Analysis and Design as Bricolage

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Abstract

Information Systems in generally acknowledged to be a complex field and many studies over time have quoted significant failure statistics. This paper seeks to answer the question – How to more appropriately evaluate and select information systems design (ISD) methods that better enable successful design outcomes. The research covers literature relating analysis and design, information systems design methods, complexity, ontology and conceptual modelling and how they relate to ISD. This research was conducted within a larger national research project aiming to improve organising practices within IT in organisations. To this end the research followed a participatory action research approach underpinned by systems thinking theoretical perspective. What emerged out of this study was the appreciation for the bricolage that takes during an analysis or design effort – this perspective highlighted the following factors that can enable improved method evaluation and selection, namely: Epistemology, Contextual Influences and Social Action. These factors are shown to operate in dialectic process that if engaged with can provide insight into what an appropriate method can be.

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1. Introduction

1.1. Overview

When conducting Information System (IS) design one needs to take care because the design outcome will be enacted in the real world and will lead to certain consequences. Due to this the designer or analyst needs to be aware of the purpose being pursued through this design process, the assumptions they are making with regard to the world and the way that they see their work acting out in reality. In this paper we will refer to the assumptions made or predispositions of the designer as their ontology and the way they see their work acting out in the world as their epistemology.

Business design in general demands more care as to epistemological presuppositions of the design context, theory and method (Recker & Niehaves, 2008). Thus there is a need to stress the guideline that business designers need to thoroughly unearth and understand their epistemological stance clearly during the design process, not only during the creation of design artifacts but also during the evaluation of those. In essence designers need to take care regarding their ontology and epistemology when engaging in the design process (Love, 2000).

Business designers should tactfully review and select the available tools and methods both for artifact development and validation so as to ensure that the selected tools and methods are ontologically and epistemologically aligned to the situation at hand (Recker & Niehaves, 2008). Historically, traditional analysis and design methods have placed focus on geometric models and worlds created by systems methodologies which tend to

diminish the pivotal role of everyday life of people, users, analysts, designers and managers and the ambiguity that typifies work in this field (Ciborra, 1998). A consequence of this is that analysts/designers perceive organizations from this limited point of view and from this disposition, subsequently create solutions/systems that are supposed to support organizations, ultimately lowering the value of the design outcomes (Ciborra, 1998).

As the main research question, this paper seeks to understand how to more appropriately select tools and methods whilst engaged in the analysis and design process that is aligned to the purpose being pursued by the designer. In order to answer the main research question, it is important to understand how the ever-present contextual influences affect business design outcomes, hence, this research first sought to answer the call made by Recker & Niehaves (2008) to understand how social action based on modelling is enabled, how epistemological dispositions affect the act of modelling and how contextual influences shape conceptual modelling outcomes.

This research utilized an action research approach within a case study highlighting the experience of a team of business designers engaged in analyzing and modelling the context of the IT operations of a financial services company in the pursuit of designing contextually relevant practices to increase their competitive advantage. This research was conducted within a larger national research project.

The aim of this overarching research project was to create more contextually relevant IT practices, which also followed an action research process. To achieve the outcomes of the project the research team was tasked with firstly

analysing and modelling the current practices within the research sites whilst also uncovering the reasons for the existence of these practices within the respective organizations. The second part of this project was to then use the insights gained with respect to how these companies organized there IT practices to inform more relevant IT organizing practices. Thus the research team of the fore mentioned project would be entering multiple organizations with the intention of analysing and understanding the IT organizing practices at play. It is within this research team that the research undertaken within this thesis will take place.

At the outsight of the project, the team had already expressed a sense of discomfort with using "traditional business analysis techniques" to reach the outcomes of the project, however, they also felt that the project would be a learning experience and that changes would be needed along the way in terms of their approach in order to satisfactorily deliver on the research outcomes. Essentially there was an understanding from the start that they would have to experiment with different methods in order to find a way that would work within the organizations they planned to investigate. Although what was clear from the outset was that systems thinking cut across all the work that was to be done, as this was seen to be central to the success of the project. As such, the research had to take into account the dynamism of the project it was embedded in.

1.2. Situation of concern

IS is generally acknowledged to be an intellectually complex field requiring expertise in the software and systems discipline which is an ever changing environment in addition to requiring expertise in the application domain in the real world application of IS (Benbya & McKelvey, 2006). However,

research has shown that traditional design methods have failed to address the complexity inherent in the application of IS within organizations (Benbya & McKelvey, 2006). Traditional design of IS has been noted to have certain limitations, namely: it describes analysis and design of relatively well defined technical goals, but says little relating to ill defined and unbounded problems; the tools and methods presume individuals are independent, rational problem solvers, whereas in reality IS design tends to involve collaboration enacted in a socio-political context that is far from rational; this practice rests on the notion that objective goals and solution requirements are defined early in the design process, however, empirical research tell us that IS design requirements and the goals thereof change like the weather, and that these goals are political, subjective, and negotiable (Benbya & McKelvey, 2006). The outcomes of such a process represents static solutions that have to endure in dynamic organizational environments (Benbya & McKelvey, 2006).

The IS discipline which at its core is based on methodologies, which are permeated with a Galilean and by default a Cartesian paradigm, tends to disregard the pivotal role of everyday life of people, users, analysts, designers and managers and the ambiguity that typifies work in this field (Ciborra, 1998). This is done whilst favouring the geometric models and worlds created by systems methodologies. By doing so human existence is neglected (Ciborra, 1998), an aspect which is fundamental to solving problems as people form one of the main components of information. The utilisation of such methods has created a certain ontological and epistemological stance towards design, one that lowers the role of everyday life in designing of solutions. A popular definition of information is that information is data enriched with the interpretation of a user (Ciborra, 1998).

Based on this definition of information, the IS discipline could be said to be characterised by this composite or hybrid nature. However despite this, hybrid and often ambiguous, nature of IS a standard approach has been adopted across the board to study and intervene in its human and natural aspects, as stated earlier (Ciborra, 1998). This natural science approach has subsequently left us with methodologies that focus on formalisation, measurement and calculation. We now sit with a situation wherein practitioners (analysts, consultant, designers and managers) are equipped with methods and tools that, by their nature, lead to social systems like organisations being viewed as an object or in our case as a technology. This is because the means of representation and thus the means of enquiry are the same methods and tools used to depict information flowing in machines (Ciborra, 1998).

The major developments that have historically come about in IS and form part of everyday life today, despite IS itself, can be seen to have brought about and sustained the apparent success of IS (Ciborra, 1998). It is worth noting however that these breakthroughs that are now an everyday occurrence came about due to the appreciation of the strategic importance of everyday life, improvisation, bricolage, and "make do" instead of some ideal method (Ciborra, 1998).

There is much evidence that bricolage/improvisation and its associated pragmatism provides a useful conceptual model to deal with the inherent complexities of design and organisations. Louridas (1999) analogises design to bricolage by reviewing the work of Claude Levi-Strauss and defining brioclage as "… creating structure out of events" and that this is the essence of design. Design is the on going interaction between events the way in

which the designer handles them and success is determined by how well, or not, contingent events are handled (Louridas, 1999). The depiction of design as bricolage means that design is a unique human endeavor and as such it impacts on the human condition in general (Louridas, 1999). The designer/bricoleur needs to be creative, create a portfolio of tools and methods to address problems and is required to create or determine the purpose of what is to be designed Louridas,1999).

1.3. Summary

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This research utilized an action research approach within a case study highlighting the experience of a team of business designers engaged in analysing and modelling the context of the IT operations of a financial services company in the pursuit of designing contextually relevant practices. Thus the research team of the fore mentioned project would be entering multiple organizations with the intention of analysing and understanding the IT organizing practices at play. It is within this research team that the research undertaken within this thesis will take place. Within this team there was an understanding from the start that they would have to experiment with different methods in order to find a way that would work within the organizations they planned to investigate. Although what was clear from the outset was that systems thinking cut across all the work that was to be done, as this was seen to be central to the success of the project. As such, the research had to take into account the dynamism of the project it was embedded in.

As the main research question, this paper seeks to understand how to more appropriately select tools and methods whilst engaged in the analysis and design process that is aligned to the purpose being pursued by the designer. To this end our research seeks to provide a narrative for the experience of an analysis and design team, outlining the importance of business design, the importance of analysis within the design process and the central role played by modelling within the IS discipline. Further, it provides an understanding of the current approach to conceptual modelling and its consequences and seeks to provide an understanding of ontology and epistemology and the importance of these concepts within conceptual modelling. It seeks to provide insights on how ontological and epistemological disposition influences the selection tools and methods for conceptual models and how this ultimately affects the perception on the design outcomes. The following chapters of this paper: Outlines the relevant literature that informed this research; Provides the Theoretical Perspective and methodology of the research; Describes the case in which the research was embedded; Captures the empirical findings of this research process; Provides a theoretical discussion of the findings and the conclusion of the paper.

2. Review of Relevant Literature

2.1. Introduction

The subject of analysis and design has had considerable attention in the IS literature. While there are a wide range of literature in the area the literature relevant to this thesis fall within the following categories: Analysis and Design; Information systems design methods; Complexity; Philosophy in information systems; and Conceptual Modelling. In the following I will first elaborate on the significance of analysis and design within the IS. Thereafter we describe a crisis within information systems, how it came about and what sustains it. This is followed by perspectives on complexity what it constitutes and how it can be handled. We also briefly look at philosophy, specifically ontology as it relates to information systems ad the role it plays in overcoming certain problems. Lastly we outline conceptual modelling and the central role it plays in enabling the analysis and design of information systems.

2.2. Analysis and Design

A thorough systemic understanding of an organisation is the foundation upon which the design of an improved organisation can occur (Swanson, 2009). Attempts at improving organisational performance have been demonstrated in various ways such as training and development, re-engineering and quality improvement, to name a few. The design of or improvement of an organisation, irrespective of the approach taken, generally consists of the following phases: Analysis, Design, Development, Implementation and Evaluation. Although there are a myriad of approaches available through which to undertake an organisational improvement initiative, a common language has evolved (Hirschheim and Klein, 1989 and

Swanson, 2009). They all claim to consider the first phase, being analysis, to be very important however when practically carried that does not seem to be the case (Swanson, 2009).

One approach in which to go about improving performance is to consider the inputs, outputs and their relation to the core processes of the organisation in order to realise value (Swanson, 2009). However another approach to go about an improvement initiative and one that appears to be most popular is to engage in a series of individual activities detached from the core processes as well as from the inputs and outputs of the organisation (Swanson, 2009). The manner in which the analysis phase of an improvement exercise is performed can be seen to determine whether the improvement forms part of a series of activities or actually supports the organisations core processes. Considering the above perspectives, in the first approach, analysis can be seen as a thorough investigation, while in the other to be a simple routine procedure.

The independent-activity approach of most organisational improvement exercises is based on what is most sought after in the market or based on compliance considerations instead of placing the focus on actual improvement (Swanson, 2009). In this case significantly less emphasis is placed on reaching the overall goal of improvement but rather on the overall delivery of a project or program (Swanson, 2009). This approach can be seen to require much less in terms of an analysis and relies more so on popularity ratings of possible solutions and simple job descriptions to form a snapshot of an organisation. If to effectively improve an organisation a thorough understanding of it were required, analysis would be the most important aspect of such an endeavour, which would require a thorough investigation

into the organisation, its processes and its people (Swanson, 2009).

Many methods exist through which to undertake a design exercise within organisation, however they are flawed in their consideration towards people especially within the traditional analysis methodologies (Ciborra, 1998).

2.3. A Crisis in Information Systems Design Methods.

Within the Information Systems Discipline (IS) a crisis occurred and is still being experienced today (Ciborra, 1998). The meaning of the Greek word "krisis" is to separate (Ciborra, 1998). However within IS there are two separations at work that have brought about this crisis (Ciborra, 1998). What this means is that there was an original separation of one thing from another that took place and then the subsequent moving away from or "forgetting" of the original separation.

In the case of IS the original separation is the separation of everyday life from scientific objectivity. The removal of people from the management of organisations and technology and focussing on an approach based on scientific objectivity. Followed by a forgetting of this original separation and continuing the development of the IS field founded on this paradigm. It is only by forgetting this crisis that IS can exist with its apparent success in a business as usual fashion (Ciborra, 1998). Essentially IS has forgotten the subjective origin of science, they have forgotten the role of everyday life in the creation or development of a methodology (Ciborra, 1998). The objective stance of the natural science paradigm attempts to describe nature as it is regardless of the subject and the same can be said for the methodologies put forward by IS (Ciborra, 1998). This objectivity inherently determines the manner in which we proceed to understand (Ciborra, 1998). Thus the

methodology establishes the way in which the world is experienced, as an object. The human science aspects of IS also attempts to adopt or extend and is some cases completely copy a natural science stance, however coming across deviations in doing so (Ciborra, 1998).

The IS discipline which at its core is based on methodologies, which are permeated with a Galilean and by default a Cartesian paradigm, tends to disregard the pivotal role of everyday life of people, users, analysts, designers and managers and the ambiguity that typifies work in this field (Ciborra, 1998). This is done whilst favouring the geometric models and worlds created by systems methodologies. By doing so human existence is neglected (Ciborra, 1998), an aspect which is fundamental to solving problems as people form one of the main components of information. The utilisation of such methods has created a certain ontological and epistemological stance towards design, one that lowers the role of everyday life in designing solutions. A popular definition of information is that information is data enriched with the interpretation of a user (Ciborra, 1998). Based on this definition of information the IS discipline could be said to be characterised by this composite or hybrid nature. However despite this hybrid and often-ambiguous nature of IS a standard approach has been adopted across the board to study and intervene in its human and natural aspects, as stated earlier (Ciborra, 1998). This natural science approach has subsequently left us with methodologies that focus on formalisation, measurement and calculation.

We now sit with a situation where in practitioners (analysts, consultant, designers and managers) are equipped with methods and tools that, by their nature, lead to social systems like organisations being viewed as an object or

in our case as a technology. This is because the means of representation and thus the means of enquiry are the same methods and tools used to depict information flowing in machines (Ciborra, 1998). It is then no surprise that human existence is ignored during this process. Thus analysts perceive organisations from this blinded point of view and subsequently further down the line systems to support organisations are built from this blinded point of view.

IS is a field of study that has been trying to catch up the real world wherein IS is practically used and forms a part of everyday life in organisations. This can be seen to be true considering the following examples from Ciborra (1998) that serve to contrast the everyday life of people and organisations with what has been espoused by IS.

Firstly, the strategic application of information technology within organisations occurred before any IS journal articles or textbooks wrote about them. This strategic use was born out of the needs of organisation, their everyday life. Organisations at the time were playing with the idea "Tinkering" of linking customers and suppliers via electronic networks and developing strategic application whilst at the same time IS textbooks conceived strategic to be the use AI based application that can support decision making at the top tiers of organisations, application which did not see the light of day. However in the real world of organisations simple ideas like order entry systems became high in demand for practical applications in everyday life.

Secondly, the Internet can be considered to be a phenomenon that sparked new interest in the field of IS. However the Internet emerged as a concept, as a technology and as a set of applications entirely independent of the IS field.

Numerous features of the Internet actually contradicted what was found in the typical IS text books at the time. Whilst the Internet is concerned with horizontal networking IS textbooks conceived the organisation as a closed network. Moreover the Internet has allowed us to share knowledge in way that IS textbooks had never imagined as well overwhelming all the standards set OSI/ISO committees.

Lastly, consider the systems analysis and design methodologies – which is the focus of this thesis. Most of the teaching in IS is centred around or concerned with methodologies of some kind. The essence of the identity of IS revolves around methodologies or the very notion of a method. This seems absurd considering the empirical evidence that has been put forward in recent years regarding the high rates of failure within IS implementations where the methodologies were unable to save failing projects. Despite the evidence of failing methodologies IS still puts much into disseminating these methodologies.

The major developments previously mentioned that have come about in IS and form part of everyday life today, despite IS itself, can be seen to have brought about and sustained the apparent success of IS (Ciborra, 1998). It is worth noting however that these breakthroughs that are now an everyday occurrence came about due to the appreciation of the strategic importance of everyday life, improvisation, bricolage, and make do instead of some ideal method (Ciborra, 1998). However the concern and fixation of IS towards methods is so deep-rooted that it blinds the field to the convincing empirical evidence that can be found in everyday experiences of IS academics and practitioners (Ciborra, 1998). Furthermore, this methodological preoccupation in IS is at play even when questioning the effectiveness of

methods (Ciborra, 1998). Considering the contrasting examples, the fore mentioned paradigms that underpin the IS field, and the preoccupation with methods it is not difficult to admit that there is a crisis that has been brewing and still persists within the IS domain. The preoccupation of IS towards methods can be seen to be a key feature of IS and is most likely the cause of the crisis (Ciborra, 1998).

We previously mentioned the important contribution of everyday life to the solutions that are designed and an appreciation of the role of this complex aspect in the design process. It may be worth exploring the concept of complexity to enrich our understanding of design.

2.4. What is Complexity?

Complexity is a qualitative concept, though several attempts have been made by various researchers to provide a relatively useful definition (Buckland, 2002). According to Langefors (1995, p.70), "Complexity is the property of being a thing that can only be perceived piecewise," and "A thing is complex when it surpasses human cognitive limitations" (Langefors, 1995, p.87). Ashby (1973, p.1) regards "a system's complexity as purely relative to a given observer" and as "something in the eye of the beholder" (Buckland, 2002). A more helpful definition of complexity within the context of design would be that complexity is something seen by someone, the complexity of the thing being seen is a measure of the effort, or the perceived effort, that is needed to comprehend and cope with it (Buckland, 2002). Likewise, Rescher (1998) describes the complexity of something as indicated by the degree to which we come across difficulty in coming to sufficient rational terms with it. The amount of effort that must be spent in understanding and representing the structure and operations of a system is

our best useful indicator of complexity, and the opposite is true as a marker of simplicity (Rescher, 1998). The relevance and advantage of seeing complexity in this way is that the complexity of a thing is allowed to change without the thing having to change as well. This characterization of complexity relates well to situation in which someone gains knowledge or experience, the same system will seem simpler to them (Buckland, 2002). To put it differently, the person is now able to adequately understand and articulate the system.

2.5. Philosophy in Information systems

The debate on philosophy in IS research may or may not be seen as essential, however, due the nature of this inquiry an engagement in philosophy cannot be avoided (Recker and Niehaves, 2008). As Collier (1994, p. 17) pointed out, "a good part of the answer to the question 'why philosophy?' is that the alternative to philosophy is not no philosophy but bad philosophy. The 'unphilosophical' person has an unconscious philosophy, which they apply in their practice - whether of science or politics or daily life." A discussion on philosophy is incomplete if a consideration of ontology is not made.

2.6. Ontology

Etymologically, the word "ontology" means the study of existence. In philosophy, ontology is the area of metaphysics associated with the essential nature of being, speaking to deep questions such as "Do nonphysical things exist?" and "Does an object remain identical to itself when it undergoes change? (Guizzardi & Halpin, 2008). Ontology goes back to Aristotle, whose discourse on metaphysics is generally agreed to underpin the concept of

ontology (Guizzardi & Halpin, 2008; Recker and Niehaves, 2008). As Guarino and Guizzardi (2006) correctly point out, ontology is not occupied with in what way people categorize their perceptions of the world, but rather seeks to cultivate general concepts to describe the world, independent from any actual reality (Recker & Niehaves, 2008).

2.7. Why Ontology?

In most recent times, there has been an increasing focus placed on the part played by ontology and other philosophical logics in the creation of theoretical foundations for conceptual modelling (Guizzardi & Halpin, 2008; Recker and Niehaves, 2008). Ontology being a theory that attempts to describe reality in categorical terms, ontology would appear to be suitable for presenting guidance to modelers in 'what' to model (Recker and Niehaves, 2008). Based on the notion that information systems are at their core representations of the real world, suggests that ontology can be used to help design information systems that encompass the necessary depictions of the real world (Recker & Niehaves, 2008). As it has been shown in a large number of recent publications, ontological theories have been successfully applied to the development and evaluation of conceptual modelling methods that contribute to the theory and practice of information systems (Guizzardi & Halpin, 2008).

2.8. Conceptual Modelling

Modelling characteristics of the world, past, present or future, real or imaginary, for purposes of survival, improvement or even pleasure, has been a human venture since primitive times (Myopoulos, 2008). Conceptual modelling provides the means to create more sophisticated representations of our now more sophisticated world for this essential human activity

(Myopoulos, 2008).

A significant part of the work undertaken in information systems (IS) analysis and design is to create illustrative representations of phenomena in the real world usually towards enriching understanding and communication amongst stakeholders (Siau, 2004; Guizzardi and Halpin, 2008). Conceptual models that appropriately capture the underlying real world phenomena have been noted to be a very helpful method through which to articulate knowledge and observations about the real world and are generally believed to be critical to IS analysis and design (Recker and Niehaves, 2008). Conceptual modelling involves four essentials, a Language, a method, an artifact, and a context (Wand and Weber, 2002; Recker & Niehaves, 2008; Guizzardi and Halpin, 2008).

Conceptual modelling, on the other hand, has been concerned with life-size models of portions of the world to be made available to human users, for purposes of understanding and communication (Mylopoulos, 1992; 1998; 2008). Naturally, this purpose of conceptual modelling places emphasis on efficiency and a focus on simplicity (Mylopoulos, 1992). It also has an advantage over statistical and other formal representations developed in IS since conceptual modelling supports organizing and interpretation facilities that are psychologically grounded (Mylopoulos, 2008). This is unsurprising, as the illustrations that come out of conceptual modelling exercises are to be used by humans, not machines (Mylopoulos, 2008; Mylopoulos, 1998).

The adequacy of a conceptual modelling notation rests on its contribution to the construction of models of reality that promote a common understanding of that reality among their human users (Guizzardi and Halpin, 2008). Other

modelling notations do share purposes with conceptual modelling however they do not place emphasis on generating common human understanding of the context they might find themselves in but rather place emphasis on how information may be represented on a physical machine and thus can be seen as a more limited modelling approach, perhaps closer to implementation of a system and not its initial design (Guizzardi and Halpin, 2008).

The quality of conceptual modelling is understood to have a significant impact on information systems analysis and design (Guizzardi and Halpin, 2008). The growing relevance of conceptual modelling for information systems analysis and design is rather apparent, due to increasing number of modelling techniques and in the amount of academic papers that have concentrated on conceptual modelling (Recker & Niehaves, 2008).

2.9. Summary

As a concluding remark we would like to point to the theory of methodological pragmatism (Rescher, 1973), which suggests that theories and methods that are more effective in achieving their objectives will be adopted in favour of others. Rescher's concept of "rational selection" predicts that more effective theories are more likely to "survive". Maybe it is of benefit to adopt this relaxed, pragmatic viewpoint. The main claim of pragmatism is that the worth of a proposition, theory or model is to be judged by the consequences of accepting it (Wicks and Freeman, 1998). Basically, the tenet of pragmatism is that any picture, theory or model is good or true or valuable if and only if it is useful - in the sense of helping people to fulfil a given need (Recker & Niehaves, 2008).

For design to be successful a thorough understanding of the situation is necessary. However, the many methods available to practitioners to

undertake a design effort are flawed in their consideration of people and everyday life. This very concept of everyday life is the complexity inherent in organizations. The thing that is difficult to comprehend and this is compounded by the lack of an appreciation for this complexity within traditional methods. If we accept this problem based on the evidence provided, then design can be improved if we can create a means to cope with the complexity experienced in the design process.

A significant consideration to make is the way in which people see the world and an appreciation for this perspective while finding ways to include this consideration in the design process. It has been proven that ontological considerations can be built into a modelling language. Such a language can aid in the improved understanding and representation of the reality faced by designers – leading to a better selection of methods and improved design outcomes.

In the next chapter we outline the environment in which this research took place. This environment was purposefully created by the participants to engage in an exercise of thoroughly understanding the environment they were intervening in so as to have the most positive impact through the analysis and design process and it is within this environment that the research for this paper was embedded.

3. Case Study Description

This section outlines aspects of the case study in which the research for this paper was undertaken. It begins by providing a context for the overall research project and how all stakeholders collaboratively shaped the overall aims of this project, which housed this research. Further, this section outlines: the organisation of the action research project; the action research objectives and the action research iteration cycles that detail the plan, actions and outcomes of each cyclical intervention conducted by the team in which the research took place.

3.1. Background of the Case Study

This case under investigation took place within a larger research project focusing on software development organizing practices. The analysis and design team was immersed in an organizational context for a 6-month period within a medium sized multinational financial services organization to observe, experience and reflect on practices being used to deliver, enhance and maintain business application systems.

The research undertaken in this thesis was within the fore mentioned team. The purpose of undertaking this research within this setting was to participate in the analysis and design process, with the aim of developing an understanding of this process, the problems associated with it and those encountered by the team. Further, it provided insight into the process of discovering possible solutions to the problems and the outcomes of introducing these solutions into the process. This presented the researcher and participants with an opportunity to gain the experience of being a part of an analysis and design process from start to end. While at the same time

interacting with the rest of the team who also have, in some cases very similar, analysis and design training and experience. In addition to the team who were essentially conducting research into this organization, this case also provided our research access to the multiple stakeholders, of whom some were participants in the project, within the organization.

The main avenue for the researcher's interaction with the participants involved being immersed in the team participating in the design process while observing the team as well as a number of stakeholder meetings and feedback sessions conducted over a period of six months.

3.2. Background of the Larger Research Project

On Wednesday afternoons a group of individuals would take time out of their schedules and meet up at UCT Business School Campus. The group consisted of some young analysts and designers, a former distinguished IS professor, an IT sector development agency representative and other IS professionals. In addition to pursuing their various careers the members of the group were all also pursuing further academic qualifications as well such as Masters, Doctorates and Professorship. The purpose of these meetings was to discuss ways in which to improve IT organising practices in South Africa, but for the time being within the Western Cape.

The format of these meetings was more or less informal. Participants spoke about their respective backgrounds, what they are currently doing and what they hoped to achieve through this forum. Everyone brought their own experience and ideas to the table as to how the competitiveness of IT within the province could be improved. At the beginning of this process there was a lot of welcomed divergence. Everybody came up with ideas guided by the

contexts they found themselves in. Generally, the ideas centred around: creating more jobs, up-skilling people – more specifically young and previously disadvantaged people, improving the effectiveness of IT operations and creating more contextually relevant practices rather than simply adopting international best practices. The people involved were definitely motivated by their various interests to get something going. There was undoubtedly a sense of wanting to do something transformative and to do so together – everybody contributing in what ever they knew how.

It was this transformation mind-set that brought all these people together, and is what catalysed the ideas that came out and the knowledge that was shared within the group. The professor involved brought his years of academic and professional experience. One part of the meeting, usually the start, was based on some relevant literature shared within the group. Some relevant literature was reviewed in the early stages on philosophical underpinnings of organizing practices. These included gathering an understanding of the various theoretical perspectives, such as the Social Construction of Reality theory (Berger and Luckmann, 1972), Thrownness (Heidegger, 1996), Systems Theory (Senge, 1997; Beer, 1985) and Making work systems better (Hoebekke, 2000). It is important to note that the literature reviewed within this phase was explored further in parallel with the fieldwork that was conducted.

The iterative literature review process was an aspect that was thoroughly enjoyed by all participants. Especially coming from their respective working environments and learning something new whilst gaining different perspectives about the field. The development agency representative provided insights from across the IT sector from private and public point of

view due to its ties with government. This provided valuable information about the industry's needs and what sorts of development initiatives were planned or already underway – the focus here was around perceived skills gaps, training programs and job creation. The seasoned professionals that were present provided a perspective on the historical context of the industry, through their years working within the large financial companies present in the province. They highlighted, longitudinally, the development of the industry, the major initiatives that have taken as well as how these played out and have come to exist within IT structures today. The rest of the group was made up of analysts and developers that have worked in the field for a couple of years and were current Masters and Doctoral candidates. With their relatively fresher perspective, to the group, they represented the future – essentially those that would be carrying the envisioned transformation forward and presently helping to build it. They might not have created the conditions that currently exist, but embody the frustrations of working within them now while at the same time embodying and wanting a change. There was an understanding that these young people would be carrying out the work that would be shaped by the group as a whole.

As the group engagement continued, it was discovered that a national government project was underway. This project sought to create improvements in the competiveness of South African IT operations by introducing CMMI across the country within several organisations, trying to make the case for this framework as a means to improve the competitiveness. Hearing about the project motivated the group even further as they saw the possibilities of aligning the work being done here with a national initiative, setting up a good platform to further develop the ideas of the group. However, there were reservations about the direction and mandate of the

project as was defined at the time. Everyone involved was against the idea that applying a standard framework to the unique South African context (and associated factors) would bring about any desirable results, however, all parties agreed that the project, principally, in its desire to improve IT practices in South Africa was something to pursue.

The group subsequently created a proposal to the body governing the implementation of the national project, suggesting an alternative way in which to go about improving IT practices. The essence of the proposal was that a bottom up approach seeking to understand how the IT practices are currently organised within organisations, that are doing well, would be the best way to understand what works best within our context and from this basis design contextually relevant practices. This proposal was favourably received by the national body and was seen as a good alternative study to have running parallel to the existing one. It is this project that the team of analysts and designers within the group would carry out and the work conducted by this team is what the research presented in this paper is based on.

3.3. Organisation of the Action Research Project

In collaboration the group and the team heading up the national project concluded on what the overall outcomes of the project in the Western Cape would be. The first outcome would be to develop business models (organizing practices) of the company under investigation that can be put forward as an operational model archetype to promote excellence and competitiveness in the local software industry. Secondly, to develop criteria from the studies by which companies can be measured and benchmarked.

And thirdly, to generate initial measures of company performances as a benchmarking report at the end of the project.

Thus, the research project would seek to define and describe the most optimal set of organizing practices that are likely to lead to reliable, measurable, and benchmarked software teams delivering business value. The team envisioned the studying of existing practices in South African companies who are doing excellent work could plausibly do this.
To achieve these outcomes a partnership was sought and created between organisations that have a significant IT operation and the research team to undertake the research towards providing models of the IT organising practices taking place. Due to the time and financial constraints of the project it was deemed that the good-to-aspire-to practices and related KPIs could not be empirically tested, but that arriving at them would be sufficient for the purposes of the project.

For this research project to be successful, it was important to everyone that there was alignment between the objectives of the organisation and that of the research team. To this end several meetings took place within the group and with the representative from the organisation, in this case being the CIO, to develop a sufficient understanding of each other's needs to essentially create a common purpose once the research got off the ground.

3.4. Action Research Project Objectives:

- To gain data from the organization in order to further a research study currently being conducted with the purpose of understanding the processes, practices and experiences that occur within the organization, related to IT governance, project/portfolio management,

software development, quality assurance, scrum and business model styles/ types.

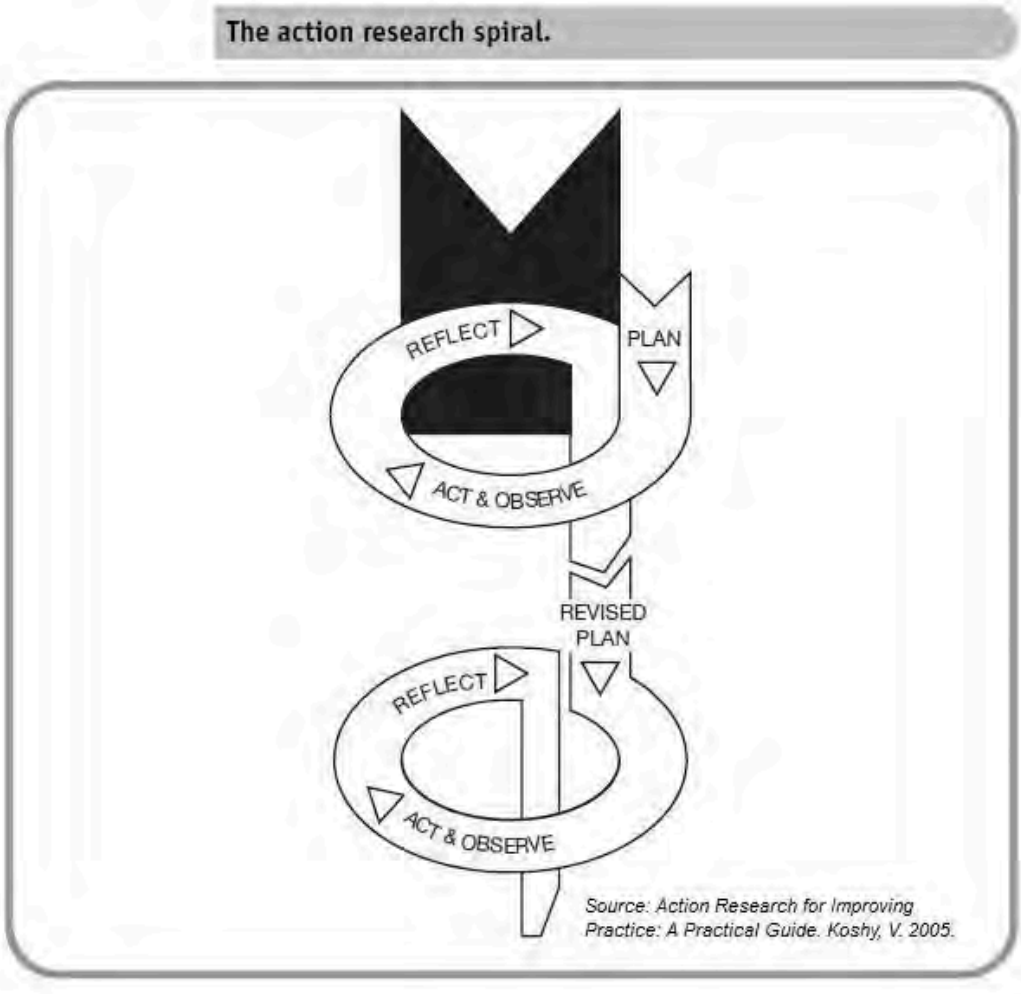
- The culmination of this research data is expected to result into a set of "organizing practices" insights that will be used to understand the "as-is" practices within Financial Service Company, and (with the addition of external research and active dialogue with the stakeholders within Financial Service Company) inform "good-to-aspire-to" practices to be included in an operations manual that will be presented to the DTI.
- To gain an understanding of their current "as-is" practices (and alignment/misalignment between these and the organizational/IT vision and purpose) within IT governance, project/portfolio management, software development, quality assurance, scrum practices/principles and business model styles/ types.
- To gain deeper insights regarding the possibilities to which the organisation may redesign (if they wish) the current "organizing practices" and business model style(s) as informed by a contextual understanding of the organization (vision, purpose and practices) and insights gained from external research, alongside active dialogue with the research team on site.

What this ultimately created the conditions for was that the participating organisation benefited from the analysis work conducted and provided deep insight into their practices as well as a comparison of this to the latest research and "good practice". The research process further stimulated reflection on what has been done, is being done, can be done within the organisation through the observation of the organising practices by a highly skilled team.

3.5. Action Research Iteration cycles

This project undertook the following action research phases as depicted in the diagram below, in iterative steps. The section following this will provide a descriptive narrative about the experience on this research process – outlining the pre scoping phase and the subsequent action research iteration cycles of: planning, action and reflection.

Figure 1: Action Research Spiral



3.6. Project Scoping

Before work had started on the project the team in collaboration with the group workshopped what the general approach to the project would be to determine what the best course of action would be in order to achieve the outcomes of the project.

Based on this, the research team had an initial understanding that essentially the research would involve understanding the current organizing practices in the organization, documenting, modelling and evaluating these practices using stakeholder feedback and relevant research findings. In addition, the research team also conducted literature reviews and fed these insights into the research as it progressed as everyone involved was at the same time pursuing their masters and doctoral qualifications. It was also assumed that once an understanding of the current practices was established the stakeholders would be engaged in brainstorming sessions to imagine better ways to organise – the research insights would play a crucial role here. The "to-be" or the ideologically good organizing practices to strive for will be abductively tested using scenarios, domain experts and leaders from the research context and other related contexts, asking what could be true, what has to be true and what is least likely to be true by employing integrative thinking.

It was agreed that the project would progress in iterations – pursuant to the methodology of the project. This approach would allow the team to quickly and in manageable amounts build up an understanding of the context whilst also progressing on project deliverables. Working in this way meant that at the end of each iteration the gathered data could be collectively interpreted, as this way of working was deemed to be the best way for the team to work,

while also allowing for reflection to take place on the outcomes of the period but also reflection on the way in which the work was conducted as well as allowing time for feedback from stakeholders about the information gathered, the manner in which it was done and the usefulness of it to the organization. This reflective process was important for the team in building their understanding of the environment but it was also seen as very important to how the work would progress going forward.

This process also aided in managing the volume of information that came in during iterations. Too much information and the team would not be able to effectively make sense of it all and if there was too little taken in during the period it would have been an ineffective use of time. The aim was to balance the volume of information with the richness of information to enable the team to most effectively make sense of and model the information. This was a learning process that continued throughout the project. Always improving and adjusting to what was required by: the organizational context, the project demands and the team's ability and capacity.

3.6.1. Immersion into the context

After all the preparatory work the team's first engagement with the organization was with the CIO. The purpose of this engagement for the team was to gather a high level understanding of the organization. This encompassed an understanding of the history of the organization and any significant events that should be noted by the team, the current structure/layout of the organization and how this came to be and the key roles in place, what the strategy and objectives were, what the clients' perception of the organization was and its relationship with suppliers as well as the CIO's concerns about his organization.

The first interview with the CIO lasted approximately two hours. The first part of which was a presentation by the CIO about the organization, while the second part of the session encompassed a question and answer discussion about the presented information and other questions the team had. After this first engagement the team also had follow up sessions to provide clarity on any unclear aspects where necessary. The CIO had a white-board in his office and also engaged in modelling the organizational elements he was speaking about, this helped the team understand a lot of the jargon that was being used and that we would encounter within the organization later on. In sketching out his thoughts he provided a breakdown of the company's origins and how his, the IT, department became central to the services being provided. The CIO also showed how the core technology infrastructure played a key role in doing so and how this impacted on the structure/layout of the IT department. With the ideal location of the CIO's office, we also had wide view of the IT floor. As he provided very detailed information about the department he could point out where the various units he was referring to were located, allowing the team to put faces to everything he was talking about. This experience provided an example of how modelling rooted in context enables enhanced situational understanding.

In addition to indicating the different departments making up the IT organization he also provided valuable information about what each unit's purpose is and who they serve, who the person in charge was and what type of person he perceived them to be, the interactions with other departments and provided insight into what his plans for the organization. These highlighted some of the contextual factors to be considered in the design intervention. The CIO also indicated what the strategy was, essentially that

there wasn't one in place, but that work was already underway to create a strategy for his organization and that the work being done by the research team would aid tremendously in this effort. This provided insight into the intended outcomes of the design intervention and allowed for the indication of the purpose being pursued.

Regarding the supply and service delivery component of his organization, he mentioned the many complaints that are received about the service clients experience, the number of incidents, often extensive, that regularly take place, in a financial environment that requires 24/7 uptime. The CIO also described the nature of the organization's relationship with its suppliers as fundamentally an intimate one and in some cases very one sided.

During the session the CIO also noted some his most pressing concerns about his organization that he had noted. For example the inadequacy of the current structure to effectively address the needs of its clients, the lack of a clear strategy to guide the actions of the organization, the need for basic processes to be put in place, the reported instability of the services provided, ultimately effected by the an unstable IT environment and the worrying nature of the supplier relationships. This provided insight into some of the key success metrics of the design intervention as being rooted in the ability of the new design to address some of he abovementioned challenges. A major concern also noted was the three restructurings that had taken place in the recent history of the organization and the pervasive effects this has had on the people, the structure and the processes or lack thereof. For the team, the information provided by the CIO illustrated the level of complexity present in the organization and the thinking that would be required of the team to makes sense of the context. The discussion functioned well in

providing insight on key contextual factors, and the CIO's perspective on the purpose being pursued by the design intervention.

The next step was for the team to go off and reflect on this engagement, towards interpreting the provided data while it was still fresh. They did so by having a collective reflection session on what each member's thoughts were about the organization based on the information received from the CIO. This was done so that each member understood and appreciated the range of alternative perspectives. This was felt to be a very important aspect of the group learning that would have to take place for the team to work well together on the project – and is a practice that was encouraged through out the project. This practice allowed for shared understanding about the context to emerge and where distinct differences in perspectives were identified it served as points to further investigate or reflect on in order to bring about further consensus before moving on and reinforced the learning aspect of the research process.

Once the group had a sufficient understanding of the information, it was time to model this information to capture this understanding in the best way possible to satisfy the research project deliverables. The modelled artefacts that emerged also served as a tool to facilitate feedback with the stakeholders that had provided the original information and the modelling process functioned as a means through which the team could create and validate their understanding of the context all while the reflective process still continued.

The team discovered that attempting to create process and information models, by their nature, directed them towards certain methods, specifically

traditional business analysis methods. Methods that at this stage of the project were experienced as insufficient for the purpose of gaining an understanding of the current organizational context as well as limited the manner in which this could be represented or modelled. The outcomes for the research project expressed the need for process and information models, however the teams project experience thus far led them to believe that traditional analysis methods and the associated models it created, which they have been trained in, were not suited to the outcomes of this stage of the project. This made the team aware of the epistemological influence contained in particular methods, however, this epistemological trajectory inherent in the method had to be considered in comparison to the purpose being pursued by the modelling exercise. Thus, it was decided that the creation of process and information models formed one of the final objectives of the project and would most likely be more suitable at a later stage, but this would be evaluated at that time.

The structural information about the organization could most effectively be represented in simple organization charts and so could the interactions between the various units within the organization to a satisfying extent. These diagrams were relatively simple to create. However, the situation was different for the rest of the information. Organization charts could not meaningfully capture the historical information about the organization and its impact on the current structure, nor that of the client perspectives and supplier relationships as well as the concerns noted by the CIO.

3.6.2. Towards gaining deeper insight about the context

With a high level understanding of the context under investigation and an appreciation of its inherent complexity, the team now sought to gain deeper

understanding of it. To this end the team planned to conduct interviews with the managers of the various units within the IT department. Namely: Infrastructure, Software development, Applications, Business intelligence, Straight through processing, knowledge management, Risk and security, Project management and the Head of IT for the South African region. In addition to meeting with all these managers it was also important to meet some of the people that reported to the managers within these teams. The purpose of this was to gain multiple perspectives on the information already received from the CIO relating to the history, strategy, structure, clients, suppliers and concerns. Further, the aim was also to understand the processes at play – how work was carried and why it was done in such a way. To understand this it was important to recognize the people carrying out the work and how they related to the work they were tasked with doing, their skills and their history within the organization.

In the experience with the team, it was found that traditional business analysis techniques did not place sufficient emphasis on gaining an understanding of people and did not allow for this aspect to be captured holistically or in relation to the processes. Process artefacts created in this manner were static in nature and required the team to disregard a lot of the rich information gathered during the interviews. To overcome this they referred back to a book they had read in the build up to the project by Hoebekke (2000) Making work systems better. The overall premise of this book was that the identification of persons with functions is the most common source of misunderstanding in organizations as a function is a static positioning concept. Once the dynamic language of contributions is used many ambiguities begin to disappear because organizational life becomes much simpler once you don't identify a person with a function as it is

impossible to infer to which processes people contribute on the basis of their organizational position and it is only by defining the processes and their outputs that their activities can be discussed (Hoebekke, 2000). This notion forms the basis for the framework, put forward in this book, for better understanding a work system (Organization).

The "Framework" as it is referred to seeks to understand the contributions, triggers, inputs, outputs and actors within a work system. Central to th framework is the idea of the contribution, a concept that was most appealing to the team in terms of providing a novel and relevant understanding of an organization. The contribution expresses the basic purpose behind the work system and transforms certain inputs into outputs through those activities belonging to a work system that can be seen as helping to realize the defined purpose through the created outputs. Triggers are those events or phenomena that lead to the necessity for a contribution to take place, or that trigger the delivery of a contribution. Inputs are those tangible or intangible requirements necessary for a contribution to take place. Outputs are the artefacts, products or services resulting from a contribution, whilst outputs from one contribution may be inputs to another and vice versa. Actors represent the people involved in the performing of a contribution.

With this framework in mind the team created a set of questions that would be used in the planned interviews with the managers and their teams. The purpose of these questions was to determine what the fore mentioned components would be for the various units within the IT department, but also to see and appreciate the varying perspectives on what these might be.

3.6.3. The questions asked

Unit Purpose: What we are trying to understand is the reason why the function exists

- Why was the unit/ function started? Or, Why did they want it to exist?
- What are the objectives that need to be achieved through this?
- Roles: We are trying to understand the composition of the team regarding the various roles that are there to do produce the required outputs
- What are the different roles you have in your team Outputs: We are trying to understand the effort required to produce the necessary outputs
- What are the things that you deliver (as a function/ unit)? Or, What are your required deliverables, key outputs? Or, What outputs are you responsible for delivering
    - The amount of time it usually takes you to deliver this (Throughput)
    - In what quantity or volume is this usually delivered? Or, How many times does it have to be delivered/do you have to deliver this a month? (Volume)
    - How thorough does this have to be? Or, What is the acceptable/expected level of quality on this/these deliverables? (Quality)

Conditions for output delivery:

- How do you deliver these outputs, what activities are necessary?
- What inputs do you need to deliver the outputs?

- What inhibits/ prevents you from doing what you need to do?
- Is there any mainstream or certified methodology that you use or have adopted within your practice, or in the production of these outputs.

Stakeholders: We are trying to understand who the clients, actors and owners are of the system

- Who are the stakeholders of this output delivery process? Contributors, Clients/beneficiaries Process/Output owner
- Who is the process owner for this function/team? Or, who is/are the owners for the (particular) outputs?
- What is the teams reporting structure?

Role in IT: What we are trying to understand is the linkages a unit has to other units in the IT value chain, and what impact it has on these?

- What role do you think your unit/ function play within the IT value chain?
- Who (which functions/units) are you dependent on to fulfil your mandate?
- Who (which units/ functions) are dependent on you to fulfil their mandate?
- What value does your unit/function have on the IT value chain, or on IT delivering to the business?
- Role in Business: We are trying to understand the perception on the strategic contribution of the unit, and business- IT perspectives.
- How important do you think your role is from the perspective of business to deliver on what they need to? And, in the provision of new (value- adding) opportunities for them
- What do you think the perspective of business is regarding IT?

- What is your perspective of IT in relation to the business?

Worldviews: Wanting to understand the world-views of the work system

- What value do you think your unit provides
- From your perspective, what do you think is wrong with IT and where should IT improve?

The interviews were conducted with the fore mentioned as questions serving as guide for the interview process to get the information sought by the team while also allowing for conversation to take place about the area under investigation between the team and participants. The interviews lasted between one to two hours. Through conducting multiple interviews, certain concepts and patterns began to show in the data. Relevant literature was then reviewed in relation to the identified patterns and concepts.

Over time, regular feedback sessions were held with participants to ensure the team derived accurate understandings of their perspectives. This was done in conjunction with the team's own reflective process, reflecting on the work they were doing at this stage of the project, the methods they were using and the results of their use.

3.6.4. Contribution Modelling – Representing the Reality

During the interviews the team engaged and followed up with all the IT managers as well as at least one member of each managers team. Through this they were able to gather a broad and thorough view of the actors, triggers, inputs, outputs and its contribution as set out in the framework. The team now had very rich information concerning each department within this IT organization. Furthermore, the interviews also provided information about

the relationships that exist between departments with respect to how work is carried out.

The team now faced the dilemma of having to model this information, which was collectively understood to be the best and most descriptive of the context. The appropriateness of this information in describing the environment was an essential marker that the collected information was satisficing and they could move onto the next objective, representing this understanding in a visual form via models that would provide a process view of current organising practices at play in the organisation. The team found it significantly difficult to reconcile the information held regarding the work system using process models. At this stage, process models were conceptualised as being activity diagrams. The selection of activity diagrams to fulfil the process view requirements came about most likely due to the team's training as Business Analysts. However specifically to the case, the team in consultation with their broader group and the client came to the same conclusion with regards to the use of an activity diagram and the need to find a more suitable approach for the project.

Congruent to the ideas suggested in the framework put forward by Hoebekke (2000) and used by the team in shaping their investigative lens the purpose for the team now was to more than simply illustrate in the most general way a set of activities that lead to an end goal but rather to depict how the people in this organisation work. Essentially, there was a tension the team was grappling with. There was a disconnect between the image that was built of the organisation during the interview stage, gathering all the varied perspectives, and reshaping that intrinsic image to one which works in a given model or rather, finding the means to extract and represent this

intrinsic image and by doing so creating the most representative model of the organisation.

It was at this point that the systems engineer in the team recalled a modelling language called IDEF0. He connected IDEF0 to the idea of a model created from basic ideas of Hoebekke's (2000) framework a model that spoke to triggers (Constraints), inputs, outputs, actors (Mechanisms) and a transformation process at the centre – this was essentially what the sought to understand during the interviews and is exactly what an IDEF0 model looks like. They were interested in using the IDEF0 structure to encapsulate the information they had gathered and began the process of playing with the model to come up with a way which could work.

Once the team began looking at IDEF0 they knew immediately that this representation would work well with the ideas the already about the model they wanted to create. The model just by looking seemed to make more sense than an activity diagram. The team also developed an understanding that what they would be using from IDEF0 is the idea and image of the four arrows centred around a transformation and not necessarily all the ideas of IDEF0. The team had already put thought into what information they wanted to gather and IDEF0 served as means to organise that information for the benefit of others, for them to see and make sense of. Its this point that resonated with the team, in that their experience showed them that activity diagrams although very similar to that of IDEF0 diagrams they aren't very easy to read or look at and to understand they way a person works would mean to look at several activity diagrams whereas an IDEF0 model can encapsulate the necessary information in one image and if necessary can be built out into several lower level images containing more detail and for the

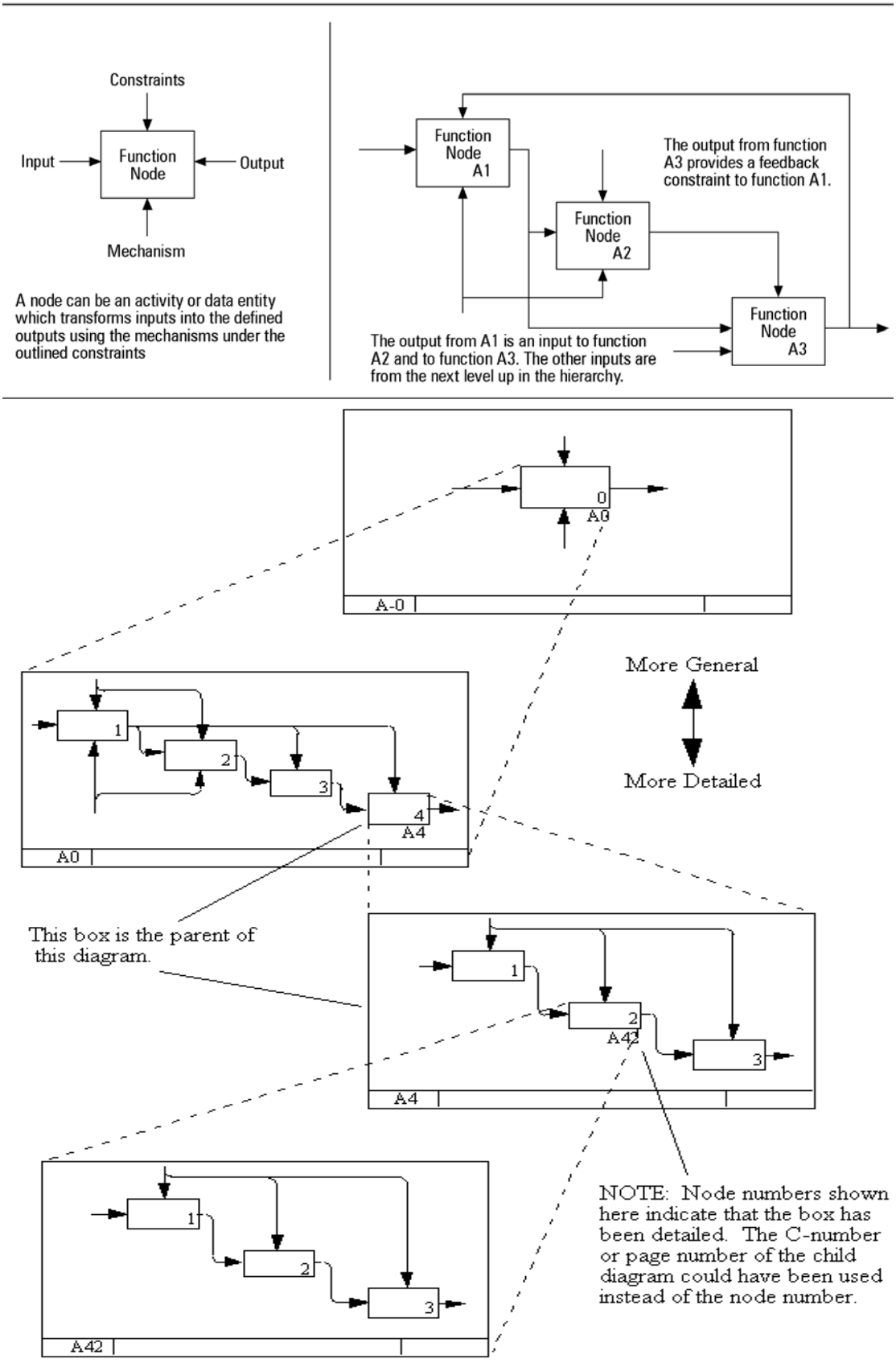
team this aspect was seen to provide a certain aesthetic to the models they sought to create.

This experience revealed a major insight regarding how contextual factors and the purpose being pursued by the modelling exercise influence both the conceptualization and practice of modelling. Further, this practice and conceptualization of the modelling exercise influences and is influenced by the epistemological disposition of the designer.

The following diagrams highlight the models that have been referred to as IDEF0 and Contribution modelling, providing a narrative which is sought to create an understanding of each, highlighting both the aesthetic similarities and functional differences of the two modelling techniques.

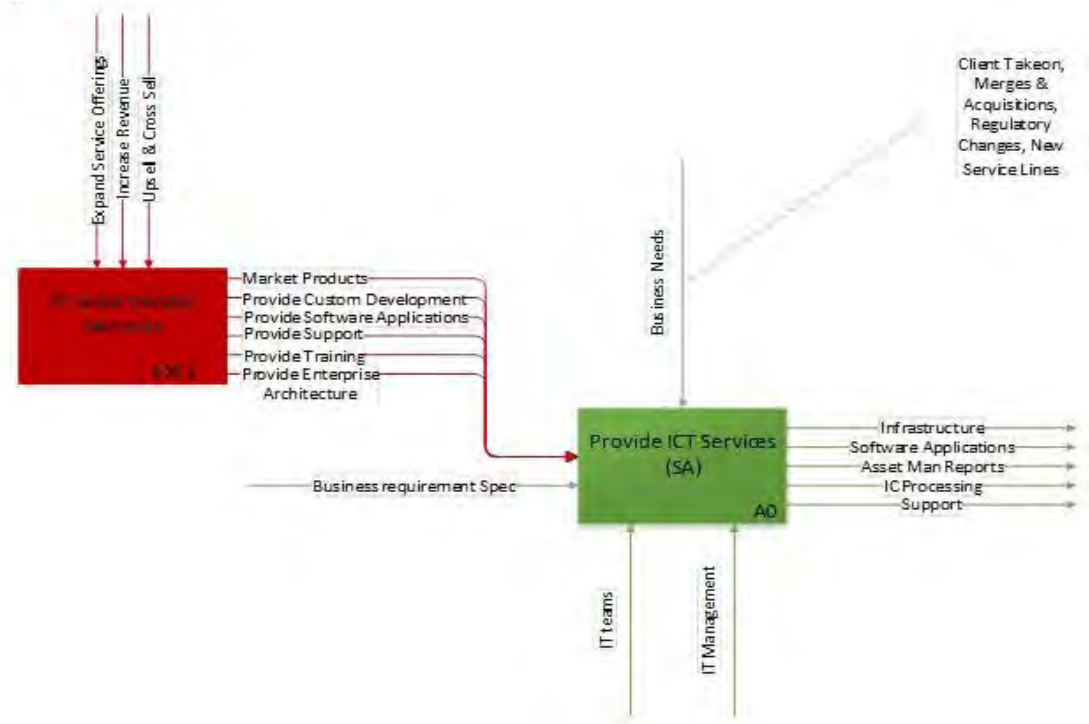
3.6.5. IDEF0 model

Figure 2: The IDEF0 Diagram



3.6.6. The created models (Contribution Models)

Figure 3: Contribution Model (High Level)



The identified contribution for IT South Africa in the Organization is to Provide ICT Services. Within this contribution, the lower level contributions of providing ICT Infrastructure; application support; software engineering; and business reporting may be identified.

This contribution is triggered by business needs for ICT services. The Business needs can comprise of Client- take- on, Mergers & Acquisitions, Regulatory changes, and the introduction of new service lines amongst others.

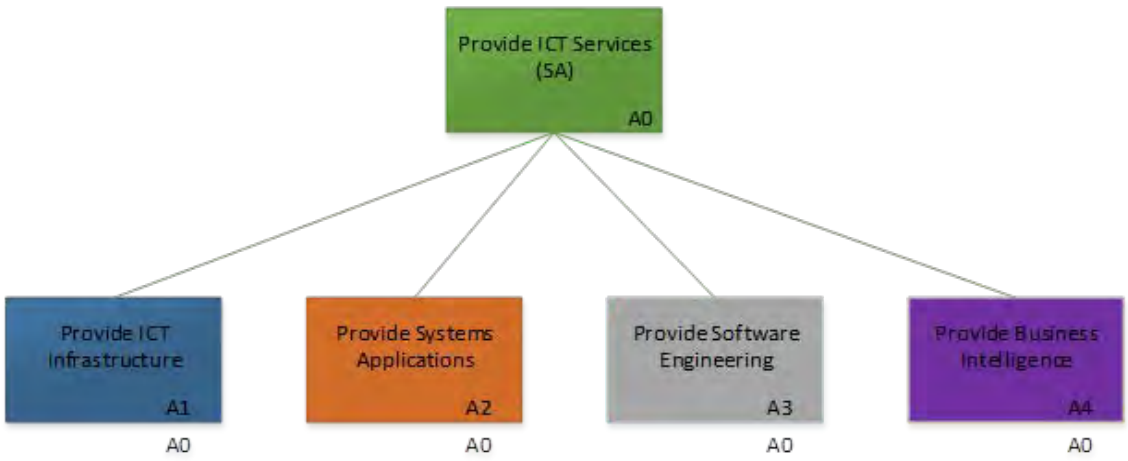
The key inputs into this contribution are the business requirements specification (these are specifications provided by business to IT SA about the nature of the ICT services they require) and vendor services (such as

Enterprise architecture, training, support, software applications and custom development). In the context of the Organization, vendor services are a key input, whereby these are used to replace or supplement a number of "common" organizational inputs into the contribution of providing ICT services.

The main actors in the provision of this contribution are the IT Teams (referring to the various IT teams within the IT SA function) as well as IT management (referring to the managers of the various IT units, as well as the head of IT SA).

The outputs emanating from this contribution are targeted at the business (including all business areas), as well as clients of the Organization. This results in the provision of IT infrastructure, software applications, asset management reports, IC processing as well as support.

Figure 4: Contribution Model (High Level Breakdown)



The previously described contribution can be broken down into the contributions provided by the different units that allow for highest contribution to take place. These contributions can also be further broken

into the contributions that take place within a team or department.

As the models created through the teams process were based on information derived from the framework previously mentioned and the diagrammatic representation of IDEF0 the team decided to call this technique they created f "Contributions Modelling" as the team had to find a way to represent the contributions they sought to unearth.

While the primary goal of modelling the information was to represent an understanding of the current organizing practices present in the organization, there was also an understanding that this also important for the stakeholders involved in the project as it is important for them to see what is happening through this project and whether it provided a benefit to them as well as for the team to learn about the modelling being done and whether it was sufficient or not for these purposes. There was immense positive feedback on the presentation of the created artefacts using contributions modelling.

3.6.7. What has created and currently maintains the system?

With the client and the wider group happy with the deliverables the team was happy to know that a sufficient understanding of the current organizing practices was obtained and represented. The contribution models that were created were great at representing how things work but there were a lot of subtle yet profound insights that could not be represented in that way. The purpose of the team was to understand the current organizing practices – what they are but also understand why they are that way. The latter purpose is exactly the reason why the team created the interview question and investigative framework they had used, to go beyond understanding what is

done to understanding why it is done in that way. This means to understand the dynamics at play within the organisation. As we mentioned earlier the team gathered significant amount historical information relating to the organisation which provided insights into why the company organised as it did and participants provided relevant insights as well during the interview process.

By being immersed in the context and regularly engaging participants the team gained deep insights into the organization. The regular feedback and reflection sessions enabled the team to validate the findings and provided the basis for unearthing why these patterns were recurring. What the team needed to do now was also represent this understanding, illustrating what created the current conditions and how this came about.

In the business and systems analysis training of the team they had learnt causal loop modelling and to the team this seemed like the most appropriate way of capturing the information, although this type of model was not initially stated in the outcomes of the project the team felt strongly and motivated why this method would be best, based on the information at hand and their experience in using causal loop diagrams. Causal loop modelling provides a language for articulating our understanding of the dynamic, interconnected nature of our world. We can think of them as sentences, which are constructed by linking together key variables and indicating the causal relationships between them. By stringing together several loops, we can create a coherent story about a particular situation of concern. Creating causal loop diagrams is not an end unto itself, but part of a process of articulating and communicating deeper insights about complex issues. Relationships between variables are shown in relation between Cause to

Effect as reinforcing/intensifying (+) or negative/slowing down (-). It is important to note that this does not indicate good or bad it just means that as the cause intensifies, so to do the effects (+) and as cause diminishes, the effect also diminishes.

With this the team went ahead and captured the information in a causal loop model. Creating several causal loop models to describe the complex situations that were not captured in any of the models created thus far. The tool was also used a means for the team to make sense of the complex environment which was unfamiliar to them, this was an aspect of casual loop diagrams that worked really well though out the project. This related sense making was also noted during feedback sessions with participants as the diagrams are very simple and intuitive and provided a language through which to speak about a situation that could be commonly understood or used as a way to create a common understanding.

While contributions modelling worked really well in representing the operational environment the use of causal loop models became very important when trying to understand the strategic environment. Essentially, contributions modelling worked well in showing how things worked, and could surely represent how strategic work gets done. However, the purpose now was to represent how things came to be, such as the lasting effects of the restructures that took place or the effect of not having a clear strategy for example. To this end causal loop modelling served our purposes well. The models that were created enabled rich dialogue about the organization and due to the open nature of causal loop modelling participant feedback and suggestions could easily be built into the created models.

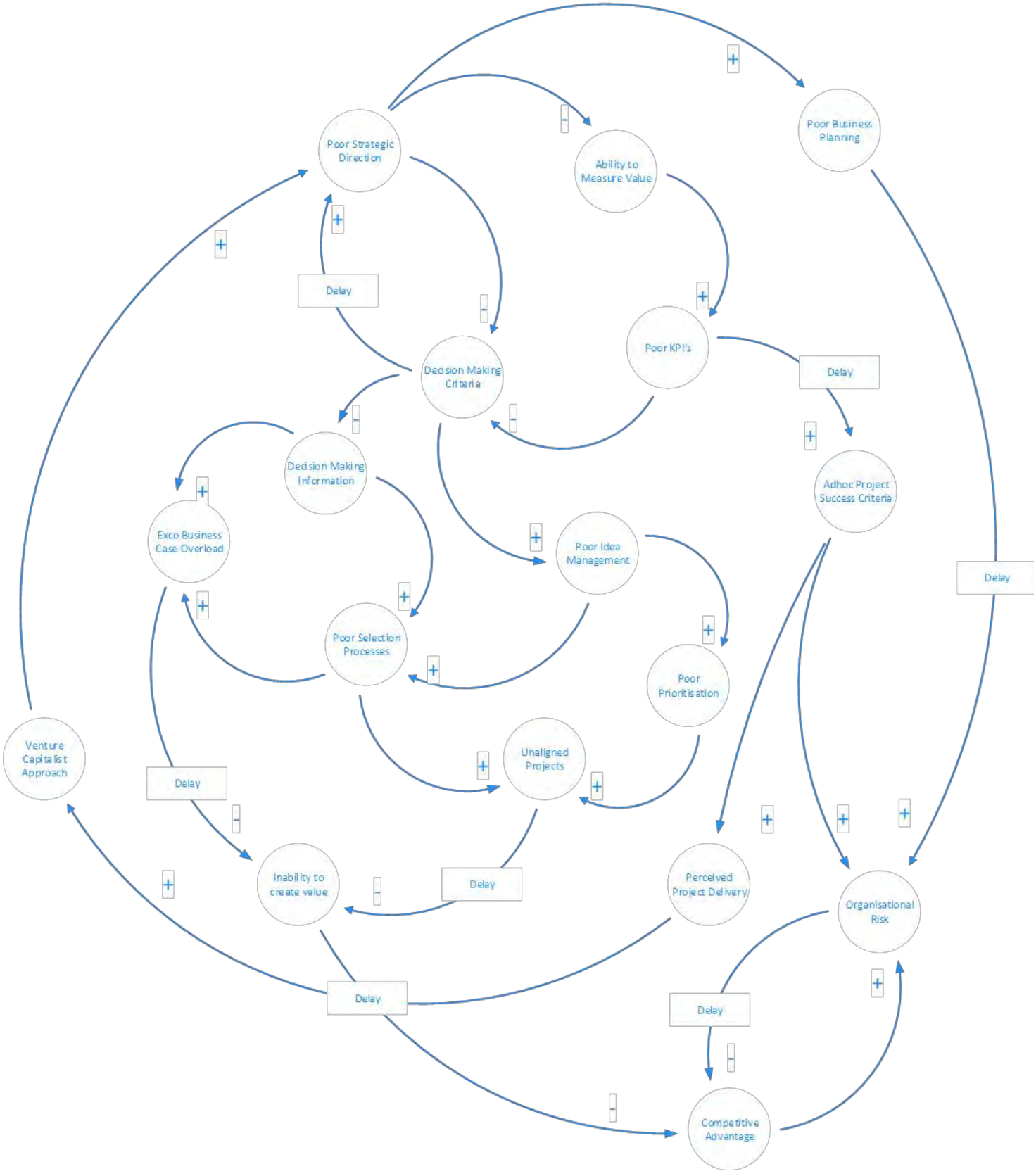
3.6.8. Causal Loop Modelling

The causal loop diagrams below were created to capture our understanding of the project and product development environment as well as that of IT Governance. The team conducted these subsequent investigations in the same way as was done for IT, but focused on the causal loop model as an output for this stage as the aspect that wanted to be highlighted was the pervasive impact their organizing in this area had on the rest of the organization.

The diagrams mentioned are illustrated below.

3.6.9. Project and Product Development Causal Loop

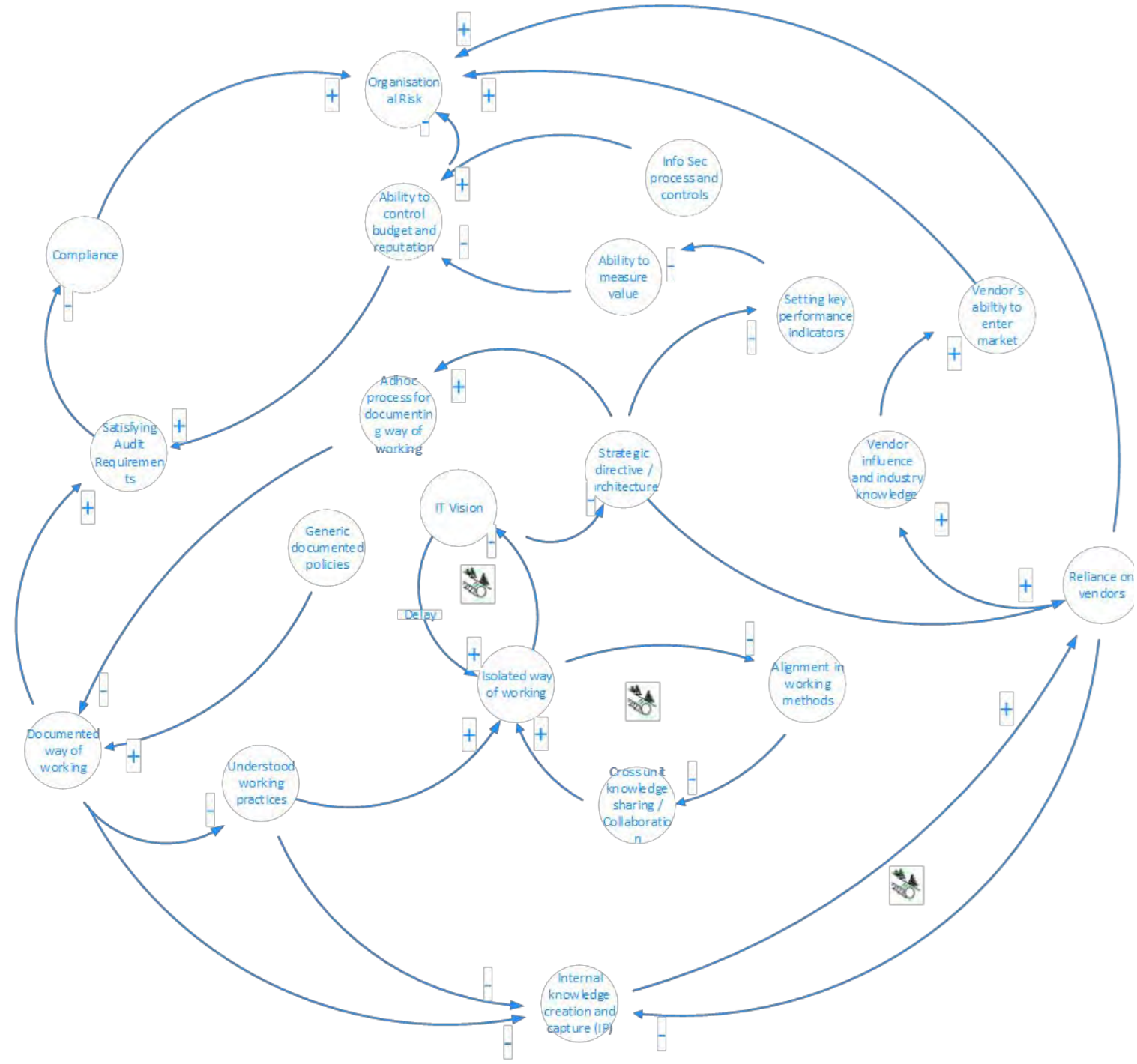
Figure 5: Causal Loop – Project Management & Product Development



3.6.10. IT Governance Causal Loop

The team also used causal loop modelling to understand and represent the governance of IT as shown below and what impact this had on the organising of IT in the organisation.

Figure 6: Causal Loop – IT Governance



3.7. Summary

What is evident from the above is that this study existed in a complex environment. There were various levels at which the actions of participants involved were contributing. There was the overall national government research project, the smaller localised research project based within the organisation and lastly the study this paper reports on which sought to provide a narrative for the work conducted by the analysis and design as well as the organisational participants to this action research process.

The action research unfolded in iterations, which sought to build up the teams understanding over time whilst also satisfying the objectives and milestones of the project ensuring the success for the research project and the client organisation. The iterations provided a structured flow for the team to initially immerse themselves in the context, then to build deeper knowledge about what was observed and thereafter to create meaningful representations of this reality that enable improved decision-making. These iterations facilitated a collaborative space for this work to be conducted in. in addition to above-mentioned outcomes certain outputs also emerged through the iterative processes. Namely: A framework of questions that was used to interview participants; Contribution Models that illustrate the operational links within the environment and Causal loop models that aided in the explanation of why things were organised in the current way.

The next chapter provides an outline of the empirical findings serving to answer the research question posed by this thesis. Namely: What The effect of epistemological dispositions on the act of modelling; what the effect of contextual influences on modelling outcomes and social action based on modelling.

4. Theoretical Perspective and Methodology

4.1. Theoretical Perspective of Research

This research is rooted in the soft systems approach to inquiry into human activity systems and adopts and action research methodology for the empirical case study of this thesis. The soft systems was developed by Peter Checkland can be seen as an appropriate metaphor for information systems design (ISD) and additionally that ISD can be seen as human activity system which soft systems methodology was specifically created to address (Bennets, Wood-Harper and Mills, 2000). We have already made the case that many design efforts following a traditional approach fail due to the omission of everyday life and people in organisations, preferring to address design linearly. Thus making the case that social, political, organizational – generally human factors should be accounted for in a methodology that seeks to aid in ISD (Bennets, Wood-Harper and Mills, 2000).

4.2. Systems Thinking

Systems theory posits that there are multiple interrelated elements within a system. It places focus on identifying and analysing linkages between these various elements and promotes a perspective of thinking holistically (Checkland, 2010).

Barton and Haslett (2007, p. 143) assert that a system is best defined as "a cognitive construct for making sense of complexity and the organization of knowledge". They further argue that the scientific method is most usefully interpreted as a dialectic (interplay between seemingly opposite ideas; process that recognizes the strengths and limitations of human cognition; provides checks and balances to avoid the excesses of extreme reductionism

and extreme holism) between analysis (provides explanation of how things work) and synthesis (provides understanding of purpose by putting things into context) (Barton and Haslett, 2007). The authors assert that systems thinking provides a distinctive approach to the manner in which both analysis and synthesis operate within the scientific method through providing a way of framing the dialectic process involving synthesis and analysis supported by the logics of abduction, deduction and induction (Barton and Haslett, 2007).

Systems thinking enables the abstraction of complex problems as holistic complex realities, according to Checkland (2000) it allows users to create models of purposeful activity, which are intellectual devices, which will aid in shaping the different emerging perspectives of the problem situation. It is important to note that Checkland (2000) did not intend these intellectual devices to be true representations of the real world situation, rather they are merely devices used to stimulate, fertilize and construct a debate about the complex problem (Checkland, 2000). Ledington (1992, p. 18) described it eloquently, stating that it "...provides a general set of concepts and an intellectual framework for articulating the search for 'images of reality' which are relevant to taking purposeful action within some problem situation".

"Systems thinking uses mapping of inter-relationships as a means to improve decision-maker understanding of how to intervene and improve system performance. Systems thinking is a heuristic, a tool of analysis that encourages discovery rather than behavioural predictions. Thus, systems thinkers do not produce deterministic models but rather models that facilitate an understanding of the interworking of systems through visualizations of the behaviour occurring within the system. Understanding the interworking of a system, or the relationships between the various actors

of a system, is useful because it improves understanding of the outcomes of the system. Systems thinking builds theories for how the system works and uses them to develop insights about the behaviour of the system over time, with the goal of improving system performance." Checkland (2000, p. 17) highlights that there are four key points in systems thinking, namely: "(1) Every situation in which decision making is involved is a social situation in which people attempt to take purposeful action that is meaningful to them. The identification of this purpose is an emergent outcome of interaction among multiple actors. (2) Many interpretations of a declared purpose (goal or objective) are possible; therefore, for every purposeful activity, the perspective or world view on which it is based has to be declared. (3) There is a need to move away from the identification of a problem that requires a solution and toward the idea of a situation that some people may regard as problematic. (4) Management action takes place when people in a given situation agree on a course of action that is desirable and feasible given their individual histories, relationships, culture, and aspirations."

Systems thinking differs from the linear styles of thinking associated to conventional thinking in that it requires ones thinking to move in a variety of different directions. It pays more attention to the identification and capturing of the flow, movement and dynamics of a particular phenomenon. Systems thinking is a way of seeing the world, seeing the effects of interactions, patterns and processes and the position opposes the efforts to create detailed foreseeable outcomes. This way of seeing the world is mostly about being present in the now, living and embracing randomness and unforeseeable consequences. When one embraces such a view, one must be willing to embrace the notions of evolution, discovery, and emergence of that which is humanness. Embracing systems thinking is thus embracing ones

humanness to the world and everything that is constructed within this world. In order to embrace the humanness of systems thinking, one must reject the illusions of objective knowledge that it is readily available for collection, because no knowledge is independent and separated from its context. Therefore when a researcher describes a particular reality, the reality is that of which the researcher has consciously or unconsciously chosen to see, which is why the researcher must see his research as a piece of clay, constantly sculpting until truth presents itself. When one is a sculptor in search of truth one must put ideologies and dogma aside, and harness the diversities of the present in order for truth to emerge (Senge, 1997; Checkland, 2010).

4.3. Rationale for Action Research

Over time there has been a change in methodologies employed, specifically from positivism to action research, so as to better deal with the complexities of everyday life in organizations (Dick, 1993). The traditional way of doing research, which stems from natural science, is to create a hypothesis and then test this hypothesis using experiments. Checklands development of Soft Systems Methodology using action research, as this approach was found to be more suitable to the social research conducted within situations, groups and organizations (Reynolds and Holwell, 2010; Checkland and Poulter, 2006) proves the appropriateness of action research to this study. People, situations and organizations differ greatly and this is due to the presence of people, the changes that take place over time and the myriad of interacting, conflicting and complex worldviews at play. Thus with this type of research, namely action research, there is an acceptance of the difficulty in applying scientific and experimental research approaches to generating understanding within human situations (Reynolds and Holwell, 2010; Checkland and Poulter, 2006). Therefore a researcher attempting to use action research should enter a human situation, get involved in its activity and use the experience as the

research object (Reynolds and Holwell, 2010).

Toward the end of the 1990s action research began growing in popularity for use in academic investigations of information systems (Baskerville, 1999). This method produces highly relevant research results, because it is grounded in practical action, aimed at solving an immediate problem situation while carefully informing theory (Reynolds and Holwell, 2010; Baskerville, 1999). Throughout the past decade, calls persisted for improved relevance in information systems research, the lack of relevance in IS research spurred much of the intensified interest in action research (Baskerville, 1999).

The type of learning created by action research represents enhanced understanding of a complex social-organizational problem. The research addresses a specific social setting, although it will generate knowledge that enhances the development of general theory. Action research aims for an understanding of a complex human process rather than prescribing a universal social law (Baskerville, 1999).

Baskerville (1999) and Miller (2003) further elaborate on the ideal setting for action research methods as one in which:

- The researcher is actively involved, with expected benefit for both researcher and participants
- The knowledge gained can be immediately applied and there is not the impression of the detached observer, but that of an active participant wishing to utilize any new knowledge based on an a clear conceptual framework.
- The research is an iterative process linking theory and practice.

Action research was explicitly introduced to the information systems community as purely a research methodology. Much like Mumford (2001) and Checkland and Poulter (2006), Wood-Harper (1996) also incorporated action research concepts into an action-based systems development methodology called Multiview (Baskerville, 1999). One clear area of importance in the ideal domain of action research is new or changed systems development methodologies as studying new or changed methodologies inherently entails the introduction of such changes, and is essentially interventionist (Dick, 1993; Avison, Lau, Myers and Nielsen, 1999 and Baskerville, 1999). Action research is one of the few valid research methodologies that can legitimately be employed to study the effects of specific alterations in methodologies in human organizations (Baskerville and Wood-Harper, 1996).

4.4. Underlying philosophy

Action researchers are amongst those who assume that complex social systems cannot be reduced for meaningful study (Miller, 2003). They believe that human organizations, as a context that interacts with information technologies, can only be comprehended holistically (Avison et al., 1999). A key inference of this assumption is that the reduction of a social context, like an organization and its information technology, into its parts, will not lead to helpful knowledge about the whole organization. How then can we develop an understanding of the interaction of complex social organizations and their information systems? The fundamental contention of the action researcher is that complex social processes can be studied best by introducing changes into these processes and observing the effects of these changes (Dick, 1993 and Baskerville, 1999).

The marginalization of action research helped mature the recognition that action research operated with a different epistemology than traditional science (Baskerville, 1999). Further, the conflicts that the approach raised were recognized (Avison et al., 1999 and Rapoport, 1970). This trend also linked action research closely to systems theory (Baskerville, 1999). Action researchers clearly recognize that human activities are systematic, and that action researchers are intervening in social systems (Baskerville, 1999).

4.5. Methodology

4.5.1. Participatory Action Research

The conventional action research approach depicted above has been developed into what is now known as "participatory action research". The most notable change is the reorganization of the roles of the researcher and subjects into one that is more collaborative (Baskerville, 1999). Previously, the researcher would have held the responsibility for theorizing, however in this new form the responsibility is shared meaning that participants are actively involved in the search for information and ideas (Greenwood, Whyte and Harkavy, 1993 and Baskerville, 1999).

This increased client participation is a major change. A significant differentiating factor for participatory action research as compared to its traditional form is the co-researcher status now held by all participants in this type of study, thus researchers and participants bring their unique theoretical and practical knowledge into the research process (Elden and Chisholm, 1993; Greenwood et al., 1993 and Baskerville, 1999). Action researchers contribute their knowledge of the action research process and general information systems theories. Whilst, participants provide contextually situated, everyday theory into the action research process. Consequently,

control over the social environment is rearranged and the research context is free to self-organize instead of being unnaturally established by the researchers (Elden and Chisholm 1993). Through the adaptations participatory action research has evolved into a theory based on assumptions that reality is situated and social systems are self-referencing (Baskerville, 1999). Thus, participatory action research can be seen as being founded on more recent organizational philosophy (Baskerville, 1999).

In participatory action research, it is not essential for researchers to extensively investigate theories surrounding the problem situation as it is assumed that the researcher can never have the profound understanding of the participants (co-researchers) as they have lived within the context for years usually (Baskerville,
1999).

4.6. Method

4.6.1. Case Study

Easton (2010, p. 119) defines case study research as a "research method that involves examining one or a small number of social situations about which data is gathered using multiple sources of data and developing a holistic description through an iterative research process" in this case being participatory action research. The case study approach is well established for conducting IS research (Klein and Myers, 1999; Benbasat et al, 1987; Ngwenyama and Nielsen, 2014). The opportunity a case study offers is the ability to understand a phenomenon comprehensively (Easton, 2010). Case study research aids in providing answers to the 'how' and 'why' questions in relation to a phenomenon as this requires an understanding of the operational links that need to be traced over time rather than the frequency

of its occurrence (Yin, 2003; Easton, 2010). Case study allows for the unravelling of complex sets of factors and interactions, and requires iterative non-linear movements between diverse research project stages (Verschuren, 2003).

Case study research has been prone to much critique, with many questioning its validity as a research method, highlighting a lack of ability make generalizations from a case study and asserting that it is prone to researcher subjectivity (Benbasat et al, 1987). Many authors have argued that case study research can not only falsify an existing theory, but also offers the possibility to make generalizations from the empirical observations to theoretical statements (Klein and Myers, 1999; Lee and Baskerville, 2003; Flyvbjerg, 2006; Ngwenyama and Nielsen, 2014). Flyvbjerg (2006, p. 237) affirms the validity of case study research through addressing the five common misunderstandings about case study research, positing context-relevant knowledge as being more valuable than the search for predictive theories and universal truths in the study of human affairs.

He (Flyvbjerg, 2006) recommends that good case studies should be read as a narrative in their entirety and admits that the summarizing of case studies is often difficult, however, the problems arising from this are more often "due to the properties of the reality being studied rather than the case study as a research method" (Flyvbjerg, 2006, p. 241).

4.7. Summary

What emerged was that this research is rooted in the systems approach to inquiry into and intervening into a social system. This theoretical perspective inclined the research to appropriately adopt the soft systems approach. Overall systems thinking provides a unique approach that encapsulates analysis and synthesis as a dialectic process, enables the holistic representation of complex situations and provides a means to understand how to intervene in a system.

Through this social systems lens action research was adopted as the methodology for the study, as this approach was found to be more suitable to the social research conducted within situations, groups and organizations (Reynolds and Holwell, 2010; Checkland and Poulter, 2006). The type of learning created by the action research process directly supported the accomplishment of the goals for the research as one clear area of importance in the ideal domain of action research is new or changed systems development methodologies as studying new or changed methodologies inherently entails the introduction of such changes, and is essentially interventionist (Dick, 1993; Avison, Lau, Myers and Nielsen, 1999 and Baskerville, 1999). Further, action research is one of the few valid research methodologies that can legitimately be employed to study the effects of specific alterations in methodologies in human organizations. The traditional action research approach subsequently developed into what is now known as "participatory action research". The most notable in this being the reorganisation of the roles of the researcher and subjects into one that is more collaborative. Through the adaptations participatory action research has evolved into a theory based on assumptions that reality is situated and social systems are self-referencing (Baskerville, 1999). Thus, participatory

action research can be seen as being founded on more recent organizational philosophy (Baskerville, 1999).

Case Study was the method adopted to gather the required data due to its ability to examine one or a small number of social situations, using multiple sources of data and developing a holistic description through an iterative research process in this case being participatory action research. Further, the case study approach is well established for conducting IS research (Klein and Myers, 1999; Benbasat et al, 1987; Ngwenyama and Nielsen, 2014).

The next chapter provides a description of the case study that outlines the conducted by the team to achieve the outcomes of the project they were involved in. The research sought to capture this experience and make meaningful observations about the manner in which they went about pursuing the goals of the project.

5. Empirical Findings

5.1. Introduction

The aim of the overarching research project was to create more contextually relevant IT practices, which also followed an action research process. To achieve the outcomes of the project the research team was tasked with firstly analysing and modelling the current practices within the research sites whilst also uncovering the reasons for the existence of these practices within the respective organizations. The second part of this project was to then use the insights gained with respect to how these companies organized there IT practices to inform more relevant IT organizing practices. Thus the research team of the fore mentioned project would be entering multiple organizations with the intention of analysing and understanding the IT organizing practices at play. It is within this research team that the research undertaken within thin thesis will take place.

At the outsight of the project the team had already expressed a sense of discomfort with using "traditional business analysis techniques" to reach the outcomes of the project, however, they also felt that the project would be a learning experience and that changes would be needed along the way in terms of their approach in order to satisfactorily deliver on the research outcomes. Essentially there was an understanding from the start that they would have to experiment with different methods in order to find a way that would work within the organizations they planned to investigate. Although what was clear from the outsight was that systems thinking cut across all the work that was to be done as this was seen to central to the success of the project. As such our research had to take into account the dynamism of the

project it was embedded in.

5.2. Effect of epistemological dispositions on the act of modelling

The research team was made up of analysts that were trained in traditional business analysis methods, however they had also been trained in systems thinking methods. At the start of the project several dialogue sessions were had with the team regarding the design process, the research project as well as what was needed for the success of the project and how the methods to be employed would be evaluated and selected.

One of The key themes that arose out of these sessions was the view of business design as being dynamic and the need to represent the dynamic nature of a system. Essentially design needs to consider a context as a whole rather than focussing on isolated components. "Design is a dynamic process, one needs to consider how the change in one component might affect the system as a whole" –Participant 1. Another Participant mentioned that "Systems have interlocking components and when you introduce a change you need to consider how this affects not only other components but also how it enables or restricts you from reaching your objectives". A general view held by the team is that each project is unique, including this one. Therefore, the approach that is taken needs to consider this uniqueness and be suited to the context. For the project to be successful the team felt that there needs to be a clear understanding of the problem situation and that this understanding would need to resonate with all the project stakeholders. The team also thought that the eventual solution needs to address the root problem and for there to be clarity on the root problem there would need to be an alignment of stakeholder worldviews.

A Participant noted, "… As a strong believer in systems thinking, I like to employ tools that are able to show how components are interrelated and unearth the interacting and conflicting worldviews… This allows me to see the problem situation that is running across stakeholders and provides a good starting point for any project".

"Through my experience as a business analyst I am versed in many methods, however I have always found that gathering a strong understanding of the context first, allows me to decide which tools are most appropriate to use… it usually starts with a discussion".

" I prefer using systems thinking techniques because they allow me to get the broadest understanding of a situation"

Upon continued observation it became apparent that the team are mostly inclined to use systems thinking techniques at the beginning of a design effort. This highlighted that the epistemological disposition of the team (Systems thinking) inclined them to use tools that would satisfy systems thinking principles. This evidence highlights how the epistemological stance of the designer or analyst predisposes the use of certain tools, methods or techniques. Thus revealing how an epistemological stance affects the act of modelling in that it reduces the amount of tools that might be employed by the practitioner. In this way the epistemological stance serves as an evaluation criterion for evolution and selection of tools and methods.

5.3. The Effect of contextual influences on modelling outcomes

In the initial engagement in the research site we found out that the organization concerned had been through three major restructurings in recent history. This affected the openness of people within the organisation

towards disclosing information that might be perceived as having negative implications to their positions for example. This resulted in the team having asymmetrical information.

Which directly influenced the ability of the team to cerate a representative model of the current state. Competing political agendas within the organisation also impacted the information received and this led to the team having to change tact with regard to engagement in order to obtain the necessary information. As the project progressed a deeper understanding of the context was acquired and this led to the need to change models that were already created as well incorporate this understanding into the models that would still need to be created. In some instances this lead to the complete recreation of models rather than simply adjusting as well as the use of completely different modelling techniques than ones previously used prior to the understanding, of this new contextual information.

In this sense it may be seen that contextual influences affected the modelling outcomes in that they increased or decreased the relevance of models based a changing understanding of the context. Thus, the understanding of the situation also functions as evaluative criteria for the usage of certain modelling techniques, as this reveals the relevance and/or irrelevance of the method to the requirements of that context.

5.4. Social action based on modelling

In the case of this project the understanding was that the modelled artefact provides a basis for collective understanding about a situation. This collective understanding then functions as a basis on which stakeholders engage in dialogue towards building a common purpose. One participant remarked "… the model is never an end in itself, but it should function to align worldviews

and form the foundation for future action… this is why its important to understand the actions you seek to enable through the models".

At the beginning of the project the team highlighted that purpose of the modelling exercise at this point was to elicit a general understanding of the key problem situation. This motivated for the use of causal loop diagramming as well as contribution modelling as these method allowed for depiction of causes and effects which showed how the current situation came to be and what was keeping it in place and depicts a work system as defined by Hoebeke (2000), a work system is a purposeful definition of the real world in which people spend effort in more or less coherent activities for mutually influencing each other and their environment, respectively. In the selection of methods the tailored approaches were created and used in order to enable the desired social actions of awareness and dialogue. Contribution modelling was selected over traditional analysis methods as it does not identify a person with a function as it is difficult to infer to which processes people contribute on the basis of their organizational position because it is only by defining the processes and their outputs that a persons activities can be discussed. In this sense the social action that was enabled by the modelling was awareness and action based on the collective awareness of the problem situation. This social action, based on a collective awareness, then affected future modelling/design activities – as this essentially introduced a change into the context. After seeing the first model (Causal lop diagram) the client noted "this is really helpful… it allows me to have more directed discussions with my teams about these issues… to start brainstorming ways out of it…"

The presentation of the first model began the process of dialogue between the team and stakeholders (this was conducted in the form of a workshop).

An outcome of the workshop was consensus being reached about the problem situation and this illuminated the key objectives of the design effort going forward.

These redefined project objectives directly informed the social action that was sought. This action was focussed on highlighting the IT practices that practitioners needed to engage in to realise their new strategy. This impacted the modelling exercise as it changed the focus from modelling current situation to recommended future practices. As an effect the modelling techniques that were now needed had to provide prescriptive guidelines for practitioners. The selection of these was primarily based on the extent to which they could enable social action to achieve the project objectives. In this sense it can be seen that the desired social action also functions as an evaluative criterion in the selection of methods.

5.5. Summary

These findings revealed how epistemological dispositions affected the act of modelling, how contextual influences affected modelling outcomes and how social action based on modelling was enabled in the context of the research project. Essentially, epistemological dispositions, contextual influences and desired social action function as evaluation and selection criteria of appropriate methods to use whilst engaged in the design process.

6. Theoretical Discussion of Findings

For the team, to more appropriately select the tools that were used whilst engaged in the design process they needed to firstly be aware of their epistemological stance and how that inclined them to select certain tools. In parallel they had to be aware of the social action they were seeking to enable (the purpose they were pursuing) and this set parameters for the types of methods they would employ to reach the outcomes. However, the contextual requirements and influences also provided their own parameters with respect to the tools and methods that would work within the context. These three considerations were the defacto decision-making criteria in the evaluation and selection of the methods employed.

How does the epistemological stance affect the act of modelling? A useful concept to understand this is that of a "Worldview". A worldview allows certain things to show up and to be blind to other things. This then shows how Epistemology serves as an evaluation criterion. Our findings also revealed that modelling outcomes are affected by contextual influences. A concept that allows us to understand this phenomenon is that of bricolage. Bricolage analogises design as a continual interplay between events and their handling by the designer; design can be seen to be successful when it handles contingent events well; and unsuccessful when it does not (Louridas, 1999). Bricolage also provides useful insight into how social action based on modelling is enabled (Louridas, 1999).

6.1. Worldview

When we interact with real-world situations we make judgements about them: are they 'good' or 'bad', 'acceptable' or 'unacceptable', 'permanent' or

'transient'? Humans make judgements about real world situations when they interact with them, determining whether they are good or bad, relevant or irrelevant, acceptable or unacceptable. In order for judgements to be made there needs to be an appeal to some criteria or standard. These criteria may be seen as characteristics, which define whether something is appropriate or inappropriate, etc. (Checkland and Poulter, 2006). A question as to where these criteria come from then arises? Checkland (2006, p. 11) provides an explanation for these, noting, "they will be formed partially by our genetic inheritance from our parents, the kind of person we are innately – and, more significantly, from our previous experience of the world. Over time these criteria and the interpretations they lead tend to firm up into a relatively stable outlook through which we perceive the world". Through this description Checkalnd provide an explanation of what has been termed "worldview". Worldviews may be seen as "built in tendencies to see the world a particular way" (Checkland, 2006, p. 11). Different worldviews incline us to characterizes people in different ways, for instance, one person might be seen as liberal whilst another as reactionary. Worldviews also apply to how we evaluate the characteristics of things such as models, for instance, certain models may be seen as prescriptive other might be seen as informative. This further affects the way in which we would evaluate and select models as desired characteristics may be viewed as abundant in one method and lacking in another, based on the worldview of the selector. Worldviews can change over time but they are relatively stable. The concept of worldview is important in understanding the complexity of human situations (Checkalnd and Poulter, 2006). In the case of this research project it may be seen that the worldview held by the team of looking at things holistically inclined the team to select methods that were congruent with this disposition. The concept of worldview thus highlights an important point,

that the way we see the world informs how we verify truth or knowledge about the world (epistemological disposition). Which in our case affects how we evaluate the appropriateness of certain methods over others. This understanding that one's worldview affects their epistemological disposition and that this in turn affects the evaluation and selection of methods provides an explanation for the observed phenomenon in this case of how epistemological disposition affect the act of modelling. This realization highlights the need for analysts or designers to become aware of their epistemological dispositions, as this would highlight the manner in which they select the tools and methods they employ.

6.2. Design and analysis as bricolage

Bricolage analogises design "as a continual interplay between contingent events and their handling by the designer; design is successful when it handles contingent events well; it is unsuccessful when it does not" (Louridas, 1999), contingent events in our case being the contextual influences. Bricolage is the construction of a work from a diverse range of things that happen to be available or a work created from such a process ("Bricolage", 2013), put simply bricolage is the creation of structure out of events (Louridas, 1999). Louridas (1999) highlights the fundamental difference between the briocleur (one who engages in bricolage) and a traditional practitioner, noting that a bricoleur makes use of a portfolio of semi-defined elements that are both abstract and concrete. The bricoleur being the person engaged in bricolage. Within this process the bricoleur would redefine the means that they already have where as a traditional practitioner would create the means for the completion of their work. The semi defined elements within a bricoleur's portfolio hold a meaning provided to them by their past uses as well the bricoleur's knowledge and skill. This meaning can be adapted to an extent based on the requirements of the project and/or

context as well as the bricoleur's intentions.

Louridas (1999, p. 5) notes "Bricolage is therefore at the mercy of contingencies, either external, in the form of influences, constraints, and adversities of the external world, or internal, in the form of the creator's idiosyncrasy". This assertion provides an explanation for the experienced phenomenon in this case. Whereby the design outcomes are affected by the epistemological disposition of the designer, the contextual influences affecting them and the social action they seek to enable through the act of modelling.

As the literature has highlighted, the traditional view of design and analysis is one operating within a scientific paradigm (Ciborra, 1998; Louridas, 1999). Traditional scientific approaches utilize structures made of underlying theories and hypothesis to arrive to reach their conclusions, which take the form of events, whilst bricolage "it creates structures, in the form of its artifacts, by means of contingent events" (louridas, 1999, p. 5). The findings of this research make it apparent that those engaged in design are indeed engaged in the process of bricolage.

As Loruridas (1999) eloquently put it: Design is not bricolage, but we can see design as bricolage – Louridas, 1999

Louridas (1999) provides an understanding of the effect of contextual influences on the modelling outcomes of the design process, highlighting the reflective conversation that the designer needs to have with the situation at hand. In this sense, it can be seen that understanding the contextual influences, how they affect the modelling efforts and outcomes and how these in turn affect the act of modelling is a hermeneutic process of iterative

understanding. The goal of this understanding is to create a structure out of the means and results of the design actions (Louridas, 1999). In order to do this the designer must be creative engaging in a dynamic process of tinkering with their models assessing the results of this (in terms of relevance in relation to dealing with the contextual influences and enabling desired social actions) and tinkering accordingly. A key part of this process is the adoption of different perspectives through which the model is assessed which highlight different considerations in terms of addressing contextual influences and enabling desired social actions. This process is akin to that undertaken by the team during the project in the creation of models that incorporate contextual influences towards enabling the desired social actions (for example the creation of the contributions model) and is referred to as metaphorical bricolage (Louridas, 1999).

A key objective of the design effort is to resolve the problem situation being faced by the organization and allow for them to realize their objectives. Due to this, the designer is required to gain a thorough understanding of the problem situation and provide novel solutions. The provision of such solutions is based on an understanding of the purpose being pursued by the organization or the social action that was sought after through the design effort. A key criterion for this is based on the designers' ability to understand the situation in a new and novel way, create a portfolio of contextually relevant methods and define the purpose of the artefact. Louridas (1999) notes, "The designer has to elicit and establish the purpose of what he designs". The awareness of the purpose being pursued by the model or the social action that is sought provides a criterion to evaluate current modelling methods and select potential methods.

6.3. Summary

The findings from the case and the concept bricolage as analogous to design highlight the functioning of epistemological disposition, contextual influence and desired social action as evaluative criteria for the evaluation and selection of tools and methods whilst engaged in the design process. It becomes apparent that being mindful of these factors allows for the use the most appropriate methods in the pursuit of the design objectives.

Essentially, we recommend that designers or analysts practice the following: An appreciation for their epistemological dispositions towards an understanding off these with the goal of illuminating their methodological inclination, an appreciation for the contextual influences at play whilst engaged in a design effort, the need for an explicit understanding of the purpose being pursued or the desired social action to be enabled by both the modelling and design exercise and the reflection that needs to take place with respect to the fore mentioned factors and their interaction within a design context.

This can be seen as a dialectic process between the dispositions of the analyst or designer (Epistemology), The environment in which the intervention takes place (Contextual Influences) and the desired outcome sought by the design exercise (Social Action). An engagement with this dialectic process can enable improved selection and evaluation of appropriate methods for an analysis and design effort.

7. Conclusion

This paper provided a review of current state of information systems discipline and the root cause of a persisting problem in this field, in this paper we refer specifically to the information systems analysis and design methods. The theoretical perspective of this research was rooted in systems thinking and this being the case favoured the selected research methodology and data collection method. This paper cannot speak to a situation in which the research was founded on different theoretical lens and in such a case what the appropriate methodologies would. This highlights the need for research into design efforts that are not necessarily based on a systems approach.

This paper acknowledges the factors that need to be considered to improve method selection towards improving a design effort, namely: Epistemology, contextual influences and social action. Additionally, another factor is of relevance but not expounded on in this paper. That is the "inventory of methods" available to a practitioner. It would be interesting to map the dialectic process mentioned in the previous chapter to include this factor as well. The strength of the findings of this study is that this was uncovered during an action research process conducted within a research team involved in a design exercise.

As this research was conducted within a limited case study it does not provide an exhaustive list of factors that may aid in more appropriate selection of methods. Therefore we recommend that future research evaluate the basic framework presented in this paper to enhance the evaluation criteria.

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