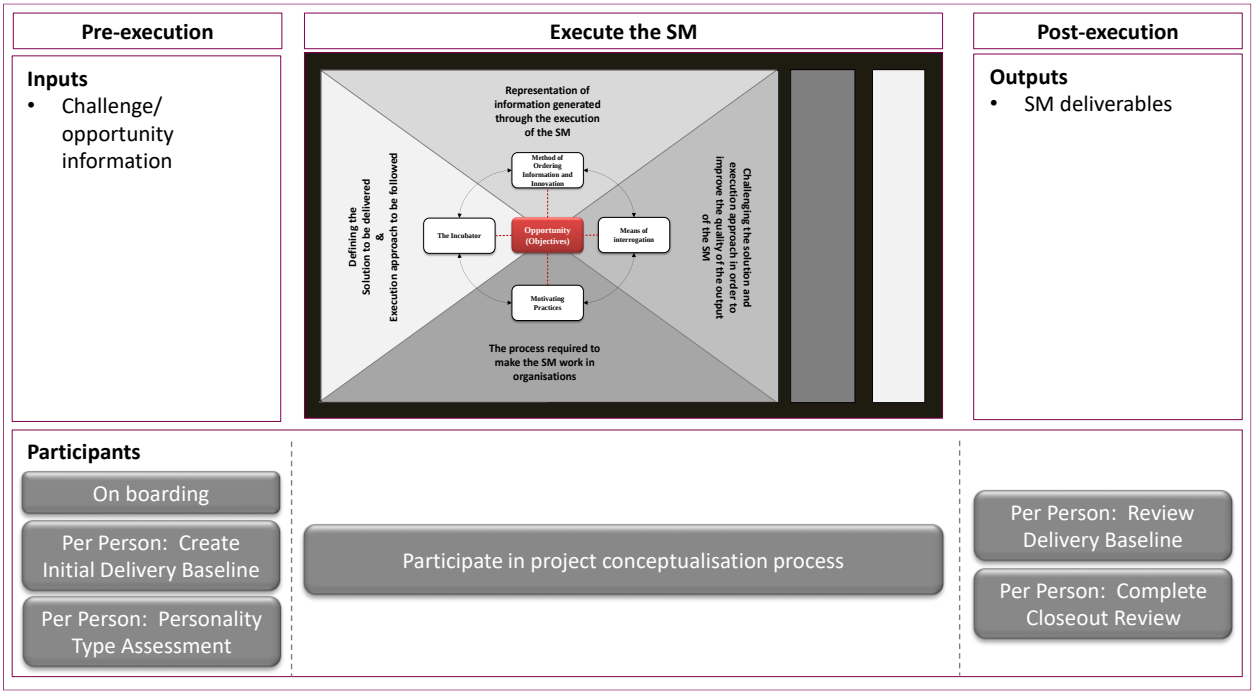
The first version of the Project Conceptualisation Canvas is represented in the first two illustrations below. In the initial version the conceptual MM was transformed into the nucleus of the PCC. Some initial consideration was given to decision making processes and this was incorporated. The general process was still rudimentary.



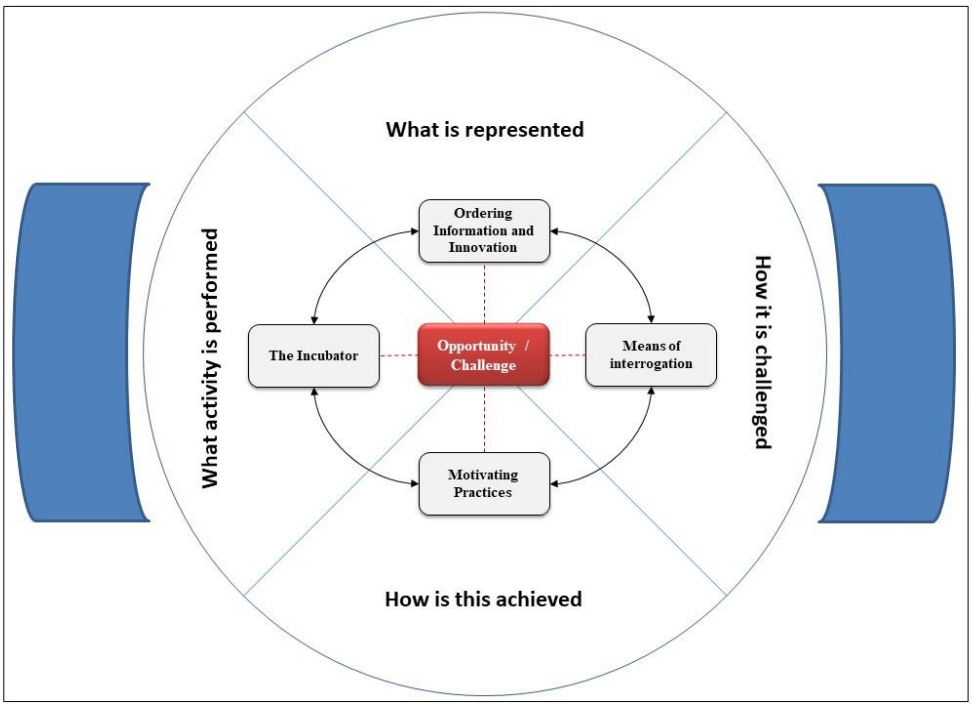


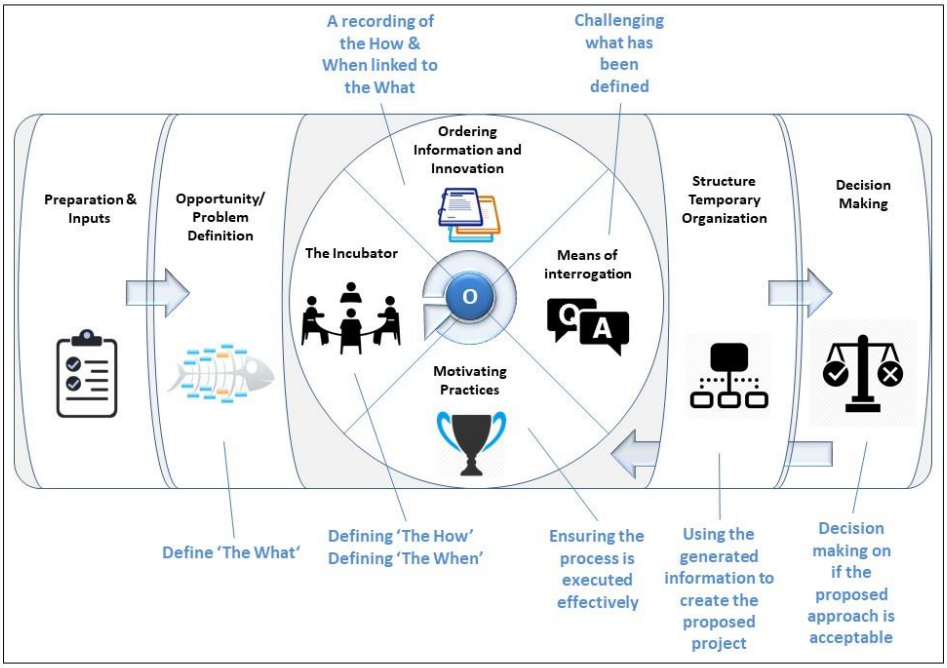
The next two illustrations show the initial enhancements to the PCC. Key enhancements that were incorporated included: processes to perform the initial design of the proposed governance structures, clear focus on preparation activities and post execution activities. Emphasis was also placed on identifying the required roles to participate in every process.



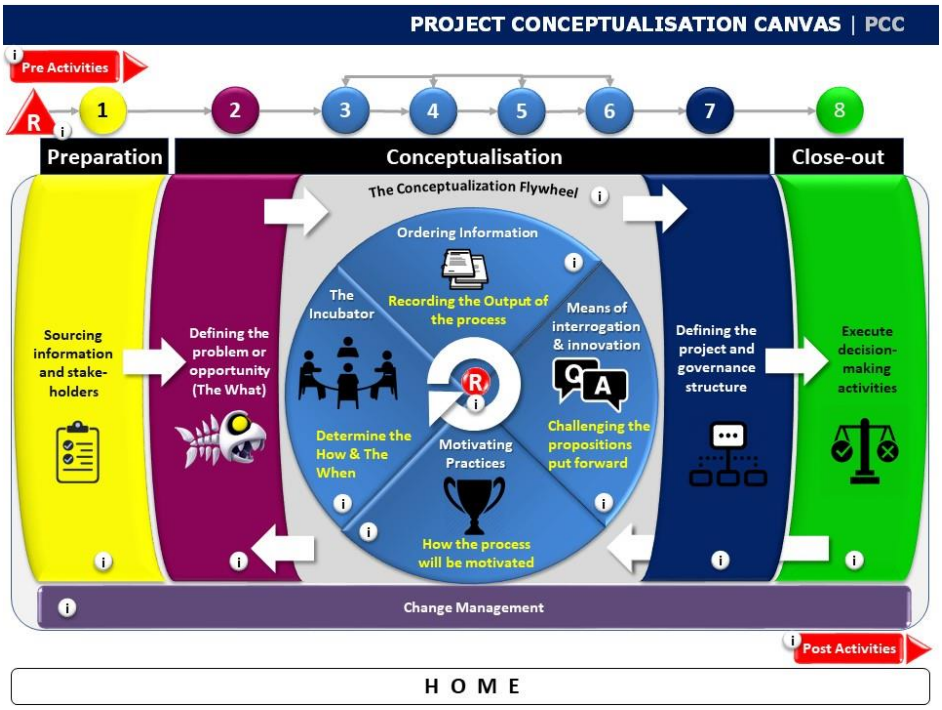


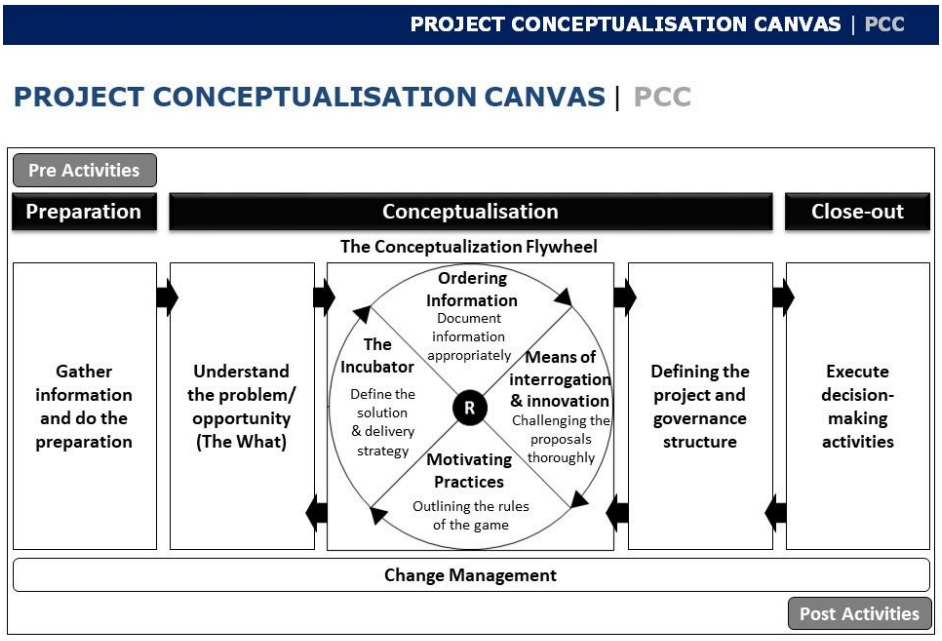
The next two illustrations shows how the shape of the PCC evolved with an improved functional flow of activities and general refinement of the artefact.





The final version of the PCC is shown below in a high colour illustration and a basic illustration.

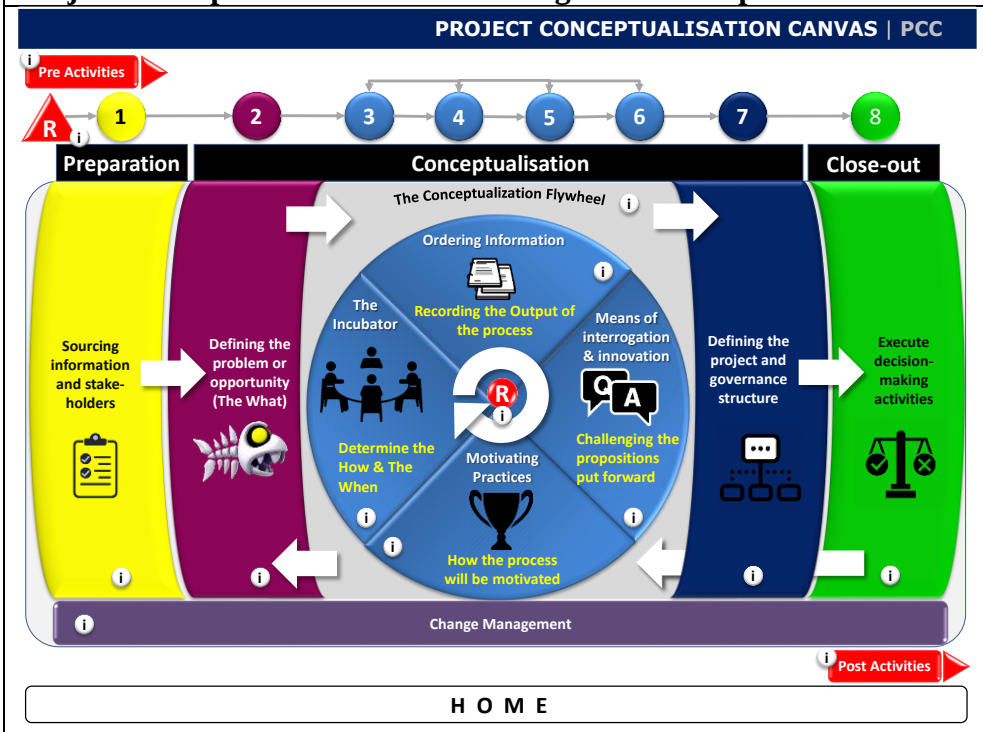


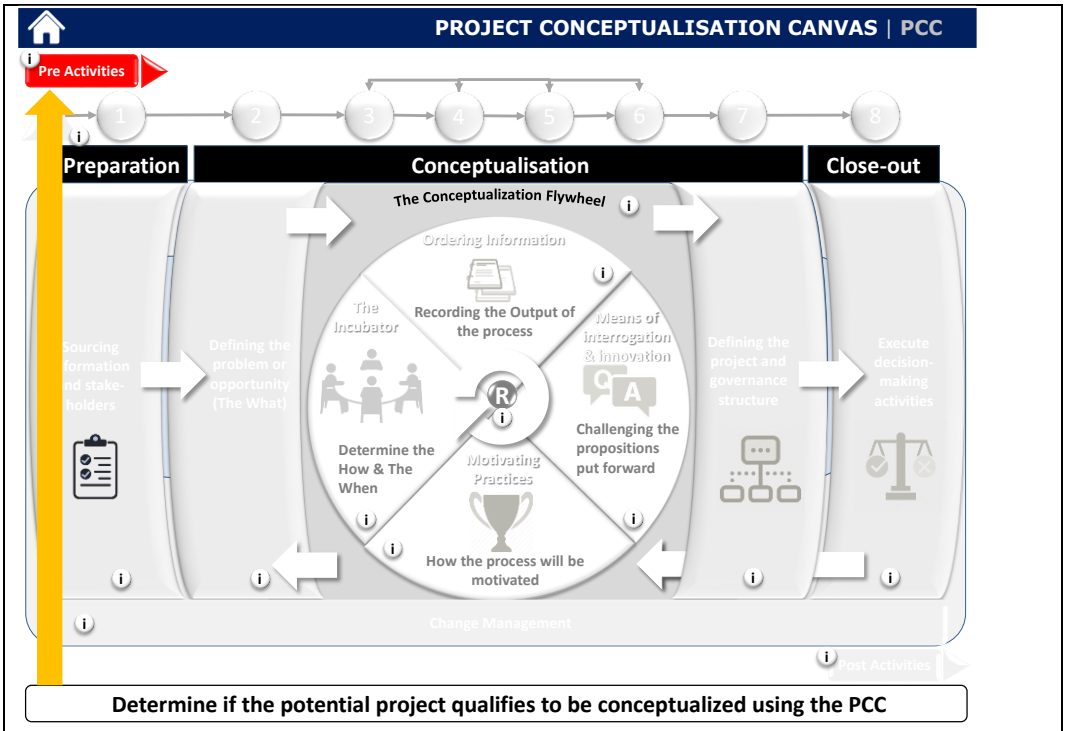


Appendix B: The PCC Navigation Framework

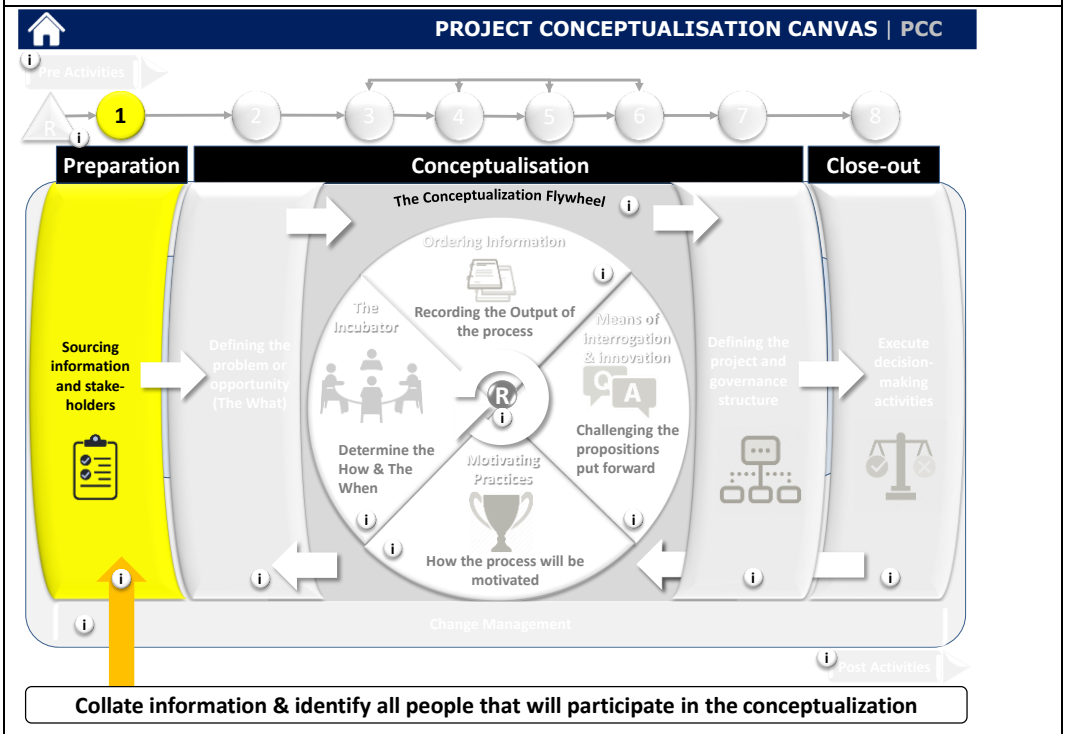
The following navigational framework was create to simplify the navigation of the PCC. The main navigation page have links to all the primary components of the PCC and is therefore easier to go to specific components. Navigation is done either by clicking on the 'i' indicator for each activity or the numbers at the top of the page.

Project Conceptualisation Canvas Navigational Component

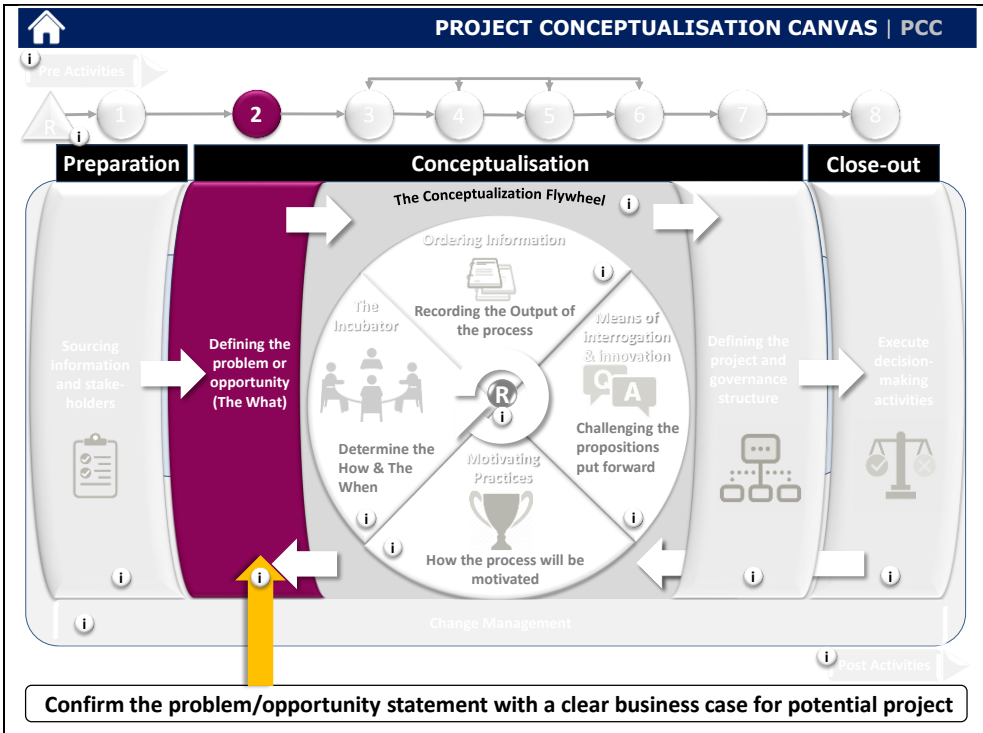


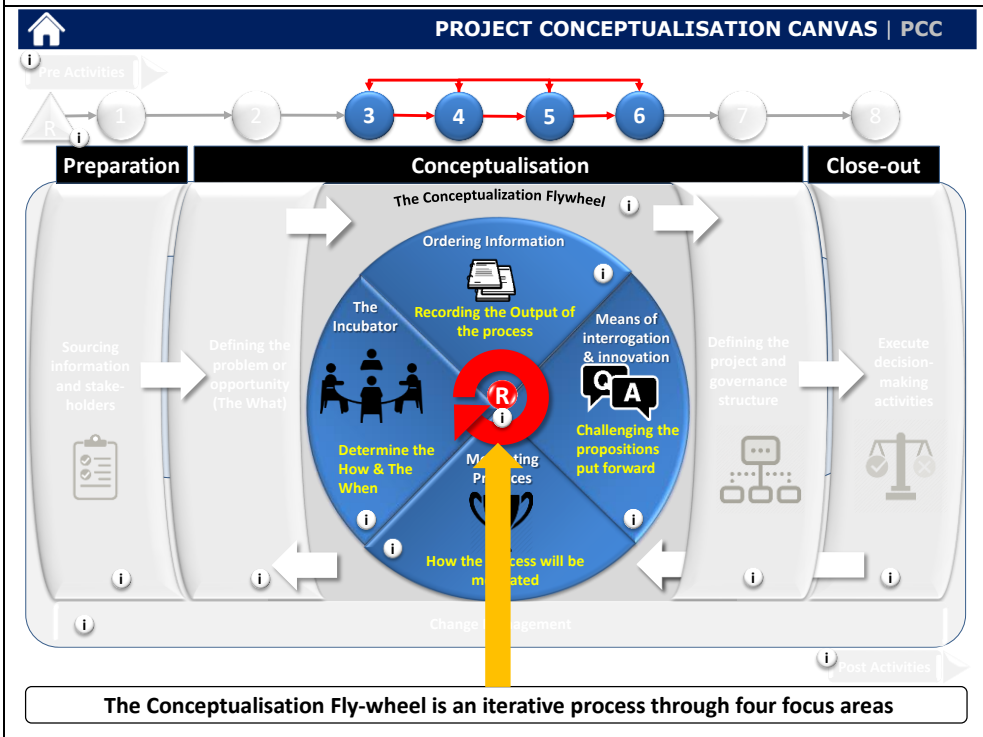


Determine if the potential project qualifies to be conceptualized using the PCC



Collate information & identify all people that will participate in the conceptualization


PROJECT CONCEPTUALISATION CANVAS | PCC
Pre Activities
1
2
3
4
5
6
7
8
Preparation
Conceptualisation
Close-out
The Conceptualization Flywheel
Ordering Information
Recording the Output of the process
Means of interrogation & innovation
Challenging the propositions put forward
How the process will be motivated
Motivating Practices
Determine the How & The When
The Incubator
Sourcing information and stake-holders
Defining the problem or opportunity (The What)
Defining the project and governance structure
Execute decision-making activities
Change Management
Post Activities
Confirm the problem/opportunity statement with a clear business case for potential project


PROJECT CONCEPTUALISATION CANVAS | PCC
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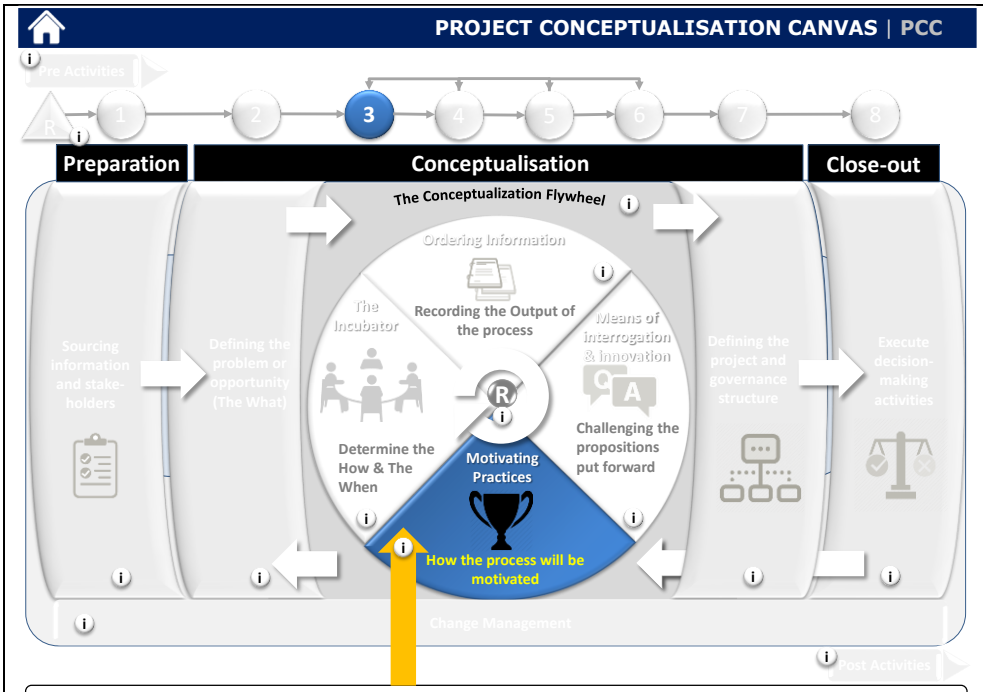
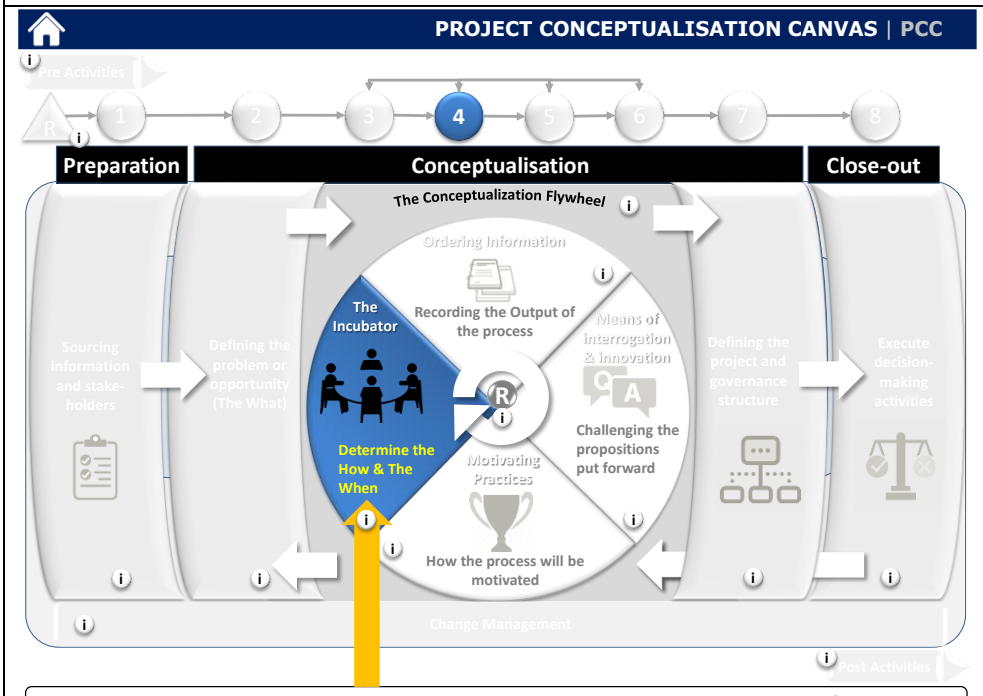
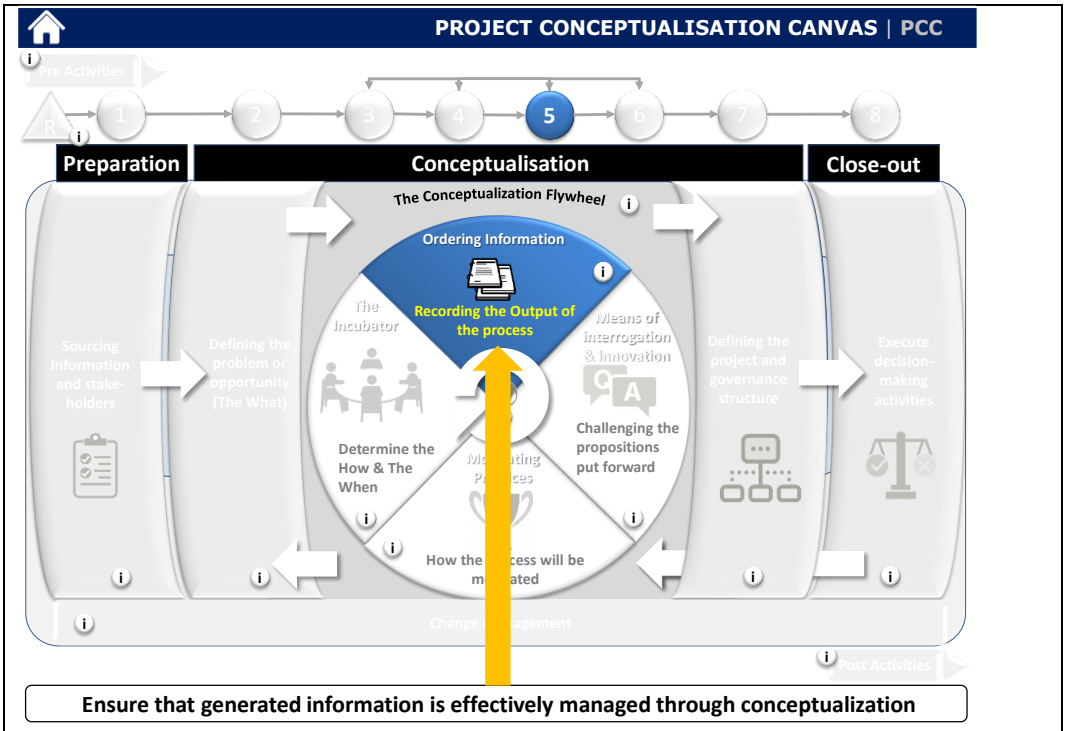
Determine the How & The When
The Incubator
Sourcing information and stake-holders
Defining the problem or opportunity (The What)
Defining the project and governance structure
Execute decision-making activities
Post Activities
The Conceptualisation Fly-wheel is an iterative process through four focus areas



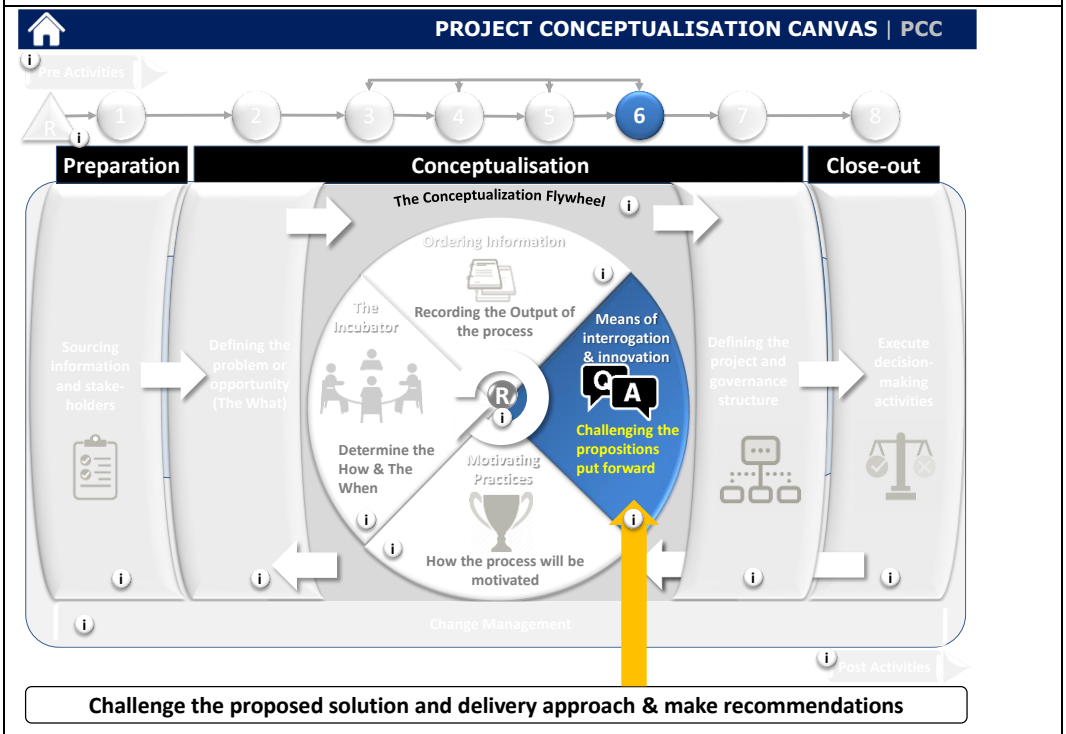
Sets out the approach, plan and governance around the conceptualization activities



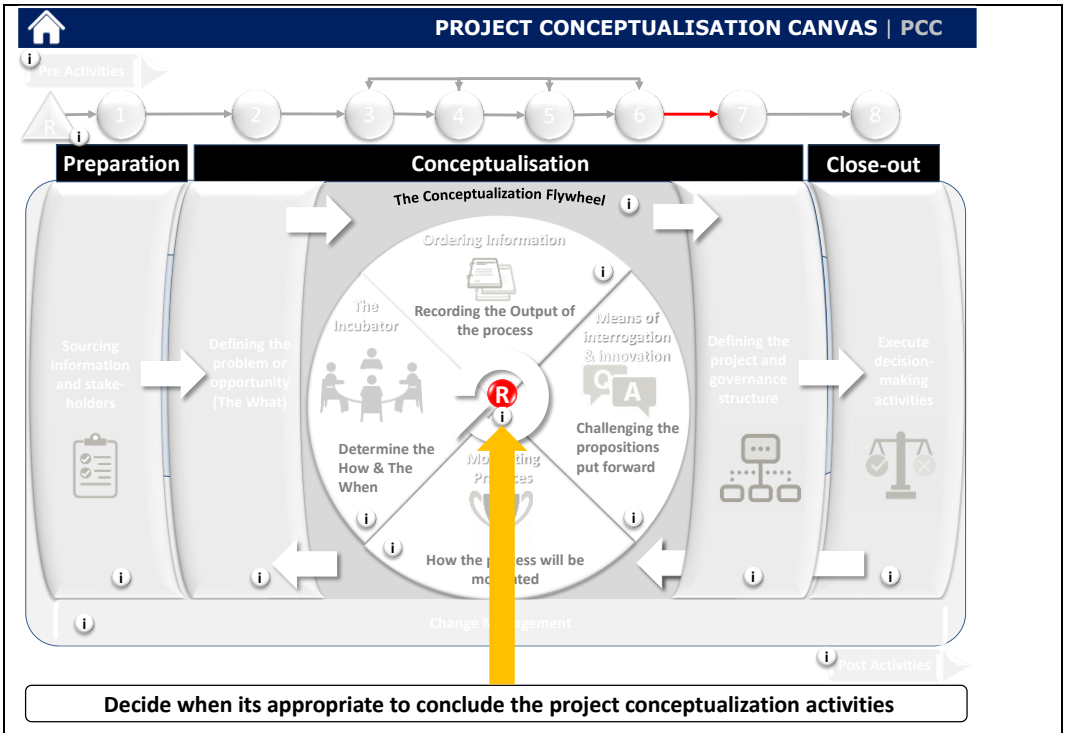
Design the proposed solution and proposed delivery approach for the problem/opportunity

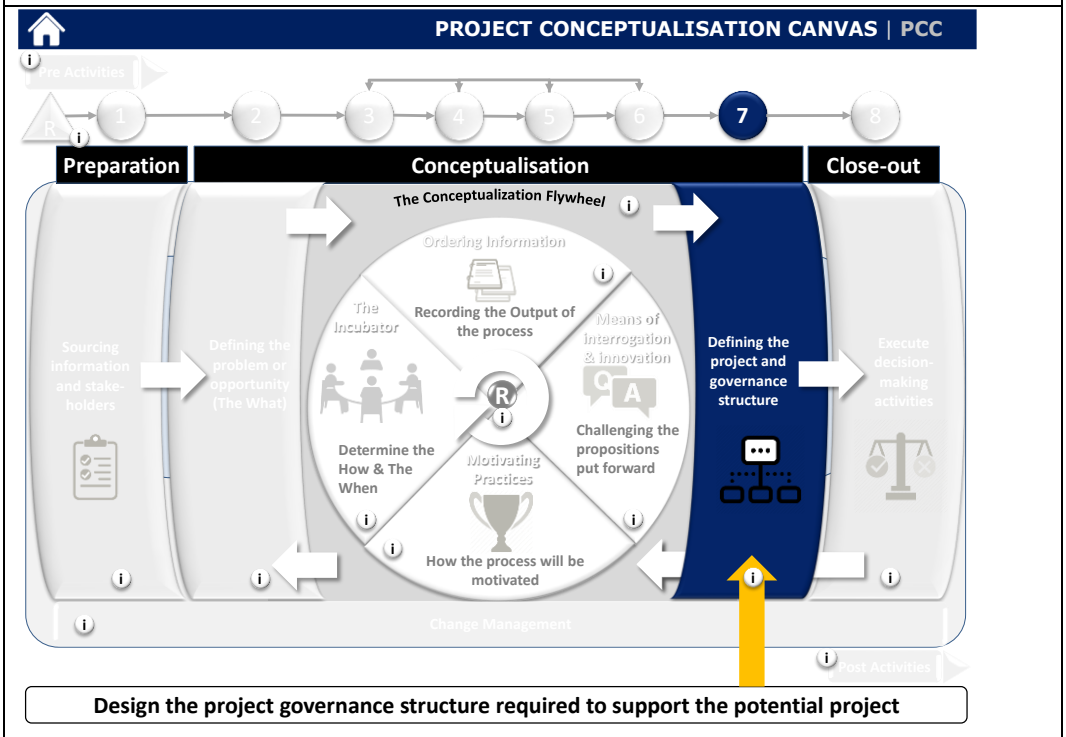


Ensure that generated information is effectively managed through conceptualization



Challenge the proposed solution and delivery approach & make recommendations


PROJECT CONCEPTUALISATION CANVAS | PCC
Preparation
Conceptualisation
Close-out
The Conceptualization Flywheel
Ordering Information
Recording the Output of the process
The Incubator
Means of Interrogation & Innovation
Sourcing information and stake-holders
Defining the problem or opportunity (The What)
Determine the How & The When
Challenging the propositions put forward
Defining the project and governance structure
Execute decision-making activities
How the process will be motivated
Change Management
Post Activities
Decide when its appropriate to conclude the project conceptualization activities


PROJECT CONCEPTUALISATION CANVAS | PCC
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Close-out
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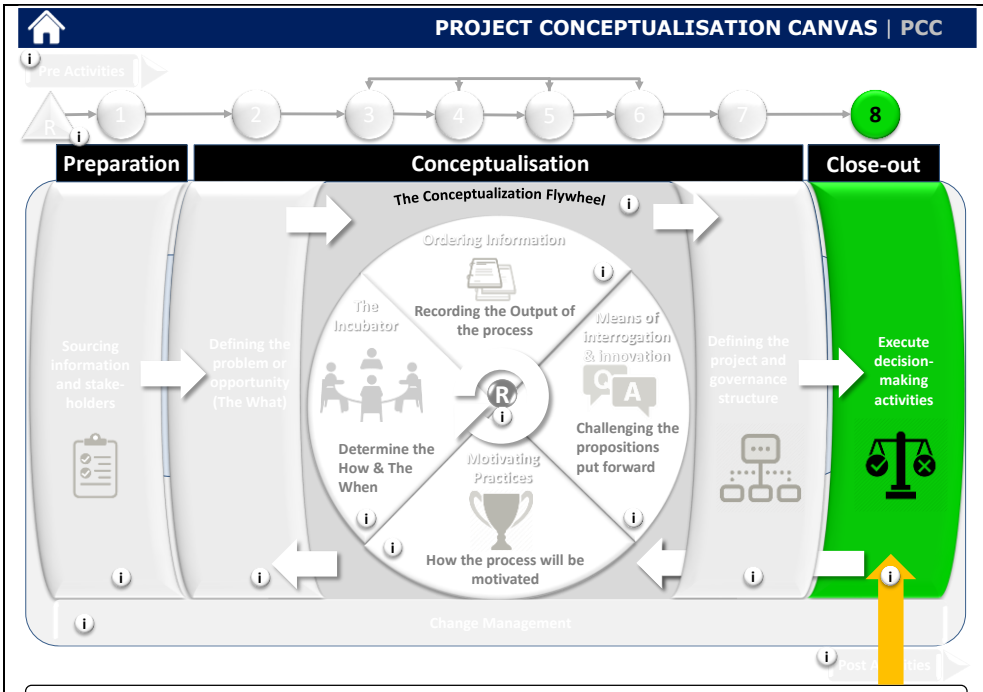
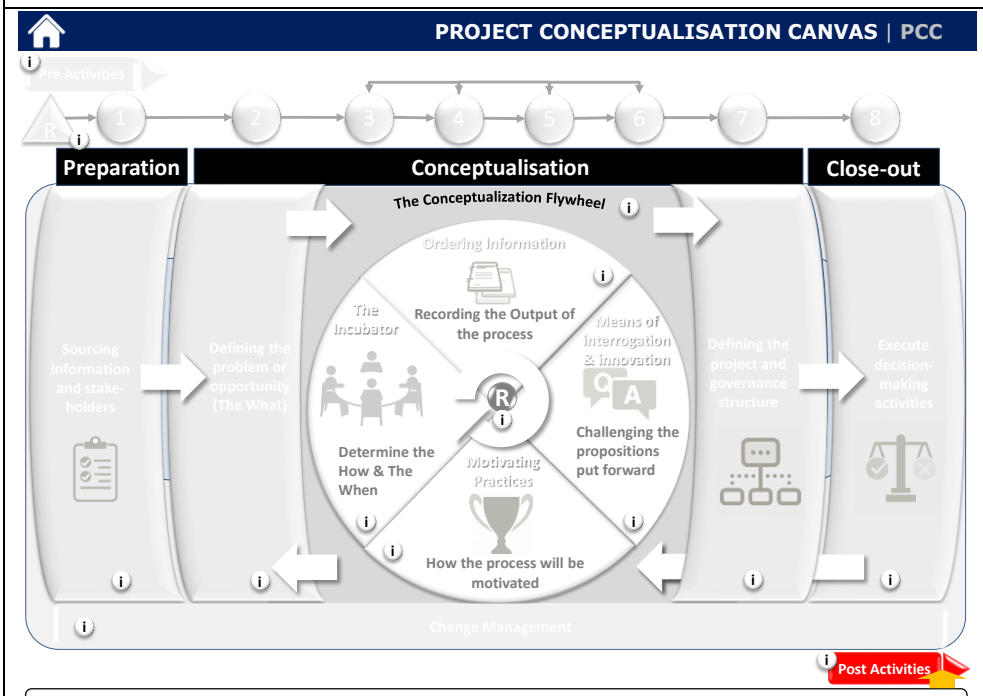
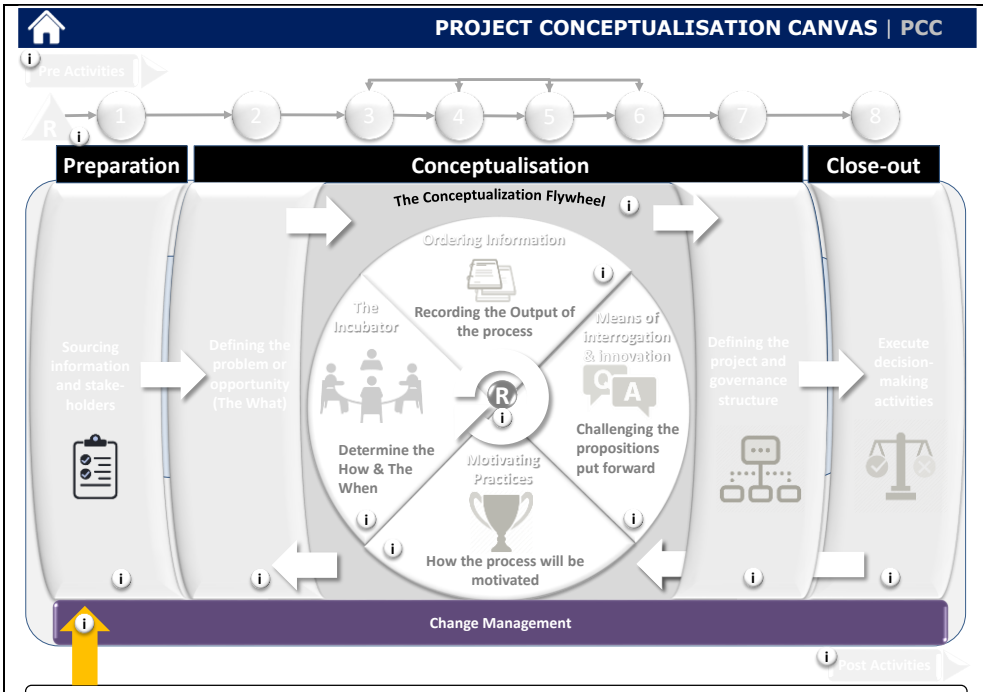
Determine the How & The When
Challenging the propositions put forward
Defining the project and governance structure
Execute decision-making activities
How the process will be motivated
Change Management
Post Activities
Design the project governance structure required to support the potential project



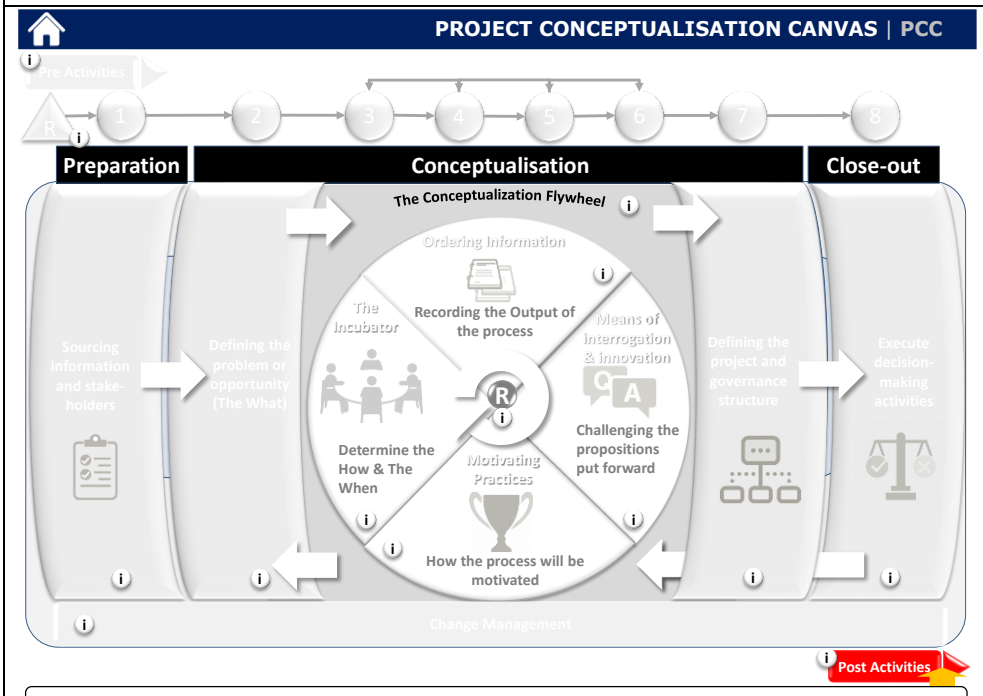
Decide if the potential project should be approved for execution



Establish a clear link between project conceptualization and project execution



Change Management activities before and during the execution of the PCC



Establish a clear link between project conceptualization and project execution

Appendix C: The PCC Deliverable Matrix

The execution of the PCC results into the following deliverables:

Del Count	Del Ref #	Deliverable Name	Primary activity the deliverable relate to
1	1.1	Decision whether to proceed with the PPC and level of detail to execute	Pre-PCC Activities
2	2.1	Stakeholder Analysis	Preparation Phase
3	2.2	Information Inventory	Preparation Phase
4	2.3	Preparation Checklist	Preparation Phase
5	2.4	Initial Requirement Statement	Preparation Phase
6	2.5	Stakeholders On Boarded	Preparation Phase
7	3.1	Conceptualization Requirement	Opportunity/Problem Analysis and Definition
8	3.2	Business Case (Version 1)	Opportunity/Problem Analysis and Definition
9	4.1	Conceptualisation Approach	Motivating Practices
10	5.1	Information generated during the incubation process	The Incubator
11	6.1	Solution Architecture	Ordering Information in the PCC
12	6.2	Project Execution Strategy	Ordering Information in the PCC
13	6.3	Delivery Baseline	Ordering Information in the PCC
14	6.4	Requirements Traceability	Ordering Information in the PCC
15	6.5	Business Case - updated (potentially multiple versions)	Ordering Information in the PCC
16	6.6	Record of responses to review suggestions and challenges	Ordering Information in the PCC
17	7.1	Interrogation and Innovation Review Report	Means of Interrogation and Innovation
18	8.1	Decision to exit or continue project conceptualisation activities	Exit the Conceptualisation Fly-wheel
19	9.1	Proposed Project Governance	Structuring the Temporary Organisation
20	9.2	Initiative Recommendation	Structuring the Temporary Organisation
21	10.1	Formal Decision/Recommendation	Decision Making
22	10.2	Project Execution Evaluation Criteria	Decision Making
23	10.3	Business Case - updated (potentially multiple versions)	Decision Making
24	11.1	Handover to PMO	Post-PCC

Appendix D: Exploratory Focus Group Questioning Route

The following questions were included in the exploratory focus group which were executed in a semi-structured approach.

1. In your opinion, do you think the approach that the PCC establish has the potential to enhance project conceptualisation? (will this lead to better outcomes)
2. What do you think are the strengths of the approach outlined by the PCC?
3. What do you believe are the potential limitations of the approach that is established by the PCC?
4. Do you have any suggested enhancements to the PCC approach based on using published frameworks and concepts, or, from experience?
5. What do you believe are the potential risks associated with this approach as proposed by the PCC?
6. From your experience on project front end management, how do the PCC compare to your experience? (What is similar, unique, unexpected?)
7. Are there any other observations you would like to call out from the discussion?

Appendix E: Confirmatory Focus Group Questionnaire

The following questionnaire was asked to be completed by the participants of the confirmatory focus groups.

#	Assessment Criteria	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	Will this process create a better appreciation for the benefit of conducting the project front-end effectively?					
	Could you please provide notes on why you chose the specific rating?					
2	Will this process enable the collection of relevant knowledge and experience in the pre-project phase?					
	Could you please provide notes on why you chose the specific rating?					
3	Will this process ensure that more adequate time is dedicated to the front-end of the project?					
	Could you please provide notes on why you chose the specific rating?					
4	Will this process ensure an effective use of resources in the project front end?					
	Could you please provide notes on why you chose the specific rating?					
5	Will this process ensure that the problem is well understood and that more than one solution is considered by more than one person?					
	Could you please provide notes on why you chose the specific rating?					
6	Will this process ensure that stakeholders are aligned during the front-end of the project?					
	Could you please provide notes on why you chose the specific rating?					
7	Will this process ensure that a clear link remain between the business strategy and the project being delivered?					
	Could you please provide notes on why you chose the specific rating?					
8	Will this process ensure that external perspectives on an appropriate delivery baseline is incorporated into the evaluation of the proposed delivery baseline?					
	Could you please provide notes on why you chose the specific rating?					

Appendix F: The ten significant enhancements and the key callouts that relate to them

The following suggestions and questions were recorded during the exploratory focus groups that led to the key enhancements of the PCC:

#	PCC Enhancement Grouping	#	Summary Suggestion for PCC
1	Highlighting the required pre and post activities of the PCC	1.1	Establish a clear link to project execution from the conceptualisation process to ensure that there is appropriate linkage between the two.
		1.2	Identify delivery progress review points in the project to reflect against what was agreed in the initial conceptualisation process. This to ensure that the project conceptualisation activities are adhered to in the project.
		1.3	When we have more certainty during project execution do we return and validate what was done in the front end management process?
		1,4	What are the specific requirements that must be in place to enable the initiation of the PCC process?
		1.5	How will the PCC ensure that amnesia is stopped from occurring after the project has been initiated?
		1.6	A clear link must be established between decisions that have been made during conceptualisation and activities during project execution.
		1.7	Consider how metrics change over time in the project, for example perceived benefit vs. real benefit, this must be considered to ensure that the conceptualisation basis is maintained.
		1.8	What are the metrics that will link project conceptualisation to project execution?
		1.9	Will the size of the project impact the conceptualisation process? Are there specific considerations in this regard?
		1.10	The formal review points in the project must be a separate indicator in the diagram. This must challenge the project execution activities.
2	General enhancements to the PCC	2.1	Be clearer on how biases will be addressed in the process.

		2.2	I recommend that a 'Conceptual Thinker' role is added as this is a specific capability that not all participants will have.
		2.3	Be clear on when to exit out of the conceptualisation flywheel process.
		2.4	Be clear about which roles are required for the different phases on the model.
		2.5	At the outset it must be decided who the decision makers will be and how they will be involved in the process.
		2.6	It must be clear how to engage external consultants or specialists that may be required for a specific project conceptualisation process.
		2.7	How to get people to understand that the reality of project failures rates and hence the importance of the project conceptualisation process. How will this be incorporated into the change management process?
		2.8	Need to involve legal & compliance representatives as required to ensure that these aspects are considered.
		2.9	How will people be motivated during this process as it is typically a challenging task?
3	Establish the PCC application continuum	3.1	Indicate when it will be useful to use this approach, for example not overinvestment into small projects. also, light vs extended implementation.
		3.2	Some kind of time indication should be provided to guide people.
		3.3	Considerations around an agile canvas vs. a detailed canvas.
		3.3	What level of detailed is required in this process? An indication of level of detail and the investment being made must be provided, a sliding scale approach with trade-offs could assist in this.
		3.5	What resource investment is required to execute this process?
		3.6	Our organisation execute projects that are small and large, where will this be applicable?
		3.7	Will this not be overkill for small projects?
		3.8	What is required in the organisation to adopt this? What is the go in position in investments required?

4	Indicate how change management activities will support the PCC	4.1	I suggest you link the change management story to the business case that has been established for the project being conceptualised.
		4.2	Provide more context of where in the organisation this may fit in, the context of use and users required to support this process.
		4.3	How will this process keep the decision makers in the loop throughout the process and not just at the end?
		4.4	How will participants be educated on the model?
		4.5	The decision makers must be on-boarded and it must be ensured that it is understood.
		4.6	What would the change management look like in the organisation that will adopt this approach?
		4.7	This process should also provide information into the change management process of the project when it's being executed.
5	Enhance the Business Case to support the PCC activities	5.1	Identify the benefit (outcome) owners at the outset of the process and ensure that they are involved in the process. Links should also be established to scorecards.
		5.2	What happens when there the work that is performed during project conceptualisation challenge the Business Case that have been compiled BC?
		5.3	Should the Business Case be shown in the context of the portfolio?
		5.4	Indicate how to link solution components to benefits that are targeted through the potential project.
		5.5	Emphasise benefits tracking!
		5.6	What is the case for change for the adoption of this process?
6	The PCC elevator pitch was established	6.1	A clear summary of the approach will assist in understanding the model.
		6.2	If I think about Red Bull I am clear about where the focus is, this model would also benefit from that focused perspective.
		6.3	The individual components are powerful, the summarised whole will be a game changer, this must be clearly understood.

		6.4	Is the focus of this before or during project execution?
7	The finalisation of the PCC success criteria	7.1	Educate people on conceptualisation, many may not understand the focus of this.
		7.2	What does success look like of the model?
		7.3	Are you clear on what the expected output of the end to end process is?
8	Highlight how the PCC can be incorporated into project execution methodologies	8.1	Where does this process fit into other methodologies?
		8.2	How can this be incorporated into the PMBOK or Prince2?
		8.3	Is this process 'in competition' with other mainstream methodologies?
9	More appropriate naming of the artefact	9.1	Solution engineering may put the emphasis only on the solution and not the rest of the process.
		9.2	I don't think the name of the process is descriptive enough.
		9.3	Consider calling the process what it is.
10	Clear link established between the PCC and the business strategy	10.1	I recommend that more emphasis is placed on the link between project conceptualisation and business strategy.
		10.2	Decision making in this process should also be guided by the business strategy.