



University of Cape Town

A thesis presented to the

Department of Information Systems

by

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August 2010

In partial fulfilment of the requirements for the Coursework and
Dissertation for a Masters in Commerce Degree

(INF5005W) Course 2010

Topic: How do South African Organisations Adopt Agile
Methodologies for Software Development in Practice?

Key Words: Actor Network Theory (ANT), Agile, Case Study,
Scrum

Dedication

This dissertation is dedicated to my wife Lho Nosipho Noruwana and children Yolo and Lilitha Noruwana.

Acknowledgements

First and foremost I am grateful and thankful to God almighty who blessed me with wisdom, guidance, good health, and a family that support me tirelessly.

This thesis was prepared under the supervision of Maureen Tanner. I would like to express my sincere gratitude to her for providing me with guidance and support on agile methods and Actor Network Theory. She gave me thought-provoking feedback and professional guidance in the planning and implementation of this research. Her invaluable support, encouragement, and scholarly analysis did not go unnoticed.

I would like to express my deepest appreciation to the interviewees, who shared with me their experiences on adoptions of agile systems development methodologies. This has assisted me in mapping agile practices to the challenges associated with traditional systems development frameworks while making a success of this research.

Last but not least, I would like to thank my wife Lho Noruwana, children Yolo and Lilitha Noruwana for their understanding and continuous support.

Declaration

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Abstract

Before organisations adopt agile methods, they need to ensure that they are prepared for the change. They also need to understand the problems they are trying to address by adopting agile methods. Agile methods deviate substantially from traditional methods of systems development (Tolfo & Wazlawick, 2008). This, therefore, makes it difficult for organisations to adopt agile methods even though they might see them attractive, as the adoption of such methods has an effect on organisational culture. If the culture cannot accommodate an agile approach, then the organisation will not be able to adopt agile (Lindvall, Basisli, Boehm, Costa, Dangle, Shull, Teseriero, Williams & Zelkowitz, 2002). Having a culture that is conducive to the adoption of agile methods is almost unanimously perceived by agile experts to be a necessary factor for the introduction of agile methodologies (eWorkshop, 2002). It is also important to understand the phases organisations go through during the process of adopting agile methods.

In this thesis the researcher has reviewed the critical points of existing knowledge, including substantive findings and theoretical and methodological contributions to the adoption of agile methods of systems development. A gap in the literature was identified as a lack of knowledge of the phases South African organisations go through during the adoption of agile methods. The researcher has also scrutinised the secondary sources of knowledge.

How organisations can manoeuvre their existing culture in order to be able to benefit from agile methods is important. The objective of this study was to uncover empirical evidence on the disparities between agile prescriptions and the way organisations actually implement agile methods using Actor Network Theory (ANT). The results of the study reveal that in adopting agile methods of systems development, organisations try to address problems that cannot be addressed by traditional methods. It has also unveiled the fact that there is no structured process for adopting agile methods and therefore organisations go through various phases in their attempts to adopt agile methods. During the various phases, organisations face challenges, of which culture-related and people-related challenges have been identified as being most prominent.

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Chapter One

1. Introduction

1.1 Context

In the modern world, organisations operate in uncertain and dynamic competitive environments. There are many sources of turbulence in these environments, emanating from factors such as intensified global competition, reduction in the lead-time and life expectancy of products, the diversification of demand, and new technologies (Ismail, Snowden, Poolton, Reid & Arokiam, 2006). Organisations should, nevertheless, be able to compete within these environments in sustainable ways. In order to address these problems, the agile approach to systems development was developed. One facet of realising agile development is lean management (Klein & Canditt, 2008).

The term “lean management” originated in assembly production (Poppendieck & Poppendieck, 2003), and refers to the elimination of activities during production that do not contribute additional value to the product. This principle is also applied in agile development where waste is eliminated from the implementation of new systems.

Types of waste vary according to type of business. Waste can be reduced or even eliminated when developing a system using lean agile software development methods (Poppendieck & Poppendieck, 2003), thus yielding direct cost savings. The following are examples of types of wastes:

- **Process waste** – entails unnecessary reviews or making review methodology more efficient.
- **Product waste** – refers to the development of unnecessary features.
- **Communication waste** – refers to long communication paths that add no value to the system.
- **Productivity waste** – refers to low motivation in development teams.

The reduction of waste in developing systems helps organisations to save money and reduce costs directly, which in turn has an immediate impact on the performance of the entire business, particularly in organisations that depend on information technology (IT) for their operations. Unlike the waterfall methodologies, these software development methodologies accommodate change and focus on the needs of the business. Waterfall methodologies are plan driven and do not accommodate change.

Agile methods of systems development continue to gain popularity in South Africa. However, little has been said about the approach and the challenges associated with the adoption of these methods in the South African context. In practice, few organisations are able to take on agile development approaches immediately and adopt them successfully over a short period of time; a full transition often takes a few years (Qumer & Henderson-Sellers 2008). Furthermore, it may be inappropriate for them to adopt all aspects of agile methods of systems development.

In addition, organisations may be unsure of how to adopt agile methods; which aspects to choose as most appropriate for their situation, how to engender enthusiasm in team members (Syed-Abdullah, Holcombe & Gheorge, 2007), and how to ensure that the whole of the development team does not succumb to the inherent desire of humankind to “resist change” (Henderson-Sellers & Serour, 2005). On the other hand, Chan and Thong (2008) state that although agile methods of systems development are believed to help improve the software development process, their adoption often encounters resistance. This resistance comes mainly from IT personnel.

There may, moreover, be other factors that could pose a challenge in the adoption of agile methods. These may be related to the process that organisations follow prior to the adoption, during the adoption and post adoption. These challenges may be based on a lack of understanding of the agile methodology being adopted or even aspects of it. In understanding the methodology, organisations need to know exactly what aspects of the methodology will address what problems. Such information should then enable South African organisations to know and understand the benefits that a successful implementation of agile can bring.

1.2 Purpose the Study

The purpose of this study is to examine the phases that South African organisations go through during the process of adopting agile methods of systems development. The results of this study may help to provide an in-depth understanding of the challenges that South African organisations experience during the adoption of agile systems development methods. Accordingly, this study intends to, firstly, analyse the problems that compel South African organisations to adopt agile methods.

Secondly, this study looks at the pre-adoption, the adoption and the post-adoption phases of agile methods, with the intention of helping South African organisations to better understand why organisations adopt agile methods, what phases they go through in the process of such adoption and the challenges that are associated with the adoption of agile methods. Hence, this study also touches on the benefits brought about by the successful adoption of agile methods.

1.3 Background

The emergence of agile methods of systems development was as a result of the realisation that traditional methods were not able to respond quickly enough to changes in business requirements (Abrahamsson, Salo & Ronkainen, 2002). It was found that the use of agile methods could optimally create a high quality environment and a high quality product (Qumer & Henderson-Sellers, 2007). The current business environment is characterised by dynamism that requires systems development methodologies to embrace change by acting quickly in attempting to meet the new business needs (Sone, 2008). According to Cockburn and Highsmith (2001), agile methods address rapidly changing business requirements by focusing on the people factor in terms of amicability, talent, skill and communication. Accordingly, in order for agile methods to work in an organisation, it is important to build a culture of responsive teams.

Agile methods in system developments were first initiated by a group of people with experience in systems development. They produced a document called the agile manifesto. The agile manifesto (2001) tried to uncover better software development methods by focusing on individuals and interactions over processes and tools, working software over

comprehensive documentation, customer collaboration over contract negotiation, and responding to change by following a plan. This manifesto generated a lot of interest in the IT industry. However, in trying to refine agile methods, there were questions as to what changes could be made in order for agile methods to work (Elliot, 2008). Elliot (2008) identifies these questions as the following: Is there a need for project managers in agile environments? How can a traditional project manager change his management style so that it works in agile environments? What culture should an organisation build in preparation for the adoption of agile methods?

Boehm and Turner (2004) indicate that managers face serious challenges, both real and perceived, in trying to adopt agile methods. They further identify most of the challenges as being change related. Accordingly, as a means of addressing the challenges while adopting agile methods, Boehm and Turner (2005) call for organisations to understand how communication within teams happens, to educate stakeholders so that they understand the processes and the benefits thereof and to involve senior managers in selling agile methods to the rest of the organisation. This is in line with Cockburn (2001) who state that emphasis should be placed on the value of agile methods and that rewards systems should be adjusted to recognise both individuals and teams.

1.4 Research Objective and Scope

In traditional software development environments, projects have a low success rate (Schwabe & Beedle, 2002). One of the factors that contribute to this low rate of project success is that traditional methods take narrow views of software projects (Longden-Thurgood & Mackintosh, 2007). These traditional methods focus on time, scope and quality. In contrast, agile methods introduce a holistic view which includes communications and people, working software, customer collaboration, and responding to change, which are seen to be contributing factors in the success or failure of projects (Law & Charron, 2005; Cockburn, 2002). The objective of this research is to uncover the disparities between the promises of agile methods and practical experiences. The research will provide details on how organisations go about implementing agile methods. It is thus expected that organisations will experience some learning. The actor network theory (ANT) will be used to trace the process that is followed in the adoption of agile methods. The ANT will reveal

how actors align their interests through the translation moments to form the network. The negotiations between the actors while aligning their interests may reveal insights in their interactions during the process of adoption.

The way in which organisations arrive at the decision of how they should adopt some aspects of agile and not others will also be addressed. However, agile adoption in distributed environments will not form part of this study; only co-located teams will form the point of focus. For convenience purposes, the study will be conducted in a Cape Town-based organisation.

1.5 Importance of this Research

This research will contribute to the systems development body of knowledge. This body of knowledge will be enriched by the empirical evidence that will come out of the research. As mentioned earlier, organisations take a narrow view to systems development (Longden-Thurgood & Mackintosh, 2007); hence this research will introduce a more holistic approach. It has been found that there is limited literature on the adoption of agile methods in the South African context.

The gap that has been identified in the literature involves the fact that no specific processes or frameworks are followed in adopting agile methods. When this study uncovers the process of adopting agile methods, it will also reveal the extent to which the adoption of agile methods can help organisations to take a holistic approach to systems development. Highsmith (2002) suggests that organisations looking to implement agile methods should start with the most complex and problematic projects. It is expected that the organisation that will be studied will deviate from this suggestion for various reasons: it could be fear of failure, uncertainties in the newly adopted methodology or any other reason.

Some of the recommendations that will come out of this research may provide a blueprint for ways in which agile methods of systems development can be adopted by organisations that are similar to the one that will be studied. These organisations can benefit by improving on what has been done, avoiding the mistakes that have been made and making use of recommendations. Those that fear the implementation of agile methods because they think they will not work can learn from the findings of this research.

1.6 Overview of the Thesis

Chapter two scrutinises the literature that is applicable to this study. It begins by providing a broad theoretical overview of agile methods and then defines and gives the history of agile methods and how they came to be applied in IT projects. The chapter focuses on agile in South African organisations, the principles of agile, as well as some of the existing agile methods and challenges associated with the adoption of agile methods.

Chapter three introduces the ANT while chapter four outlines the research approach followed in the study. It introduces the Actor Network Theory (ANT) and a number of related concepts. The chapter also examines the research methodology, the process of collecting data and analysis of the data.

Chapter five identifies the research approach used and then gives a description of the case used in this research. Chapter six follows with an analysis of the data, the discussion of which is based on the ANT. Chapter seven gives details of the findings of this research while Chapter eight concludes the thesis.

Chapter Two

2. Literature Review

2.1 Introduction

This chapter aims to review the critical points of existing knowledge, including substantive findings and the theoretical and methodological contributions to the adoption of agile methods of systems development in particular. The researcher will also scrutinise secondary sources of knowledge.

2.1.1 Outline of this Chapter

The literature review will focus on giving a comprehensive understanding of what agile methods are. The section that defines agile will provide an understanding of what the term “agile” means. This term will also be looked at from a systems development point of view. The section on the history of agile methods will focus on where the application of agile methods of systems development comes from and at what stage agile methods are in relation to the technology adoption lifecycle model. Furthermore, the section on the principles of agile methods will look at the reasons why agile methods are attractive to the world of systems development. Finally, the literature review will briefly introduce some of the agile methods that organisations can adopt.

2.2 Background to Agile

2.2.1 Definition of Agile

According to the *Oxford dictionary*, “agile” is the ability to move quickly and easily. This definition does not look at any specific application of the word. Highsmith (2002) has introduced a definition that applies to the general business environment. He states that agile is the ability to respond to change in order to profit in a dynamic business environment. This definition refers to any business environment. Our main interest here is to understand what agile means in the systems development context. Maurer and Melnik (2007) see agile as a humanistic and collaborative style of systems development which promotes and encourages

the continual realignment of development goals with the needs and expectations of the customer. This is in line with Boehm and Turner (2004) who regard agile as being applicable to memory and history in order to adjust to new environments, react and adapt, take advantage of unexpected opportunities and update the experience for the future.

It is evident from the above that agile is about a state of flexibility and responding to environmental changes. To be able to accommodate that flexibility, organisations need to adhere to certain principles prescribed by agile methods. Boehm and Turner (2004) see agility as being strengthened by discipline of those who use it. Discipline is one of the key agile principles, particularly among software development teams. This principle states that, in agile methods, teams are empowered to make their own decisions (Cockburn & Highsmith, 2001). This ensures that teams are better equipped to respond to change with minimal red-tape. The autonomy of teams is accompanied by responsibility.

Highsmith (2004) describes agile software development as consisting of the principles, practices and values that assist software development practitioners with impromptu challenges that cannot be handled using traditional methods. Some of the benefits of implementing agile systems development are the ability to produce software in a dynamic and adaptable manner and to receive early customer feedback, which enables software development teams to perfect their products sooner (Beck, 1999).

2.2.2 History of Agile Methods

Agile methods are sometimes referred to as “lean” methods. The term “lean” means the “elimination of waste”, because agile methods aim to do away with non-essential activities in projects and focus only on what is required. The term “lean” comes from the Toyota Company, a Japanese car manufacturer that now manufactures cars for the world market. The term “lean” dates back to the late 1940s and, before the introduction of lean manufacturing there was only mass production, which focused on manufacturing thousands of cars that were identical. As the Japanese market at the time was not big enough for that scale of production, the only option was to make cars in small quantities and keep them inexpensive (Poppendieck & Poppendieck, 2003).

The elimination of waste focused on eliminating features that were not needed by the customer, the minimisation of wasted time between batches, minimising the waiting time by shortening the distance travelled during production and minimising defects. These techniques minimised costs and increased Toyota's competitiveness.

In the late 1980s to early 1990s, agile software development methods emerged with rapid application development (RAD) being the first agile method (Kettunen, 2008; Hughes & Cotterell, 2006; Pressman, 2005). From this method some of the agile methods were born. These are extreme programming (XP) (Beck, 1999), Scrum (Schwaber & Beedle, 2002), feature driven development (FDD) with Jeff De Luca and Peter Coad being the pioneers (Highsmith, 2002) and dynamic systems development method (DSDM) (Abrahamsson *et al.*, 2002; Boehm & Turner, 2004).

In recent years the adoption of agile methods is considered as being at the chasm, which is a stage between early adopters and early majority of the technology adoption life cycle (Mahanti, 2006; Maurer & Spagnuolo, 2008; Spagnuolo, 2008). This puts agile methods in a position where they need to cross over the chasm in order to become the mainstream methodology. The success rate of adoption of agile methods could have an impact on whether these methods cross the chasm or not. According to a recent study conducted by Vijayarathy (2008), there has been a positive response from organisations that have adopted agile methods. His findings suggest that increased productivity, quality improvement with lessened defects, reduced software release times, reduced costs, customer involvement and customer satisfaction were attributed to agile methods.

Vijayarathy (2008) has released results suggesting that the application of agile methods is best suited to web applications which face rapid changes in requirements and facilitating technologies. Figure 1 show the types of project where agile methods have been adopted with the highest percentage being the web applications.

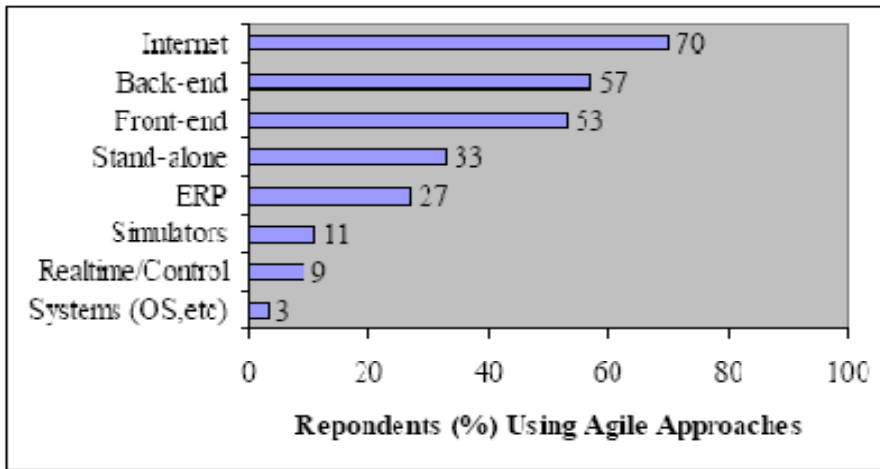


Figure 2.1 - Technologies and Agile Projects

Source: Vijayasarathy (2008)

Vijayasarathy (2008) also reports on the factors that influence the adoption of agile methods. Figure 2 shows that personal interest has the highest influence and trade publications have the least.

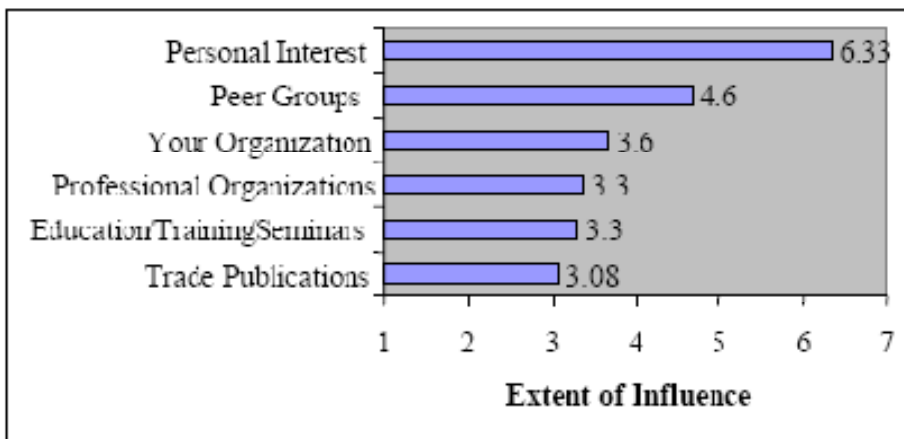


Figure 2.2 - Extent of influence to Adopt Agile Method

Source: Vijayasarathy (2008)

2.3 Principles of Agile Methods

Agile methods cannot be implemented in every project (Mahanti, 2006). This is due to the fact that some projects have requirements that seldom change, but follow a predetermined

plan. In line with their definition, agile methods would be suitable for environments that are market driven, where requirements changes are the order of the day. Such environments need systems development methods that meet the changing business requirements. Traditional methods, which are plan-driven, lack the flexibility to adjust to the development process (Nerur, Mahapatra & Mangalaraj, 2005; Cohn & Ford, 2003). It is also important to note that because agile methods deliver working software within a period of two to four weeks, organisations are able to quickly seize opportunities presented by the environment (Nerur *et al.*, 2005).

Unlike traditional methods, agile methods are better able to deal with uncertainties by relying on people's creativity rather than processes (Cockburn & Highsmith, 2001). This could be married with the fact that agile methods emphasise a good mix of skill within teams as well as promote collaborative decision making involving stakeholders (Nerur *et al.*, 2005). Furthermore, the creativity of team members is encouraged by the rotation of members to ensure the cross pollination of knowledge.

“Agile processes are designed to capitalize on each individual and each team's unique strengths”
(Cockburn & Highsmith, 2001, p. 132).

Team members are also empowered to use their own discretion in organising themselves and responding to changes in the environment (Elliott, 2008).

Berteig (2007) identifies the following benefits of agile methods:

- **Rapid learning** – scientific methods of discovering.
- **Early return on investment** – an opportunity to use the results of work at the end of each iteration.
- **Satisfied stakeholders** – engage stakeholders and allow them to make meaningful contributions.
- **Increased control** – work is steered in the direction that ensures goals are met.
- **Responsive to change** – change is embraced rather than rejected. This ensures that changes in the business are can be accommodated.

The benefits of agile methods identified by Berteig (2007) are entailed in the principles of agile methods. It would be expected that if agile methods are implemented carefully, they will experience these benefits.

2.4 Existing Agile Methods

Organisations that wish to adopt agile methods have a variety of agile approaches to select from. However, what the approaches promise differ. Organisations do not follow agile methods exactly as prescribed by the literature (Longden-Thurgood & Mackintosh, 2007) and method selection is based on the nature and size of projects. For purpose of this research the researcher will give attention to XP and Scrum.

2.4.1 Extreme Programming (XP)

The name extreme comes from the drive to take agile methods to extremes (Beck, 1999). XP brings the whole team together and uses simple practices with effective feedback to enable the team members to see where they are in the project and to adjust the XP practices to their unique situation (Lindstrom & Jeffries, 2004). Although this method might have its strengths and weaknesses, it is regarded the most popular agile method (Mannaro, 2008).

According to William-Jones and Graham, (2007), XP was developed mainly for object-oriented projects. The values that underlie this method are the following:

- **Communication** – In line with agile principles, the XP practices discussed above encourage face-to-face interaction among members of the project team. William-Jones and Graham (2007) states that the most difficult problems that project teams face emanate from team members not communicating when they should.
- **Simplicity** – The principle here is to confine the systems that meet the customer's needs. This implies that system developers must stick to what the customer believes will add business value.
- **Feedback** – There must be feedback from the customer on the piece of functionality released after each iteration, as this feedback will drive the next iteration. In addition, the implementation feedback loops are built into the XP methodology via pair programming and TDD (Williams, 2003).

- **Courage** – This encourages the team members to be realistic when making estimates. They should not make promises that they will not be able to keep.
- **Respect** – The team members need to treat the project and one another with respect.

The values of XP methodology are congruent with the key principles of agile methods. These values are face-to-face interaction among members of the project team, Focus on customer needs, regular feedback, realistic workload estimates and respect among team members.

The XP Process

Each agile method follows a specific process. The XP process is characterised by five phases as detailed in Figure 3 and comprise the following:

- **Exploration phase** – In this phase, customers write their story cards. Story cards are cards that contain brief descriptions of what the customer and developer agree on what should be produced (Williams, 2007). On the other hand, the project teams acquaint themselves with the tools and technology that will be employed during the project execution. This can take weeks or months depending on how quickly the team gets acquainted with the tools (Abrahamsson *et al.*, 2002).

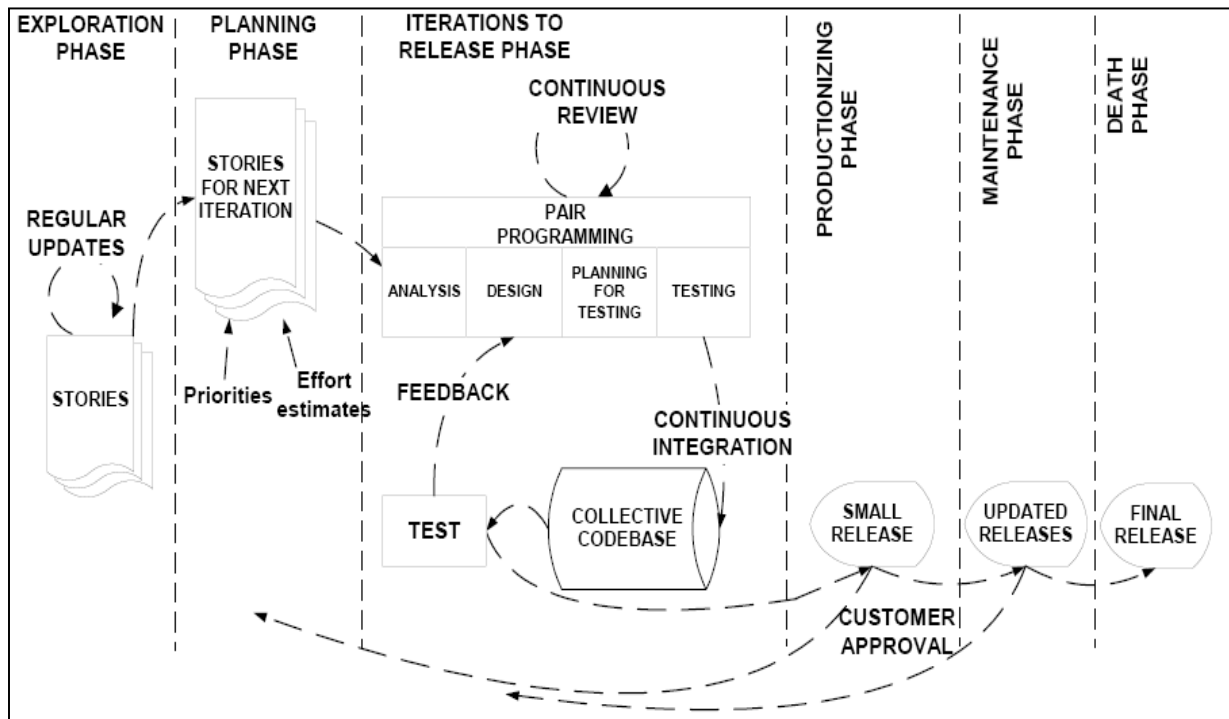


Figure 2.3 - The Extreme Programming process

Source: Abrahamson, Salo, Ronekainen and Warsta (2002).

- **Planning phase** – The stories that were written out in the exploration phase are listed in order of priority and developers estimate the effort required for each story. The resulting artifact for this phase is the schedule for the iteration, which usually ranges from two weeks to one month (Abrahamsson *et al.*, 2002).
- **Iterations to release** – Several iterations happen at this phase before anything is released.

“The first iteration creates a system with the architecture for the whole system” (Abrahamsson *et al.*, 2002, p. 20).

- **Productionising phase** – This is where extra testing takes place before the system is delivered to the customer. Some of the items, ideas and suggestions may be postponed. These will be noted so that they get included in the next iteration. This is where the functionality for the first iteration goes live and the support inherits the problem handling. For this release to happen there must be customer satisfaction that the system performs as intended (Williams, 2007). After the production phase the development

team goes back to select more stories for the next iteration. This process will happen until there are no more stories for the iteration. At this stage the death phase has been reached and the project ends.

Roles and responsibilities in the XP project

Williams (2007) and Abrahamsson *et al.* (2002) identify six roles that are performed in the XP project. These roles are the following:

- **Manager** – determines the current project situation, establishes difficulties in the process and makes the necessary decisions. He basically owns the team together with its problems. He functions as an interface between the team and the external stakeholders.
- **Coach** – This is the person who teaches others how XP functions. Such a person ensures that the XP process is followed and he or she would typically come from the development team.
- **Tracker** – A tracker traces the progress of iterations. He or she gives feedback to the customer on how far the development team is in relation to the target. A tracker will also say whether the iteration goal is reachable given the current resources and time. This is to ensure that there is improvement in estimating work.
- **Programmer** – A programmer writes the code and keeps working towards the set targets. He is also responsible for designing automated tests and keeping the code simple.
- **Tester** – A tester helps the customer in writing functional tests and also conducts tests continuously during and after each iteration.
- **Customer** – Customers write the stories. With the assistance of a tester, they produce functional tests.

2.4.2 Scrum

The term “Scrum” is taken from of the game of rugby. The strength of the scrum comes from the strength of the teamwork that is revealed by the rugby team (Rising & Janoff, 2000). According to Larman (2003), the Scrum method can easily be combined with complementary agile methods of systems development.

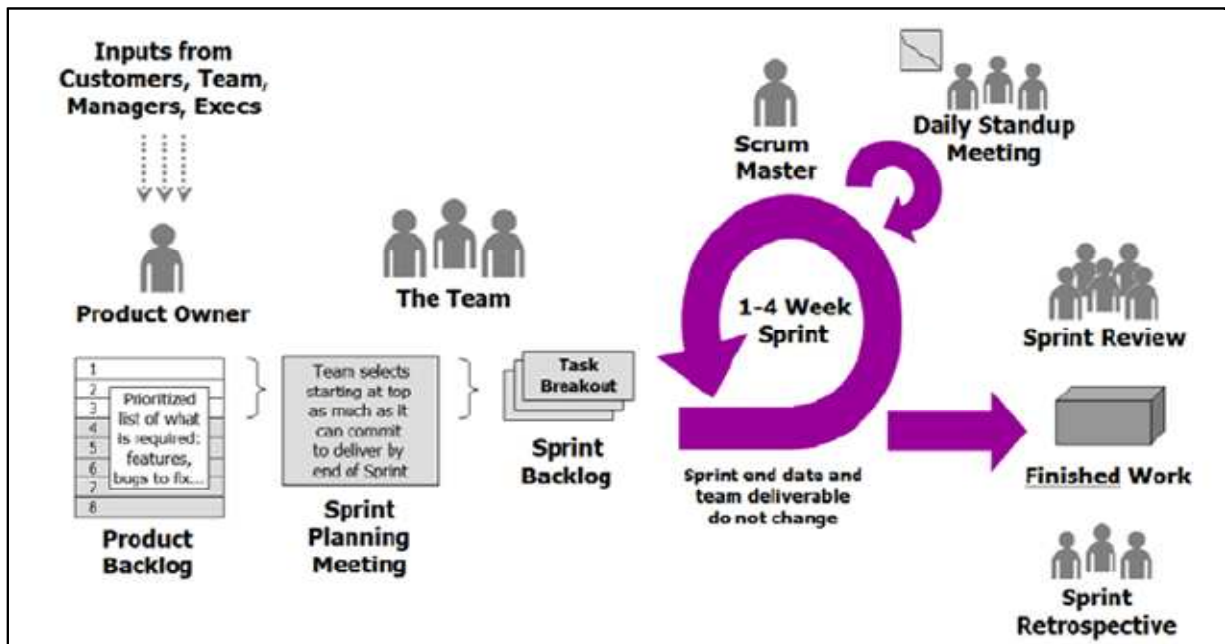


Figure 2.4 - The ScrumProcess

Source: Schwaber and Beedle (2002)

The Scrum process

Figure 4 shows the details of the Scrum process which are described below.

- **Step 1.** The product owner shares the product vision with the team that will be part of the project. This takes the form of a prioritised list of what is required, ranked in order of business value, with the highest value items at the top of the list. This is called the product backlog, and it exists and evolves over the lifetime of the project. The product backlog will include a variety of items, such as features, development requirements, exploratory work and known bugs.
- **Step 2.** The aspect in this step is the sprint. A sprint is period of two to four weeks during which a Scrum team should produce working software. At the beginning of each sprint, the sprint planning meeting takes place. In the first part of the sprint planning meeting, the product owner and Scrum team, with facilitation from the

Scrum master, review the product backlog, discussing the goals, and providing the Scrum team with insight into the product owner's thinking. In the second part of the meeting, the Scrum team selects the items from the product backlog to commit to complete by the end of the sprint, starting with the items that are the highest priority and working down the list in order. The team decides how much work they will commit to complete, rather than having it assigned to them by the product owner. This results in a much more reliable commitment. The product owner does not have any control over how much the team commits to; he or she knows that the items the team is committing to are rated as most important and that they work together, breaking it down into individual tasks, which are recorded in a document called the sprint backlog.

- **Step 3.** Once the sprint has started, the Scrum team engages in daily stand-up meetings. This is a meeting that lasts about 15 minutes that happens every workday at an appointed time and everyone on the Scrum team attends. In order to ensure that it stays brief, everyone stands, hence the term “stand-up meeting”. One by one, each member of the team reports just three things to the other members of the team: What they are busy with, what they will do before the next meeting and what the obstacles are. The Scrum master makes a note of the obstacles, and then tries to get them out of the way after the meeting. There is no discussion during the daily stand-up meetings, just the reporting of the three key pieces of information.

After the meeting, the team members update the amount of time remaining to complete each of the tasks on the sprint backlog. This information is recorded on a graph called the sprint burn down chart – see figure 2.5. This shows, each day, how much work, measured in hours or days, remains until the team's commitment is completed as well as the team's actual progress towards its goal.

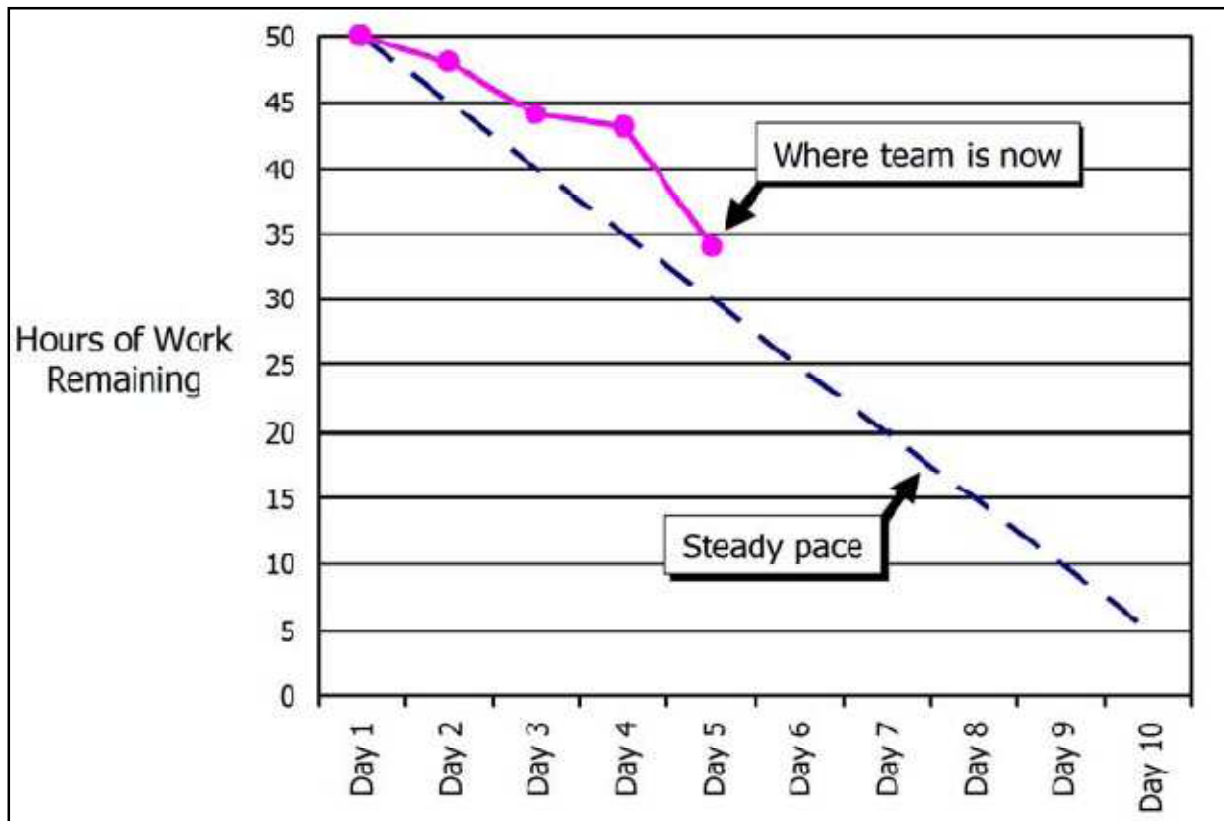


Figure 2.5 - Burn down chart

- **Step 4.** After the sprint ends, there is the sprint review, where the team demonstrates what it has built during the sprint. Present at this meeting are the product owner, team members, and Scrum master, plus customers, stakeholders, experts, executives, and anyone else interested. This is not a presentation but a demonstration of what has been built, and anyone present is free to ask questions and give input.
- **Step 5.** Following the sprint review, the team gets together for the sprint retrospective. This is one of the most important tools for making Scrum successful. It is an opportunity for the team to discuss what is working and what is not, and to agree on changes. The Scrum team, the product owner, and the Scrum master will all attend, and a neutral outsider will facilitate the meeting.

A simple way to structure the sprint retrospective is to hang two sheets of poster-sized paper labelled “What’s Working Well” and “What’s Not Working or Could Work Better”, and then have each person add several items to either. The team then looks for underlying causes

of problems, and agrees on changes to make in the upcoming sprint, along with a commitment to review the results at the next sprint retrospective.

Sprints continue until the product owner decides the product is almost ready for release, at which point there may be a “release sprint” to do final integration and testing in preparation for launch. If the team has followed good development practices along the way, with continuous integration, and effective testing during each sprint, there should be little clean up required. Product owners may choose one release approach where Scrum is no different from other development methodologies.

2.5 Challenges of Adopting Agile Methods

Introducing agile methods in an organisation can be a challenging task (Mahanti, 2006).

Challenges associated with the adoption of agile methods are summarised in table 2.1.

Challenge	Description
Culture	Difficult to change the existing culture
Lack of Structured Approach	Makes the process of adopting agile systems difficult and exposes it to failure.
Assigning of New Roles	Team members find it difficult to change the roles they are used to.
Slow buy-in	Resistance to change
Developers Opposed to Pair Programming	Developers prefer to be private about their knowledge.
Resistance to Team Evaluation	Individuals want to be recognised as individuals for their contributions.

Table 2.1 - Challenges of Adopting Agile Methods

Mahanti (2006) indicates that culture is rarely considered when adopting new systems development methods and yet it plays a major role. It therefore, makes sense to understand the adoption of agile methods in the South African context. However, there is no structured approach to agile systems development adoption in the public domain (Sidky & Arthur, 2007), which makes the process of adopting agile systems difficult. Sidky and Arthur (2007)

further identify some issues that need to be considered when organisations consider adopting agile methods. These organisations need to be ready for the adoption, understand the agile practices they should adopt, anticipate potential difficulties in the process, and understand the preparations that have to be made for agile adoption.

According to Highsmith (2004), Cohn and Ford (2003), and Boehm and Turner (2009), agile adopters usually struggle in terms of assigning new roles to management, the inability of developers to handle the transition from legacy to agile, and negotiating with management on the issues pertaining to adoption. There are also problems relating to resistance to change that would prevent organisations from adopting agile methods (Cohn & Ford, 2003).

Tolfo and Wazlawick (2008) conducted a study on the influence of culture in the adoption of agile methods. In contrast with what agile methods prescribe, Tolfo and Wazlawick (2008) found that organisations need to choose software development methods that suit their culture instead of changing their culture to accommodate the methodology.

“...company policies related to employees’ motivation, cohesion in the development team, and democratic leadership. The absence of these aspects at the organizational environment may demand deep changes in the company, (Tolfo & Wazlawick, 2008, p. 195).

It should be noted, however, that Tolfo and Wazlawick’s (2008) research focuses only on organisational culture. This is limiting because there are various cultures that may impact on the adoption of agile methods, including group culture and individual culture. Culture should not be taken for granted in the adoption of new methods of systems development.

The research conducted by Vijayarathy (2008) found that the adoption of agile methods was accompanied by a number of challenges such as slow buy-in, developers being opposed to pair-programming, the threat of scope creep, the difficulty of evaluating and rewarding individual performance, and the need for significant on-site customer involvement, management support, competent managers and developers, and extensive training. However, it is expected that the adoption of new systems development methodology will face some challenges. Vijayarathy’s (2008) findings are in line with those of Boehm and Turner (2005).

The adoption of new ways of doing things in an organisation does not go without challenges. Vijayasarathy (2008) has come up with findings that are detailed in figure 6. These findings reveal that organisational resistance is the greatest obstacle to the adoption of agile methods.

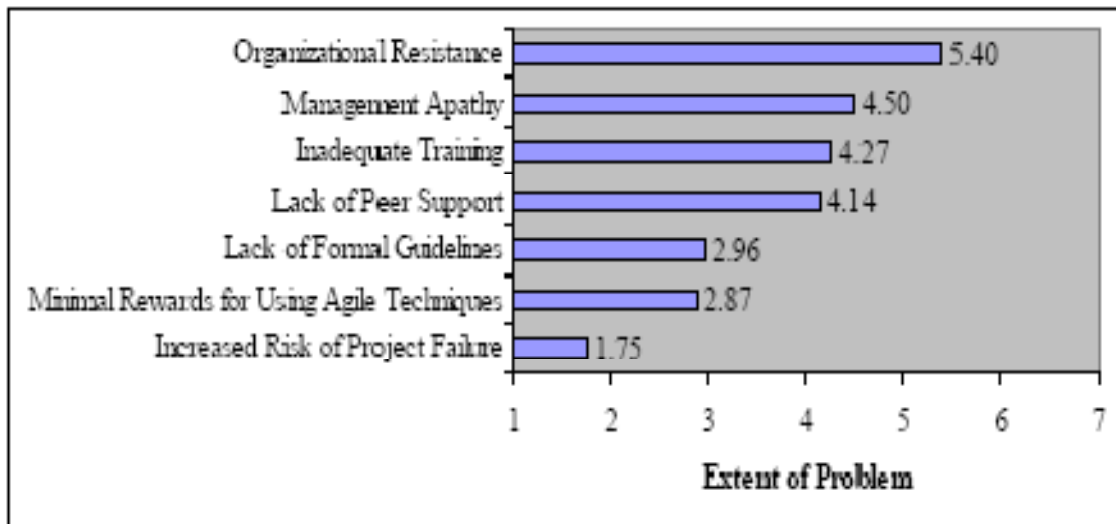


Figure 2.6 - Challenges of agile adoption

Source: Vijayasarathy (2008)

The challenges associated with the adoption of agile methods are based on studies done globally but do not include South Africa. This therefore leaves a gap in the literature when it comes to this country. This study will be focusing on South Africa which could have a different culture to the countries that have been studied in the literature. As this study will be conducted on a local organisation, it will provide recommendations that may help South African organisations looking to implement agile methods and increase their confidence in doing so, owing to the fact that the study has been conducted in the environment they identify with.

2.6 Agile Methods in South Africa

In South Africa, Friedrich and van der Poll (2007) conducted a study where they discovered that the problems that were being experienced by software development companies include late software releases, cost overruns, insufficient requirements and documentation and resource constraints. It is has also been found that a lack of understanding of user requirements to some extent is a cause of problems. A study done recently by a private South-African company, Sunnyvale (2004), confirms that poor communication between developers and users is among the key causes of project failure.

Some of the problems that emerged from the study conducted by Friedrich and van der Poll (2007) are concerned with getting to understand exactly what the business requirements of organisations are. This leads to further problems in the form of incomplete and incorrect requirements documents. BMC Software (2004) found that many projects fail as a result of a communications gap between the business and the IT department, which creates a further problem in terms of the misalignment of the organisation's business and IT goals. BMC Software (2004) states that communication gaps appear to be at the heart of systems development problems in South Africa.

In South Africa, a study was conducted by Ferreira and Cohen (2008). This study investigated stakeholder satisfaction in organisations that have adopted agile methods of systems development. Similar to the study conducted by Vijayasarathy (2008), the respondents were experienced individuals in the businesses and included analysts, developers, project managers, IT managers, architects and organisational stakeholders. The study by Ferreira and Cohen (2008) found that smaller teams of about one to five members brought about greater stakeholder satisfaction than larger teams. Ferreira and Cohen's (2008) findings also revealed that stakeholders were more receptive to certain aspects of agile methods. Iterative development, collective ownership and continuous integration brought the highest satisfaction to stakeholders while TDD and face-to-face communication were not well received.

Longden-Thurgood and Mackintosh (2007) state that organisations that adopt agile methods do not follow the exact prescriptions by agile methods; the nature and size of project

determine which aspects of such methods to follow. Therefore, it is expected that organisations will show some deviations in the way they go about practising agile methods.

There is a gap in the literature in terms of the fact that nowhere does it address the process to be followed in implementing agile methods in South African organisations. That is to say, none of the interactions between role-players are traced until the agile methods are fully adopted. There is also no measurement of how organisations were performing prior to the adoption in terms of delivering systems. This makes it difficult to say to what extent the expected results from agile methods have been achieved. This research will seek to understand what problems the organisations were trying to address by adopting agile methods, to what extent these problems were addressed and the process that was followed in the adoption of agile methods.

As stated by Longden-Thurgood and Mackintosh (2007), organisations only use the parts of the methodology that make sense in their environment. Organisations therefore adopt the principle that there is no single methodology that can address all systems development problems and only use aspects that add value to their environment.

2.7 Recommendations for Research

Future researchers should attempt to improve on this research and uncover areas that may have been omitted. There may also be some omissions in the literature review which would need to be identified. A similar study could be conducted on organisations that differ from the one this research will examine. These differences could be in terms of size, number of employees, income, culture or current methods followed in developing systems.

Future research could also be conducted on how organisations get to decide on adopting agile methods. It is expected that organisations would have different expectations from agile methods and the interactions that lead to those decisions could be tracked and documented.

Another possible area of research is the development of knowledge management frameworks for agile environments. The literature reviewed says nothing about how knowledge management in such environments can be handled. This research could

contribute to developing an agile systems body of knowledge by establishing a framework that could be documented and used.

2.8 Conclusion

The justification for this research is that no studies have yet been conducted in South Africa into the process organisations follow in adopting agile methods. The results of the study will benefit the systems development body of knowledge and agile practitioners.

This research is aimed at uncovering the agile adoption process followed by South African organisations. The study will be conducted in an organisation in Cape Town in the Western Cape province of South Africa. This is purely for convenience purposes and it is expected that there will be very few differences between firms that are located in other provinces.

Chapter Three

3. The ANT and Research Methodology

3.1 Introduction

This chapter describes the ANT as was pioneered by Bruno Latour, Michel Callon and John Law (Callon, 1986; Callon & Latour, 1981; Latour, 1987; Law, 1991) and the research methodology.

There are many approaches to research in technological areas that exclude the social, but ANT proposes a socio-technical account in which neither the social (Human) nor the technical (Non-human) elements are privileged.

The research methodology used is based on case study. One Cape Town based organisation that has adopted agile method will be selected for the study for convenience purposes. It is believed that organisations in this province are representative of organisations in the greater South Africa.

3.2 The ANT

ANT provides a bridge between the social-technical divide by denying that purely technical or purely social relations exist in isolation (Mpazaje, 2009). ANT attempts to facilitate an understanding of the construction and transformation of networks made of heterogeneous elements relating to each other. The heterogeneous elements referred to as actors could be human or non-human such as organisations, agents, machines, artefacts and methodologies (Nijland, 2004).

For the purpose of this research, the researcher has focused on four moments of translation which are discussed in the following sub-sections.

3.2.1 Moments of Translation

An actor in a network is independent and can resist influence from other actors (William-Jones & Graham, 2003). Therefore, for the network to exist something should encourage the actors to be involved in the network. This encouragement is known as translation. The ANT

considers actors, human and non-human, to have their own interests. By translating those interests into potential actors, network stability will be established. According to Callon (1986) negotiations of common interest between actors, motivations and goals are transferred from one actor to another. Accordingly, in the process, the way actors interact in the network is transformed.

When organisations adopt new technology, they go through moments of translation. In line with Latour (1996), this study will explore how the networks of relations in the adoption of agile methods of systems development will be composed. The study will also seek to uncover how these networks emerged, formed and are maintained.

Callon (1986) identifies problematisation, interestment, enrolment, and mobilisation as the bond that holds the network together. These are referred to as “moments of translation”. For a network to be stable and successful, it must go through the four moments of translation. William-Jones and Graham (2003) state that there may be resistance during the development of relations in actor networks and counter-claims may arise, and these have the potential to hinder network stability. If the key actors have managed to get all actors to buy-in to the proposed change, then the actors are considered as being enrolled in the network. This means that consensus has been reached and there is buy-in from the actors. This also means that the key actors were successful in convincing the other actors to buy-in to the proposed change.

(i) Problematisation

According to Mpazaje (2009), the stage of problematisation is where the key actor may want to change the way things are done. Accordingly, the key actor’s interests are revealed and shared with potential actors and attempts to create alliances with other actors with similar objectives are made.

The power structures present in a network will affect the ability of some actors to oppose the initial problematisation of technology adoption (William-Jones & Graham, 2003). One example is that if a chief information officer is the main actor in the network of adoption of agile methods, because of his power in the network, the developer and end users may not be

able to contest the initial problematisation. This may be linked to the position he holds in the organisation.

(ii) Interestment

At this stage the key actor tries to impose his identity on other actors that have become part of the alliance thus far (Callon, 1986). This stage can involve some compromise, persuasion and seduction in order to get actors interested in role proposed to them.

William-Jones and Graham (2003) indicate that the power structures present in the network will affect some of the actors who were opposed to the initial problematisation. This will compel them to become part of the network. This is known as the obligatory passage point (OPP).

(iii) Enrolment

This is the stage where the actors accept the roles proposed to, or imposed them by the key actor and begin to align their interests with those of the main actor. Roles are defined in the evolving actor network (Banderker *et al.*, 2006) and actors are convinced to become part of the network where the objectives of the main actor can be pursued. For the process of enrolment to succeed, the main actor needs to capture the other actors; however, they also need to accept being part of the network.

(iv) Mobilisation

Mobilisation is the final stage of translation. The key actor tries to influence other actors to act according to what has been agreed on and thus maintaining the course of action. The objective is to stabilise the network and maintain relationships. The main actor needs to continually convince the actors that their interests are still the same. Controversy, at this stage, no longer exists if there is support from the actors (Mähring *et al.*, 2004).

3.3 Positioning ANT in IS adoption

The ANT is used as an analytical framework in the adoption of IS (Codella & Shaikh, 2006). According to Lee (1994) the rapid introduction of new IS has made it difficult to spot the differences between the technology and the users. The importance of the interplay between technology and society has been prevalent in the IS literature for many years, and

the ANT is not the only theory that can address this issue (Codella & Shaikh, 2006). Phenomenology (Boland, 1985) and hermeneutics (Lee, 1994) are two of the models that can address the problem of interplay between the technology and the users in IS. Codella and Shaikh (2006) maintain that technology develops independently from social contexts even though it directly affects society.

The ANT has been identified as the best analytical tool for this research, as it addresses the relationships and interactions between humans and technology and focuses on the dynamics of these relationships and interactions and not on the stability of the relationships (Latour, 1987). In the field of information systems, the ANT has been seen as having the ability to enable the understanding of the complex social interactions associated with the adoption of new technology (Mahring *et al.*, 2004). It has also been used to interpret the political processes associated with the implementation of new technology.

3.4 Research Methodology

3.4.1 Definition of Case Study

A case study research method excels at bringing us to an understanding of complex issues and emphasises the detailed contextual analysis of a limited number of events or conditions and their relationships (Dooley, 2002). Case study is defined differently by various authors, however, for the purpose of this research two definitions will be considered.

“A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities” (Benbasat *et al.*, 1987, p. 307).

In this definition, Benbasat *et al.* (1987) state that case studies are conducted in natural settings. They further state that the researcher has several data collection methods at his or her disposal. Accordingly, the type of data collection method would be determined by what the researcher is trying to investigate.

Yin (2003), on the other hand, states that a case study

“...tries to illuminate a decision or a set of decisions: why they were taken, how they were implemented, and with what result (Yin, 2003, p. 12).

In line with the ANT, which will be used in the analysis of the research findings; this definition cites “decisions” as a major focus. Yin (2003) states that case study research covers the logic of the design, the data collection techniques, and the specific approaches to data analysis.

3.4.2 Case Study as a Research Strategy

Yin (2003) states that the aim of the researcher is to design good case studies, and to collect, present and analyse data in a manner that is fair, so as to be able to produce a compelling report. He further indicates that case studies enable the researcher to ascertain the holistic and meaningful characteristics of real-life processes. Case study research should be concerned with the rigorous and fair presentation of data.

Case study is one of the most commonly used approaches in IS research (Gerring, 2004). The usefulness of case studies is concerned with the formation of descriptive inferences (Gerring, 2004). Benbasat, Goldstein and Mead (1987) suggest that single case studies are appropriate if it is an extreme or unique case. Although this research on the adoption of agile methods is not extreme or unique, a single study will be used. The use of a single case study is based on Flyvbjerg (2006) and Lee and Baskerville (2003) who define a case study as a detailed examination of a single example. Lee and Baskerville (2003) further state that it is correct for one to generalise on a single case study and that it is an appropriate and valuable approach. What would be incorrect would be to assert that this is the only way to work. The use of a single case can depend on the case one is picking and how it is chosen. Selection of such cases should be based on the case that can best represent the greater population. This forms the basis for the use of one organisation in this research.

In conducting case study research, questions are formulated prior to conducting the research. According to Benbasat *et al.* (1987) case study methodology is useful when applied in natural settings. They further indicate that a rich natural setting can be fertile ground for generating theories.

For the purpose of this research, Investment Management was used. IM is a South African investment management organisation which was established in 1973. This organisation is located in Cape Town. The researcher has selected this organisation on the basis that it uses Scrum.

3.4.3 Research Questions

According to Yin (2003) case study research questions focus on “who” and “why”. He further states that research questions are important tools in empirical research. The structure of research questions can be hierarchical, with the main research question at the top, the secondary questions below and the interview question at the bottom. The answers to the interview questions feed into the secondary questions which, in turn, feed into the main research question.

As detailed in figure 7, questions for this research take the same format. In figure 3.1, the level 1 question includes Q-1 through to Q-15 and these comprise the possible interview questions. When the level 1 questions have been answered, they should answer level 2 questions and level 2 questions should answer the level 3 question, which is the main research question.

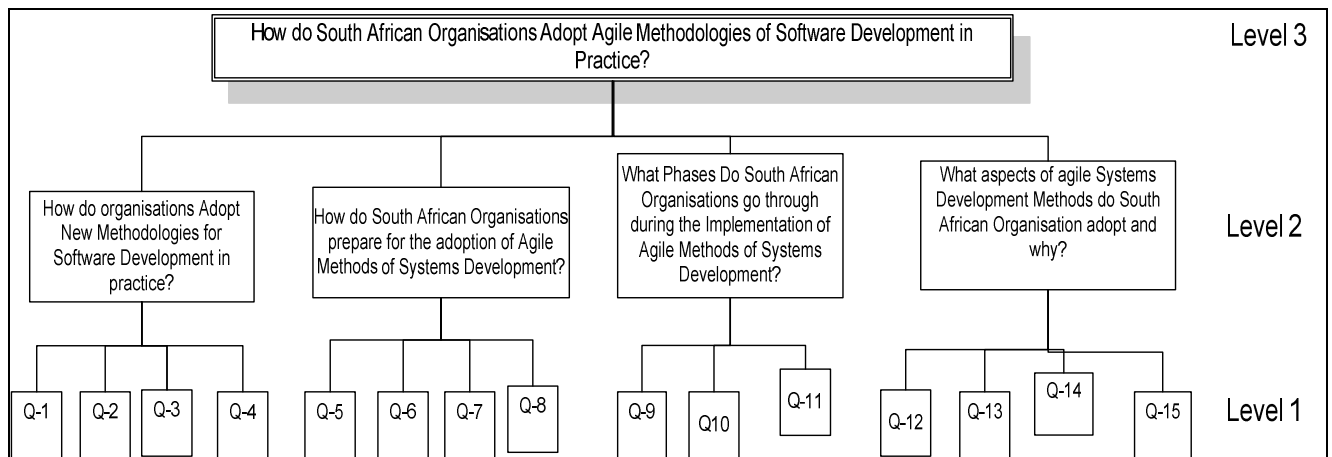


Figure 3.1 - Hierarchical research questions

How do organisations Adopt New Methodologies for Software Development in practice? This question tries to uncover the reliance of South African organisations, particularly large organisations, on IT. The answer that is obtained to this question will bring out the importance of IT to South African organisations. This, in turn, will uncover the importance for IT departments to continuously improve their methods of systems development, while on the other hand addressing the needs of the business.

How do South African organisations prepare for the adoption of agile methods of systems development? This question seeks to elucidate the steps that South African organisations follow in preparing for the adoption of agile methods of systems development. In adopting any systems development methodology, organisations would go through some planning and understanding of what they would like to get out of the new methodology. This question seeks to uncover the sequence of events that takes place in the preparation for the adoption.

What phases do South African Organisations go through during the implementation of agile methods of systems development? There is no structured approach to the implementation of agile methods of systems development and this has been identified as a gap in the literature. This question seeks to uncover the challenges that organisations face in trying to adopt agile methods of systems development. Answers to this question could be used to develop a framework for structuring the implementation of agile methods of systems development.

What aspects of agile methods do South African organisations follow and why? This question attempts to establish whether South African organisations adopt agile methods as prescribed or whether they select aspects that would address their systems development problems. An answer to this question would further strengthen the need for further research in order to develop a framework that can be used to structure the adoption of agile methods.

3.4.4 Selection of the Sample

Owing to the fact that the researcher is a consultant in the IT industry and is in contact with a number of organisations that claim to be using agile approach to systems development, it will be fairly easy to identify the organisation that will be contacted for this research. The

actual interviewees cannot be known in advance owing to the fact that this research is based on the ANT, which will trace a network that is not possible to know beforehand (William-Jones & Graham, 2003).

3.5 Conclusion

Having chosen the ANT as a theoretical lens and the case study as a research strategy, the researcher is fairly confident that the anticipated results will be obtained. It is the intention of the researcher to adhere to the research approach as laid out in this document.

Chapter Four

4. Research Design

This chapter will discuss the research process followed, the data collection method, as well as the recording and analysis of the data.

4.1 Introduction

The approach that will be used in this research is based on the ANT, which was developed by Callon (1986a), Latour (1987), Law (1991), and Callon and Latour (1981). Callon (1991) and Latour (1992) describe the ANT as a framework and a systematic way for considering the infrastructure surrounding technological achievements by assigning equal status to both human and non-human elements. This implies that ANT does not recognise the difference between humans and non-humans.

ANT was developed to explain and interpret human and non-human developments and also to create an understanding of the construction and transformation of networks. Networks in this context are formed through interactions between the different actors. This also explains how heterogeneous elements relate to each other. These heterogeneous elements can be seen as people, organisations, technologies and processes (Nijland, 2004).

By using the ANT, one would look at which technologies are being adopted, how change agents helped in the adoption of that technology, why the technology was adopted, and over what time frame this process happened. Change agents should be understood as catalysts that initiate change such as the adoption of new technology. This is achieved through a translation process (Law, 1992). Translation is made up four stages, problematisation, interestment, enrolment and mobilisation (Callon & Latour, 1981). These stages will be discussed in more detail in the following sections.

According to Walsham (1997), the ANT is mostly used to uncover human and non-human interactions and to understand the political processes in place during the adoption of new information systems (IS). Studies having the ANT as their underpinning theory also reveal the reasons for the successful and failed adoption of IS (Nijland, 2004).

For this research, a case study design will be used as a research strategy, with one exploratory case study being employed. This research adopts an empirical, qualitative and interpretive stance and will focus only on the successful adoption of agile methods.

4.2 Research Method

The method that will be used in this research is case study, which is a qualitative method of research. This means that it deals with theoretical data analysis. This selection has been made on the basis that the ANT will be used in gathering and analysing data.

Case studies are widely used in the field of IS (Benbasat *et al.*, 1987) and such research is used mainly to produce empirical evidence from real-life contexts (Yin, 2003). According to Tanner (2006) this method of research applies an approach where the detailed investigation of one or more organisations, or groups within organisations, is involved in the study. In line with the ANT, case studies reveal complex and ubiquitous interactions among organisations, technologies and people (Dubé & Paré, 2003). This method will suit this research because it focuses on people and technologies.

4.3 Research Approach and Paradigm

There are various approaches to conducting research. A researcher may adopt a quantitative or a qualitative approach, depending on what he/she is trying to investigate. For the purpose of this research the researcher has used the qualitative approach. This is due to the fact that the investigation involves tracing the formation of the network using the ANT.

Research methods can be classified as positivist, interpretative and empirical or non-empirical. For the purpose of this research, an interpretive, empirical and qualitative approach will be used. One case will be studied and the method of data collection will include interviews, and observation. Data collection and analysis will be based on the ANT approach which is concerned with tracing the network of interactions. The ANT suggests that it is not possible to know upfront who the researcher will be interviewing. Therefore, the interviewees will be determined by tracing the network.

Nijland (2004) identifies three paradigms used in the IS field. These are positivistic, critical and interpretive. While researchers may choose to use a research paradigm that they deem

appropriate for their particular research (Myers, 1997), the fact that these paradigms may have strengths and weaknesses should not be overlooked. To provide a better understanding and appreciation of the subject matter being researched, a hybrid of paradigms can be used (Robey, 1996).

This research makes use of the interpretive approach, using the ANT as a lens to understand the process followed in adopting agile methods in systems development in the South African context. This research will adopt an interpretive approach as it tries to understand and make sense of different roles in the actor network when adopting agile methods.

4.4 Data Gathering and Analysis

A clear description of data sources and the way they contribute to the findings of the research is important, as this will ensure the reliability and validity of the results (Benbasat *et al.*, 1987). In keeping with the aim of this research, which is to gain a deeper understanding of the social processes involved in the adoption of agile methods, the data collected will be qualitative in nature.

There are several methods of data collection available. For the purpose of this research the researcher will focus only on the ones that will be used. As indicated by Benbasat *et al.* (1987) and Gerring (2004) these are the following:

- **Interviews** – These constitute questioning which may be open ended or focused. In the case of this research, the interview questions will be semi-structured. This will grant the researcher an opportunity to ask follow-up questions where clarity is required.
- **Direct observations** – This involves absorbing and noting the actions of people in the environment under scrutiny. This will also be another way of collecting data that will be implemented in this research.

These methods will be used in collecting data for this research. They will also constitute triangulation of the data, which will ensure the credibility of the research. During the interviews, the researcher will take notes while also electronically recording the interviews. This will ensure that important points raised by the interviewees are not missed.

Before analysing the data collected, the recorded data from the interviews will be converted into a full written copy immediately after the interview to avoid loss of important points.

4.5 Research Instrument

Interviews were guided by the interview guide (Annexure 1). This questionnaire comprises four sections, which are structured according to the research questions. The analysis of the answers to these questions constitutes the answers to the research questions which, in turn, answer the main research question. Owing to the nature of research approach, the ANT, where a network is being traced, interviewees were not known in advance, but were identified by those participants who have been interviewed. This, therefore, means that interviewees were not informed beforehand about the interviews.

4.6 Confidentiality and Ethics

The University of Cape Town considers the issue of research ethics as being very important. As per the Ethics Committee application form (Annexure 2), the researcher has undertaken to take every possible step to ensure that the information gathered for the purpose of this study will not be used for any other purpose but for this study. Interviewees together with their organisations will remain completely anonymous. Accordingly, the ethics form has been submitted to the Ethics Committee for approval and the researcher is obliged to comply with the requirements of the research institution. All participants will be informed of the agenda of the interview and will also sign an interview consent form.

Confidentiality regarding organisational matters will be maintained. All information obtained from the organisations will be presented in a way that will ensure that confidential information is not divulged. The interviewees will not be obliged to participate and their identity will not be revealed.

4.7 Conclusion

The researcher is aware that for the successful completion of this research, enthusiasm and curiosity in the adoption of agile methods is required. In addition, the researcher aims at producing a stimulating and valuable report by following the standards laid out in this document carefully.

Chapter Five

5. IM Case - Description

5.1 Introduction and History of IM

IM is a South African investment management organisation which was established in 1973. It grew from a small sole proprietorship to become one of the largest privately owned, independent asset managers in Southern Africa. It was founded by a South African, based in East London, who studied at Rhodes University, qualified as a chartered accountant and later obtained a Masters in Business Administration degree through Harvard Business School. The founder had a strong desire to see his clients succeed and he was convinced that he could establish a firm that could deliver superior returns in the long-term through a research-based approach and by consistently applying a rational investment approach. IM focuses on long-term investments and, as a result, has a long-term investment focus. It still has some of its original clients from 1973.

Table 5.1 summarises branches at IM.

Branch	Focus
Cape Town	institutional clients such as pension funds, financial advisors and investors
Namibia	Institutional and Small Investors
Botswana	institutional clients such as pension funds, financial advisors and investors
London	institutional clients such as pension funds, financial advisors and investors

Table 5.1 - Branches in IM

Up until 1978 IM focused only on private clients. In 1978, however, it extended its services to institutional clients. In 1996, IM opened an office in Namibia to research Namibian

investments and to service its Namibian clients. Two years later it was able to offer its services to smaller investors for the first time through the launch of its first unit trust. This unit trust is called the IM Equity Fund and has proven to be a success.

In year 2000, IM launched a range of pooled investment funds suitable for smaller retirement funds. This was followed by the introduction of simple individual retirement and annuity products. Two years later it also introduced an endowment policy.

IM's Botswana branch was founded in 2004 as an independent investment management company sharing the investment philosophy and purpose of the broader IM group. In addition to the core group purpose, IM Botswana aims to contribute to the development of investment skills, the financial markets and the investment management industry in Botswana.

Over the past ten years IM has grown from strength to strength and it currently employs a total of 800 employees spread between the Cape Town, Namibian and Botswana offices.

5.2 IM's Business Operations

IM's main purpose is to assist its clients in building long-term wealth. This is achieved by buying companies whose share price is less than their intrinsic value. The intrinsic value is what a prudent businessman would pay to buy the whole company. In particular, a businessman is more concerned about the long-term prospects of the company than its short-term outlook. This involves constant study of what is happening in the market.

IM deals with institutional clients such as pension funds, financial advisors and investors. IM runs seven unit trust funds and also a linked investment platform. Through IM funds, one can invest in 50 to 60 South African funds as well as twenty-five foreign (off-shore) funds. IM has its own investment team who manages its funds, do administration and also client services activities for retail clients.

The Namibia office was an independent investment management company focused on improving the service offered to their Namibian clients, especially pertaining to domestic investment opportunities. IM Namibia also shares the investment philosophy and purpose of

the broader IM group. Today IM Namibia has assets under management of approximately N\$10 billion

IM has an international association with the Reward Group based in London. Through this association IM is able to offer South African investors a global product range. IM and the Reward Group share the same investment approach, culture and commitment to their clients.

IM buys shares at the time when they are not favoured by the market. It also tends to buy early, which means that the share price may continue to fall after it has bought the shares. A lower share price encourages IM to buy more shares on behalf of their clients. This approach needs at least four years of investment in shares, which means that the company is willing to wait for the market to go through any short-term period of pessimism before it sells.

The manner in which IM conducts its business has a strong dependence on IT which is seen not as a competitive advantage but as a business enabler; it is therefore imperative for IM to engage up-to-date technology with processes that will enable it to respond quickly to the opportunities that prevail in the market.

IM's business is divided into five functional areas which it calls domains. Functional areas (domains) are departments which carry particular business functions. Their main purpose is to ensure that all important business activities are carried out efficiently, which is essential in order for the business to achieve its aims and objectives. In addition, specific areas will be responsible for supporting specific types of aims and objectives. Each of the domains at IM has a domain owner whose responsibility is to prioritise what needs to be done and ensure that the work gets done. The five domains of IM are as follows:

Online domain: The main purpose of this domain is to improve the method of providing services to clients over the internet. The head of the online domain is referred to as the online domain owner. This is the domain where the adoption of agile has taken place.

Customer relationship (CRM) domain: The CRM domain has the responsibility of building long-term and effective relationships with customers. The CRM part of IM's

business is also responsible for making it easy for customers to do business with IM. Their focus is on customer loyalty by providing personalised services to IM customers.

Business process management (BPM) domain: The importance of BPM at IM includes allowing increasing flexibility in the organization to meet changing external demands. Furthermore they address the speed of responsiveness to the demands of customers. The BPM domain continuously revise processes to facilitates the reduction of costs, increased speed of product and service delivery reliability, and address the quality of products and services in terms of their consistency and capability. At IM processes are part of the philosophy of total quality management (TQM).

Investment management domain: The investment domain is responsible for making decisions on investment. This domain assists clients build long-term wealth. They constantly study the market in order to take advantage of opportunities that would maximise their client wealth within a period of four years.

Business intelligence (BI) domain: The BI domain is responsible for collecting data and transforming it into information. This domain helps IM to have a more comprehensive knowledge of the factors affecting the business, such as metrics on sales, production, internal operations, and they help the organisation to make better business decisions and improve company performance.

The BI domain is involved in a constant routine of extracting corresponding information, creating and distributing accurate reports, identify successes and failures and take appropriate actions. This involves continuous process of implementing policy and receiving how those policies either successfully or ineffectively achieved the goals they were set and to attain results in increased efficiencies for the organization.

5.3 The Role of IT at IM

IM sees IT as a business enabler, which allows it to respond rapidly to market changes. Thus, most of the organisation's annual budget is spent on IT. Most of this expenditure goes towards the salaries of IT staff, new software, software upgrades, enhancements and data

migration projects. IM also constantly investigates up-to-date hardware such as servers, desktops, printers and connectivity. All this is done to ensure the quick and effective delivery of services to clients.

Before the adoption of Scrum, the quality of the systems that were implemented, the upgrades and predictability were a big issue at IM. The systems contained bugs and the functionality was not what was intended and required work-around. Predictability can be understood to indicate the level of trust by the business that the software will be delivered on time, will be of the right quality and free from bugs. Work-around, on the other hand, is a way the business avoids a system problem when the requested functionality has not been delivered. The IT department was not delivering according to its promises and therefore it was seen as being unpredictable and unreliable. There was a question as to how productive IT was. These were the problems that triggered the investigation of new methods of systems development for the online domain.

Prior the adoption of Scrum, the online domain had a team of twenty three team members. These team members were located in different places of the business according to their functions. Business analysts were in the same location, developers sat together, network specialists in their own location and so on. The systems development team members had specialised skills with no multi-skilling. Communication among these groups of specialists was very limited. The team only really got together when they had their weekly project meetings. The systems development team was not really operating as a team but as team of teams who were grouped according to their specialisation.

IT is the most significant part of the business. It is the area where IM spends most money each year. We see it as a business enabler. This business cannot survive without IT. It would not be able to respond to the market quickly. It is imperative that we deliver good quality technology to the business fairly frequently to keep up with the market changes (Online Domain Owner: IM).

The online domain did not deliver the expected business value even though he he understands IT to be the most significant part of the business, as stated in the quotation above. All these problems experienced triggered the need for a more reliable software

development approach. Scrum was discovered by one of the developers in the IT department, who communicated this to the online domain owner.

5.4 Background of Scrum at IM

The first project used by IM for the adoption of Scrum is a software upgrade project. The selection was based on the fact that the online domain was experiencing most problems. The first attempt to solve the problems, which was a home-brewed methodology, failed. The details are discussed in the subsequent sections of this chapter. This project entailed upgrading the Decalog system which was used to administer IM's clients' assets. The result was chaos as there was no clarity as to who should perform what tasks. Furthermore, the project team experienced enormous software problems which compelled them to declare the project unsuccessful.

The online domain owner then invited the systems development team to start thinking about how it could improve the way it developed software to address issues around predictability, quality and productivity. In response to the key actor's invitation, the system development team attempted to develop its own methodology which proved unworkable.

The process of adopting Scrum was also not without problems. The development team first attempted adopting Scrum without involving a Scrum consultant and did not succeed. The adoption of Scrum succeeded after the involvement of the Scrum consultant who guided the team during the process of implementation.

5.5 Introducing Actors and Networks Identified

In analysing this case study a total of seventeen actors were identified. See table 4.1.

In some instances actors may be black boxed for simplicity. This is because the different actors who do similar work would tend to share similar views, for example developers would share similar views. The list of actors presented in table 1 is in no particular order.

Actor	Description of role
Online domain owner	Responsible for the online functional area
Business analysts (boxed)	Gather business requirements, map business processes and produce functional specifications
Developers (boxed)	Code the required functionality and produce working software
Network administrators (boxed)	Ensures that there is connectivity in the network and there are no interruptions
Testers (boxed)	These test the piece of software developed. They ensure that software is according to the business requirements and is free from errors and bugs.
Scrum	The new software development methodology that is adopted.
The CIO	Manages the information needs of the business through technology. Ensures that the business has everything it needs to get the right information at the right time at the right place.
Scrum consultant	This is the external resource that was be used to guide the process of adoption.
The business (boxed)	These are the users and business managers. They are the ultimate users of the systems to service clients.
Waterfall methodology	This is the traditional method of systems development which was to be phased out at IM
Database Administrator (Boxed)	These are responsible for administering database servers. This includes ensuring that they are backed-

	up and are always up and running.
Project Administrator	Performs all the administrative activities of the project.
Support Consultants (Boxed)	They are responsible for supporting the business in terms of the systems.
Change Managers (Boxed)	They encourage acceptance of change. They basically deal with resistance to change by applying strategies that will ensure that change is accepted.
Project manager	Manages the project.
Product Specialists (Boxed)	Provides guidance with regards to the software product in use. These are experts in software product knowledge.

Table 5.2- Identified Actors in the network

Chapter Six

6. IM Case – Data Analysis

In this Chapter the researcher will look at the way IM progressed through the different stages of inscription, translation and irreversibility in analysing the adoption process. Translation goes through four moments: *problematization*, *interestment*, *enrolment* and *mobilisation*. The four moments of translation form the core aspects of analysis and findings in this research study. Data analysis is discussed using the vocabulary of these four moments of translation.

After several rounds of reading the transcripts and field notes from the interviews and observations, the researcher noticed stories starting to emerge. They provide answers to the research questions and thereby achieving the objective of this research study. Even though the stories are relayed using the ANT vocabulary this does not necessarily mean that stories in this thesis are the only reasonable ones ever to come out of this agile adoption. Others could have come up with their own stories, depending on their perceptions. The stories in this study followed the ANT in accordance with the objective of the research study.

6.1 Moments of Translation and Inscription at IM

According to Mähring *et al.* (2004), inscriptions are determined by (1) the identification of explicit anticipations/scenarios/objectives (2) the anticipations are inscribed to interest actants (3) the core actors behind the inscriptions and (4) the strength of the inscriptions and their capability of forming strong and irreversible networks.

The online domain owner was the head of the online channel and during the preliminary investigation on how Scrum was adopted; he was identified as the key actor during the adoption of Scrum. The online domain owner had attended a number of training in online and e-commerce and business change management. In his career as a consultant he had been involved in process design, software delivery and business strategy and had held this position for the past eight years.

The online channel domain owner's main interest was to be able to fulfill his role of delivering easy to use website functionality. This included new functionality, enhancements, fixes, the operational management of the website and internet self-service functionality for IM's clients that was reliable and easy to use. Before the adoption of Scrum they experienced problems of predictability, quality and productivity. These were the areas that needed major attention.

“Our aim was to implement Scrum as a way of getting things done. Our objectives were to improve predictability, quality and productivity.” (Online Domain Owner: IM).

In line with Banderker *et al.* (2006), the key actor, the online domain owner, wanted to change the way things were done in his domain. This emanated from the rapid rate of change in the market which made it impossible for him to deliver the level of software quality that was expected.

Before the Scrum was introduced, the call centre at IM was congested with calls from clients who needed to be serviced. This was creating discomfort to their clients as in many occasions clients had to abandon calls because of the length of time it took for the call centre to answer. Even though internet functionality was available, it was not reliable and there were numerous issues that clients experienced when trying to use it. The only viable option was to physically go to the IM offices.

The business analysts on the other hand, as interfaces between IT and business, were concerned about the delays between the time the business requests functionality and the delivery thereof. This is evidenced by the quotation below. The interest of business analysts at this point are in line with those of the key actor (online domain owner). The online domain owner did not have difficulty in problematising his interests to the business analysts. There seemed to be an alliance between the business analysts and the online domain owner.

“I think we've improved a lot now that we've started using Scrum, because with the waterfall approach there was a big delay since the business requests something to when we give it” (Business Analyst: IM).

In addition to the interests of the domain owner one of the business analysts indicated that continuous improvement was one of the aspects of Scrum that stood out for them as business analysts as quoted below. The business analysts went further to identify other aspects of Scrum that were of interest to them. This proves that problematisation can be different for different actors in the network.

“...the continuous improvement, doing the same thing over and over and attempt to improve each time. You do it, you inspect how you’ve done it and a little change and you would try it again. The continuous was change it was really something that stood out” (Business Analyst: IM).

6.1 First Attempt of Problematisation at IM

The key actor, online domain owner, tried to impose his identity on the systems development team to start thinking about better ways of developing software that would address issues around predictability, quality and productivity. This action constituted the problematisation where the key actor was problematizing his interests on the team through negotiations. The key actor ensured that the problem was known by everybody on whom it impacted. He was attempting to create an alliance with the entire systems development team. This was in order to ensure that everybody became part of trying to find the solution.

In response to the key actor’s problematisation, the systems development team attempted to develop its own methodology which subsequently proved unfeasible. The team ended up holding long meetings that did not bare any fruits as there were too many different ideas that for the team needed to consider. In addition, there was no standard approach and the situation became chaotic as everyone wanted their idea to be considered. Everybody was striving to address his interest without seeing the big picture. Some actors were seizing the opportunity to pursue their own interests, as quoted below.

“I did not really like the idea of changing from the current way we worked but I decided to play along. When the new home-brewed methodology was being implemented I had to make it a point that I had a say in the whole matter because it would affect me. Apparently there were a few of us who had the same feeling.” (Developer: IM).

In trying to implement the home-brewed methodology, there was lack of understanding of the concept of lean documentation which states that there has to be just enough documentation and nothing unnecessary (Poppendieck & Poppendieck, 2003). This was a clear indication that problematisation was failing.

The probable reason for this failure was the structures and powers that were already in the network. The structures and powers refer to the actors that were already in the network and their power to influence new actors to join and stay in the network (Strathern, 1999). At this stage the actor who had the most influence in the network was the online domain owner. There were actors with more power than the executive management. The other probable reason is that even though the online domain owner tried to problematize his interest on the rest of the team, he allowed the situation to turn around and seem like a bottom-up approach. As discussed in Chapter two, this is the situation where employees lower in the hierarchy drive the initiative. As opposed to the top-down approach, the problem with bottom-up approach is that too many actors become active participants in the network and this can give rise to chaos as in the case of the home-brewed methodology.

Even though there was a clear overall objective of delivering good quality software, there was no common ground among the actors in the network as to how the methodology would be used to address the problems. In some cases there was resistance to change which brought about conflicts within the team. The business analysts were resisting moving away from the traditional method of writing specifications and the actor network was very unstable. Subsequently, it became very difficult for the online domain owner to manage the situation. This went on for six months before the project was abandoned. This was the first attempt of problematisation and after it had failed, and abandoned the team reverted to the old waterfall method.

It is also important to note that the waterfall method of systems development was at this stage quite a strong actor in the network. Because the network was weak at this stage, the waterfall method of systems development had little or no opposition in the network. The waterfall method of systems development managed to problematize its interests on the already existing network of actors and succeeded. The evidence is that the new methodology was abandoned and the team reverted to the waterfall method of systems development.

“In the beginning we thought we were quite agile but it turned out that we were not. We started looking at alternative ways of developing software. We even went to an extent of attempting implementing our own methodology. This was all around the quality of software that was produced but we did not succeed”, (Domain owner: IM).

The failure of this problematisation proves that the domain owner at this stage was also not adequately equipped nor experienced to act as a key actor, see quotation above. The fact that there were conflicting interests between human and non-human actors complicated the matter further for the key actor. It was not a simple task for him to manage interests of human actors around those of non-human actors.

6.2 Second Attempt of Problematisation at IM

The second attempt of problematisation started three months after the first one had failed. This attempt of problematisation was in response to an urgent need to find a solution to the problems that they were experiencing at IM. At this stage the original issues that drove them to adopt an improved method of systems development had worsened. Something had to be done quickly in order to rescue the situation as the quality of software needed serious attention and there was no team motivation or cohesiveness. The call centre was flooded with calls as software upgrades were failing and functionality that had worked before failed. There was tension in the team and a quick solution was urgently required.

Because the online domain owner was a subscriber to the Gantthead IT Newsletter, in browsing one of the issues he came across Scrum and was interested in reading about it. Gantthead was a short lived non-human actor in the network. This is because it only appears in the network to introduce Scrum to the online domain owner. Scrum as a methodology drew the interest of the online domain owner. He introduced Scrum as to the development team as an option to the resolution of systems development problems. Scrum became a significant non-human actor in the network as it seemed to be a way of developing software that was well received by most in the online domain. The IS team composed of system developers, business analysts, project manager, etc, read books about scrum and tried to implement it. As was the case with the home-brewed methodology, this attempt ended up in long meetings and debates trying to interpret what the books were saying. Ultimately they

were introduced to company called Scrum Consulting by the one of the business analysts. Scrum consulting and the online domain reached an agreement to appoint a Scrum consultant who would provide coaching, training and consulting work at IM.

Initially when the Scrum consultant was introduced, to the online domain owner and the Scrum consultant seemed to share the same role of key actor in the network. As the Scrum consultant became more involved in the network, he became more dominant in the and finally became the key actor. Because of his experience he was the most the influential actor in the adoption of Scrum. Although the domain owner had been the key actor in the beginning, the introduction of the Scrum consultant changed the actor status of the domain owner. The Scrum consultant was influential in the steps that were followed in implementing Scrum. This is evidenced by the fact that he was given a platform to impose his interests on the other actors by providing a detailed presentation to the actors already in the network on how Scrum works. All actors already in the network were in support of the interests of the key actor (Scrum consultant), see quotation below.

“Scrum consultant provided expertise in Scrum and provided the organisation an opportunity to get going with the adoption of Scrum”, Domain owner: IM.

After the presentation of scrum to the development team by the Scrum consultant, the interests of the actors grew. Members of the systems development team seemed excited about the idea of Scrum. The fact that Scrum methodology was tested and proved to be working brought a high level of interest in the actors in systems development team. The fact that a consultant would guide the team was seen as an aspect of adoption that would ensure order in the adoption process. This can be seen as ensuring that problematisation succeeds. This is evidenced by the quotation below.

“The involvement of the Scrum consultant was a big milestone in the process of the adoption of Scrum” (Online Domain Owner: IM).

Even though the online domain owner was instrumental in ensuring that things were happening, the Scrum consultant still maintained the role of key actor in the network. The following are the most important aspects of scrum that drew the online domain owner’s

attention. These were identified during the presentation by the Scrum consultant and reading about Scrum:

“The key aspects that we liked about scrum were small focused teams that were autonomous and ensured that we kill dependencies to ensure that teams were on their own, the short sprints of two weeks in which people could commit to what they could get done in two weeks. We liked the commitment of what teams were going to do in the two weeks. That seemed like it was bringing accountability. We also liked the simplicity of user stories. We liked the fact that what was in the sprint was committed and what was not in the sprint could be changed. We were very responsive to change. Continuous improvement was one of the aspects that we liked. It is the critical aspect of scrum where teams continuously look at ways getting better” (Online Domain Owner: IM).

In continuing with the process of problematisation, the network was extended by the problematisation of the chief information officer (CIO). The online domain owner problematised his interest to the CIO. After a series of meetings and PowerPoint presentations, to the CIO by the online domain owner together with the Scrum consultant, the CIO was problematised. See comment by the CIO below:

“This is truly something that we needed in this organisation. This seemed like a methodology which could address many of our problems” (CIO: IM).

The interests of the CIO were now aligned with those of the domain owner and the key actor. At this stage the network was made up of system development team (three system developers, four business analysts, two database administrators, two system architect, two testers, project administrator, two support consultants, two change managers, a project manager and two product specialists), online domain owner, the CIO and the executive team, the business, Scrum consultant, Scrum as a methodology, and the waterfall methodology as in figure 8.

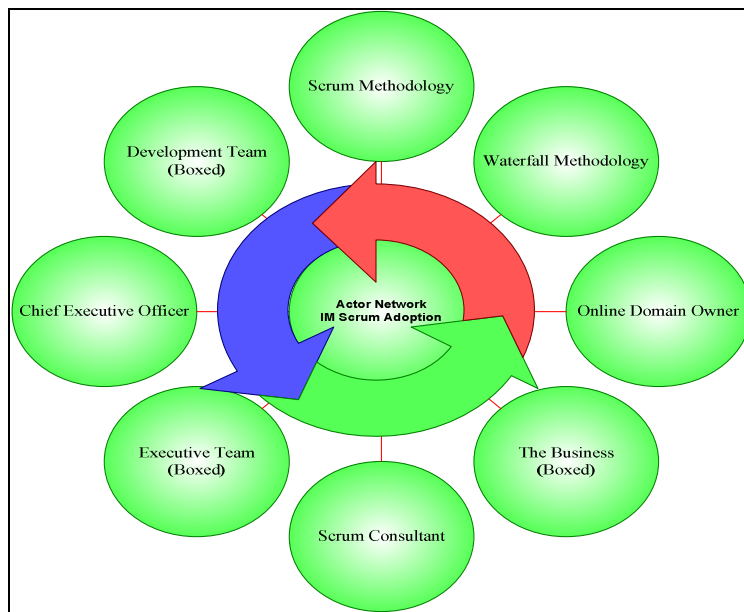


Figure 6.1 - Actor Network in IM - Scrum Adoption

Unlike in the first attempt, the strategy adopted by the online domain owner was that if the CIO becomes problematised and becomes part of the network in the adoption of Scrum, there could be very little resistance from other stakeholders during the process of problematisation. This made Scrum become the obligatory passage point (OPP). This is in line with William-Jones and Graham (2003) who indicate that the power structures present in the network will affect some of the actors who were opposed to the initial problematisation.

The presentations that were given to the CIO and the executive team were done by the Scrum consultant who gave details of how Scrum works. The Scrum consultant also explained the changes that would need to happen in order for Scrum to be successfully implemented. The online domain owner clearly indicated that without the CIO buying in, they would not have been able to go ahead with the implementation of Scrum. The CIO was

responsible for funding the implementation and also for driving the implementation by communicating the new envisaged approach of systems development to the rest of the business.

The CIO formally introduced scrum to all internal stakeholders including the affected business areas, and the systems development team. This formal introduction was done in the presence of the Scrum consultant so as to be able to answer all questions from the stakeholders. In his introduction, the CIO called on everyone to support the new approach to systems development. By this introduction, the CIO was re-emphasising problematisation of the rest of the actors. He was officially confirming that Scrum would be used, thus making it the OPP.

It was agreed between the online domain owner that and the CIO that the CIO would send weekly bulletins to the entire organisation informing members of the progress of Scrum implementation. This ensured that actors that there are strong power structures in the network so as to weaken any possible resistance from potential actors. Problematisation in this case is continuous and the network moves from strength to strength.

At this stage all major stakeholders had become problematised. This is line with Callon (1991) who states that conflict of interests among stakeholders must be absent for the network to be strong which the network was indeed doing.

6.3 Interestment

As stated by Callon (1996), the stage of interestment is the persuasion of actors to get interested in becoming part of the network. Interestment may or may not succeed. The success of interestment results in enrollment (Callon, 1986).

At the time of Scrum adoption at IM, the business processes were quite new which made it quite easy for the Scrum consultant to introduce the new way of thinking at IM. The online domain had recently in-sourced some of the systems development work that had previously been outsourced and the systems development structure and processes were quite new. Nothing was firmly entrenched and the systems development team was quite open to new ideas.

“I definitely think it’s a paradigm shift to the traditional way of systems development. Because it is such a different way of doing things, I think it’s one of those things you need a coach to help you implement. At the same time it is really a simple way of getting things done. Part of Scrum power is simplicity” (Online Domain Owner: IM).

Different strategies can be used in interesting actors and have them as part of the adoption of Scrum. In the case of the online domain owner, he tried to involve the development team in trying to come up with a methodology that could be suitable to address problems that they experienced in their systems development environment. Even though this was also used as problematisation, it also constitutes interestment. The actors in the systems development team were locked in place by virtue of acting on the online domain’s request.

Although there was some form of resistance from some of the systems development team members, it was believed that there would have been more resistance if the online domain processes were matured. Even after the official introduction of Scrum by the CIO, there was some resistance from some of the members of the development team. The actors who were resisting to the adoption of Scrum or some aspects of and how they were addressed are detailed in the following section.

Resistance from Business Analysts – The Business Analysts, as was the case with the first attempt of problematisation, objected to the aspect of lean documentation as they did not regard this as being possible, *see quotation below*. They still wanted to go to a corner for three days and generate sixty page specifications.

“There was one thing that I thought would not change, the need to have the complete business requirement specification before you start development. As business analysts we were totally against lean documentation” Business Analyst: IM).

Resistance from Old Experienced Employees – This is a group of people who had many years of experience in the waterfall methodology. They did not see any benefit of going through all that trouble of change from Waterfall methodology to Scrum when they only had a few years left before they could retire. Due to resistance to change, one employee who was close to retirement opted for early retirement. He was not willing to accommodate change.

The retirement of this employee constitutes failure in interestment. The experienced developer was quoted as follows:

“My colleague decided to take early retirement because he was left with only two years before he could retire” Old & Experienced Developer: Retired.

Resistance against sitting arrangement - Another area that attracted some resistance from the development team was the fact that the arrangement of office space had to be changed to encourage face-to-face communication, introduce pair-programming and solving of problems quickly. This was a cultural issue and had to be dealt with. The culture of IM was that people were provided their working space where they would have privacy and work comfortably on their own. There were cubicles that provided privacy where one person could not see what the other one was doing. People were comfortable in their ‘own’ little spaces. Some had photos, plants, soft music, etc. They perceived the re-arrangement as invasion of their privacy. This is evidenced by the quotation below. Intense interestment strategy had to be applied in order to convince this group of people that this was for the benefit of the team performance.

“I was not against Scrum, but the re-arrangement business drove me insane. I needed space and privacy, in fact I still do” (Developer: IM).

Dealing with Resistance

There were number of interestment strategies used during the adoption of scrum. In This regard, driven by the Scrum consultant, corridor salesmanship was used, where Scrum became the talk of the entire organisation. No company meeting would end without the word “Scrum” being mentioned. Informal discussions on Scrum would erupt among the system development team members, which presented opportunities for interestment by clarifying misconceptions.

One of the major acts of intrestment strategies was the provision of training to all actors that would play a role in Scrum. Scrum training was provided by the Scrum consultant. The course clarified the Scrum role players, the key principles of Scrum, Scrum tools and the process. Details of these are in section 5.3.5.

After the Scrum training, the business analysts, who were quite resistant to introduction of lean documentation, were made to understand how documentation was done in Scrum. The way the consultant dealt with the resistance was to keep emphasising the need to focus on the needed functionality and not everything. The Scrum consultant also indicated that lean documentation, did not mean there should be no documentation, but documentation should just be enough to get the required functionality in production. The consultant further focused the team on the priorities by drawing their attention to the requirements of the stories in a sprint. The business analysts were made to understand the business value that was intended and ensured that they produced just enough documentation in just enough time. These actions constituted acts of interestment on the business analysts who were resisting playing accordingly in their new envisaged roles in Scrum.

In the interview, the Scrum Master who had previously been a project manager indicated that he had done a lot of explaining and motivating for the adoption of Scrum with the aim of getting all stakeholders to buy into the idea. This was another strategy of interestment. The project manager was quoted as follows:

“It was important that we make use of every opportunity to educate people about Scrum. I remember vividly spending hours with developers debating about the need to go through all this trouble of Scrum. In my mind at the time I knew that this was a developer thing, to sit lone with code silently and trying to get it to work. What they were really running away from was the fact that they would no longer be on their own. In all that I saw an opportunity to explain and motivate. Trust me; I have had few of such debates from the development team” Project Manager: IM.

The aim of the project manager was to get all actors to be on the same level of understanding of Scrum. This is in line with Vaagaasar (2006) who emphasises the importance of agreement amongst stakeholders where the stakeholders who have already become actors, translate their interests in order to enroll other stakeholders.

6.4 Enrolment

Enrolment is the acceptance of the roles proposed or imposed by the key actor. There are two things that were interesting about the network at this stage: firstly it involved people with influence in terms of the hierarchy in the organisation and, secondly, it had gained strength as a result of the fact that all actors in the network strongly believed that Scrum would work. However, there was still no clear enrolment of actors. In this section the researcher will discuss the roles proposed or imposed on each actor by the key actor.

Because the network was already strong and stable, it was difficult for any stakeholder not to become part of the network as this would have made them feel isolated because they knew that Scrum adoption would happen with or without them. This means that the members of the development team would be enrolled because they had to perform the tasks. Through the assistance of the Scrum consultant, the business analysts got to understand the new approach to their roles. This new approach brought comfort to the business analysts, which was another instance of enrollment in the actor network. The role that they played in the waterfall method was re-defined and they accepted the fact that they would no longer have to produce the lengthy documentation that containing unneeded functionality.

Another form of enrolment was the division the team of 23 into two teams. In dividing the team the key actor tried to balance the skills in each team. At this point team members were enrolled at least to a team. They had a sense of belonging and feeling that they are still needed. Team members were informed that they would maintain their respective roles. This was yet another form of enrolment.

Scrum prescribes that team members should not be addressed by their roles but as team members. This is one of the aspects of Scrum that was not well received by the domain owner and his team. They thought that this could bring confusion to the team.

Similarly the CIO's role as the one to who had officially introduced Scrum to the organisation can also be seen as enrolment. His role in the network was clear and was that of introducing Scrum to the organization and sending out all official communication regarding Scrum to the organisation.

Training sessions also included specifying what the different roles would be entailed in the Scrum systems development method. As mentioned earlier, this involved re-defining the roles of each actor in the network. Everyone who was going to play a role in Scrum was taken through training by the Scrum consultant. This included the development team, the business, domain owner, etc. After the training all actors understood their roles in Scrum. At this stage, every stakeholder had become an actor in the network. The roles for all stakeholders were clear.

6.5 Mobilisation

This is the final stage of translation and is the stage where the key actor is represented by poke-agents authorised to speak legitimately for the rest of the actors (Blackburn, 2002). All actors who would speak against the network would be silenced and the network would be strengthened. In IM mobilisation the key actor tries to influence the other actors to act according to what has been agreed upon in the enrolment stage. This is important to maintain the direction towards which the key actor was initially envisaging. The aim is to keep actors focused on the main objective of the network. It also plays a role of stabilizing the network. The extent of mobilisation determines the extent of success of the adoption (Stanforth, 2006). The agents are discussed as follows:

Scrum Consultant: At IM the Scrum consultants was the most conspicuous spokes-agent in the network. He gave direction and guidance as to what needed to be done and also made suggestions of how best to go about implementing Scrum. The Scrum consultant acted in the interests of the online domain owner in terms of mobilizing the network. He coached all members of the Scrum team, the Scrum master and, the product owner. The detail of how Scrum works at IM has been addressed in Chapter two.

Six months after scrum was implemented, the scrum consultant was invited again to by the domain owner to determine whether the actors are acting according to what has been agreed upon in the enrollment. This was the second visit by the Scrum consultant which re-emphasised the role of the Scrum consultant as a spoke-agent. His role as a spoke-agent was key to the success of the adoption of Scrum. The importance of the visit after six months

was that if there were any deviations on what was agreed upon in the enrollment stage, they could be rectified.

The Scrum Forum: This was another spokes-agent that was very influential in the mobilization of the actors in the network. The aim of this forum was to discuss challenges and to share new developments pertaining to the Scrum method of systems development. In some cases an external Scrum consultant would be invited to share his experiences, new developments and answer questions. This forum proved to be a very effective spokes-agent. Instead of actors speaking negative about scrum, they would rather raise their concerns during the forums. These Scrum forums were well attended and were not only limited to the Scrum team, but all interested parties. Being an actor in the network for the adoption of Scrum became a pride in the organization.

These forums had effect on other business areas that had not adopted scrum. They became interested at this new methodology of systems development insomuch that at the time of conducting interviews for this thesis, the BPM domain was preparing for the adoption of scrum.

Problems: The problems that drove the domain owner to initiate the adoption of a new methodology of systems development, predictability, quality and productivity, were also agents that the Scrum consultant kept reminding the team about. These problems were also the focus of the business. The actors in the network were very interested in seeing how Scrum would address these problems.

Scrum Roles and Responsibilities: Scrum and its roles and responsibilities were spoke-agents in the network. All actors enrolled in the network who were allocated roles were reminded about their roles by virtue of being in the network. The mobilisation was more emphatic on the Scrum team because they held daily team meetings where they had to report on tasks in their roles.

Scrum has six roles which are based on the definition by Schwaber and Beedle (2002). These roles are Scrum master, product owner, Scrum team, customer, user and management. Table 2 gives descriptions of theoretical responsibilities attached to each role together with the practical responsibility as implemented at IM.

Role	Theoretical Responsibility	Practical Responsibility at IM
Scrum master	Ensure the project is carried out according to Scrum practices, values and rules. Interacts with project team as well as business. Removes impediments and ensures productive team work. Should be dedicated to one team.	In IM this role is not dedicated to one team. There is one scrum master responsible for the two Scrum teams.
Product owner	Responsible for the project. Manages and controls what should be developed in a sprint.	The responsibility of the product owner was implemented as is prescribed by Scrum. This was to encourage the Scrum team to focus on the needed functionality and also working together with the business.
Scrum team	This is the core project team. Ensures self organisation and has the authority to decide on actions to take. No specific roles are identified. Team members are called team member.	The Scrum teams consisted of members with all skills required to deliver software functionality. Contrary to the Scrum prescription, Scrum team members were not merely called team members but named according to their specialization, like, business analyst, system developer, system architect etc.
Customer	Participates in tasks relating to the product backlog.	There was no customer role in IM. Any actor who represented the business was regarded as the business. The product owner was regarded as a manager in the business. He was also regarded as the project sponsor.
User	This is the person who will be using the system being built. They ensure that their issues are known and addressed.	As in the role of a customer, there was no user in IM Scrum. The user was regarded as part of the business.
Management	Makes final decisions. Participates in setting goals and requirements.	The implementation of Scrum in IM referred to all actors who represented the business as “business” and the manager being the product owner.

Table 6.1 - Scrum Roles and Responsibilities Adopted in IM

Scrum Practices and Tools: As mentioned in the literature review in Chapter two, Scrum is based on the use of certain management practices and tools. These are applied in various phases of Scrum. These tools help in avoiding chaos that can be brought about by complexity and unpredictability. Table 3 shows the different practices and tools as implemented in IM.

Practice/Tool	Practice/Tool Description	Practice/Tool in IM	Benefits of Practice/Tool at IM
Product backlog	Defines everything that is needed for the final product. Keeps record of the work to be done in order to complete the project. Consists of prioritised and up-to-date list of business and technical requirements for the system build. The Product Owner is responsible for the maintenance of the product backlog.	The term “product backlog was not used in IM”. Instead, the big project was broken down into functionalities that listed in order of priority. That is where the workload for a sprint would be extracted. The project plan was more detailed than what the product backlog would be. In compiling the project plan all aspects of the required functionality would be brought to the surface right at the beginning. This approach was seen as taking more weight from the shoulders of the Scrum team and allowed them to focus on delivering functionality. Stories for the sprint were derived from the project plan.	Not used at IM.
Effort estimation	This is an iterative process of estimating effort as more information becomes available on specific product backlog item. The Product Owner together with the Scrum team is responsible for this exercise.	This was not used in IM. It just did not the interests of the actors. The online domain owner together with the Scrum team believed that with experience they would be able to estimate how long tasks would take and did not use some formula to estimate.	Not used at IM, instead relied on experience to estimate timeframes for tasks.
Sprint	This is the way of adapting to the changes like requirements, time, resources, knowledge, technology etc. This is a period of two to four weeks after which working piece of software should be produced.	The sprint was embraced by the domain owner and the development team right from the beginning. This was one of the features that attracted him to Scrum. In implementing this feature in IM a two week sprints were used and they worked well. Functionality would not always end up being used after a sprint because of dependencies. But the functionality would be completely developed and ready to be deployed.	The benefit derived from this practice is continuous learning. The team continuously improved on the way they developed systems and the quality, dependability and productivity were ever improving.
Sprint planning	This is the meeting of the Scrum team together with the	At IM sprint planning meetings were seen as necessary. These meetings were made	The benefit derived from this practice was that the

meeting	Scrum master to plan how a piece of software is going to be implemented during a sprint.	short because they selected item that constitute a sprint from a project plan which already contained enough detail and the possible resources were already allocated.	team started a sprint with clear allocation of tasks they would perform for the next two weeks.
Sprint backlog	These are items that constitute a workload for a sprint. These are items selected by the Scrum team, Scrum master and the product owner in a sprint planning meeting from the project plan.	The sprint backlog was used in IM. This is what constitute a two week deliverable for the team.	The benefit of this tool is to keep a visual record of how the team is progressing in the sprint.
Daily Scrum meeting	This meeting helps in keeping progress of the tasks allocated to individuals. This meeting is fifteen minutes in length with three basic questions to be answered: What did you do since the last meeting, what are you doing now and, what your impediments are. This meeting is run by the Scrum master.	Scrum meetings were held three days a week (Monday, Wednesday and Friday). Their meetings were slightly longer than the prescribed fifteen minutes. The reason was for the Scrum master to get more detail of what was going on in the team. This worked well in IM and kept the team on its toes in terms of progress.	This keeps team members on their toes. This also brings to the surface issues that obstruct the progress of the team so that the Scrum master can deal with them.
Sprint review meeting	This is a meeting where the Scrum mater presents working software to the business and product owner at the end of a sprint. This is where the next sprint items are decides on.	Although the piece of functionality may not be implementable because of dependencies, but it must be complete. There must be demonstration of how it works. After the demonstration the business points out the functionality for the next sprint. This is done according to the priorities of the business.	This is a necessary meeting in IM. It is not taken lightly as it is an opportunity for the Scrum team to demonstrate what they have been busy with in the past two weeks. This marks the completion of a piece of functionality that the business has signed off.
Sprint	This is a Scrum team meeting	The sprint review meetings were embraced	This practice improved

retrospective meeting	where the team looks at what they performed well, what they need to refrain from doing and, what they need to start doing. This is a way of encouraging team learning and improvement after every sprint.	at IM. They saw them as an opportunity to reflect on how they performed in the past two weeks and take corrective steps to improve. This worked for them.	team productivity and cohesiveness. Issues that were experienced during the sprint would be addressed. This encouraged learning exercises within periods of two weeks.
Stories	This is description of desired functionality told from the perspective of the user or customer.	Stories were derived from the project plan. Because the project plan is broken down to the smallest detail, Stories in the project plan would also include tasks.	This was used at IM and worked well. There was clarity as to who was busy with what as these stories were on a board.
Burn-down chart	This is used to tracks sprint progress. Marks day-by-day progress of the Scrum team and how much work remains (are we ahead or behind).	The burn-down chart is used in IM. This is placed in such a way that everybody who visits the team can see the progress of the sprint. This chart uses days as units of time. The burn-down chart is updated daily.	Any stakeholder interested in seeing team progress would visit the burn-down chart and get a clear picture of the sprint progress.
Small Scrum team	Scrum works with a principle of teams with five to nine people.	At IM a team of 23 was split into 2 teams. One team has 11 members and the other has 12. This was an effort to reduce the team size in line with the principle of small teams. Even though it did not fall within the range prescribed by Scrum, it was close after dividing the team.	It was much easier to work with smaller teams as there was cohesion.
Scrum team sitting together	In Scrum team members should sit together so as to encourage face to face communication, quick resolution of issues and, pair programming.	The team members of the different teams sat together but this did not stop email communication. There was still that element of wanting to secure oneself by writing an email and keep a record instead of face-to-face communication. This was one area that still needed to be developed at IM. Developing this area would promote trust amongst team members.	Issues were resolved much quicker and there was transparency in what team members were doing. This compelled team to perform.
Impediment list	This is a board with the list of everything that impedes the	The scrum master kept an impediment list which was visible to the whole team. The	The whole team understands what the

	progress of the Scrum team.	Scrum master would feed back to the team member who raised an impediment on a daily basis. This feedback was not dependent on the team meeting because some impediments were urgent and holding back the progress of the team or team member.	obstacles are and they also know when they have been removed.
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Table 6.2 - Scrum Practices and Tools as Applied in IM

Highlights of Mobilisation

The Team Members: The domain owner together with the development teams decided to retain their role names and not change to team members. They argued that if they changed to be team members that would bring confusion to the team, and to the business. They wanted to maintain their role titles, for example, business analyst, developer, network specialist, and so on. The team further noted that the changing of their roles name to team member would further undermine their areas specialisation. In addition, if a new member was needed to join the team it would not be clear as to what skills were required. This implies that South Africans enjoy having clearly delineated roles and that is one of the possible reasons why they would not like to be called team members. This can be regarded as a cultural influence.

Another important aspect pertaining to teams is the seating arrangement. Scrum prescribes that teams sit in such a way that face-to-face communication is encouraged. In the case of IM, the only change that was implemented was to move team members close together. Members still maintained the privacy. The environment did not really encourage face-to face communication as emails were still used. Another reason, as stated by the interview respondents, was that people still believed that they need to cover their backs. This means that there was no absolute trust amongst the members. Emails were seen as a way of keeping a record of what was communicated and when it was communicated. Trust is another cultural aspect that team members still need to develop.

Scrum master: Scrum prescribes that a Scrum team needs to have at least one dedicated Scrum master. It was not the case at IM. There was one Scrum master that was shared by the two Scrum teams. The reason for this is that there were limited resources and there was a need for more skills within the teams. This confirms the findings of Friedrich and van der Poll (2007) who conducted a study in South Africa. In his study he found that there are not enough resources trained in agile environments in South Africa. Due to that constraint, a consensus at IM was reached that the one Scrum master would fulfil the Scrum master role for both teams.

Product Backlog and Sprint: At IM, there was no product backlog; instead, the approach was that of breaking a project into smaller sub-projects according to functionality. The teams and the product owner still wanted to work with traditional project plans. The difference was that they would make their project plans visible to all team members. From the project plan they would select what would make up a sprint. A sprint in their case is a sub-project that a team could complete in two weeks. The team would divide the tasks amongst themselves.

Small teams: As one of the key aspects, Scrum prescribes that a Scrum team should be made up of between five to nine members. Before the adoption of Scrum at IM, the development team was made up of twenty-three members with different specialisations. In trying to reduce the team size, the Scrum consultant split the team into two teams that would work independently and focus on different projects. One team had eleven members while the other was made up of twelve members. From each team, all members were clear about the roles they were to play. We can already identify the fact that even though Scrum prescribes a maximum team size of nine it is not always possible.

Visual Tools: Scrum's visual tools include the sprint backlog, the burn down chart, and the impediment list, which were embraced at IM and adopted as they were. IM online domain believed that project progress should be visible to all stakeholders. They also believed that this approach would also contribute positively to the progress of the team if the entire team could see their progress. This would eliminate activities that were not attended to until the last minute. The visual tools were also seen as tools of monitoring individual progress against time.

Benefits associated with Adoption of Scrum: The Online domain owner indicated that they got more than they expected from the adoption of scrum.

“Quality has improved exponentially. We have fewer defects and we are much better at delivering on our promises. Teams are a lot more productive. An added bonus was that partnership between business and IT grew”, (Online Domain Owner: IM).

The adoption of scrum has addressed the problems that online domain at IM had. One can also draw from the domain owner that they received more benefits than they hoped for. This shows that Scrum when implemented correctly, it can bring amazing results. More benefits associated with the adoption of Scrum are shown in table 5.2.

6.6 Irreversibility

At this stage, the network had reached a good level of stability and could be regarded as having reached an irreversible stage where it becomes difficult to abandon the adoption owing to the actor network having been established and strengthened (Mpazanje, 2009). The organisation had spent money in the adoption of Scrum and the network elements were so strongly connected that it would have been almost impossible to revert back to the old method of systems development.

The other contributor to the state of irreversibility was the fact that IM used a Scrum consultant who was experienced and had probably consulted in many Scrum implementations before. The Scrum consultant was able to anticipate the problem areas and deal with them appropriately. This made Scrum implementation a smooth process. According to Mpazanje (2009), irreversibility is also born by strong inscriptions.

6.7 Inscription

According to Latour (1992), inscription is a process of creating artifacts to ensure protection of actors' interests. The CIO would ensure that the vision of producing quality software was fulfilled by presenting the idea to the rest of the organisation and by providing funding. On the other hand, the Scrum consultant would provide coaching and guidance during the adoption of Scrum in a manner that would not prejudice any of the actors. This is yet another form of inscription.

When the CIO and the executive team were pledging their support for the adoption of Scrum, they were inscripting. Due to their promises, the stakeholders became more comfortable and willing to join the network. The involvement of the CIO by either communicating the progress of scrum or visiting the systems development team made the actors feel that their interests were protected and thereby being inscribed.

6.8 Conclusion of the Chapter

During the process of adopting Scrum, in the beginning it seemed like trial and error where IM tried one methodology that did not work. The involvement of a Scrum consultant helped in ensuring a smooth transition from the waterfall method of systems development to Scrum. It is also important to note that IM did not adopt all aspects of Scrum but selected those aspects that would address their problems. The implementation of Scrum at IM yielded better results than was expected.

From this chapter it is clear that IM as an investment organisation relied on IT. They were keen on producing good quality software on time. This put pressure on the IT department to search for methodologies that could address their problems. In trying to get to a stage where Scrum was adopted, some alignment of stakeholder interests had to happen. Actors went through a process negotiations, reinterpretation and translation of interest in order to enroll other actors.

Chapter Seven

7. Findings, Discussions, and interpretations

7.1 Introduction

This chapter discusses the findings that emerged from this research study. It also attempts to interpret the findings. One organization was used in this investigation due to Lee and Baskerville (2003) stating that it is correct for one to generalise on a single case study and that it is an appropriate and valuable approach. What would be incorrect would be to assert that this is the only way to work. The use of a single case can depend on the case one is picking and how it is chosen. Selection of such cases should be based on the case that can best represent the greater population.

The organization where the study was conducted is of South African origin. Even though it grew to have branches in Botswana, Swaziland and London, the head office in South Africa still had influence on the other branches. This makes this organisation a true representation of South African organisations.

Future researchers are encouraged to conduct a similar study using more than one organisation. Such a study would strengthen generalisation of findings. This would also present an opportunity to compare findings.

The structure of the chapter is as follows:

In section 6.2 the need for a number of actors in a network in order to make a success of the adoption of agile methods is discussed. It looks at the changes that occur in the roles of actors in the network. Section 6.3 discusses the fact that actors in the ANT have conflicting interests which have the potential to derail the adoption of agile methodologies. At the same time, these interests cannot be “cast in stone”. The findings therefore encompass the way South African organisations prepare for the adoption of agile methods. Section 6.4 hence discusses the organisations and the process of adopting agile methodologies.

It is evident from the analysis that even though agile methods of systems development may be an attractive approach to use; organisations still need to understand what their needs are and which aspects of agile could best address them. This therefore means that the organisations should understand the aspects of agile methods that could work for them and pursue the adoption of those.

7.2 IM and Technology

Finding: Some organisations cannot operate without IT. Therefore they need to continuously improve the quality of systems they deliver to the business. Owing to frequent market changes, there is a need for organisations to deliver systems to the business quickly in order to be abreast with those changes. Scrum helps in addressing this need in that it delivers most needed functionality within short period of time. This enables the IT to be agile in its approach.

Research question answered: To what extent do South African organisations rely on IT in order to be competitive?

Discussion: If we look at the history of Toyota as one of the pioneers of the agile approach, we can see that they identified the need to eliminate waste and to produce only what was required (Poppendieck & Poppendieck, 2003). In adopting this approach, they were moving away from mass production in order to reduce costs. IM also has a similar history of delivering huge software projects they needed to be more agile in their approach so that they are able to reduce costs and adapt quickly to changes in the market.

Before the adoption of Scrum, there was misalignment between the business and the IT department. The attitude of the business was that the expenditure on IT was not justifiable. This emanated from the low quality of the systems that were implemented, the system upgrades that caused more problems than they added value, and the fact that the IT was not reliable in terms of software delivery. This study reveals that IT expenditure must be justifiable. Accordingly, an agile approach to systems development can help by delivering working software within a short period of time. This enables the businesses to realise a quicker return on investment (ROI). This finding is in line with the study conducted by Friedrich and van der Poll (2007) who discovered that the problems experienced by

software development companies in South Africa include late releases, cost overruns, resource constraints and lack of understanding of business requirements.

Contribution: The finding contributes to the agile body of knowledge by uncovering the major problems that South African organisations experience during software development. These problems are quality of software, systems development team productivity and cohesiveness, and dependability of the systems development team. These problems can be resolved by the use of Scrum in a South African context.

7.3 Preparation for Adoption

Finding: In preparing to adoption agile software development methods, organisations go through a process of trying to reach a point of common understanding of what the problems are. Thereafter stakeholders, that is, IT department and the business need to work together in trying to find solutions to those problems. Agile methods require collaboration among stakeholders (Maurer & Melnik, 2007). While Scrum requires collaboration, there needs to be collaboration prior to the adoption.

When stakeholders do not have a common idea of the solution to be adopted and pursue their own agenda, adoption of agile methods of systems development fail. It is important to have a common understanding and perception of the methodology to be adopted.

Research question answered: How do South African Organisations prepare for the adoption of agile software development methods?

Discussion: In this research, it was found that the adoption of agile methods of software development is triggered by the existence of problems. These problems include poor quality of software, not delivering functionality as promised and project overruns. Some of the problems are associated with the fact that IT departments cannot keep up with market changes. All these problems render the stakeholders dissatisfied. These findings are in line with Ferreira and Cohen (2008) and Vijayasathy (2008) who conducted a stakeholder satisfaction survey in South Africa.

This study reveals that stakeholders need to be aware of the problems that prevail although they might not have solutions to such problems, the awareness of them will encourage them to collaborate in solving them. In preparing to address the problems, all stakeholders should have common understanding of the problems. Moreover there might be a need for some adjustments in how these problems are understood as the awareness of problems could commit stakeholders to becoming part of the solution.

In getting stakeholders to understand the problem, various approaches may be needed to get them onto the same page of understanding the problem. Some of these approaches include getting to understand the problem from their perspective and what it means to have the problem resolved. In some cases stakeholders would have to adjust their understanding of the problem in order to accommodate the other stakeholders. This is in line with Vaagaasar (2006) who states that an idea can be adopted as it was intended or modified to accommodate the other stakeholders.

The importance of common understanding is evident in the study. This is a recurrent theme in the study. At several occasions problematisation failed because the stakeholders did not have a common shared view of the solution. We can see that it is crucial for all stakeholders to have a common idea, understanding, and view of what the methodology consists of. It goes beyond the idea of just having the name Scrum. We must move beyond the abstraction of the name and ensure that everyone commonly understand what it consist of.

Contribution: Before adopting agile methods of systems development, there needs to be a common understanding of what problems need to be addressed by an agile approach to systems development. This means that stakeholders must be aware of the existence of the problems and also be willing to be part of finding solutions to them and not just want them resolved. In this way commitment is built among stakeholders.

7.4 The Process of Adoption

Finding: The adoption of agile methods is a process that needs careful management. Due to the absence of an agile adoption framework, organizations adopting agile go through phases: Prior adoption phase, adoption phase and post adoption phase.

Research question answered: What processes are followed in the actual adoption of agile methods of systems development?

Discussion: A major finding in this study is that South African organisations that adopt agile methods go through different phases in the adoption of such methods of systems development. This is the gap that has been identified in literature. The gap is that there is no study that has been conducted on the process that South African organisations follow when adopting agile methods of system development. The process involves: firstly, getting the stakeholders to understand that there is a problem that needs to be addressed, secondly, be on the same level of understanding of what the problem is, third, agree on the methodology that will be used to address the problem, lastly, adopt and check if the problems have been addressed. This gap has been addressed in Chapter five using the ANT.

If challenges prevail during the phases of adoption of agile methods, they can lead to the abortion of the adoption process. Most challenges relate to people and their reasons for resisting change. The challenges include the fact that culture can be identified as playing a major role in the adoption of agile methodologies of system development by South African organisations. This is in line with Kim, Lee, and Yu, (2004) who states that culture is a rarely considered in adopting new systems development methods and yet it plays a major role. Another challenge that emerged is that employees fear the unknown and resist change because they do not want to move out of their comfort zones. This means that they like to do things that they are comfortable with. When methodology of systems development is introduced, that interferes with their comfort.

Organisations need guidance during adoption and proof that the methodology works and is trustworthy. This was the service provided by the Scrum consultant at IM. Management involvement and approval is also crucial to the adoption of Scrum. Such involvement could take the form of management formally introducing the methodology themselves to the organisation. This shows that they approve of it and that makes the rest of the organisation trust it. Other approaches failed because this approach was not followed.

It is easier to introduce a new agile methodology such as Scrum to an organisation when the business processes are quite new and can thus be easily reshaped. This has been the case at

IM. People had not been acquainted with the processes and therefore there was nothing heavily entrenched in their way of doing things.

There is no structured approach to the adoption of agile methods of systems development (Sidky & Arthur, 2007). Although organisations may make attempts to adopt agile methods, they may not get it right, as it takes determination to succeed. The use of consultants can help in getting it right the first time.

Contribution: It is important to engage consultants when adopting agile methods of systems development. This allows the organisation to involve an objective approach to the process of adoption. Using internal resources to implement agile methodology would expose the process to subjectivity. It is also important to engage the stakeholders in finding the method to be used. The following are some of the practices that are helpful for the successful adoption of Scrum:

Corridor Salesmanship: It is important to get people talking about the methodology that is to be adopted. These talks should be heard all over the organisation corridors.

Talking about scrum in meetings: In every company meeting there should be a slot that would enable conversations about scrum. These slots should introduce people to aspects and benefits of scrum. This would ensure that the whole organization is on the same level of understanding of scrum.

Informal discussions on scrum: Informal discussions should be encouraged. Such discussions bring out misconceptions about the methodology and these can then be addressed accordingly.

Training on the new methodology: All stakeholders should feel that they still have a role to play in the new methodology (the business analysts did not want to follow lean documentation, but who later accepted after training where they were made aware of their roles)

7.5 Aspects of Agile Adopted by South African Organisations

Finding: In adopting agile methods of systems development, organisations select the aspects of these methods that will address the problems they experience.

Research question answered: What aspects of agile methods of systems development do organisations adopt and why.

Discussion: Organisations that adopt agile methods do not follow the exact methods prescribed by these methods of systems development. The nature of the environment, the resource constraints, and the problems that are being addressed by adopting agile methods are the key determinants of what the organisation should adopt (Langden-Thurgood & Mackintosh, 2008). This has been the case at IM where the focus was on addressing the problems at hand.

As mentioned in Chapter five5, only a selection of Scrum aspects that were adopted at IM. These were perceived those that were needed to address the problems. This is congruent with Longden-Thurgood and Mackintosh (2008) who state that organisations that adopt agile methods of systems development do not always follow exact prescription of that particular method but customize the method to suit their unique circumstances. Even though the waterfall method is known to have problems, there certain aspects that organization would still find useful. These, the organization would keep. This would also lighten the burden of adopting new methodology.

Contribution: Organisations need to understand their problems before they engage in the adoption process. In addition they need to have good understanding of the methodology they will use. This would put them in a better position to pick aspects of the methodology that would best address their problems. The end results would be a lighter adoption process as there is no need to change what works well.

7.6 Do South African Organisations Follow Agile Principles

Findings: South African organizations only select some aspects of agile methodologies of systems development.

Research question answered: Do South African organizations comply with agile principles as embodied by agile methodologies while developing systems?

Discussion: South African organisations that adopt agile methods of systems development do so in order to address specific problems. In trying to address those problems, they only selected the aspects of agile methods that make sense for their environment. This is line with Fitzgerald, 1996 who states that systems development teams use parts of methodologies and do not follow all the steps required by a particular methodology.

As indicated in Chapter five, predictability, quality and productivity were identified as main problems that forced the IT department to seek new ways of systems development. In IM, the Consultant was interested in seeing to it that the adoption of agile methods of systems development did indeed address these problems. In selecting appropriate aspects of Scrum, the focus was on breaking down of one big team into two small teams that focused on different projects. This aspect of Scrum addressed the problem of productivity. The teams were more productive. Another aspect that was embraced was the iterations approach to systems development. This aspect encouraged learning within short periods of time and thereby improving quality of software. It also encouraged delivery of working software within a sprint; this improved predictability in IM.

A methodology may fail to address the problems when users end up focusing more on the features of a methodology as opposed to the task at hand. Methodologies are the tools used to develop information systems in order to get the job done (Jantsch, 1980; Prigogine & Stengers, 1985; Von Foerster, 1984). This is also the case with the South African organisations; they focused on solving the problems rather than the methodology itself. In the case of the case study organization, this focus was made possible by the use of external

consultant who would focus on the methodology while the development team focused on getting their problems resolved.

South African organisations know limitations posed by agile methodologies and therefore know when to “break” the rules of the methodology. Knowing when to break the rules requires the ability to abandon the mindset that believes that there is a single methodology that can address all systems development problems.

Contribution: Agile methods may address many of the problems associated with systems development in the South African context. However, there is no single methodology that can address all these problems. South African organisations need to focus on adopting aspects that will address their problems.

7.7 Conclusion of Chapter

In adopting agile methods, it is important for the stakeholders to be on the same page pertaining to what problems they are experiencing. It also helps to engage all stakeholders in trying to find a solution to the problems.

It should be considered important to involve external consultants in the adoption of agile methods as this would do away with subjectivity that might prevail if internal resources are used. Owing to the lack of a framework for the adoption of agile methods, in adopting agile methods in South Africa organisations go through phases before during and after adoption.

Lastly, Organisations do not adopt agile methods exactly as prescribed, but pick aspects that would address the prevailing problems. At the end of it all, organizations realize more benefit than they anticipated would come from the adoption of agile methods.

Chapter Eight

8. Conclusion of Thesis

8.1 Conclusion

The goal of this study was to provide an understanding of what phases South African organisations go through in their attempt to adopt agile methods of systems development.

8.1.1 The approach of the research

Because the researcher had to look, amongst other things at the relations between the stakeholders, the ANT was used as a research approach. The ANT traces the way relationships are formed amongst stakeholders during the adoption of agile methods. The intention of using the ANT was to explain complex relationships among stakeholders in scientific research settings (William-Jones & Graham, 2003). It also provided a comprehensive approach for tracing of the way interests of stakeholders are aligned (Mahring *et al.*, 2004).

8.1.2 Summary of findings

South African organisations need to understand the benefits they can obtain by adopting agile methods of systems development. One of the findings, amongst others, from IM case is that adoption of agile methods by South African organisations is driven by problems that prevail within the IT department. Owing to the business's dependence on IT, IT is pressured to improve the quality of the systems it develops. Frequent market changes also compel IT to deliver systems to the business quickly in order to keep up with those changes. In the case of IM Scrum has contributed to the resolution of those problems.

There is an absence of an agile adoption framework applicable to the South African context. This makes the adoption of agile methods by South African organisations unstructured. It has been revealed by the study conducted at IM that in adopting agile methods of systems development, South African organisations go through phases. These are the pre-adoption

phase, adoption phase and the post-adoption phase. These phases need to be managed carefully in order to make the adoption a success.

There are also challenges that are experienced during the adoption of agile methodologies. Many of these challenges relate to people and the organisational culture and reveal that South African organizations need to manage the transition from traditional methodologies carefully. It is important to get stakeholder buy-in in order to succeed in the adoption of agile methodology.

It has also been found from this study that South African organisations do not adopt agile methods as prescribed, but select aspects of agile methods that will address the problems that they experience in their organisations. This is in line with the findings of Fitzgerald (1996) who states that systems development teams use parts of methodologies and do not follow all the steps required by a particular methodology (Fitzgerald, 1996)

8.1.3 Consideration for Future research

Adoption of agile methods in South Africa is on the rise but there is no structured approach to adopting these methods. The absence of structure in the approach organisation follow could expose them to abortive adoptions. For future research, there would be value in developing a framework that would make it easy for South African organisations to adopt agile methods. This framework would reduce the chances of failure during the adoption of agile methods.

8.1.4 Contribution to the field of IS

There is a move by organisations away from the traditional methods of systems development to agile methods. Although some organisations may aspire to this kind of move, the obstacle to such a move is a lack of empirical evidence as to what process have been followed by other organisations in South Africa. This research will spell out the problems encountered by organisations in adopting agile methods.

The purpose of the proposed study is to provide organisations with empirical evidence of the steps to be followed by organisations when adopting agile methods of systems development.

This will equip organisations to understand the challenges that organisations face when adopting agile methods in South Africa. It will also enable organisations that aspire to the adoption of agile methods to manage the process better.

References

- Abrahamsson, P., Salo, O., Ronkainen, J. & Warsta, J. (2002). *Agile software development: A review and analysis*. Retrieved 13 May 2009, 2009, from <http://www.vtt.fi/inf/pdf/publications/2002/P478.pdf>
- Akrich, M. (1992). The de-scription of technical objects. In Bijker, W.E. and Law, J. (eds), *Shaping Technology -- Building Society: Studies in Sociotechnical Change*, MIT Press, Cambridge, Mass.
- Allison, I. (2005). Towards an agile approach to software process improvement: Addressing the changing needs of software products. *Communication of the IIMA*, 5(1), 67–76.
- Alshayeb, M. & Li, W. (2006). An empirical study of relationships among xtreme programming engineering activities. *Information and software technology*, 48(11), 1068–1072.
- Bandeker, N., Patel, K., van Rooyen, G. & Tanner, M. (2006). *Information infrastructure development: An African ANT perspective*. Unpublished masters information systems, University of Cape Town, University of Cape Town.
- Beck, K. (1999). Embracing change with extreme programming. *IEEE Computer*, 32(10), 70–77.
- Benbasat, I., Goldstein, D. & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly*, 11(3), 369–386.
- Berteig, M. (2007). *Agile benefits: Five essential reasons to try agile*. Retrieved June, 2009, from http://www.agileadvice.com/archives/2007/09/agile_benefits_1.html
- Sunnvayle, C., (2004). Adoption of agile in South Africa. Retrieved June, 2009, from <http://www.bmc.com/news/press-releases/2008-archive>.
- Boehm, B. & Turner, R. (2004). *Balancing agility and discipline: A guide for the perplexed*. Boston: Addison-Wesley (Pearson Education).
- Boehm, B. & Turner, R. (2009). *Management challenges to implementing agile processes in traditional development organisations*. Boston: Addison-Wesley.

- Boland, R. J. (1985). Phenomenology: A preferred approach to research in information systems. In H. T. Wood (Ed.), *Research methods in information systems* (193-2-1). Amsterdam: North Holland.
- Burmeister, B., Arnold, M., Copaciu, F. & Rimassa, G. (2008). BDI-agents for agile goal-oriented business processes. International conference on autonomous agents and multiagents systems, Estoril, Portugal, pp. 37–44.
- Callon, M. (1986a). Some elements of sociology of translation: domestication of the scallops and the fishermen of St Brioux Bay. In J. Law (Eds.), *Power, action & belief: A new sociology of knowledge?* (pp. 196 – 229). London: Routledge & Kegan Paul.
- Callon, M. (1986b). Some elements of sociology of translation: Domestication of the scallops and the fishermen of St Brioux bay. *Power, action and belief: A New sociology of knowledge*, 196–223.
- Callon, M. (1991). *Actant-networks*. Retrieved 13, May, 2009, from <https://tspace.library.utoronto.ca/citd/holtorf/3.11.html>
- Callon, M. (1991). *Techno-economic networks and irreversibility: Technology and domination* (pp. 132–161). London: Routledge.
- Callon, M. (2003). Keynote speech: “Actor-network theory – the market test”. Paris: Lanchester University.
- Callon, M. & Latour, B. (1981). Unscrewing the big leviathan: How actors macro-structure reality and how sociologists help them to do so. *Advances in social theory and methodology*, 277–303.
- Chan, F. K. Y. & Thong, J. Y. L. (2008). Acceptance of agile methodologies: A critical review and conceptual framework (pp. 1–2). Hong Kong, Elsevier.
- Chan, H. C. & Teo, H. (2007). Evaluating the boundary conditions of the technology acceptance model: An exploratory investigation. *ACM Transactions on computer-human interaction*, 14(2).
- Cheng, K., Harrison, D. K. & Pam, P. Y. (1998). Implementation of agile manufacturing: An AI and internet-based approach. *Journal of materials processing technology*, 76, 96–101.

- Chow, T. & Cao, D. (2007). A survey study of critical success factors in agile software projects. *The Journal of systems and Software*, 81, 961–971.
- Cockburn, A., (2002). *Agile software development*, paperback, Addison-Wesley Professional.
- Cockburn, A. & Highsmith, J. (2001). Agile software development: The business of innovation. *Computer*, 16, 120–122.
- Cohn, M. & Ford, D. (2003). Introducing an agile process to an organisation. *IEEE Computer society*, 74–78.
- Cordella, A. & Shaikh, M. (2006). *From epistemology to ontology: Challenging the constructed truth and ANT*. Retrieved 12, September, 2009, from <http://is2.lse.ac.uk/WP/PDF/wp143.pdf>
- Darakhshani, S. (2005). The viability of outsourcing offshore contact centres to the Western Cape. Masters in information systems, University of Cape Town, pp. 1–15.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quart*, 13(3), 319–340.
- Dooley, L. M. (2002). Case study research and theory building. *Advances in developing human resources*, 4(3), 335–354.
- Dyba, T. & Dingsoyr, T. (2008). Empirical studies of agile software development: A systematic review. *Information and Software Technology*, 50, 833–859.
- Dubé, L. & Paré, G. (2003). Rigor in information systems positivist case research: Current practices, trends and recommendations, 27(4), 597-653.
- Elliott, S. (2008). Agile project management: Seminar on current trends in software Industry. Department of computer science, University of Helsinki.
- eWorkshop. (2002). Summary of the first eWorkshop on agile methods. Retrieved 13, May, 2009, from <http://fcmd.umd.edu/projects/Agile/Summary/SummaryPF.htm>
- Ferreira, C. & Cohen, J. (2008). *Agile project management*. University of Helsinki: Computer systems organisation.
- Ferreira, C. (2008). Agile systems development and stakeholder satisfaction: A South African empirical study. Wilderness Beach Hotel, South Africa. (ACM) 48–55.

- Fitzgerald, B., (1996). Formalised systems development methodologies: a critical perspective. *Information systems journal*, 6 (1), 3–23.
- Flyvbjerg, B. (2006). Five misunderstanding of csase study research. *Qualitative Enquiry*, 12(2), 219–245.
- Friedrich, W. R. & van der Poll, J. A. (2007). Towards a methodology to elicit tacit domain knowledge from users. *Interdisciplinary journal of information, knowledge, and management*, 2, 180–193.
- Fritzsche, M. & Keil, P. (2007). Agile methods and CMMI: Compatibility or conflict? *E-information software engineering journal*, 1(1), 9–26.
- Gadamer, H. (1976). *The historicity of understanding*. Penguin Books, 6(4), 117-113.
- Geertz, C. (1973). *The interpretation of cultures*. New York: Basic Books.
- George, A. L. & Andrew, B. (2004). *Case studies and theory development*. Cambridge, MA: MIT Press.
- Gerring, J. (2004). What is a case study good for? *The American political science review*, 98(2), 341–354.
- Groeschl, S. & Doherty, L. (2000). Conceptualising culture. *Cross cultural management: an international journal*, 7(4).
- Gummesson, E. (2007). Case study research and network theory: Birds of a feather. *Qualitative research in organisations and management: An international journal*, 2(3), 226–248.
- Henderson-Sellers, B. & Serour, M. K., (2005). Creating a dual agility method: The value of method engineering. *Journal of database management*, 16(4), 1–24.
- Highsmith, J. (2002). *Agile software development ecosystems*. Boston, MA: Addison-Wesley (Pearson Education).
- Highsmith, J. (Ed.). (2004). *Agile project management: Creating innovative products*. New York: Addison-Wesley professional.
- Hughes, B. & Cotterell, M. (2006). *Software project management* (4th ed.). London, UK: McGraw-Hill.
- Ismail, H.S., Snowden, S.P., Poolton, J., Reid, I.R. & Arokiam, I.C. (2006). Agile manufacturing framework and practice. *International journal of agile systems and management* 1(1), 11–28.

- Jacobsen, L., Christerson, M., Jonsson, P. & Overgaard, G. (1994). *Object-oriented software engineering: A use-case-driven approach*. Boston, MA: Addison-Wesley.
- Jantsch, E. (1980). *Self-organizing universe: Scientific and human implications of the emerging paradigm of evolution*. Oxford: Pergamon Press.
- Johnston, R. B. (2001). *Situated action, struction and actor-network theory: An integrative theoretical perspective*. The 9th European conference on information systems, Bled, Slovenia, pp. 232–242.
- Kettunen, P. (2008). Adopting key lessons from agile manufacturing to agile software product development: A comparative study. *Technovation*, 6(2), 45-75.
- Kim, S., Lee, J. & Yu, K. (2004). Corporate culture and organisational performance. *Journal of managerial psychology*, 19(4), 340–359.
- Klein, H. & Canditt, S. (2008). Using opinion polls to help measure business impact in agile development. *ACM*, 8(5), 25–31.
- Kozar, K. A. (1989). Adopting systems development methods: An exploratory study, *Journal of management information systems*, 5(4), 73–86.
- Larman, C. (2003). *Agile and iterative development: A manager's guide*. Boston, MA: Addison-Wesley.
- Latour, B. (Ed.). (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.
- Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change, London, England*, (pp. 225–258).
- Latour, B. (1996). *Aramis or the love of technology*. Cambridge, MA: Harvard University Press.
- Law, A. & Charron, R. (2005). *Effects of agile practices on social factors*. St Louis, ACM: New York, 30(4) 1–5.
- Law, J. (1991). *A sociology of monsters: Essays on power, technology and domination*. London: Routledge.
- Law, J. (1992). Notes on the theory of the actor network: Ordering, strategy and heterogeneity. Retrieved 05/13, 2009, from <http://www.lancs.ac.uk/fass/sociology/papers/law-notes-on-ant.pdf>

- Law, J. (2001). *Networks, relations, cyborgs: On the social study of technology*. Retrieved May, 13, 2009, from <http://www.lancs.ac.uk/fass/sociology/papers/law-networks-relations-cyborgs.pdf>
- Layman, L., Williams, L. & Cunningham, L. (2006). Motivation and measurements in an agile case study. *Journal of Systems Architecture*, 52, 654–667.
- Layman, L., Williams, L., Damian, D. & Bures, H. (2006). Essential communication practices for extreme programming in a global software development team. *Information and software technology*, 48(9), 781–794.
- Lee, A. S. (1994). Electronic mail as a medium for rich communication: An empirical investigation using hermeneutic interpretation. *MIS Quarterly*, 18(2), 143–157.
- Lee, A. S. & Baskerville, R. L. (2003). Generalizing generalisability in information systems research. *Information systems research*, 14(3), 221–243.
- Lehtonen, T. (2008). The domestication of new technologies as a set of trials. *Journal of consumer culture*, 3, 362–385.
- Linde, A. & Linderoth, H. C. J. (2006). An actor network theory perspective on IT projects. In D. Hodgson & S. Cicmil (Eds.), *Management, work & organisations: Making projects critical* (pp. 155–170). New York: Palgrave Macmillan.
- Lindstrom, L. & Jeffries, R. (2004). Extreme programming and agile software development methodologies. *Information systems management*, 12(3), 41–52.
- Lindvall, M., Basisli, V. R., Boehm, B. W., Costa, P., Dangle, K., Shull, F., Teseriero, R., Williams, L. A. & Zelkowitz, M. V., (2002). *Empirical findings in agile methods*. Proceedings of Extreme Programming and Agile Methods XP/Agile Universe, 197–207.
- Line, M. B. (1999). Types of organisational culture. *Library management*, 20(2), 73–75.
- Longden-Thurgood, R. & Mackintosh, C. (2007). *How structured are agile practices?* BCom (Hons), University of Cape Town, pp. 1–73.
- Maanen, V. (1979). The fact of fiction in organisational ethnography. *Administrative science quarterly*, 24, 539–611.
- Mahanti, A. (2006). Challenges in enterprise adoption of agile methods: A survey. *Journal of computing and information technology: CIT*, 14(3), 197–206.

- Mahring, M., Holmstrom, J., Keil, M. & Montealegre, R. (2004). Trojan actor-network and swift translation: Bringing the actor-network theory to IT project escalation studies. *Information technology and people*, 17(2), 210–238.
- Mannaro, K. (2008). *Adopting agile methodologies in distributed software development*. PhD Information systems, University of Cagliari.
- Maurer, F. & Melnik, G. (2006). *Agile methods: Moving towards the mainstream of the software industry*. Shanghai: ICSE.
- Maurer, F. & Melnik, G. (2007). *Agile methods: Crossing the chasm*. 29th International conference on software engineering, 1–2.
- McAvoy, J. & Butler, T. (2007). The impact of the abilene paradox on double loop learning in an agile team. *Information and software technology*, 49, 552–563.
- Miller, L. & Sy, D. (2009). *Agile user experience SIG*. CHI 2009, Boston, MA, USA.
- Monteiro, E. & Hepso, V. (Eds.). (2000). *Infrastructure strategy formation: Seize the day at Statoil, in Ciborra*. C.U. Oxford: Oxford University Press.
- Mpazanje, F. T. H. (2009). *Towards understanding as-lived experiences in information systems projects: An actor-network theory perspective*. Unpublished masters information systems, University of Cape Town.
- Mutch, A. (2002). Actors and networks or agents and structures: Towards a realist view of information systems. *Organisation*, 9(3), 477–496.
- Myers, M. D. (1997). Qualitative research in information systems. *MIS Quarterly discovery*, 21(2), 241–242.
- Nerur, S., Mahapatra, R. & Mangalaraj, G. (2005). Challenges of migrating to agile methodologies. *Communications of the ACM*, 48(5), 73–78.
- Nijland. (2004). *Understanding the use of IT evaluation methods in organisations*. PhD Thesis, London school of economics and political science.
- Petersen, K. & Wohlin, C. A. (in press). Comparison of issues and advantages in agile and incremental development between state of the art and an industrial case. *Journal of systems and software*.
- Pitt-Francis, J., Bernabeu, M. O., Cooper, J., Garny, A., Momtahan, L., Osborne, J., *et al.* (2008). Chaste: Using agile programming techniques to develop computational

- biology software. *Philosophical transactions. Series A. Mathematical, physical, and engineering sciences*, 366(1878), 3111–3136.
- Poppendieck, M. & Poppendieck, T. (2003). *Lean software development: An agile toolkit*. Boston, MA: Addison-Wesley (Pearson Education).
- Pressman, R. S. (2005). *Software engineering: A practitioner's approach* (6th ed.), New York, McGraw-Hill.
- Prigogine, I. & Stengers, I. (1985). *Order out of chaos*. New York: Bantam Books.
- Qumer, A. & Henderson-Sellers, B. (2008a). An evaluation of the degree of agility in six agile methods and its applicability for method engineering. *Information and software technology*, 50(4), 280–295.
- Qumer, A. & Henderson-Sellers, B. (2008b). A framework to support the evaluation, adoption and improvement of agile methods in practice. *The journal of systems and software*, 81, 1899–1919.
- Riege, A. M. (2003). Validity and reliability tests in case study research: A literature review with "hands-on" applications for each research phase. *Qualitative market research: An international journal*, 6(2), 75–86.
- Rising, L. & Janoff, N. S. (2000). The Scrum software development process for small teams. *IEEE SOFTWARE*, 17(4), 2–8.
- Robey, D. (1996). Research commentary: Diversity in information systems research: Threat, promise, and responsibility. *Information systems research*, 7(4), 400–408.
- Rogers, E. (Ed.). (1983). *Diffusion of innovations* (3rd ed.). New York: Free Press.
- Ross, J. & Staw, B. M. (1993). Organisational escalation and exit: Lessons from the Shoreham nuclear power plant. *Academy of management journal*, 36, 701–732.
- Salo, O. & Abrahamsson, P. (2008). Agile methods in European embedded software development organisations: A survey on the actual use and usefulness of Extreme programming and Scrum. *The Institution of engineering and technology*, 2(1), 58–64.
- Schwabe, K. (1996). Controlled chaos: Living on the edge. *American programmer*, 9(5), 10–16.
- Schwabe, K. & Beedle, M. (2002). *Agile software development with Scrum* (series in agile software development) (14ed). Reading, MA: Addison Wesley.

- Serres, M. (2001). *Hominescence*. Paris: Pommier.
- Sharp, H. & Robinson, H. (2008). Collaboration and co-ordination in mature eXtreme programming teams. *International journal of human-computer studies*, 66(7), 506–518.
- Sharp, H., Robinson, H. & Petre, M. (2009). The role of physical artefacts in agile software development: Two complementary perspectives. *Interacting with computers*, 21, 108–116.
- Sidky, A. (2006). *The agile adoption process framework*. Virginia: Virginia Tech.
- Sidky, A. & Arthur, J. (2007). *A disciplined approach to adopting agile practices: The agile adoption framework*. Virginia: Virginia Tech.
- Smith, M. E. (2003). Changing the organisation's culture: Correctness of success and failure. *Leadership and organisational development journal*, 24(5), 249–261.
- Sone, S. P. (2008). *Mapping agile project management practices to project management challenges for software development*. Doctor of Business Administration, University of Washington DC, p. 191.
- Spagnuolo, C. (2008). *Agile adoption in the GIS industry*. Glencoe: Directions magazine: All things locations.
- Spann, D. (2008). Breaking the facade of truth: An introspective view into and a case study about the “Apparent truths” of agile No. 9. Cutter Consortium.
- Syed-Abdullah, S., Holcombe, M. & Gheorge, M. (2007). The impact of an agile methodology on the well being of development teams. *Empirical Software Engineering*, 11, 145–169.
- Tanner, M. C. (2006). *Culture and communication in global software development*, Cape Town: University of Cape Town.
- Mpazanje, F. (2009). *Towards understanding as-lived experiences in information systems projects: An actor-network theory perspective*. Unpublished masters dissertation, University of Cape Town.
- Tolfo, C. & Wazlawick, R. S. (2008). The influence of organisational culture on the adoption of extreme programming. *Journal of systems and software*, 81(11), 1955–1967.

- Vaagaasar, A. N. (2006). *From tool to actor: How a project came to orchestrate its own life and that of others*. Degree of Dr. Oecon, BI Norwegian school of management.
- Vijayasarathy, L. R. (2008). Agile software development: A survey of early adopters. *Journal of information technology management*, XIX(2), 1042–1319.
- Von Foerster, H. (1984). *Principles of self-organisation: In a socio-managerial context*. Berlin: Springer.
- Walsham, G. (1997). Actor-network theory and IS research: Current status and future prospects. *Information systems and qualitative research*, 6(8) 466–480.
- Walsham, G. & Sahay, S. (1999). GIS for district-level administration in India: Problems and opportunities. *MIS Quarterly*, 23(1), 39–66.
- Welman, C., Kruger, F. & Mitchell, B. (2007). *Research methodology* (3rd ed.). Cape Town: Oxford University Press South Africa.
- William-Jones, B. & Graham, J. E. (2003). Actor-network theory: A tool to support ethical analysis of commercial genetic testing. *New genetics and society*, 22(3), 271–296.
- Williams, L. (2003). The XP programmer: The few minutes programmer. *IEEE Software*, 20(3), 16–20.
- Williams, L. (2007). *A survey of agile development methodologies*. Retrieved May, 13, 2009, from <http://www.google.co.za/search?hl=en&q=A+Survey+of+Agile+Development+Methodologies&btnG=Google+Search&meta=&aq=f&oq=>
- Woodside, A. G. & Wilson, E. J. (2003). Case study research methods for theory building. *Journal of business and industrial marketing*, 18(6/7), 493–508.
- Yin, R. K. (Ed.). (2003). *Case study research: Design and methods* (3rd ed.). London: Sage.

Annexure

Annexure 1 – The Interview Guide

Section A: Demographics

1. Name of the organisation
2. Sector in which organisation operates
3. Short description of core business
4. Number of employees in the organisation
5. Department participant is employed under
6. Number of years in the organisation
7. Participant's designation
8. Number of years in the career
9. Have you had any training in project management?

Section B: Attitude of the organisation towards technology and vice versa

10. To what extent do you value IT? Does it deliver value to the organisation? (*For business*)
11. If not where are the problem areas?
12. In your view, do you satisfy the needs of the business? (*For IT*)
13. If not what are the problems?

Section B: Preparation for adoption

14. Can you take me through the process of preparation for the adoption of agile methods?
15. What agile methodology have you adopted?
16. Who do you think is behind the adoption of agile methods in this organisation?
17. How did you learn about agile methods? (*Who spoke to you first and what was his role*)?
18. What was your first response?
19. What aspects of agile methodologies attracted you?
20. Did you tell anyone about agile methods? (*Who and was his role*)
21. How did you convince him/her that agile methods are worth adopting?
22. What did you do to ensure that all stakeholders accepted the idea of agile methods and how?
23. Did you experience any resistance? (*what was the reasons for that*)
24. How did you deal with resistance?

25. What did you expect to get out of agile methods? (*Project costs, people, project overrun, value added, quality of software, business/IT relationship*)

Section B: The adoption process

26. What was the **name** and **size** of the project where you first implemented agile? (*Size in terms of cost, size of project team and duration*)

27. What was the objective of the project? (*checking influences of actor associations and interactions*)

28. Why did you select this particular project?

29. In implementing agile the methodology what aspects you did not follow? (*Why?*)

30. What aspects did you not follow? (*Why?*)

31. How long did it take the project to deliver its objectives?

32. In this project, what role(s) did you play?

33. What challenges did you experience during you first agile project? (*How did you handle them?*)

34. What techniques did you use to ensure that project team adheres to the agile methods being adopted? (*To check reinforcement of the network and mobilisation as well as networks of power*)

35. To what extent would you say the expectations from using agile methods were met? (*Project costs, people, project overrun, value added, quality of software, business/IT relationship*)

36. Would you say agile methods work better?

37. What advice would you give to organizations wishing to go agile?

Annexure 2 – Ethics Committee Application Form



UNIVERSITY OF CAPE TOWN

Commerce Faculty Ethics in Research Committee

Any individual in the Faculty of Commerce at the University of Cape Town undertaking any research that involves the use of human subjects, or research that may hold ethical consequences for the University of Cape Town, is required to complete this form. The completed form should be submitted to departmental Ethics Committee representatives for submission to the Commerce Faculty Ethics in Research Committee

1. PROJECT DETAILS	
Project title:	<i>Do South African Organisations Comply with Agile Principles as Embodied by Agile Methodologies?</i>
Principal Researcher/s:	Nimrod Noruwana
E-Mail Address:	Nimrod@webmail.co.za
Research Supervisor / Co-researchers:	Maureen Tanner
Brief description of the project: This research project looks at how organizations maneuver their existing culture to be able to benefit from agile methods. The objective of this study is to uncover empirical evidence on the disparities between the agile prescriptions and how organizations implement agile methods. The study will also unveil the steps organizations take towards the actual adoption of agile methods of systems development. The challenges that they face will surface and how they deal with them will also be uncovered. Interactions and changes in mind-sets will also be revealed.	
Research methods and procedure: (please tick and explain procedure) <input checked="" type="checkbox"/> Interviews <input type="checkbox"/> Survey questionnaire <input type="checkbox"/> Experiment <input type="checkbox"/> Secondary data <input type="checkbox"/> Observation <input type="checkbox"/> Other (please specify):	
2. PARTICIPANTS	

Characteristics of participants:

Gender: Male or Female
Race / Ethnicity: All Races
Age range: No specific age
Location: Cape Town
Other:

Affiliations of participants: (please tick)

Company employees Hospital employees General public Military staff Farm workers Students Other (specify)

If your sample includes children (aged 15 and below), mentally incompetent persons, or legally restricted groups please explain on a separate page why it is necessary to use these particular groups

3. ORGANISATIONAL PERMISSION

If your research is being conducted within a specific organisation, please state how organisational permission will be obtained:

As a consultant, I have a relationship with key people in a number of organizations. To be able to conduct my research in any of these organisations I will contact the people who I already work within those organizations and request permission to conduct research.

4. INFORMED CONSENT

What type of consent will be obtained from study participants?

- Oral consent
- **Written consent** ✓
- Anonymous survey questionnaire (covering letter required, no consent form needed)
- Other (specify): _____

How and where will consent/permission be recorded?

This consent will be in a form of a letter which I will keep with all my research documents.

If subjects are minors or mentally incompetent, describe on a separate page how and by whom permission will be granted?

5. CONFIDENTIALITY OF DATA

What precautions will be taken to safeguard identifiable records of individuals? Please describe specific procedures to be used to provide confidentiality of data by you and others, in both the short and long run. This question also applies if you are using secondary sources of data.

The organisation being studied will be assured that the data collected will be kept as confidential as possible. The data collected will not be used for anything else either than trying to getting to the results of the research. There will be no sharing of any kind of data or information with anyone who is not entitled to it. The handling of such data during processing will be done in the absence of any party that could get hold of it. When the research has been completed, the data will be stored in a safe place where it is not easily accessible.

6. RISK TO PARTICIPANTS

Does the proposed research pose any physical, psychological, social, legal, economic, or other risks to study participants you can foresee, both immediate and long range? (tick one)

Yes No

If yes, answer the following questions on a separate page:

1. Describe in detail the nature and extent of the risk and provide the rationale for the necessity of such risks
2. Outline any alternative approaches that were or will be considered and why alternatives may not be feasible in the study
3. Outline whether and why you feel that the value of information to be gained outweighs the risks

7. Intended dissemination of research findings

Have you discussed authorship issues with your co-researchers or supervisor? (tick one)

Yes No

If yes, what did you agree?

PLEASE ATTACH THE FOLLOWING DOCUMENTS TO YOUR APPLICATION

1. A full copy of the research proposal
2. Any consent form that will be signed by the participants or read to them (if any)
3. Any interview schedules, cover letters, forms, instruction sheets, survey questionnaires or other material that will be used in the study.

I certify that that the material contained herein is truthful and that all co-researchers and supervisors are aware of the contents thereof:

Applicant's signature: _____ Date: _____

For Ethics committee representative only

Recommendation:

Signature:

Date:

For Ethics committee CHAIRPERSON only

Recommendation:

Signature:

Date:

Annexure 3 – Interview Consent Form



UNIVERSITY OF CAPE TOWN

Department of Information Systems
Leslie Commerce Building
Upper Campus
or Private Bag, Rondebosch 77001
Cape Town
Tel: 650-2261
Fax No: (021) 650-2280

Interview participation consent form

One of the requirements for completing a Master's degree in Information Systems in the Information Systems Department (IS), Faculty of Commerce at the University of Cape Town (UCT) is the completion of a dissertation research project.

As a student pursuing the aforementioned degree, I am interested to study adoption of agile methods of systems development. I am, therefore, interested in conducting a study entitled:

“Do South African Organisations Comply with Agile Principles as Embodied by Agile Methodologies?”

The research objectives of this study are:

- Discover the process followed by organizations in adopting agile methods.
- To discover the disparities between what agile methods prescribe and how organizations implement these methods.
- Understand the challenges to agile adoption and how they are dealt with.

Research ethics is an issue of utmost importance to me, the IS department, the faculty of Commerce and the University of Cape Town. Consequently, I guarantee confidentiality and anonymity of the details and comments you will provide in this study. All comments and details will be treated in strict confidence and will be used strictly for the sole purpose of the aforementioned dissertation research project.

Your participation in this study is entirely voluntary. You may opt out of the study at any point in time without any consequences. If you opt to participate in this research project, please sign the consent form below.

PARTICIPANT CONSENT FORM

By signing this participant consent form, you are agreeing to participate in a research project entitled, *“Do South African Organisations Comply with Agile Principles as Embodied by Agile Methodologies?”*, conducted by Nimrod Noruwana as one of the requirement for the completion of a Masters degree in IS. The researcher guarantees confidentiality and anonymity of the details and comments you will provide in this study. All comments and details will be treated in strict confidence and will be used strictly for the sole purpose of the aforementioned dissertation research project.

Signature _____ Date _____

For any enquiries, please feel free to contact:

Nimrod Noruwana

E-Mail: nimrod@webmail.co.za

Cell: 084 601 5361

OR

Supervisors:

Ms Maureen Tanner

Department of Information Systems

University of Cape Town

E-Mail: M.Tanner@uct.ac.za

Phone: 021 650 4860

Prof Kevin Johnston

Department of Information Systems

University of Cape Town

E-Mail: Kevin.Johnston@uct.ac.za

Phone: 021 650 2266

Annexure 4 – AN INTRODUCTORY LETTER



UNIVERSITY OF CAPE TOWN

Department of Information Systems
Leslie Commerce Building
Upper Campus
or Private Bag, Rondebosch 7701
Tel: (021) 650-4670
Fax No: (021) 650-2280

Dear Sir/Madam,

Request to Conduct Research in your Organisation

I am a post graduate student at the University of Cape Town in the Department of Information Systems (IS). I am busy with a Masters Degree research project. This research project looks at how organizations maneuver their existing culture to be able to benefit from agile methods. The objective is to uncover empirical evidence on the disparities between agile prescriptions and how organisations implement these methods. The challenges that they face and how they deal with them will be revealed.

To be able to conduct this research, I need a setting where agile methods of systems development have been adopted. Participation in this study will remain anonymous and all information gathered in the interviews about the organisation and individuals will be treated as strictly confidential.

Should my request be accepted, please inform me or my supervisor about when the study can begin.

Yours sincerely,

Handwritten signature of Nimrod Noruwana in blue ink.

Nimrod Noruwana (Researcher)

Nimrod@webmail.co.za

Cell: 084 601 5361

Handwritten signature of Maureen Tanner in blue ink.

Maureen Tanner (Supervisor)

M.Tanner@uct.ac.za

021 650 4860

Annexure 5 – ABBREVIATIONS

Abbreviation	Description
ANT	Actor Network Theory
IT	Information Technology
IS	Information Systems
TAM	Technology Acceptance Model
OPP	Obligatory Passage Point
RAD	Rapid Application Development
XP	Extreme Programming
FDD	Feature Driven Development
CRM	Customer Relationship Management
BPM	Business Process Management
TQM	Total Quality Management
BI	Business Intelligence
CIO	Chief Information Officer
ROI	Return on Investment