Challenges and benefits of agile project management in a South African bank: A case study

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i. ABSTRACT

The main focus of this research study is based on the field of agile project engineering management; this includes the challenges and benefits of agile project engineering management at the First National Bank. Agile tool is becoming popular for small to medium projects; it is continuously and gradually being adopted as internal business units strive to please the customer needs and wants.

Most business units within the bank decided to adopt the agile methodology instead of previously used traditional waterfall methodology, which would enforce the business units to wait for the eighteen month project delivery cycle which may often result in delivering of the wrong product to the market. The idea of agile delivering in short cycles which is two weeks and quarterly project release is appealing. Business units want to get better at producing products and services to targeted customers faster.

Agile uses an approach that is value driven which enables the project management administrators and managers to produce high quality work, high priority and this results in the project managers look more effective and efficient to stakeholders.

ii)   STATEMENT

This research report in partial achievement of the prerequisite for the MING Engineering Management degree at the University of Johannesburg, I have the same opinion that consent for general copying of this report for academic purposes may be granted by the head of my department or by the representatives. It is understood that illegal use or publication of this report for financial gain shall not be allowed without my written permission

MZWANDILE SIBOTHO

Signed at _____on this the _____day of _____

iii) ACKNOWLEDGEMENTS

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Last but not least, many thanks to my fiancé Nosisa Tyilana for her support and understanding me and to my mother Nomzwandile Cynthia Sibotho

LIST OF ABBREVIATION

- SEBOK – System Engineering Body of Knowledge.
- IEEE – Institute of Electrical and Electronics Engineers.
- IIBA – International Institute of Business Analysis.
- CAQDAS – Computer Assisted Qualitative Data Analysis.

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DEFINITION OF TERMS	
Problem Statement	It is a straight-forward description stating the problems and issues to be resolved by the researcher.
Research Questions	A research question is basically the centre of the research study project and literature review. It mains focuses methodology and guides the phases of analysis.
Research Process	This process details the steps of the research project, paper and presentations.
Research design	The research design often refers to specific approach a researcher chooses to combine various elements of the research study in a sequential way to address the research problem.
Research Layout	The layout influences the way research data is presented and interpreted.
Agile Project Management Method	It refers to the incremental, iterative way of ensuring that the project design and develop engineering activities, IT and other business activities to enable new product development in a very flexible manner.
Waterfall Project Management Method	This is a logical flow model which is not iterative, it is used within the software development area whereby processes are shown flowing downward more like waterfall.
Systems Engineering	Refers to interdisciplinary ways to enable a successful software and system which meet the stakeholder and customer needs.
Project Management	Project Management is a short term venture to carry out and create unique services and products.
Scrum	It is a method of project managing a software development with information technology and engineering areas.
Sprint Cycle	The sprint cycle deals with repeatable and regular work cycle which may differ starting from two weeks

	to thirty days long.

CHAPTER 1: INTRODUCTION

1.1   BACKGROUND TO THE STUDY

The South African banking sector in the 21st century is faced with pressure to deliver more innovative products and services to existing and new customers. This research study discusses about the challenges and benefits of agile project engineering management in the implementation of software projects and techniques to respond quickly to customer needs and wants. Agile project engineering management technique provides and offers quickness, while it retains the project concepts, project deliverables and project engineering management. This allows businesses to keep the best existing practices in project management and produce the results while receiving benefits through agile way of conducting project (Besner and Hobbs, 2006).

To have the best and controlled processes that are flexible may produce the best solutions in the agile project engineering management area. The agile methodology technique becomes more effective when it is used by the project team with sound knowledge to model and attain the tight timelines of project delivery. This tool is flexible and recognizes the processes that project management officers are relatively confident to carry out their projects efficiently (Augustine, 2011)

According to Antlova and Klara (2014), had the same view and opinion that the introduction of agile tool for projects is driven by the customer technological savvy, this has resulted to most internal business units to come up with different ways to attract and please their customers. The bank decided to adopt agile methods and techniques for small to medium size projects while the legacy waterfall life cycle technique is used for large projects that caters and impacts all the business units within the bank (De Panfilis, 2005). Agile project management technique is frequently employed and is slowly becoming the best technique for the software system development and is showing some good benefits for project teams and clients (Ballard and Howell, 2003).

The above mentioned authors highlighted and argued that agile tool provides the best quality results and is the cheapest tool if the firm wants to implement projects in small portions. This technique caters for the client's needs and requirements which changes constantly. It works the best in the IT project environment and agile projects always add a lot of value to the customer as compared to the traditional waterfall project management tool.

Most business units are now using agile methodology for their projects to deliver customer needs on time and delivering on the quality software systems (Atkinson, 1999).

1.2   THE PURPOSE OF THE RESEARCH

1.2.1   Problem Statement

This research study seeks to address the challenges and benefits associated with the use of agile project engineering management within the First National Bank. This includes costs reduction, efficiency and effective project delivery.

The concept of agility as a newly introduced paradigm to enhance the competitiveness was researched from the early nineties. This concept is now being recognized as one of the winning strategies to survive and grow the business environments. The aim of introducing the agile is becoming a critical step and focal point for most researchers (Payne and Sencindiver, 2009).

The software and system engineering project constantly change. This is in the case whereby the business user which is a customer expected to conclude the business requirements and all of sudden unplanned delays often hijack the project. The agile project engineering management is designed to embrace change and accommodate the late business requirements before the development phase. Agile tool delivers the best features that are associated with the best business value and provide the real time information to ensure that time, cost and scoped are well managed (Turner, 2009).

1.3   OBJECTIVES OF THE RESEARCH STUDY

The main objective of this study was to define and determine the challenges and benefits of agile methodology to deliver project deliverables on time and produce reliable products and services.

1.4   RESEARCH QUESTIONS

The following questions were raised:

- **RQ 1**: What are the benefits and challenges of using agile project management?
- **RQ 2**: How does agile project tools and methodology contribute towards the project success?

1.5   RESEARCH PROCESS

The below structured approach illustrates the research process to be followed and is adapted from Cooper and Schindler (2008) and is illustrated in figure 1.
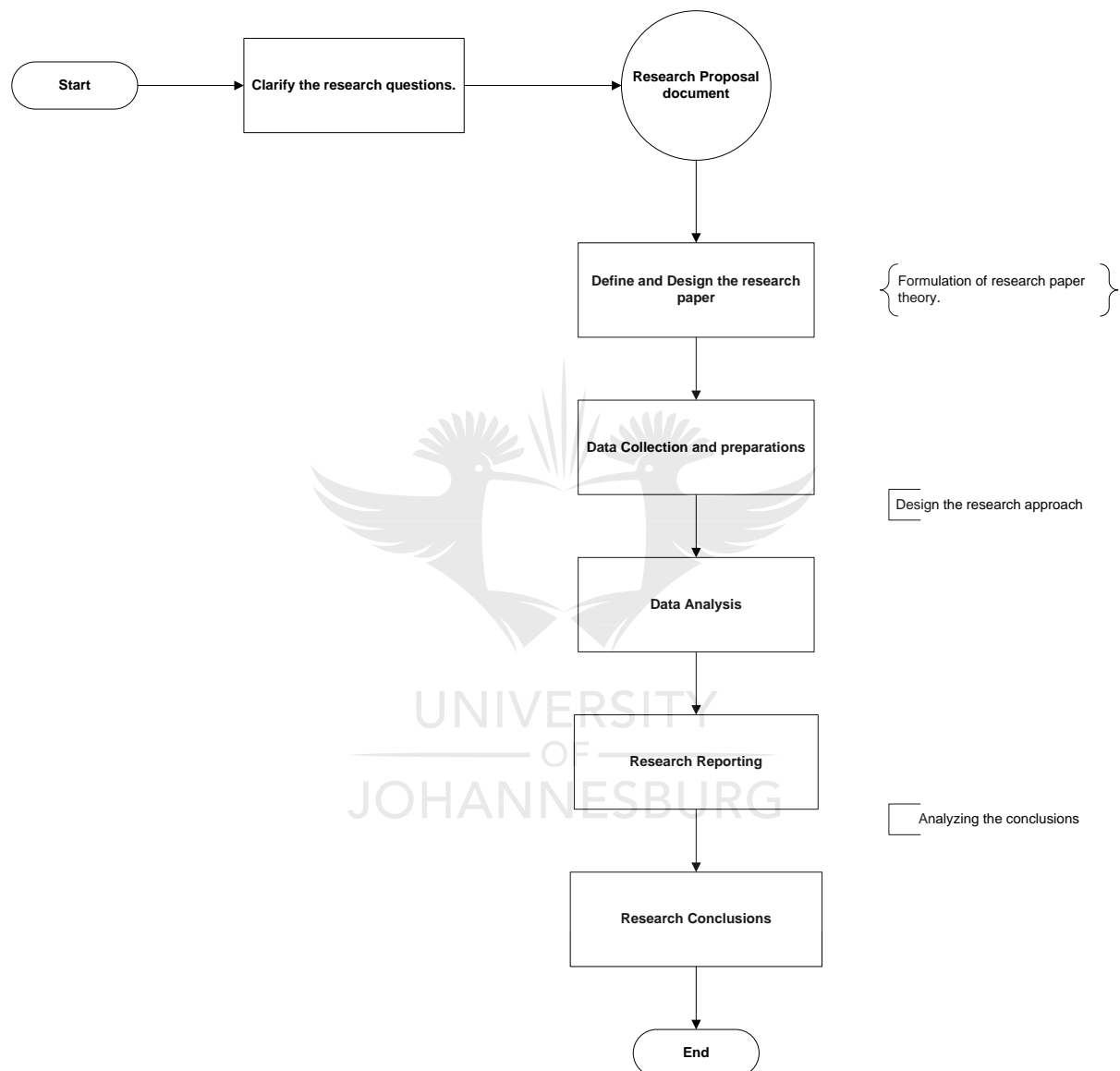
Figure 1: Research process (Adapted from Cooper and Schindler, 2008)

1.5.1   Research question clarification

The research question clarification was to identify the effective tool to deliver projects successfully on time at a less cost. The adoption of agile methodology enabled the project

teams to deliver more projects on time compared to traditional waterfall project management methodology.

1.5.2 Design of the research

In gathering the research requirements, it is important to lay out a research plan and address ways as to how the research questions will be answered. There various sources to be consulted to argue and determine the conclusion.

- To gain more understanding of what other researchers in the field had established and developed their argument.
- The potential methods of research were investigated to answer the research questions in the literature review.
- Recommendations were to address the benefits of effectively using the agile project management in an organization.

1.5.3 Collection of data and preparation

This explained the research methodology which was selected and the nature of data that was collected (Ceschi, 2005).

1.5.4 Analysis of collected data and interpretation

Applying the proof and evidence gathered and interpretation made. The research answers to the questions raised were assessed and study findings were documented. The research layout process stages were presented different chapters of this study. The following section gives more details around the research layout.

1.6 The layout of the research

In chapter 1, the background about the research study was explained and gave an overview as to what is the research about and research questions were raised (Westerveld, 2003).

Chapter 2 mainly focused on the literature review to find out what other authors had stated about the benefits and challenges of using agile project engineering management. The

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literature review scope covered the effective use of agile tools and methods (Ballard and Howell, 2003).

In Chapter 3, the research tools and methodology were assessed and case studies were used as a tool of the research methods to determine the answers to raised research questions. The research data was collected and analyzed accordingly (Schwaber and Beedle, 2002).

Chapter 4 discussed about the background of the projects which the researcher observed, participated and case studies evidence was also used to prove the validity of the research (Hardy-Vallee, 2013).

While Chapter 5 focused on the examination of both case studies to categorize their differences and similarities (Mieritz, 2012).

In Chapter 6, concluded this research study.

1.7   CONCLUSION

The conclusion addressed the critical aspects of the research and how it was going to be conducted. The key aspects of the research were discussed in more details on the chapters covered in this document. In the early 1970's, Dr Winston Royce submitted and presented a journal paper which was entitled "Managing the development of large software systems" which did not see value in using the traditional waterfall development. He pointed out that software were not supposed to be developed as automobiles within an assembly line whereby each piece of metal must be added in the chronological order and phases. In those phases, project phases must be dependent on one another before a next phase can begin. He recommended that the developers must first conduct the project requirements, design and complete the entire architecture and then write the codes and so on. He objected to the traditional project approach due to lack and failure of communication among the technical and specialized teams which should complete each phase of the project (Augustine, Payne, Sencindiver and Woodcock, 2005).

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CHAPTER 2 - LITERATURE REVIEW STUDY

This section focuses on the evaluation and analysis of all the relevant data and information that has been previously collected and published. The questions for the literature review study which will be attempted to be addressed are as follows:

- What is agile project management in systems engineering context?
- How is agile projects executed?
- How important is agile tools in project management environment?
- What are the key challenges faced in agile project management?
- What are the key benefits of using agile project management?

The below context data diagram is evaluated as a background. The covered scope of the literature study will mainly focus on the known benefits and challenges which contribute to the success of the agile projects during all the phases of the project from the concept to implementation of failure or successful project.

2.1   AGILE PROJECT MANAGEMENT OVERVIEW
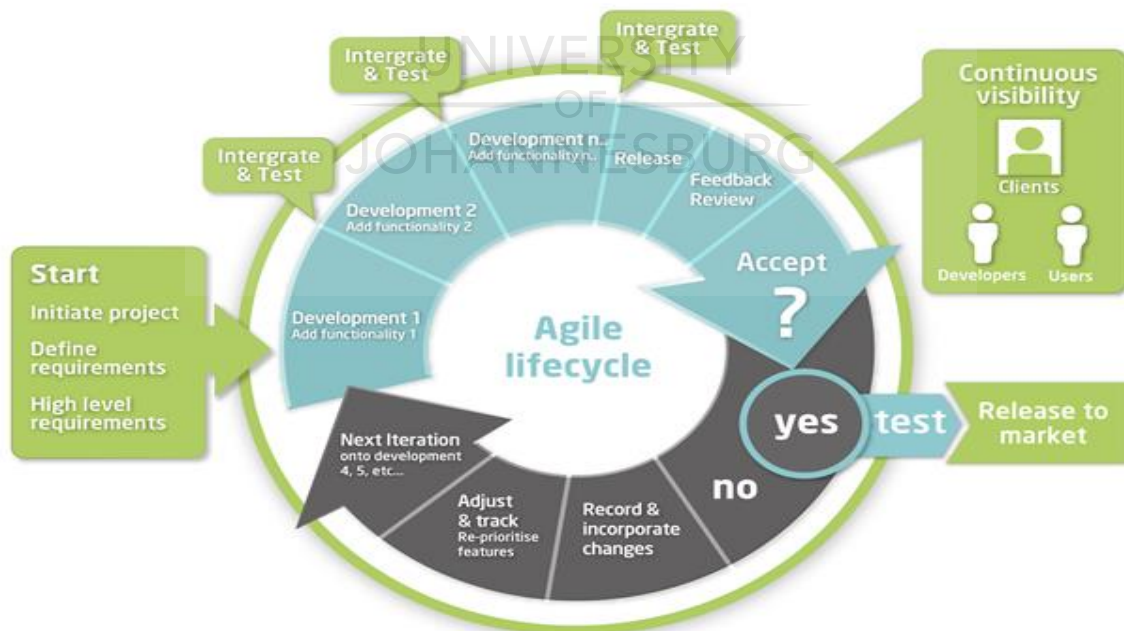
Figure 2: Agile project management overview (Glaiel, 2012)

2.2 BACKGROUND AND BRIEF HISTORY OF AGILE TOOLS OF PROJECT MANAGEMENT

2.2.1 What is agile?

The agile methodology is an alternative to waterfall tradition traditional project management which is mostly used in systems engineering and IT software development. This tool assists the agile teams to be more responsive to unpredictability via iterative work and incremental (Hardy-Vallee, 2013).

2.2.2 What is SCRUM?

Due to agility's flexibility and simplicity, the scrum is popular and many business organizations claims to be exercising the usage of scrum however those organization are not really closer to the actual definition of scrum. The emphasis of scrum is on the empirical feedback, striving to develop properly tested systems and software increments during the short iteration. This is done through self-managed and disciplined teams which aim to produce quality of products and meet and exceed the expectations of deliverables. Exercising scrum as written in the books normally comes with teams conflicts which might exist with certain habits which are established in non-agile business organizations (Nerur, 2005).

The scrum is divided into different roles such as Product Owner, Scrum master and the team which the responsibilities and roles of traditional project manager are shared within the different three scrum roles. There are five identified meeting which occurs in the scrum, these include: - 15 minutes standup meetings on a daily basis, Sprint planning, Sprint review meetings, backlog refinement and retrospective meetings (Drury-Grogan and Meghann, 2014).

2.2.3 History of agile methodology

Dr Winston Royce submitted and presented a journal paper in the early 1970's, which was entitled "Managing the development of large software systems" which did not see value in using the traditional waterfall development (Mangalara, 2005). He pointed out that software are not supposed to be developed as automobiles within an assembly line whereby each piece of metal must be added in the chronological order and phases. In those phases,

project phases must be dependent on one another before a next phase can begin. He recommended that the developers must first conduct the project requirements, design and complete the entire architecture and then write the codes and so on. He objected to the traditional project approach due to lack and failure of communication among the technical and specialized teams which should complete each phase of the project (Augustine, Payne, Sencindiver and Woodcock, 2005).

He believed that the waterfall methodology is a bit far from optimized when it is being compared to the agile methodology. Dr. W Royce stated that traditional sequential methodology assumes that each and every requirement within the project may be identified before design and coding occurs. He highlighted that it is easy to describe the vision and idea to the team of developers which could react to functional requirement software. He pointed out that realities of the businesses have since changed so dramatically which a product gets irrelevant quickly if waterfall is adopted. In this case, the business organization would have spent time and money to build software which is no longer applicable and needed (Augustine, Payne, Sencindiver and Woodcock, 2005).

2.2.4   Why is agile methodology tool so important in project management?

The agile methodology tool offers many opportunities to evaluate the growth and direction of the project in all the project and system development lifecycles. This is mainly made possible by means of short iterations and teams are mostly expected to present the potential product increment. Through putting more focus on repetition of work cycles which results to functional product (Meghann and Drury-Grogan, 2012).

The agile project management technique offers and provides agility while retains the project concept, project deliverables and project management. It makes the business organization to obtain the benefits associated with agile approach without having to introduce avoidable risks. This encourages the organizations to retain the good existing practices in project management and deliver the results while getting benefits through agile way of conducting project (Meghann and Drury-Grogan, 2012).

Having good and controlled processes which are flexible may deliver best solutions in agile project management space. This technique is more effective when it is used by people with good knowledge to model and achieve the tight timelines delivery. It is so flexible and at the

same time recognizes the processes which project managers are confident to conduct their projects efficiently (Meghann and Drury-Grogan, 2012).

2.2.5 Motivation for agile methodology in project management

The development of the agile methodologies gives many opportunities to evaluate the project's direction throughout the lifecycle of the development. This is made possible by means of regular iterative and incremental. In traditional waterfall development, the teams normally have one chance to get each and every aspect of the project right. In the paradigm of agile, each and every aspect of software development, requirements, designs, coding, development, testing and implementations, all the aspects are continuously rechecked throughout the project lifecycle. In the case whereby the team stops and re-assesses the project direction every second week, this provides another opportunity to steer the project to the right direction (Drury-Grogan and O'Dwyer, 2013).

The results which come with this approach emerge into reduction of development costs and time to market. This means that team may develop a system or software at the same time while requirements are still being gathered. This phenomenon is best known as 'analysis paralysis' which is normally less likely to delay a team from ensuring that they are making progress. Simply because the cycles of team work is limited to two weeks, it provides stakeholders opportunities which are recurring to attune project releases for success. The agile methodology assists business organizations to build and create the right product. This tool empowers teams to continuously make alternative plans for their releases to optimize their values throughout all the phases of development; this allows teams to be more effective and efficient to deliver competitive software products in the marketplace. The development applying the agile tools and methodologies preserve a critical product market relevance and makes sure that teams work do not stay on the shelf and never be released (Drury-Grogan and O'Dwyer, 2013).

The abovementioned authors came to the common point of understanding and explained that the cycles of the team work are limited to two weeks; this allows stakeholders opportunities that are recurring to attune the successful project releases. Thereafter the project team can monitor the changes for three days to endure that the delivered system or software product is working perfectly and then hand it over to the product owner to manage the operational activities.

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2.3 ADOPTION OF THE AGILE PROJECT MANAGEMENT METHODOLOGY WITHIN FIRST NATIONAL BANK

Businesses are increasingly putting customer's wants and needs first and try to satisfy those needs through developing products and service catered for such needs. The introduction of agile project management tool attracted a lot of interest in the field of system engineering and IT industry. This result to a lot of businesses to employ the agile methodology for projects as the consumer needs and expectation increased. The customers today need to see more creative products and services at a cheaper prices but better quality that products seen in the past. This put pressure on the business organization to improve their business tools capabilities to me more efficient and become productive (Englund and Graham, 2009).

The authors stated that agile core delivery principles differ at some point in their practices, but they advocate to the core agile principle which is incremental deliverable, interactive, continuous improvement and collaborations. Below are the reasons to adopt the agile methodology.

2.3.1 **Incremental delivery and interactive** - the projects are divided into small functional releases to ensure that risks are managed well and also provide feedback to customers and to end users. The mentioned small releases are often delivered on scheduled using the iterations which normally lasts for about one to four weeks. This takes in the form of Plans, requirements documentation, product design, coding, testing is done initially and also updated incrementally as required to adopt to project changes (Woodcock, 2009).

2.3.2 **Collaboration**- all the impacted team members are often co-located in an open shared area to facilitate the face to face type of communication and to interact. This space is provided and is used for regular meetings; product designs sessions and other informal group task activities. This drives the team's self-organize through the continuously finishing tasks jointly without top down management control (Woodcock, 2009).

2.3.3 **Continuous improvement**- the activities that results into delivery processes inspection and ensuring that adaptation is integrated into the methods of agile. The reflections of the project are often done in a form of a meeting while the project is still underway to ease the regular reflections on its failures and successes to ensure that there is an exchange of valuable information and to make proper improvements (Woodcock, 2009).

2.4   SOFTWARE SYSTEM DEVELOPMENT IN AGILE ENVIRONMENT

The use of agile tools within the financial and banking sector is driven by customer technological savvy and firms are forced to introduce various ways to develop and produce products and services which will attract and please the targeted customers' base. These initiatives result in new techniques and tools being introduced to the market while the legacy waterfall life cycle techniques are effectively and still being used for very large complex projects. An Agile tools for project management are frequently used and gradually becoming the best techniques for the development of engineering and IT systems and software (Hass and Kathleen, 2012).

This tool provides the best quality results and is the cheapest tool if the firm wants to implement projects in small portions. This technique caters for the client's needs and requirements which changes constantly. It works the best in the IT project environment and system engineering space. Below is the agile system engineering diagram to illustrate value within the use of agile in the system engineering space (Boehm and Turner, 2005).
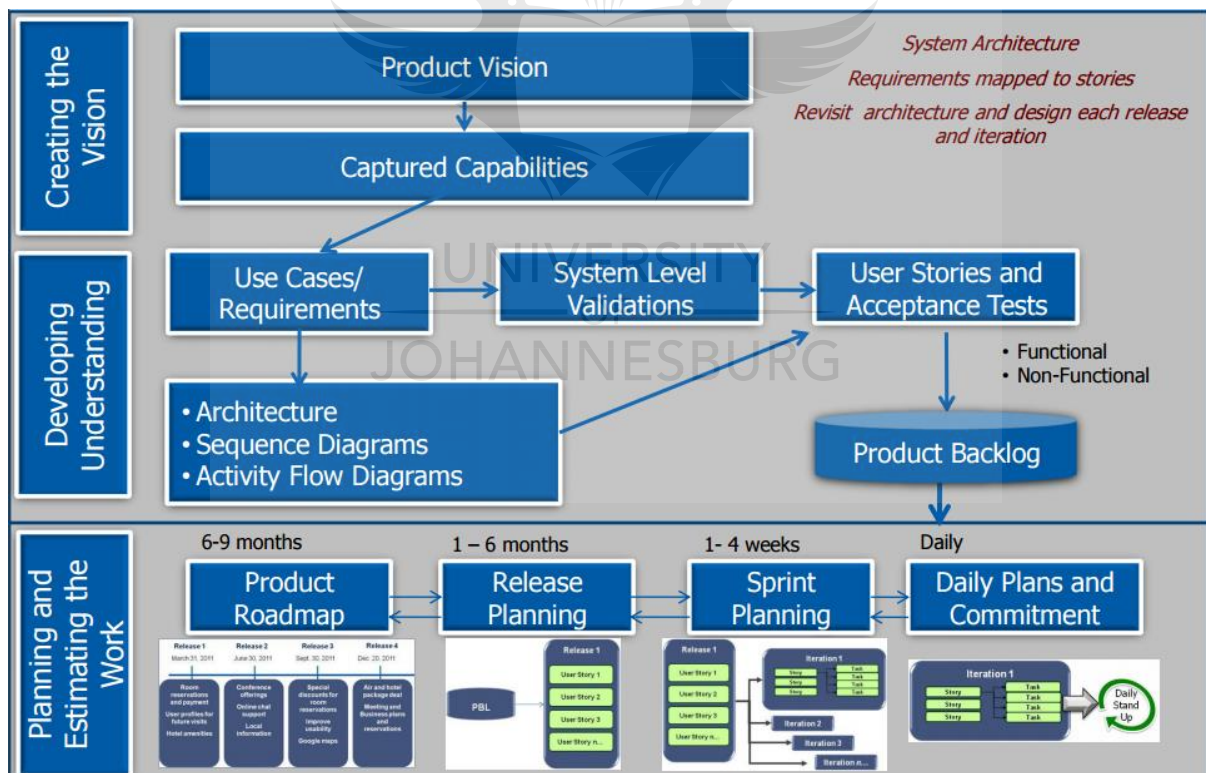
Figure 3: Agile system engineering (Boehm, 2005)

2.5   THE BENEFITS OF USING AGILE PROJECT MANAGEMENT METHODOLOGY.

The agile methodology benefits for carrying out any system software engineering projects. There are a couple of agile system engineering software development ways however the one that is mostly used in agile is Scrum and Extreme Programming. Agile tools always try to minimize the risks and maximize productivity through the development of system software in short iterations and also de-emphasize work on the short term artefacts. Below are some of the benefits for agile project management (Augustine, 2011).

- Deliver regularly
- More iterations
- Minimum defects
- Conduct testing regularly
- Collaborative approach to projects
- Maximum Return on Investments

Agile project management is very effective and efficient in project environments where regular changes in the business requirement occur more often due to different business reasons. Hence it has regular iterations; it continuously involves the client participation and testing attempts that assures a proposed solution for the business requirements. Some people believe that there is less business requirement documentation in agile however agile also have documentation which may be used in small or large projects. In the agile project management environment, Development and testing are integrated throughout the project lice cycle (Augustine, 2011).

One of the challenges and problems for the product testing team within the project may be that they might not have the business case. This will force the test team to the detail requirements from the business users or from the developers. The test team will end up doing quality assurance work that their testing works. There are a lot of different methodologies of agile and are sharing more of the similar philosophy, characteristics and practices. In the implementation phase, each team applies its own set of practices, tactics and terminology. Below are the two main agile methods which are mostly used (Boehm and Turner, 2005).

- **Scrum**- which is the lightweight framework management with broad applicability to manage and control iterations and projects incremental of all possible types. This tool is slowly and increasingly becoming more popular in banks for IT software community

because it is so simple and its increased productivity is proven. This tool focuses more on how to ensure that tasks in the team are managed in the development environment.

- **Extreme programming** is leaning towards radical agile methodology and is more focused on software development process and addresses the analysis, development and testing phases through deploying the novel approach that is aimed at ensuring substantial difference to the quality of the end product (Boehm and Turner, 2005).

Within the agile software system development project environment, the project management is conducted in a slightly different way from just relying more on project managers set of skills which include facilitation, communication and putting less emphasis on planning and controlling. The environment for agile project management and development may be very invigorating approach and exciting even though some projects may suite agile more than others do. The visibility and collaboration may produce a much richer and very rewarding experience for the involved teams to design and develop great software products. This development for agile may be a lot more pleasing compared to waterfall approach which needs a lot of documentation and is not flexible (Boehm and Turner, 2005).

2.6 THE CHALLENGES OF USING AGILE PROJECT MANAGEMENT WITHIN BANKING INDUSTRY IN SOUTH AFRICA

There are three major challenges which are identified for agile project management in the large organizations; these include the development process conflicts, business process conflicts and human resource conflicts.

2.6.1 Development process conflicts

The conflicts within the development process phase are the difficult area. The best way to deal with this sort of conflict would be to manage the variability in the sub-systems and the technical teams which are developing the system software for the particular product. The technical team may develop radically various artefacts which may not integrate easily. The agile processes are often focuses on the immediately producing and delivering functionality in the same time the traditional tools and methods pay more attention on optimizing development throughout the period. The business legacy systems are difficult to re-factor to allow the agile replacements which will need to establish capability in increments. The requirements of agile tend to be more functional and reasonably informal; this might not work well with the system engineering validations and verifications approach (Payne and Sencindiver, 2009).

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2.6.2 Business process conflicts

In the business process conflicts, the business will need almost perfect infrastructure predictions of complicated to estimate activities and tasks other than to encourage the experimentation and the development with knowledge for short term results. The business organizations should learn to allow the human resources challenges like team orientation against individual rewards, role description and time- keeping and needed set of skills. In agile team development, the team needs the right skills and experience to perform their duties and produce results. The author stated that the milestones, traditional contracts and measurement techniques progress may be not enough to support processes of agile in a rapid pace. This method of agile is not supporting the use of documentation and its infrastructure needed (Payne and Sencindiver, 2009).

2.6.3 Human resource conflicts

The human resources conflicts issues are the most important in the management improvement and personal development. Addressing such issues is very critical to the adoption and combining of agile tools and methods and practices into the business organizations processes. The big management processes normally tend to transmit employees as exchangeable parts. In most organizations, employees are associated with particular roles which not part of the multitasking qualities of agile team members. The agile methods require status charts on the walls, assignments and pair programming stations. This type of environment encourages team members to easily share information. There may be issues to deal with employees that refuse to adapt to new methods and agile requires customer's onsite, customer input to conduct accept testing, customer iterations and feedback (Payne and Sencindiver, 2009).

The authors explained that top management processes usually transmit as exchangeable parts, this found in most organizations which employees are associated with particular roles that not part of the multitasking qualities of the agile team members. The methods of agile management need status charts on the walls, assignments and pair programming stations. This kind of environment encourages team members to easily share information.

2.7 THE SPRINT CYCLE FOR PROJECT MANAGEMENT

2.7.1 The length of the agile scrum sprint cycle

In the initiation phase of the project whereby a team uses the scrum approach, the question at the back of the team's mind is that "in terms of the duration, how long will the scrum sprint be?" When the team fully understand the meaning of the sprint and the way it should work. There will be couple of discussions related to execute the task at hand. This research study explains the importance of scrum and why the industry made two weeks as a set standard time when the next time-box can be suitable fine to a certain conditions (Brown, 2009). The below illustrates the scrum sprint cycle for project management within the agile space.
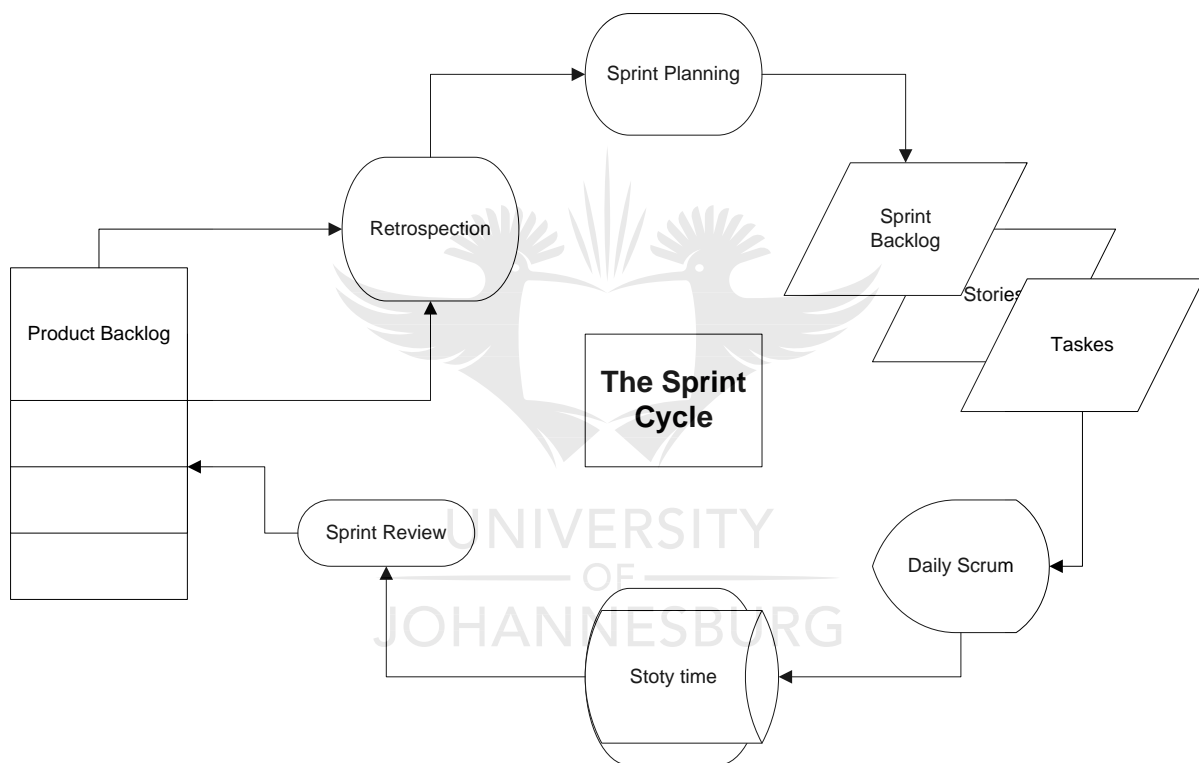
Figure 4: The sprint cycle (Drury-Grogan M.L and O'Dwyer O, 2013).

2.7.2 The considerations of the scrum duration

Many teams are newly introduced to struggle of scrum's question duration and certain expectations which may be achieved through the sprint of the scrum. May questions will be in lines such as how will it be possible for the team to complete a huge task at a short period of time and how will it be determined if the team has chosen the right length of time? Within the development of the scrum, it is the usual thing for the team who are just exposed to scrum to pick a time-box which has a longer end of some sort of scale. This is because it

appears that they might not know how the team could design, develop and perform testing in a very short period of time and able to produce a quality of system or any kind of a product. The fear the team will always have is that, if they get more time, then it becomes possible to obtain what they commit in (Lindstrom and Jeffries, 2004).

2.7.3 Measuring of the checkpoint

The sprints are not changeable in the scrum and time-boxes which assist the team with the measuring of checkpoint for collecting data which is related to the team's progress and making necessary changes to the scope, forecasting, staff and project timelines. With this in mind, the more routine checkpoint done, the better metrics are collected and the easier and more faster the cycle time made by the team to focus on inspecting and making adjustments which may lead to more effective and efficient scrum process more faster. This is done through estimating and understanding how the launch plan should be updated? This leads to management asking how they can assist to obtain faster and better velocity. So all the stakeholders within the project are included and assisting each other for the success of the project goals (Alleman, 2002).

2.7.4 The review of the sprint review

The review of the sprint meeting results into an opportunity which team members get feedback from peers, product owners and other stakeholders. The more session of the sprint review happens, is the better feedback provided to the team members involved in a project. This results in an incremental improvement of the product. If the reviews happens in a shorter cycles, the will be more improvement to produce a good product compared to longer end cycle times. Good feedback prepares and results in production release (Lindstrom and Jeffries, 2004).

2.7.5 The retrospective

This section is the key aspect of the scrum cycle, the more a group of individual consider the streamlines in the process, and this will help the team identify issues which needs to be addressed to reach velocity (Lindstrom and Jeffries, 2004).

2.7.6 The planning of the sprint

The false truth is that to push longer durations provides a breathing room. Maybe this might be true but it might cost the team's velocity. This statement suggests that the shorter the duration of the sprint, the better the team produces good results. This is achieved by means

of conducting better research and provides the reliable solutions (Nerur, Mahapatra and Mangalara, 2005).

2.7.7 The commitment

The commitment of the entire team members towards achieving the project goals only puts unity within the team. The project timelines are met and project deliverable are achieved on time (Nerur, Mahapatra and Mangalara, 2005).

2.7.8 The reality and human nature

The reality is that the teams should allocate time for testing and the sprint review sessions. Another factor is that team needs to adjust what it can do in the process of the iteration time and ensure that expectations are set in a proper manner among themselves than other possible options that may lengthen iteration. This will enable the team to finalize the stories they set commitment to. The best solution is to decrease the amount of commitment in and ensure that stories are then broken down into smaller tasks, identify more opportunity, ensure that the team deliver functionality a bit earlier within iteration and time should be allocated for testing and preparations of the sprint review from the beginning (Nerur, Mahapatra and Mangalara, 2005).

2.7.9 Procrastination

Human beings in general like to postpone and delay time at work that they fully understand that they need to perform. Most people within the team will procrastinate to commence with the given task however when they are looking at the time, they would feel like, that they have more time to complete and execute the task. In the scrum team, the long team durations sprint does not feel like sprints, if the duration gets to six weeks or more.

2.7.10 Team challenges visibility

The developers should be smart translators which may be able to solve puzzle. The developers become busy through the challenges which are identified and are often try to solve the challenges. Within a short sprint cycle duration, the challenges are identified and made visible to the scrum master (Augustine, Payne, Sencindiver and Woodcock, 2005).

The abovementioned authors did not mention that politics within the team sometimes may tend to delay the project deliverables and push out the target project release.

2.7.11 Story creation

The possible and better approach is trying to establish the check-point with the peer reviews that may assist to validate that a story is ready to be promoted into the development. This verification phase may be considered as the checkpoint measurement for the story creation's rate that can result into providing one or more than data point for management and the scrum team to get to understand its productivity and velocity (Alleman, 2002).

2.7.12 Scrum metrics to consider

In the case of the velocity capital over a period of seven week period, the team may produce the same results whether they get under pressure within the one week or the two week sprints (Alleman, 2002).

2.8 THE FRAMEWORK OF A TEAM ROLES WITHIN AN AGILE PROJECT MANAGEMENT AT FIRST NATIONAL BANK

This scrum framework explains the agile team roles within an agile project managed development. The product owner, development team and scrum master are called scrum team that works on the project every-day. When the teams expand, it will consist of the stakeholders and agile mentors. This team then becomes a project team which is focusing on project development as shown on the figure below (Woodcock, 2005). The project structure is shown on the below diagram.
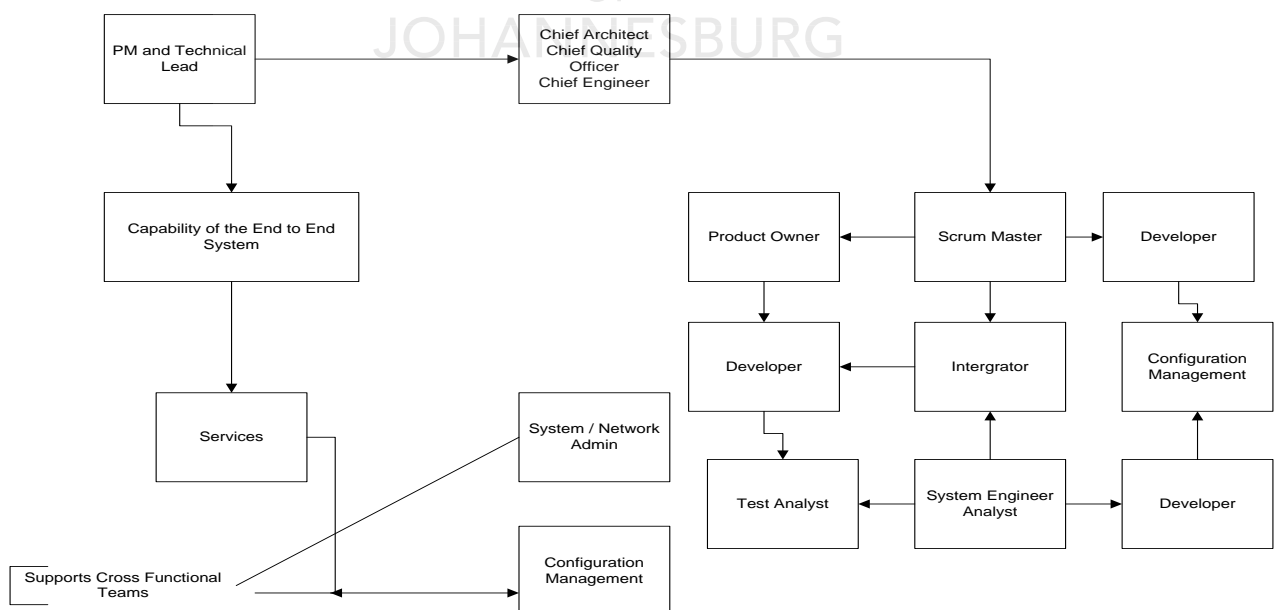
Figure 5: Agile project team structure (Layton, 2006)

2.8.1 Below is the definition of the agile team member's roles within the project management:

2.8.1.1 Project development team:

This is the team that create and develop the software or the product. It consists of Business Analysts, Product Owner, Programmers, Testers, designers, writers and all other stakeholders that have hands on role in the development of the software or the product.

2.8.1.2 The product owner:

This is the person who managed to identify the gaps between customer needs, business and technology and now is responsible for bridging those gaps. This person is normally an expert on the product and the needs of the customer. The product owners usually assist to clarify the project requirements. Product owners are the decision makers with regards to what the product can and cannot include. In most cases, the product owner makes decision as to when to release the product to the customers and when this can be done. For this role, the person occupying this role must be a technological savvy and a smart person (Mangalara, 2005).

2.8.1.3 The Scrum master:

This member of the team is normally regarded as the coach of the team, s/he supports the development team, and keeping project processes strictly to agile principles, and lastly clears the business organizational show stoppers. A scrum master is not a project manager, the organization which uses traditional project waterfall approach normally have a project manager. A scrum muster is referred to as the servant leader that ensures that s/he supports the team in order to function well and be more productive. This role makes things happen than accountability role (Drury-Grogan, 2012).

2.8.1.4 The stakeholders:

So the stakeholders of the project within the business are normally individuals with interest within the project. They are not responsible for the development of the product but plays a vital role in terms of providing valuable input. The stakeholders are affected by the project's outcome and stakeholders are diverse as they can be people coming from the government, other companies or from different business units within the business. Below are the examples of the stakeholders.

- The end user customer

- Technical savvy people such as system administrators and infrastructure architects.

- For legal requirements, legal departments, account & finance managers, marketing & sales people and contact centre agents.

- The Subject Matter Experts other than the product owner.

These kinds of people in the business may provide help and assistance in key insights regarding the product its-self and its use. In most cases, the stakeholders work closely with the business analyst, product owner during the process of the sprint and provide valuable feedback about the product development during the sprint session review at the end of each sprint (Drury-Grogan, 2012).

2.8.1.5 Agile mentor:

The agile mentor is a person with lots of critical experience in implementing and executing agile projects. The mentor may share the valuable experience with the agile project team members. This person is the best guy for any area of the project to assist to develop new skill sets and expertise. S/he can provide the vital feedback and provide advises to new project teams that are willing to perform at the best level. Agile mentor is normally an agile expert with lots of field experience in the implementation of agile techniques. They are usually not part of the scrum project team; s/he is a person from the outside of the business but can assist with the provision of the objectives guidance with no political and personal considerations (Lindstrom and Jeffries, 2004).

2.9 UNDERSTANDING THE AGILE METHODOLOGY USING THE CYNEFIN FRAMEWORK

Getting to fully understand the agile using cynefin framework tool is very important to categorize problems into different dimensions. The dimensions are illustrated on the diagram which simplifies an optimal plan that needs to be created. The reason agile tool was introduced is because it was created to serve to resolve the chaotic domain. This then provides the value within the plan in the domain that is chaotic and depends on uncontrollable and unknown time variable. The cynefin framework diagram below shows the four dimension of agile tool using the cynefin framework.

C = Cause and E = Effect
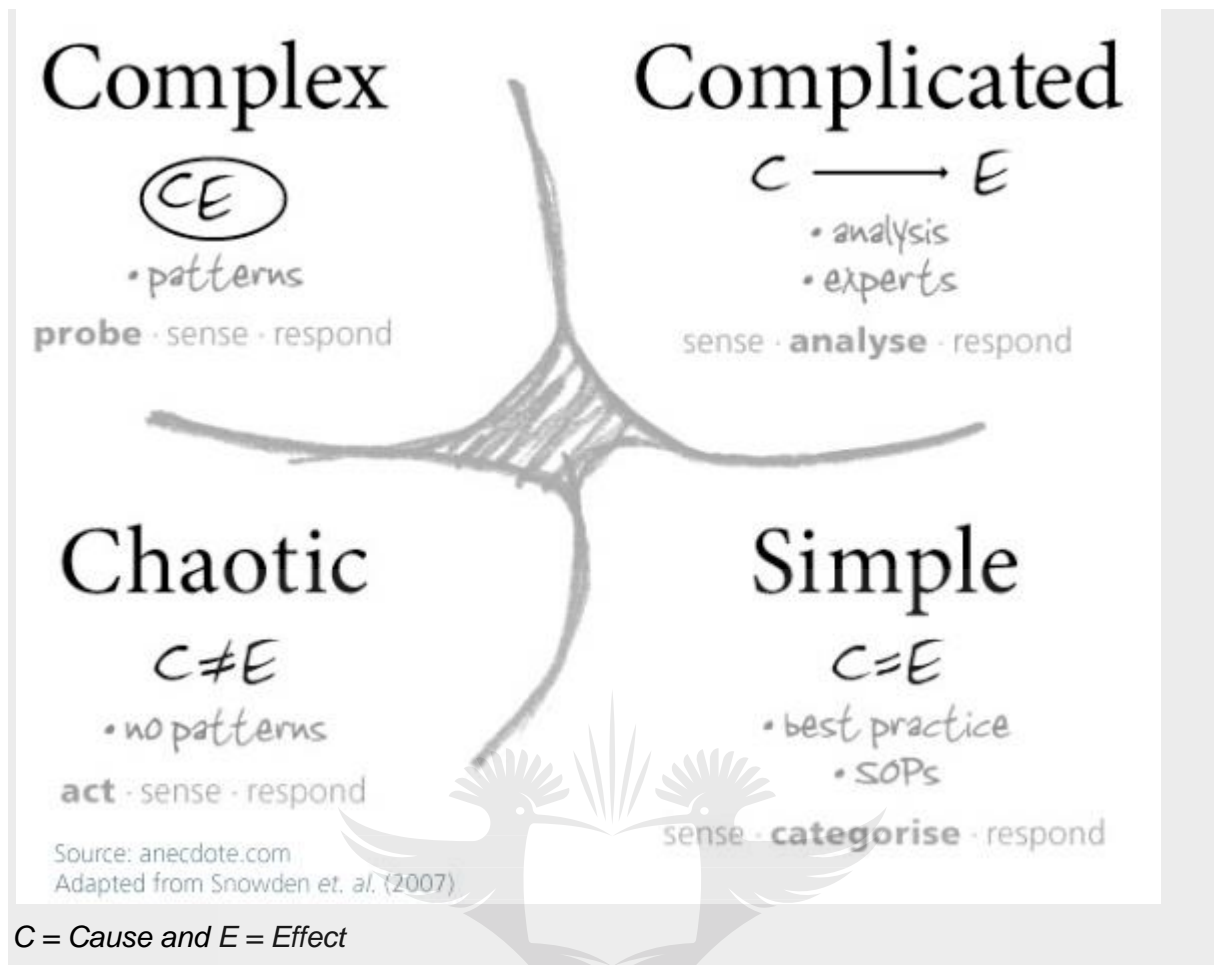
Figure 6: Cynefin Framework; adapted from snowden et.al. (2007)

In the 21st century within the very fast paced business, the chaotic domain may require society at large. The cynefin may validate the business case to start of any kind of the project. The complicated and complex domains are at some point simple gradients of the domains once mentioned in the past however this is dependent on the capacity. The use of the Cynefin assist with the decisions which recognizes the informal differences that may exist within different types of systems, it then tries to propose new approaches towards the decision making in social complex environment. This tool is a sense making model categorizes data. There are five types of software systems within Cynefin namely; Simple, Complicated, Chaotic and Complex.

2.9.1 The simple domain

Within the simple domain is where a relationship between the cause and effects is predictable in advance, below the best practices is applied:

- Sense- visualize what is on the way
- Analyze – Use expert understanding and knowledge
- Respond- being able to make decisions as to what to do next.

2.9.2   The complicated domain

On the complicated domain, the ordered system and there is a healthy relationship within the team to execute the tasks. Appropriate examples are listed below:

- Sense- visualize what is on the way
- Analyze – Use expert understanding and knowledge
- Respond- being able to make decisions as to what to do next.

2.9.3   Complex domain

Relationship among cause and effect are perceived in a retrospect manner and results are often unpredictable. Below are the examples:

- Probe   - run experiment regarding the input
- Sense   - successes or maybe failure
- Respond - being able to make decisions as to what to do next.

2.9.4   Chaotic domain

Positions may be stabilized very quickly , please see below.
- Act – always try to stabilize
- Sense   - successes or maybe failure
- Respond - being able to make decisions as to what to do next.

2.9.5   Domain of disorder

Lastly, this domain involves the state of understanding the kind of causality which exist. The challenge is that the outcome is interpreted and assessed based on personal preference (Cognizant, www.cognizant.com; accessed, 15 June 2016).

2.10   CAPABILITY MATURITY MODEL INTERGRATION (CMMI) WITHIN FINANCIAL AND BANIKING SECTOR.

2.10.1 Objectives of using the capability maturity model integration within the banking and financial sector.

The big banks in South Africa came to terms and agreed that using capability maturity model makes lots of improvements within the software system development and obtains the recognition of the international standards however this tool is a bit expensive for small business with limited budget. According Barry Dwolatzky, a director of Johannesburg Centre for Software Engineering (JCSE) argued that CMMI tool is not expensive however within the local market, management is ignorant and has a perception that only big banks and companies that can afford this tool.

(Dwolatzky, 2006) continued to spearhead a CMMI project pilot to expose a variety range of South African businesses to contribute and benefit from the programme and strive to make it more affordable for small businesses. "Through bringing CMMI training facilities and assessments to South African businesses, JCSE managed to enable the local businesses to reap the benefits associated with the use of CMMI tool without the local businesses to send the staff overseas for training or getting people from overseas to train local people within the financial and banking sector. The JCSE embarked to facilitate the CMMI pilot programme which begun in November 2009, this programme forms part of the broader international project research which is conducted through SEI to zoom in to CMMI initiative to engage with small businesses on this programme. This pilot was targeted at securing the South African government support for usage and adoption of CMMI tool to assist the local businesses to attract the international market." In the recent workshops held by Dutch government at Rotterndam, it was identified that there was a lack of recognition within the international quality standard and was pointed out that the South African companies' IT software development were weak compared to other IT firms around the world. Nedbank was identified as one of the major sponsor of the CMMI pilot programme in the country. The Nedbank's chief information officer (CIO) Len de Villiers stated that CMMI may play a very important role in ensuring that there are developments of software, hardware, process management skill set and system engineering. This tool will enable and assist South African businesses to position itself as a possible technology outsource country. (*Warwick Ashford, ITWeb London correspondent Johannesburg*, 11 December 2006. http://www.itweb.co.za/; accessed 30 June 2016).

According to engineering news site (http://www.engineeringnews.co.za/; accessed 30 June 2016) stated that the JCSE and University of Witwatersrand launched an engineering project research which focused on the software to determine the position of software engineering in South Africa. This research was conducted to find out about what practices are employed in the usage of software engineering in South Africa.

The approach used to determine the effectiveness of CMMI was done through focus groups; this assisted the institution to have a direct contact with the members of different communities of software engineering.

2.10.2 Characteristics of capability maturity model integration

Below diagram shows a high level of CMMI characteristics (Jeffries, 2004).
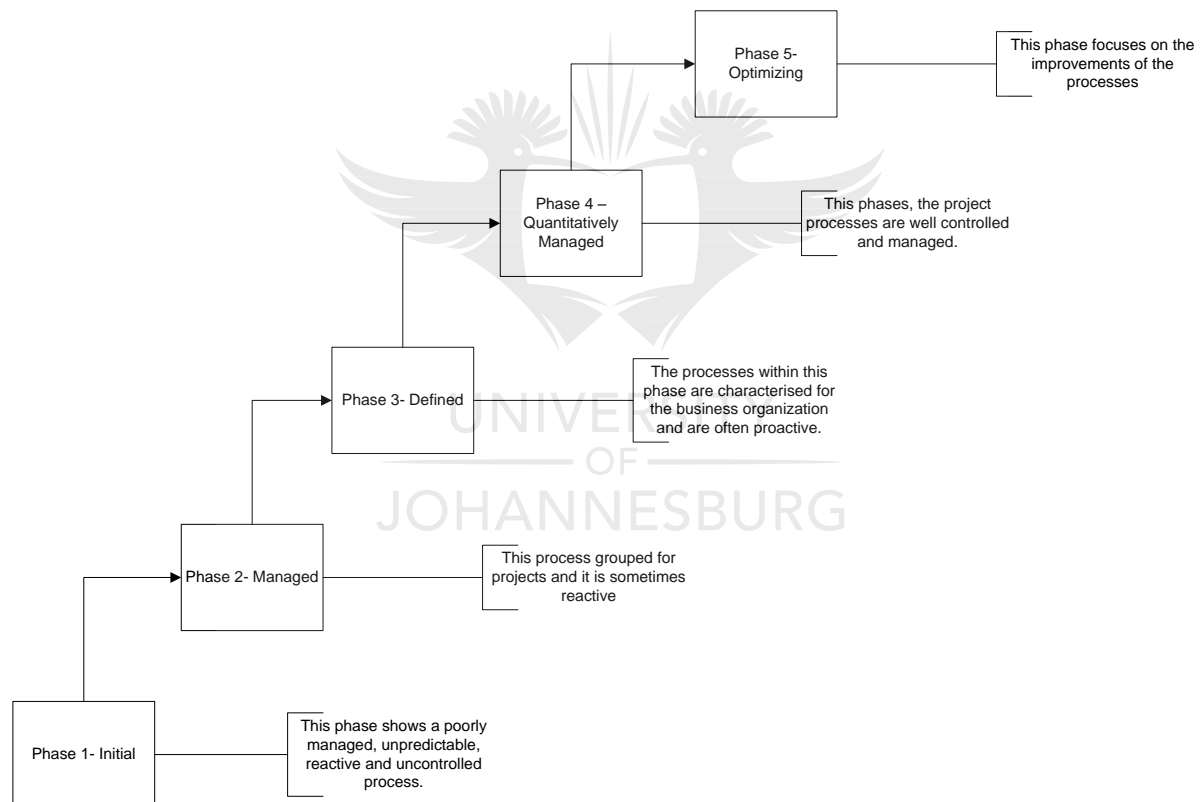
Figure 7: CMMI Characteristics (Jeffries, 2004)

2.10.2.1   Maturity level 1 - initial phase

In this phase of CMMI, processes are normally chaotic and ad hoc. This means that the business is not in good and stable environment. The achievements and success of the business is dependent on the heroics and competence of the employees within the

business. In most cases, business will produce good services and products that work well but at the same time the budget and schedule of the project is exceeded (Ballard and Howell, 2003).

2.10.2.2 Maturity level 2 - managed phase

It might happen that a business organization may obtain generic and specific goals regarding the process. This happens in the case whereby business and user requirements are well managed and business processes are performed, controlled, measured and planned. This process assists the organization to determine and make sure that the current practices are retained within the stress times. In the case whereby these practices are in place, the organizational projects are done and managed as they have been documented. The products and services being offered are created to ensure that specified user requirements, standards and goals are met (Westerveld, 2003).

2.10.2.3 Maturity level 3 - defined phase

Within the defined phase suggest that a business organization has obtained generic and specific goals on the process assigned. The important difference between phases / level 2 and 3 is that scope of procedures, standards and process description. Within the level 2, the processes description, standards and procedures might be a bit different in each particular instance of the project processes. At level 3 of the maturity, procedure, processes and standards are customized for the business organization's set of standards process to best fit a specific project of particular business unit. The business organization's set process standards may include processes that are stated in maturity level 2 and 3. At the maturity level 3, the processes are well managed in a more pro-actively manner using thoughtful of interrelationship of some detailed process activities and measures of the processes for work's products and provided services (Schwaber and Beedle, 2002).

2.10.2.4 Maturity level 4 – quantitative managed

In this level, the business organization will be assumed to have obtained the particular and targeted goals of the process areas given to maturity levels 2, 3 and level 4 which suggest that generic goals are assigned to levels 2 and level 3. Within the level 4, the sub-processes that are chosen are controlled using a quantitative techniques and statistical methods. The objectives of quantitative for process performance and quality are created and used as the criteria to manage processes. These quantitative objectives are aimed at the customer needs, organization, end users and process executors. The processes and quality

performance is made more understandable in statistical manner and managed all out the life cycle of the process (Mieritz, 2012).

2.10.2.5   Maturity level 5 - optimizing

This maturity level 5 optimises processes which are innovative and agile depends on the participation to ensure that workforce is empowered and aligned with the objectives of the business organization and business values. The business organization ability to effectively manage to adopt and respond to technology changes and identify new opportunities is assisted by shared learning. To strive to improve processes is every employee's role which may result into continuous process improvement. It might happen processes produce predictable results; some results may not be enough to obtain set objectives. Within the maturity level 5, the processes are mainly concerned with solving the known causes of process changes and variations to make process improvements in performance to obtain the established quantitative and statistical improvements within the process (Bloch, Blumberg and Laartz, 2012).

The abovementioned authors are almost agreeing about the characteristics of Capability Maturity Model Integration as it provides guidelines in terms of ensuring that the process improvements are made to achieve the project deadlines and goals. This results into more efficiency in terms of project deliverables.

2.11   THE AGILE SYSTEM ENGINEERING MANAGEMENT PROCESS WITHIN PROJECT MANAGEMENT
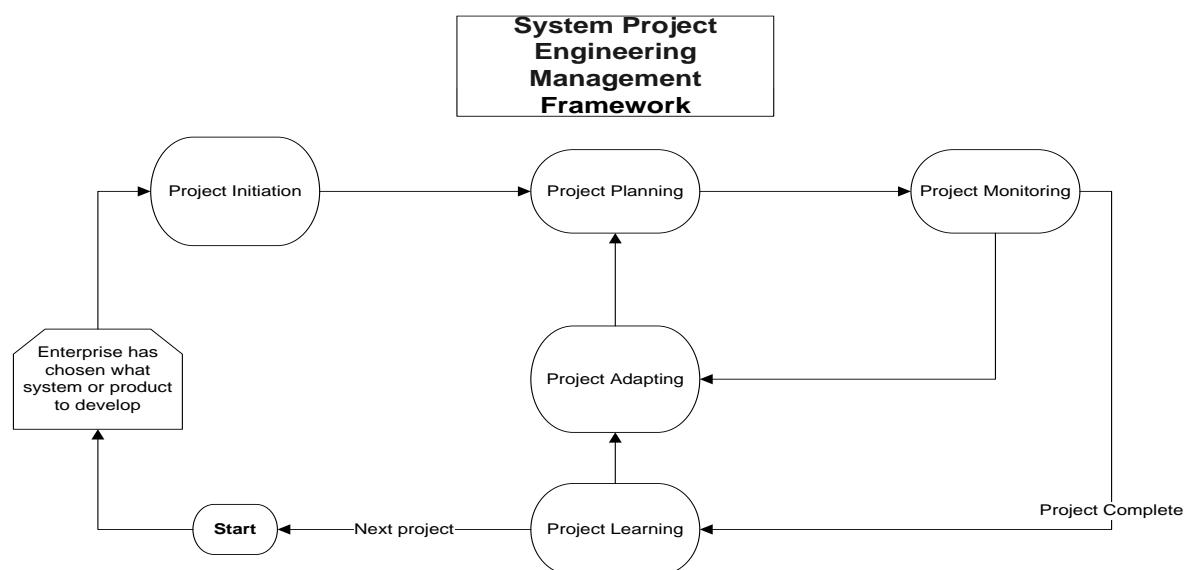
Figure 8: A framework for system project management (Olivier de Weck, 2003).

In the 21st century, systems are often threatened by unexpected changes coming from volatility in business and user requirements, System Engineering and Information Technology revive rates and quickly respond to vulnerabilities of the security. With so much changes in information technology, a static's long development cycle phases of the (SIS) software intensive system that represents big segment in single or multiple criteria such as system development risk, system development cost, system functionality and time taken for the development which may impact negatively towards the system before even development starts (Westerveld, 2003).

The ever changing technology revive rate is accompanied with the need to react to user requirements which changes all the time, this leads to a complete agile development process, this is in the case whereby business, systems and technology areas have an agile toll framework and work in agreement to create a very successful software intensive systems. The shortfall in any identified three aspects might impact negatively to the overall process. The continuous increase in systems and software may result in increased the necessity and requirements for an agile system engineering process. The new information system technology life-cycle acquisition emerged to provide the basics of the business unit's transformation to agility. The technology area provides a very important link within business and technology areas, in this manner; the agility's lack within the technology area may result in debilitating effect towards the entire development process. The increase of risk opposing towards the improvements which are made in the business areas may impact the current process of agile in the technology area. The introduction of the agile system engineering framework is much needed to improve and enhance the entire effectiveness of the software intensive system development process. The critical interfaces also need to be identified from the business and technology area's perspective to enable seamless communication within the impacted areas. Below is the system engineering process diagram (Besner and Hobbs, 2006).
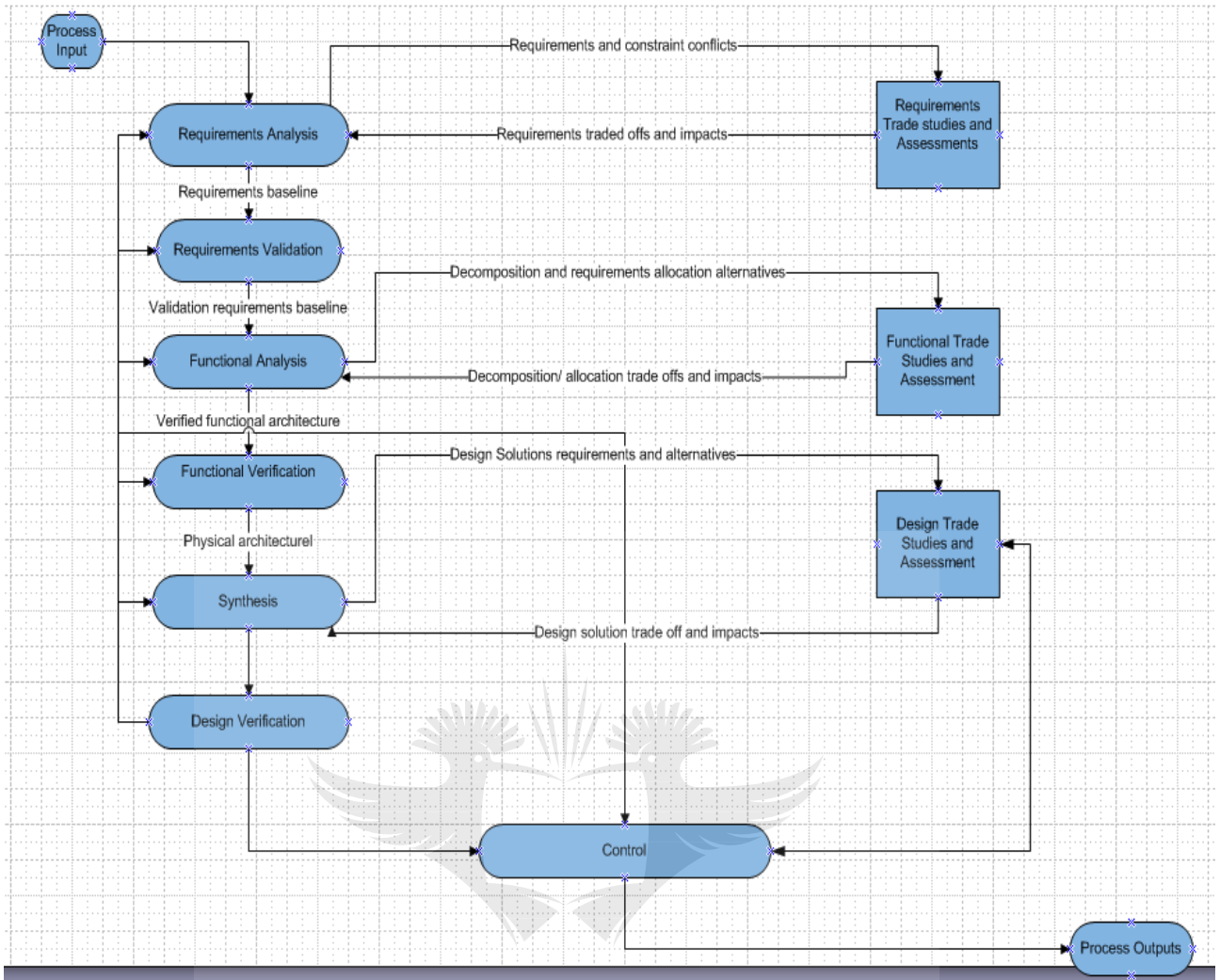
Figure 9: Systems Engineering Process (De Panfilis, 2005).

2.12. ORGANISATIONAL CULTURES AND STRUCTURES

The adaption of agile project management is a very huge exercise for the business in the migration of culture. This may depend on the geographic location, the business organization's products and services provided, may drive the firm to take the journey of moving from traditional methods to agile new methods. The change is good but other employees might show resistance to the new idea of employing agile as the new tool to conduct projects within the firm. Within the business, there are problems which comes with the migration from the traditional project management environment to a new agile project environment, this include the objections and resistance that occurs (Corsaro and Levine, 2010).

2.12.1 Traditional project manager versus agile project leader

The usual project management that manages the project management constraints such as scope, time and resources by using the project plan will have to change their management approaches to manage the agile team force. The new agile project manager will migrate from being a manager to being a leader, facilitator innovation and creativity (Guang-yong, 2011).

2.12.2 Analyse existing product development and project management methodologies

The author argues that the organizational culture and structures may determine the efforts needed to migrate to agile method. So it is vital to the company top management, executives and project leaders to understand the below questions (Guang-yong, 2011).

- How much investment time, resources and efforts are needed to establish the new tool, processes and template?
- Are the metrics techniques of measurement going to determine the project failure or success?
- Which existing tools, processes and templates for implementing projects may be used to agile framework management?
- How certain project process and structure within the business are will be impacted (Guang-yong, 2011)?

2.12.3 Agile project management and traditional project management functions

Both functions of agile project management and traditional project management are mentioned. Once the business organization decides to give an agile project management a chance, it is very important to not to go big bang in terms of implementation. The business may instead choose small projects from the creative and innovation projects to establish a team to implement such initiative. Below is the differentiation between agile and traditional project management (Hass, 2012).

2.13 WATERFALL METHODOLOGY VERSUS AGILE METHODOLOGY

The business units within First National Bank face challenges as to which development methodology should be used when a new project is undertaken. This discussion often

results into heated debates because some of the project team members may be more comfortable with Agile while others prefer waterfall methodology (Schwaber and Beedle, 2002).

2.13.1 There are two basic and most popular project management methodologies

These two most popular project methodologies are:

- **Waterfall methodology** – is mostly called traditional project management approach, and

- **Agile methodology** – is a specific kind of Rapid Application Development and is the latest tool than traditional however is not that new, is mostly implemented though Scrum.

Both of the mentioned above tools are usable, best methodologies. For the teams that have been involved in more software and systems development projects for much longer time, Agile may be more helpful to cater for continuously changing customer's and user requirements for a particular product or service. The below is a fully explained difference between these two project management methodologies (Ballard and Howell, 2003).

AGILE PROJECT MANAGEMENT	TRADITIONAL PROJECT MANAGEMENT
✓ Put more attention on team interaction and communication	✓ The focus is on processes and tools
✓ The focus is based on developing software and architectural solutions which will be gradually modified and improved	✓ Expects partial variations and requires detailed documentation
✓ The full emphasises is on the importance of customer satisfaction and team collaboration for daily interactions and communication	✓ This puts focus on the emphasises of contract negotiation.
✓ This methodology is flexibility and easily response to change	✓ This method works with the plan and it follows the plan from the initiation to the end of the project.
✓ Within the agile space, teams are usually self-directed and more than free to achieve deliverable they set as long as	✓ While in the traditional waterfall, there are normally tight controlled processes in place in terms of detailed schedules.

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they follow what was agreed upon.	
✓ The requirements of the project are developed within the process as uses and needed. This may mean that the final outcome may be different from what was envisioned.	✓ Requirement of the project are identified way before the commencement of the project. If something leads to scope creep, it is handled as a separate entity.
✓ The end user testing and feedback to customers happen constantly. This makes things easy and learns from the past mistakes, feedback. Testing is a big and challenging.	✓ The customer feedback and user testing normally take place when the project is about to be launched.
✓ Teams constantly assess the scope and direction of their product or project. This means that they can change direction at any time in the process to make sure that their product will meet changing needs. Because of this, however, it can be difficult to write a business case at the outset, because the final outcome is not fully known.	✓ Teams work on a final product that can be delivered some time - often months or years - after the project begins. Sometimes, the end product or project is no longer relevant, because business or customer needs have changed.

Table 1: Waterfall versus agile project management methodology (Hardy-vallee, 2013)

2.13.2 Waterfall project management methodology

This methodology is a linear approach for the development of the systems and software. Below shows the examples of the sequence events which are dependent on one another before the next phase starts.

- Carry out the business case
- Project Initiation
- Gather and document the business requirement
- Design

- Code and conduct the unit testing
- Perform the system testing
- Perform the user acceptance testing (UAT)
- Raise and fix defects
- Implement and deliver the final product

The South African banks employ this tool within the waterfall software development project, each of the above phases depends on one another and each stage normally generally finishes before the next one begins. There are also times which are different in terms of moving to the next stage, for an example business requirement and functional requirement specifications must be circulated to all the impacted areas and be signed off by the right stakeholders before the design phase starts.

2.13.3 There are positive and negative things about Waterfall approach

> **The good sides of this tool are:**

The customers and the developers normally agree on what needs to be delivered early within the development project lifecycle. This results into more straightforward planning and designing. The project progress is easily measured and the scope of the work discussed and known by the project team in advance. During the course of the development efforts, the team may not only work on one project at the time, this depends on the current phase of the project. For instance, Business Analysts may learn, understand and document the user or business requirements. Thereafter the developers start coding and testers can prepare for test cases.

The requestor or the customer is not necessarily required to attend the meetings, Joint Application Development, reviews and updates meetings (Succi and De Panfilis, 2005).

2.13.4 Below are some negative issues associated with waterfall approach

The most complicated part of this phase is whereby the business analyst has to gather and documenting the requirements from the customer. Sometimes customer provides unclear details and do not have a clear visual of an application from the requirements document. In most instances, the end users have difficulties in putting together the requirement elements together to get to the clear picture of what they need.

Another possible setback of the waterfall approach is the chances that customer would be happy with the final product of software or service. The final product is based on the initial requirement that were gathered and elicited from the project requestor which is the customer (Succi and De Panfilis, 2005).

In my own experience as a business analyst, most customers do not see what would be delivered until the project is almost coming to an end, by that time, it is impossible to make changes due to costs to cancel and start a new project.

2.13.5 Agile project management methodology

The agile project management methodology mainly focuses on an iterative, team based kind of approach to develop software and systems. The emphasis is put on the rapid delivery of an application with finished functional elements. Instead of creating project scheduling, tasks, and the agile applies phases called Sprints. Different sprints have the defined amount of time; this usually ranges between two weeks and more with the execution of the list of deliverables which are planned at the beginning of the sprint. These deliverables are prioritised through the business values which are determined by the user requirements. If all do not work according to the sprint plan, the task is taken back to prioritization and the data is used for any possible future sprint planning. In case whereby the work was done thoroughly, this can be reviewed and assessed by the customer and the project team during the end of sprint demos and daily builds. This tool of agile mostly relies on customer involvement during the project from the initiation to implementation more especially in reviews (Alleman, 2002).

2.13.6 The advantages of agile approach:

- The end users and the customers are more involved and are able to see the work which is being delivered, this helps them to make decisions and make minor changes during the project development.
- Involving the customer in the early stages of the project allows the customer to gain a sense of ownership through providing input and working directly with the project members throughout the development of the project.
- In situations whereby the time to market a particular software application becomes a concern compared to an implementation of the full feature is set at the beginning of the

launch. This methodology can be more responsive and produce any basic version of working system or software that may be built in successive team iterations.

- The focus is on delivering the customer requirements on time and keeps the customer happy (Alleman, 2002).

2.13.7 The disadvantages of agile approach:

- More involvement of the customers may result into problems.

- This methodology works best if the team members of the development team are dedicated towards the completion of the project.

- This tool mainly focuses on time boxed delivery and sometimes taken back to prioritization, sometimes it is possible for some items for delivery may not be finished within the set time-frame.

- It is very easy to manage the close working relationships within the agile space if the team members are assigned working space even though there are many reasons to manage this issue like collaborations and webcams (Nerur, Mahapatra and Mangalara, 2005).

2.14 CONCLUSION

The traditional project management may be applied to drive and manage a project through the plan or the process approach. This approach is found to be useful in the project environment whereby the project scope is thoroughly defined in the environment of no complexities and uncertainties (Fernandez, 2009).

Many banks use agile tools and techniques software and system development engineering projects. A lot of financial and banking sector firms who adopted agile methodology for their projects have seen fairly measurable improvement in products quality, customer satisfaction and to market. This results in many firms within the finance looking forward to scale the processes of agile for the growing projects which involve a major number of external consultants and employees. This is applied to small-medium sized IT and engineering system development projects, since these projects have a good advantages compared to other large projects when it comes to efficiency and planning (Guang-yong, 2011).

CHAPTER 3:   PROPOSED RESEARCH DESIGN

3.2 RESEARCH PROCESS / METHODOLOGY

3.2.1   Research case study

The case study was carried out to investigate if success was achieved during agile project engineering management to develop and implement a system and software which is a domain related and details of managing agile management process. The research process is carried out to gain more understanding and the case studies were assessed and enabled the selection of certain case study were used for the research questions and answered. Lastly, the collection of data and analysis of the research was well explained.

This research study was conducted through case study, questionnaires, observations and applicable search sources from the internet. This study included both the primary data (data that was gathered and assembled specifically for this research study at hand) and the secondary data (data which was previously collected for other research project other than the one at hand). The data and information was gathered through the facilitated workgroup in a form of written questionnaires and interviews where applicable. Qualitative research was a method of inquiry used in this research (Creswell, 1997).

3.1.2   Research case study definition

A case study is explained as an intensive study of a certain situation other than focusing on the quantitative surveys. It is known as a tool to narrow down a vague and broad study field of the research into small and topics which are easily researchable. Research may not answer all the questions raised however it may provide some indications and elaborate. The design of the case study is so useful in assessing and testing if the models and scientific theories are applicable and working in real world (Lindstrom and Jeffries, 2004).

According to Atkinson (1999) a case study is defined as an activity account, problems and events which contain hypothetical and real life situations. These may the complexities that may be encountered in the society or workplace. So the case study is used to assist the researchers to determine how the decisions are influenced by difficulties of the real life. Going through and analyze a case study needs the researcher to start practicing to apply their knowledge and thinking set of skills to hypothetical and real life situations.

A very good case study possess the below features:

a. It is created due to real life challenges.

b. It contains all parts which end with points of discussions and problems.

c. The information on the case study is enough for the reader to understand and solve issues and problems.

d. In most cases the case study includes personalities, sequence of events and settings.

3.1.3 Case study research's benefits and drawbacks

The benefits and drawbacks of a case study are summarized below:

3.1.3.1 Benefits

- **Capturing reality** – the vital benefit for case study is their capability to detain reality. They have the potential when used and applied accordingly to ensure that more of the hypothetical and real life situations are captured (Hodkinson and Hodkinson, 2001).

- **Case Study flexibility** – they may be conducted in many ways in the case study research process. The researchers known to love them to develop critical ideas which may be used for extensive research in future projects and pilot studies. They are known to be effective for broad and wide range of research methods. In that way, case studies are regarded as non-prejudicial against any sort of research. The focus groups are frequently used within the case study research as the form of questionnaires and participant observations (Hodkinson and Hodkinson, 2001).

3.1.3.2 Drawbacks

- **The generality challenges** – a closer look needs to be done when attempting to use the generalized findings. It is advisable that the researchers must choose their case study sites more careful, at the same time base their analysis and assumptions in the findings of the existing research which is obtained from other research designs.

- **Amateurism case study** – no partisan authors and researchers may result in wondering if the case study provides finance strapped and time that is convenient to provide

findings and recommendations. Given the kind of the case study, this may either provides more stories to tell or nothing valuable at all.

No theoretical knowledge is required but practical is needed to gain more understanding on how to use an agile project management tool. It is evident that case studies may result to an in-depth on how to effectively use the agile tool in project management, in the case that a systematic approach is employed to produce a good case study and research design. Case study in general are usually compared to other research tool and methods in the below section (Creswell, 1997).

3.1.4 Comparison of research method

A high-level summary of research method comparison is shown table 2 below to assess whether a research method is best used or not for a situation. There are three factors which are used to determine the right method to use for a certain research.

- The kind of the research questions the author or research is investigating.
- The approach and ability the researchers have to influence the behavioral events investigated.
- The amount of focus on contemporary compared with historical events.

Table 2: Applicable situations for diverse methods of research (Brady and Lawson, 2001)

Method	1. Type of the research Question	2. Control of Behavioral Events	3. More attention is on Contemporary Events
Conduct experiment	What, How?	Yes	Yes
Survey	What, Why, Where, When? How many and How much?	Yes / No	Yes
Analysis	What, Why, Where, When? How many and How much?	No	Yes / No
Historical Events	What, How?	No	No
Case Study Research	What, How?	No	Yes

There were two investigated research questions to understand the full and in-depth of how agile project management method is used to achieve the success of the project goals and, or project failure. The second point which was addressed was the purpose of using agile project tool towards the project success or failure which could result from inexperience team trying to use agile to accommodate user and business requirements. The research study objectives were to define and determine the challenges and benefits for using agile methodology to deliver project deliverables on time and produce reliable products and services to attract and please the targeted customers. The above summary indicates the "What" and "How" a research question are self-explanatory and works best for the case study scenarios and experiment methods. The history methods are applied when tackling and dealing with what was conducted in the past and investigations normally relies on the documents and other sources of evidence stored. In the case of employing the experiment methods the authors and, or the researchers have control over the actual events. Within the process of agile management, the researchers do not normally have control over the real events and are unable to influence the definite behaviour of the investigated events. The case study research method was identified as the best tool to achieve the objectives of the research as stated in chapter 1 of this study (Brady and Lawson, 2001).

A poor decision to choose the wrong method and research design may negatively influence the research results. It was important to ensure that a good research design was employed and two case studies were used. The below logical process was used to indicate the case study process.

3.1.5 Process of the case study

The crucial steps of the case study research process that needs to be followed are listed below (Brady and Lawson, 2001).

- The definition of a case study highlights the research plans and objectives.
- The critical part of the research design is choosing the right method and define the data will be collected.
- Data collection whereby the actual evidence taken from the cases and also using different sources.
- Assessing and analyzing the data collected.
- Report and arriving to the conclusions.

The below figure 8 is illustrated and shows how a researcher has put together the research case study applying the below flow diagram.
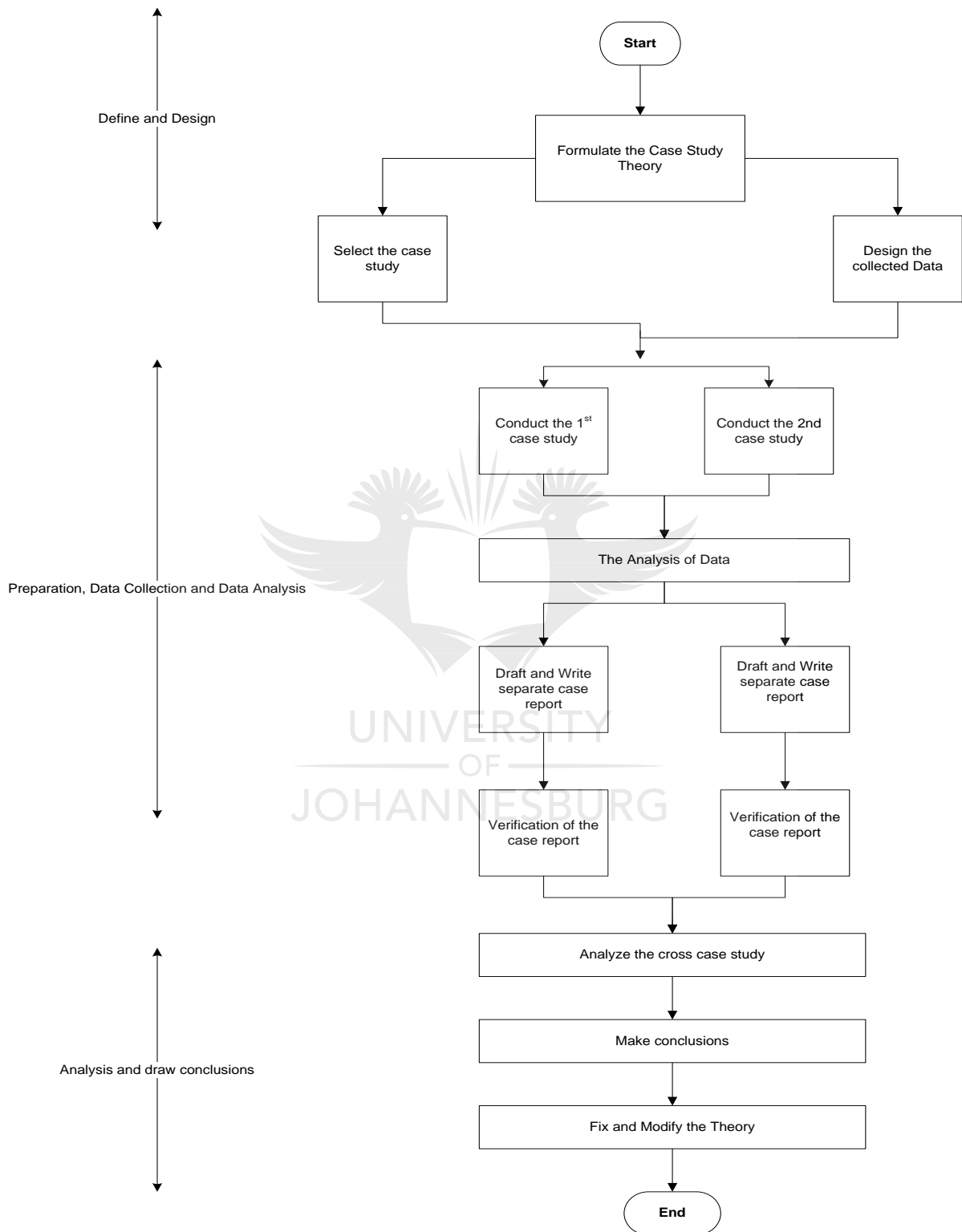
Figure 10: Case study process, (Lawson, 2001)

The below section describes how the process of the research was done

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3.1.6 Definition of research case study and design

The first phase of the study of research involves the formulation of the case study theory, select the right cases and design the collection of data. The literature review on chapter 2 described the theory formulation about the challenges and benefits of using agile project engineering management within the South African banks. The interesting points which are stated on section 2.2.4 are that agile tool offers many opportunities to evaluate the growth and direction of the project in all the project and system development lifecycles. This is mainly made possible by means of short iterations and teams are mostly expected to present the potential product increment. The case study validates if there is a relationship between project team and agile project management during the project and software implementation in practice and if it could be regarded as one of the contributing factor towards the project success as highlighted on the literature review. The intention was to find data to maintain the assumption made on the literature and some of the real life experiences of the project success and failures. The data was collected with an intention to answer the research questions as listed in chapter 1:

- **RQ 1**: What are the benefits and challenges of using agile project management?
- **RQ 2**: How does agile project tools and methodology contribute towards the project success?

3.1.7 The selection of the case study

This section describes the suitable cases which were used for the study of this research. The objectives of this research study were to gather and understand the practice of agile methodology and tools that add value towards the project deliverables to meet the customer expectation within the project system implementation. All the case studies selected were about the challenges and benefits of using agile project management as the tool.

This research study intends to identify if there is a relationship between project team and practice of employing the agile project management tools and methodology.

- Carry out the factors which resulted into proper application of agile methodology and tools within the software project implementation.

- Carry out factors which resulted into failure application of agile methodology and tools within the software project implementation.
- Carry out factors with contributed to project success or failure.

As abovementioned factors within the research case selections, the criteria below were applied to ensure that the chosen cases had suitable data for collection.

- The agile project management tools and methodology process applied during the software project implementation could have either resulted into successful or failure of implementation of the project goals and deliverables.
- The implementation of the project using agile project management tools and methodology had to be done to allow the research investigation to determine the factors which resulted to the failure or success of the project.

Below are the set of guidelines used to select a case study (Brady and Lawson, 2001).

- Selected a research case study where applicable data was simple available, this included document reviews, interviews and observations.
- Lastly, the researcher selected a case study which had a full potential of relevant data to answer the research questions.

According to the procedure and guidelines given by the researchers, for this study, two research case studies were used to get a clear understanding of the real life software implementation. Two projects from different business units within the First National Bank, as a staff member within the bank, conducted observations and participated within software implementation project life cycle. The resources and research data were fairly easy accessible due to the fact that as a researcher I was involved within projects implementation. The chosen support business unit was working towards building a system to cater for operational and strategic goals. This business unit's constraints were that it had limited systems which were isolated from the mainframe system which had data which can be viewable across all the organization's business unit.

Project AAA was conducted to build a new system called Jira, this system allows project managers, business analysis and developers to log new projects, update project statuses, upload of the project documents and project closing on the system. This was piloted and rolled out into two business units and they were happy to implement it. Other business units

were brought on board as well. This eliminated human interaction when a new project is supposed to be logged and no paper-work within the process. Everything is done on Jira systems. This resulted in more efficient and effective project management office. The total budget to configure the new system was at around about R15 million. All the business units were happy and satisfied with the solution of Jira system. The researcher used this case study because it would provide the necessary data to determine the factors which resulted into project success.

Project XXX was designed and developed in-house with a budget of R25 million. The system was developed to support two business units within the organization. The business requirements were the same however, the system was customized according to the specific business unit's requirements and to serve their unique needs. The agile project methodology and tools were applied to cater for each business unit's requirements. The researcher collected data from this case study to determine the factors which resulted in to successful implementation of the project using agile methodology and tools.

Relevant data was collected from the chosen case studies to find solutions and answers to the research questions. Below described the techniques and methods employed to gather the research data and collection.

3.1.8 Protocol of Data Collections

The below section focuses on how the required data was gathered and assembled for research case study and also determined which principle stick to;

Protocol 1: Various data sources must be used

For the chosen research case studies, researcher used different sources of evidence for based on the following:

- The business case, project initiation document, business requirements specification, functional specifications and system requirement specification documents were signed off by all the impacted stakeholders. These documents are accessible and could be repeatedly reviewed by the researcher to understand how the software was implemented.
- The researcher was directly involved as an observer and participant in scrum meetings, iterations and implementation of projects.

- The questionnaires as the tools were also used to ensure that the researcher was not bias, the aim was to provide the accurate feedback. See Appendix A.

Protocol 2: The research case study database

The researcher created a well-structured way of collecting the research evidence which could assist during the analysis of data. All the gathered data was kept confidential but the research finding could be made available to everyone.

Protocol 3: Series of research evidence

A series of research evidence required to be kept consistent to guarantee that a case study had enough citations for the collected research data. This provided the researcher to be able to identify that evidence was either coming from the participation or observations, questionnaires and the specific research documents. Lastly, the case study process dealt with the preparation and the collection of data. The following section with discuss about steps to prepare, collect and analyze data.

3.1.9 Preparation, Collection and Analysis of Data
3.1.9.1 Preparation of data collection

The approval was obtained from the chief information office and head of project management office. The purpose of this research exercise was clearly explained.

The researcher and the organization's participants for the interviews and questionnaires had to agree on the below rules and principles.

- All the participant names within the organization were kept anonymous.
- The collected data was kept confidential however the research study findings of this report were published.
- The participants were asked to be critical to derive to objective answers.

Project AAA: Case Study 1

Twenty four members of the project team participated in the survey and twenty two of them agreed that agile development enables the quickness of project delivery of business value.

This is achieved in a form of continuous planning and feedback to ensure that value is maximized within the process of development. The projects teams are able to align needed business needs and delivered projects. The other two participants disagreed and stated that agile lacks emphasis on detailed documentation and on necessary software designing. This therefore means that if the customer requirements are not clear, then the project can get off track easily.

The participants included the developers, business analysts, system analysts, test analyst, product developments managers, solutions architectures, heads of project management office, programme managers and chief information officer. The participants were engaged based on the understanding of both project management tools such as waterfall and agile during the software project implementation.

Project XXX: Case Study 2

Twenty members of the project team participated however eighteen provided a response which agreed that agile accommodates the entire customer changing requirements throughout the project development process. The well tested working software is delivered within weeks and there is more attention to excellence of technical and best design. The other two participants stated that there were comfortable with previously used traditional waterfall methodology.

The participants included the developers, business analysts, system analysts, test analyst, product developments managers, solutions architectures, heads of project management office, programme managers and chief information officer. The participants were engaged based on the understanding of both project management tools such as waterfall and agile during the software project implementation.

3.1.10 Evidence for Collection of Data

The participation and observation was solely based on the hands on and directly involved within the software implementation as staff member. The questionnaires were shared with the participants through eSurvey Creator and the feedback due date was requested via e-mails. The researcher stored the collected data into the database in order for it to be analyzed separately. The overall data and case study integration were conducted during the cross case study assessments.

3.1.11 Analysis of Collected Data, Research Report Writing and Verification

The responses of the research questionnaires were loaded into eSurvey Creator and computer assisting qualitative data analysis package to assist with the analysis of documentations and questionnaires (Brady and Lawson, 2001). This enables an easy development of the deep and clear understanding of application of the data that was collected (Mieritz, 2012). The questionnaires were completed electronically by the participants and the researcher did not do any kind of interpretation as the exactly response of the participants were used.

3.1.12 Analysis and Conclusion

This last stage was to analyze the evidence of the case study and conclude. The analysis focused on the case study theories to establish the benefits and challenges of using agile project engineering management within the banking sector in South Africa.

The below strategies could be applied during the analysis of data (Westerveld, 2003).

- Apply qualitative data for analysis.
- Create a case study framework description.
- Utilize the theoretical evidence to analyze for proposition.

The researcher used the data analysis strategy which was mostly relied on the theoretical proposition. This strategy guides the researcher through the collection of data plan (Westerveld, 2003).

Below refers to five analytical techniques that can be applied during the data analysis (Mieritz, 2012).

- The analyses of data for patterns that are matching are compared with empirical pattern which are estimated.
- The data analysis for the case study would be explained regarding the independent and dependent variables.
- Over time, the sequence models refer to the logical and chain events for cause and repeated effect patterns.

- All the differences and similarities of the case studies are grouped and categorized together.

The matching patterns are employed as the methods and techniques to conduct data analysis and the set of possible results are matched with actual results. To get to the conclusion of the data analysis and provide answers to the research questions, a logical and sequential approach was needed to present the analysis of data into more understandable manner.

- The research study was conducted through observations, questionnaires and document analysis to determine and identify the benefits and challenges of using agile project engineering to implement a successful software project. The process of data reduction was used.
- The enablement of coding assisted to split the data into categories and segments which could be compared to each other to reach the accurate results.

3.1.13 The Quality of the Case Study

This section stated that about four of the case studies were applied to ensure that quality of the research was met. This assured that construct validity for internal internally, external and study was reliable (Creswell, 1997).

- The concept of the study requires the researcher to employ the correct measures for the construct validity.
- Internal validity suggests that some and, or most conditions need many pieces and small components from various sources to expose convergence positions of inquiry.
- External validity suggests that case and cases findings are not built to generalize, literature review and case examinations assist with external validity.
- Reliable often refers to consistently proper in quality and design of the case studies illustrated that processes and procedures are documented properly and same results may be obtainable.

The table 3 below illustrates the possible approaches which were applied within the case study to establish validity and also few sections from the study are mentioned to back up the argument.

Case Study Test	Application of the Case Study	Addressed Sections
Construct Validity	o Various sources were consulted for evidence.	3.1.6
	o A series of evidence.	3.1.6
	o The responses of the participants to research questionnaires were done electronically. Data was not interpreted; original response was used as is.	3.1.8 ; 3.1.9; 3.1.10
Validity for Internal	o Matching Patterns.	3.1.13
Validity for External	o Research Study – Literature Reviews	3.1.13
	o Case Study Examinations.	
Reliability	o Creation of the Case Study Database.	3.1.13

Table 3: Four designs test of the case study tactics (Hodkinson, 2001).

3.2 Conclusions

This chapter purely focused on the research case studies as the research tools and methods and the researchers thoroughly explained the process to get to validity and rigidity. The methods and tools used weaknesses and strengths were exposed. The application of the case study as the research tool and method equipped the researcher detailed and proper understanding of the issues and problems being solved at hand. For the purpose of the dissertation at hand, case studies were employed to identify and determined the benefits and challenges of using agile project engineering management to successfully implement a software project. This assisted the researcher to gain more understanding of the challenges associated with the wrongly use of agile tools and methods. To ensure that results are more trustworthy, a proper research process and methods were followed.

CHAPTER 4: RESEARCH CASE STUDY DESCRIPTIONS

This chapter of the research study mainly focuses on the on the background of the two case studies that were used. It will also provide more details as to how the evidence of the case studies was collected, analyzed and used within the study as discussed in previous chapter 3.

4.1   Objectives of the research study

The evidence provided in this research study was obtained from two projects which were delivered within the same organization at a certain business unit. A two year period was chosen to conduct this study. The selected projects were aimed at developing the software systems through applying the agile project management methods and tools. In this case the benefits and challenges of using agile were encountered during the software development life cycle.

The research goal was identify and determine the benefits and challenges of using agile project management methods and tools through the system development life cycle. The first project applied waterfall methodology when it started however due to customer and user requirements which kept on changing all the times, the project team was forced to change from waterfall to agile project methods to cater for ever changing user needs. This project was successfully implemented. The second project within the same organization but different business unit was implemented successfully through applying the agile methods and tools from the onset. The below research questions needed to be addressed through answers.

- **RQ 1**: What are the benefits and challenges of using agile project management?
- **RQ 2**: How does agile project tools and methodology contribute towards the project success?

The researcher's goal was to gather data to maintain assumption that if the project team gets proper exposure to agile methods and tools, they would implement project successfully and deliver good results on time.

4.2   Setting of Research: The Digital Support Service Area and its Agile project management methodologies

The research background is based on the company and the digital support area whereby this research was carried out.

4.2.1   The Digital Support Service Area

The research was carried out in a banking organization within the digital support area in Gauteng, South Africa. The business organization had various business units with their own digital support service areas which may have similar governance of business processes and procedures for premier market segments. The support service area had to address and advise the various business units about values of customer's day to day activities, this approach assisted the business units in executing the business processes and functions to support activities in-support of business processes and procedures provided by digital support area. The below figure 9 illustrates the business operating model at the company which the study was conducted.
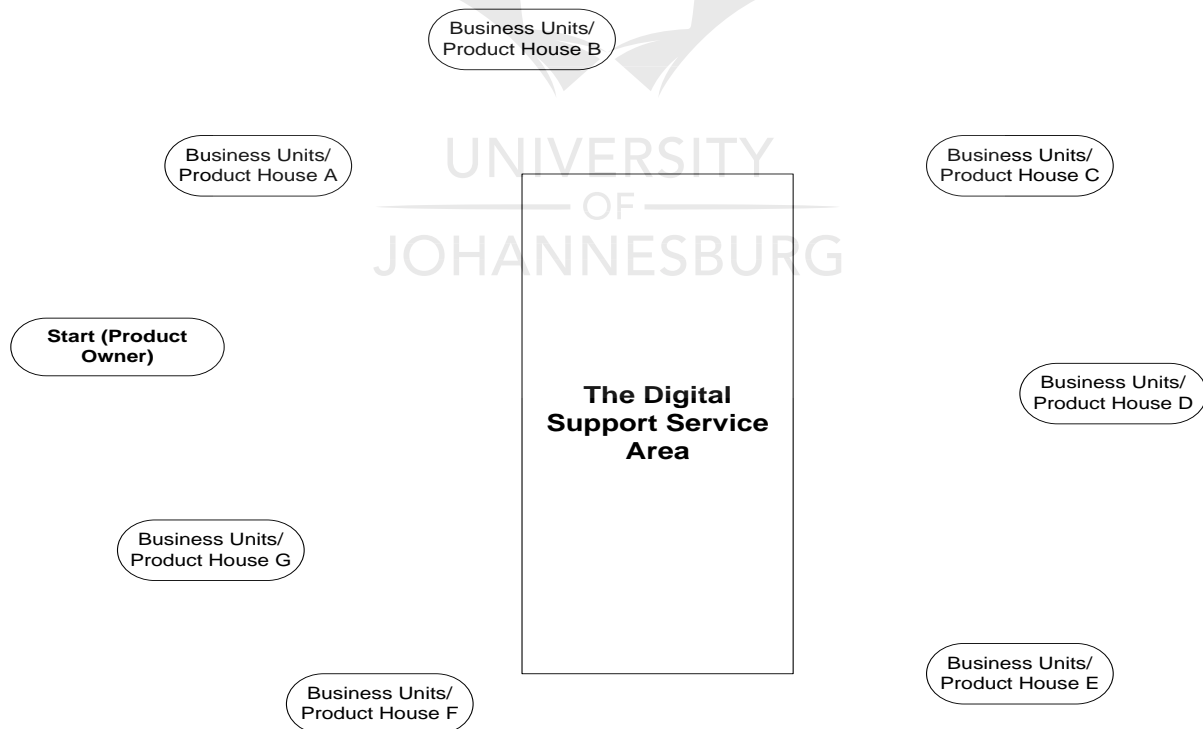
Figure 11: Business Operating Model

As illustrated in business operating model in figure 11, projects are initiated by the product houses, the project owner would identify an opportunity or a problem within their business space. Then they would write a business case to be logged within the Digital Support Service Area, PMO. Then the formal project to address identified and raised issues begins and follows the agile methodology to complete it. The challenges within this space are that some business unit prefers the waterfall project methodology.

- Certain business units were comfortable with waterfall project methodology even though it took more time to complete the projects due to interdependency.
- Other product houses preferred agile project methodology as they needed to respond quickly to customer demands to provide innovative products and services to their customers.
- The business units that had flexible requirements released more projects than business units that used waterfall methodology.

Lack of agile project management knowledge resulted into poor project efficiency, poor operational activities and poor risk assessments. To fix the issues, the digital support area had to build Jira systems to address and enable business consistent information about the various business units' operational activities.

4.2.2 Selected Projects for the Study

The researcher chose two projects to carry out the study to establish the benefits and challenges of using agile project management within the organization. Some business units strongly believed in waterfall methodology which takes more time before the product is delivered to the customer. This resulted into digital service support project team delivering product that was not needed. Other business units which were flexible enough implemented more projects and deliver products and service to customer on time. This enabled the support team to produce more effective products and adapt to changing business requirements.

- **Project AAA** was conducted to build a new system called Jira, this system allows project managers, business analysis and developers to log new projects, update project statuses, upload of the project documents and project closing on the system. This was piloted and rolled out into two business units and they were happy to implement it.

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- **Project XXX** was designed and developed in-house with a budget of R25 million. The system was developed to support two business units within the organization. The business requirements were the same however, the system was customized according to the specific business unit's requirements and to serve their unique needs.

Both of the above-mentioned projects were carried out in 2014 and were implemented successfully. The following section would provide a detailed summary of the agile project management process within the system development life cycle.

4.2.3 Background of the Project AAA using agile project management process

When Project AAA was implemented all the stakeholders and end user customers were happy to utilize the new system to log and store project documents. This reduced paper work and missing of documents. The system enhancement may be conducted if clients have specific items and field that needed to be added. Jira is a flexible system for all the project team across various business units to update progress, track new changes and retrieve archive documents. The following point will provide high level summary of the agile project methods.

- Clearly understanding of the business requirements and applying the correct project methodology tool to adapt to continuous changes in business needs and wants.
- The project team met with each business units to gather the specific business requirements and to understand the challenges and problems they were facing.
- The iteration were triggered by the business needs which continuously changes and needed revisions and updating the existing requirements.
- Changes made were based on the re-assessment of the data collected. After seven business units, a combined overall view of user and business units requirements were gathered and joint application development sessions were conducted with all stakeholders coming from various business units. The sessions were aimed at reaching an agreement in terms of priority needed for the functionality, verify requirements, reach agreement and resolve raised issues.
- Within JAD (joint application development) sessions, each business unit provided their set of business rules which were communicated to all other stakeholders.
- Group discussions were conducted on a weekly basis to discuss about the requirements and business rules. All the stakeholders included end users, business operation managers, legal teams and all other project team members.

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- All the Jira system users within the various business units atleast had one or two experts within their business area. Some team members fully understood the operational activities for their business units and others were in strategic positions to drive the business unit to the greater heights.
- All the project team members that are utilizing Jira to log, track project and review archived documents were satisfied with the system delivery.
- There was no rework done, enhancements were made based on new functionality that needed to be added.

The agile project management process was followed on working on Project AAA and Project XXX, both projects were implemented successfully due to project team that fully understood the application of agile tools.

4.2.4 Background of the Project XXX using agile project management process

Within the implementation of Project XXX business units had the same need for the new system however due to business needs that continuously changed; the proposed system had to be customized as per each business unit to suit their needs.

The following point covered the summary of the project method used to implement the system following the agile project engineering methodology.

- A business case was approved and the project initiation and requirements approaches were defined.
- A business analyst had to gather and document the business requirements from the product owner and interviewed the subject matter experts from each business unit to understand the business activities.
- Each business unit had its own terminology which contradicted with the standard terminology that is used across the enterprise.
- An As-Is analysis was conducted to fully understand how each business unit currently operates.
- The existing business processes and procedures were documented to understand the weaknesses within the current system. This was done across all the impacted business units.
- The detailed business and functional requirements specifications were sent out to all the stakeholders for sign off.

- One of the other business units had different requirements, and then the implementation of the system had to be customized according to each business unit's needs and wants.
- Two different project management methodologies had to be applied to ensure that the project team delivered products and services according to the business requirements.
- Conflict and internal company politics between the stakeholders was the biggest challenge and it resulted into delays in terms of delivering the project within the planned time.
- The business unit A strongly believed in waterfall methodology to deliver the requirements while business unit B, had continuous changing business requirements. The timelines were limited and the business unit needed final product and services on time. This resulted into project team applying agile engineering mythologies to cater for the user and business needs.
- Even though there were issues about the project methodology to be applied and used, conflict around the requirements and internal politics, the project team implemented the required system successfully and the end users of the system were satisfied.

There were lot of iteration done and subject matter experts, business analysts, project owners and all other stakeholder were involved to kick off the project and through implementation.

4.3   Collection of Research Data

The research data was collected from various sources and methods that included the project observations, participation, document reviews and also in the form of questionnaires. The process that was followed to collect data is explained below.

4.3.1   Documentation Reviews

The documents that were prepared for the two projects were reviewed by all the stakeholders. The system development life cycle regarding IEEE Computer Society (2004) and SWEBOK were adapted. The below artifacts were collected.

- A detailed business case was documented and approved with financial after an opportunity identified to build new systems.
- The study detailed data quality with challenges that business units experienced.

- The research contained the problem statement, background and proposed implementation plans.
- The business analysts put together the high level user and business requirements for the system to be implemented.
- Functional and System requirement specifications were documented indicating how the new system would behave and function.
- The As-Is business processes and procedures were documented to be determined the To-Be.
- Business process operations activities were documented.
- Necessary work request and change request were conducted to cater for additional business requirements within the system development.
- The pre and post implementation project documents were cautiously reviewed and lessons learned were also documented.

The hard copy documents such as e-mails, release communications, meeting minutes and presentations were used to track all the updates and decisions that were made.

4.3.2 Observation and Participation within the Project

The research study was conducted within the firm whereby the researcher is currently employed by the business organization. He is the member of the digital support services area. During the two year period of the study between years 2014 to 2015, the researcher role within the organization is shown below:

Table 4: Overview role of the researcher on Project AAA

Role of the researcher	Description	Project AAA
• **Observation:** Solutions Architect	• Identity the impacted areas and systems	• **Year:** February 2014 – August 2014
• **Participation within the Project :** Business Analyst	• Elicit, validate and document the user and business requirements. • Set up JAD sessions to discuss the possible solutions. • Document As-Is and To-	• **Year:** September 2014 – November 2014

	• Be process flows.	
	• Complete the business requirement specification and functional requirement specification.	
	• Send out documents for sign off.	
	• Make changes required on the document and send it out for sign off.	
	• Create test case pack.	
	• Assist with testing the entire positive and negative scenario.	
• **Participation within the Project:** Project Manager	• Manages the project from the initiation to software project implementation. • Keep project team updated about the project status.	• **Year:** September 2014 – November 2015

Table 5: Overview role of the researcher on Project XXX

Role of the researcher	Description	Project AAA
• **Observation:** Solutions Architect	• Identity the impacted areas, channels and systems	• **Year:** March 2014 – May 2014
• **Participation within the Project :** Business Analyst	• Elicit, validate and document the user and business requirements. • Set up JAD sessions to discuss the possible solutions.	• **Year:** June 2014 – November 2014

	• Document As-Is and To-Be process flows.	
	• Complete the business requirement specification and functional requirement specification.	
	• Send out documents for sign off.	
	• Make changes required on the document and send it out for sign off.	
	• Create test case pack.	
	• Assist with testing the entire positive and negative scenario.	
• **Participation within the Project:** Project Manager	• Manages the project from the initiation to software project implementation.	• **Year:** March 2014 – November 2015
	• Keep project team updated about the project status.	

The researcher played two roles such as observation and being involved within the software development life cycle of the abovementioned projects.

4.3.3 Research Questionnaires

The research questionnaires were sent out to ensure that the researcher was not bias as he participated and observed within the software development life cycle using the agile project management methodology. Questionnaires are shown in Appendix A, the researcher participated as a member of the project team that was tasked to build Jira systems and other software within the business organization.

For Project AAA, twenty four members of the project team participated however twenty two of them provided the response. The participants included the project managers, developers, business analysts, system analysts, test analyst, product developments managers, solutions architectures, technical leads, heads of project management office, programme managers and chief information officer. Within Project XXX, there were twenty members of the project team participated while eighteen of them provided the response. The overview of the participant is shown on the below table.

Table 6: Participants Overview for Both Projects

	Project AAA	Project XXX
Roles of Participants	**Participant's number**	**Participant's number**
Project Managers	2	1
Developers	3	3
Business Analysts	2	2
Systems Analysts	2	1
Test Analysts	3	2
Product Development Managers	2	1
Solutions Architectures	2	2
Technical Leads	2	2
Heads of Project Management Office	1	1
Programme Managers	2	2
Chief Information Officers	1	1

The aspects of challenges and benefits of using agile project engineering management within the software development life cycle which was carried out using questionnaires are more explained below.

4.3.4 Investigation through Questionnaires

The survey of using questionnaires was carried out during 2016 to verify the researcher's findings within the project participation, observation and project document reviews. The details of the research questions are described and shown in Appendix A. The description of questions in the research questionnaires are explained on the following sub-section.

4.3.4.1 Feedback on each individual role within the Project

The approach which was applied to gather research data was through involving participants to answer questions and also get general feedback about the roles of the participants and the number of years they have with the organization. This approach was based on the understanding the business environment before the project was carried out and implemented. This enabled that researcher with an understanding as to what knowledge the participants had with regards to application of agile tools and methods within the software development life cycle. Lastly, the researcher needed to find out if the implementation of Jira and other new systems had positive impact on individual performances to deliver quality of work.

4.3.4.2 Agile Techniques applied during implementation

During the implementation of agile, gathering of the requirements started with scrum type of meetings. The business and users were involved to show the digital service support team activities being conducted on the system. Then the support team mapped the As-Is processes and systems to determine the proposed To-Be processes and how the system would function. The existing challenges were addressed by the business to the digital consultants (Michael, 2014).

The project documents such as business requirements and functional requirement specifications were created even though they were less formal, the agile team would use the Jira system to capture user stories. Then the next step would be the developers configuring the system to resolve the issues on the user stories. This approach was more effective and fast which would be completed within two weeks. All the updates would be tested and any problems raised would be resolved immediately (Jamison, 2016).

Participants were asked about their familiarity with agile project engineering management methodology throughout project system development life cycle. Then the following questions were based on each participant's roles and contribution in project implementation.

4.3.4.3 Quality and Proper Knowledge of using Agile

To verify the quality of the researcher's view that agile methods process delivered the benefits of using agile project engineering management and also the challenges associated

with agile. The participants were requested to state and comment if challenges and benefits of using agile were realized in the implementation of the systems.

4.3.4.4 Satisfaction of the Customer

To satisfy the customer and business users, the project had to be delivered on time and ensured that the new systems and processes build were effective in assisting the business user with their day to day activities. If the system couldn't function according to the business users, then it would be regarded as useless and unsuccessful. The participants were required to answer questions about factors contributed to the project success. The researcher tried to display the relationship between proper use of agile project engineering management methodology to deliver software and project deliverables on time and satisfying the customer needs. If the system is not successful, then the business users would not use the system and that would mean that the system was built unsuccessful.

4.3.4.5 Analysis of Research Data

The questionnaires that were completed were then loaded on the eSurvey-Creator to analyze. This software helps the researcher to effectively manage the data analysis. It has a capability to assist with coding and put together a chunk amount of text however does not usually generate codes (Crawford and Richardson, 2007). It assists the researcher to categories data more effectively and faster unlike having to do it manually (Crossan, 2005).

This results into qualitative coding whereby the collected data during the process of research is put in themes which normally relates to one another. This helps the researcher to be able to search for patterns within data more easily (Cunha and Kamoche, 1999),

The data was put together to reach evidence for the proposition of the study. The main questions within the questionnaires catered for the agile project engineering management process.

The segments of the collected data were measured for the coding and this was identified through the research questions. The following points are proving more clarity.

- To be able to analyze the research data to reach to the evidence to the proposition of the study, the following sub-point needs to be taken into consideration.
  - Impact of the knowledge of agile project engineering management methodology.

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- The best way to analyze data to reach to the data evidence to provide answers to research questions which reads as follows: What are the benefits and challenges of using agile project management? How does agile project tools and methodology contribute towards the project success?

  - Factors contribute to project success using agile project management.
  - Factors contribute to project failure using agile project management.
  - Challenges and benefits of using agile project engineering management methodologies.
  - Factors contributing to satisfaction of the business users.

The collected data should be categorised into small parts of data after all data was coded into various segments available. The data coded was categorised as the following:

- Factors contributing to project success; factors contributing to project failure; knowledge of agile methodologies; satisfaction of business users; system failures and rework.

To produce the quality and trustworthy research, strategies of the verifications should be executed. This assisted to show that quality and appropriate application is done for each strategy within the study. This is explained in the below section.

4.5   Validity

The methods of the research case studies were applied to further increase the knowledge and understanding of issues raised. To argue that the quality results were obtained and to ensure that internal validity, external validity, construct validity and research reliability (Author). All of the four tests were applied as indicated in table 3. The following section will provide more details about how these four tests were applied.

4.5.1   Validity Construct

This validity often refers to operational measures which created for the themes which were studies. This was made to establish if the researcher chose accurately what to measure with regards to what the research study aims to measure to produce the accurate results (Cervone, 2014).

Validity of Intentional – the question was raised to understand if the chosen construct would represent what the research study intended to achieve? This study aimed at factors contributing to project success using the agile methodology within the project management space and also the incorrect use of agile methods and tools which may result into failure to implement a successful software system. The literature review was used to guide the researcher to conduct the case study which will assist to produce valuable input.

Validity of Representation – this mainly focused on how representation validity and construct translated into measures which were observable? Various forms of sources to extract data were used to ensure that basis of the research were covered to determined and produce strong evidence. Participants which agreed to participate ensured that responses were completed electronically without any interpretation done by the researcher. The database of the research study had all the required and necessary references to ensure that evidence of the origin was well kept.

4.5.2 Validity of Internal

The matching patterns were applied on specific techniques of analytical that may be compared to an empirical pattern that can be predictable.

4.5.3 Validity of External

The strategy used for data analysis by the researcher was based on proposition of theory and the literature review was conducted to pay more attention on case study research. This was done to verify if the research findings may be tested into various cases.

4.5.4 Research Study Reliability

To ensure that the research and finding are reliable, a rigid logical approach was applied, to add more, during the data collection, a systematic and very structured database was made. This whole approach assisted to build a strong evidence for audit point of view in case the finding may be traced back to its origin.

4.6 Conclusions

To investigate the challenges and benefits of using agile project engineering management methodology, there were two case studies selected to reach the in-depth of understanding

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regarding the factors and process followed to deliver project goals using agile tools and methods. The collected evidence was conducted logical, systematically and analyzed in a form of logical and systematic approach to reach a concreate design of the research.

This enabled the case study to be utilized as one of the tools to broaden the understanding of the researcher with regards to the challenges and benefits of using agile project engineering management towards project success and failures. The knowledge acquired assisted the researcher to gain more knowledge and understanding of factors contributing to project success and failures when using agile project methodology.

The chapter 5 of this study has the findings obtained from each research case study and cross case examination to find out if the vague finding can be made.

CHAPTER 5: RESULTS OF THE RESEARCH

The identified data patterns for each case study within their analysis are discussed in details in this chapter. To point out the actual text and themes adapted from data which was put into categories which are similar with one another. After the research data has been put together into small families and to their categories, themes were made.

5.1   Data Results for Project AAA

There completed questionnaires by the participants for Project AAA produced about four themes that adapted from the retrieved data.

Table 7: Themes of Project AAA

Theme	Theme Description
Theme A	The knowledge of applying the agile methodology and tools.
Theme B	Factors contributing to proper use of agile methods and tools.
Theme C	Factors that contribute to project success
Theme D	The business user satisfaction

These themes are discussed in more details in below sections.

5.1.1   Project AAA Theme A: Knowledge of the applying agile methodology and tool

The literature of this study pointed out a number of challenges and benefits of using agile project engineering management to deliver project goals and deliverables on time at the best quality. The main challenge was the improper knowledge of applying agile methods and tools.

A total number of almost 91% agreed with what has been detailed in the literature. This shows a positive sign that good knowledge of applying agile methods and tools may assist the team to deliver best quality of work. A participant's distribution percentage is clearly shown on table 8, of this study. Twenty two participants stated that this exercise was critical and they playing the important roles to ensure that project were delivered on time.
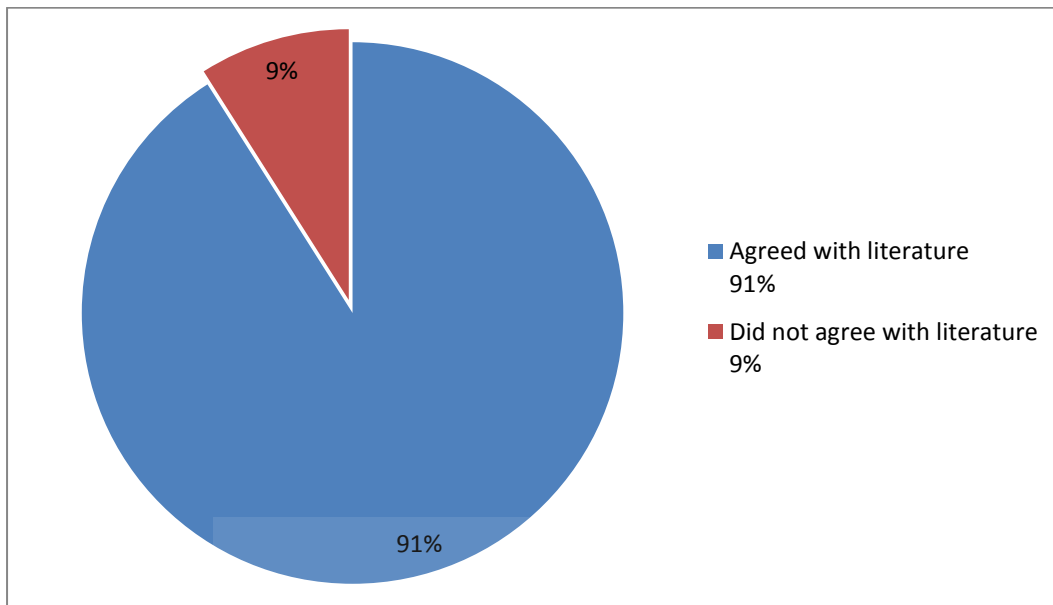
Figure 12: Project AAA, Percentages of participants support the use of agile

The members of Project AAA fully agreed with the finding found on the literature that good knowledge of applying agile methods and tools have good impact in delivering the project. This suggests that if limited knowledge of agile tools and methods is applied, the business solutions will not be complete. The solution team should acquire more knowledge to deliver quality requirements using the agile methodologies to build a system / application that will work as required by the business.

5.1.2 Project AAA Theme B: Factors contributing to proper use of agile methods and tools.

There are various practices of agile, scrum method is the mostly used to share the important patterns as stated below:

- Hire a Product Owner which will be committed to the success of the product and be in a position to dedicate his or her time for the development of it, this consists of defining the overall vision of the product, features and prepares the requirements.
- Then a development team is then assembled by the scrum master to manage members of the team with the focus of driving the process so smooth.
- The process of development normally split into incremental iterations which are sprints of 2- 3 weeks, they mainly focus on delivering a product in small portions.

- Based on the delivering product in small portion, the business users can look and feel like and be in a position to provide feedback to technology team to initiate changes where applicable.
- The development team, stakeholders and product owner makes use of sprint planning when they conduct meetings to discuss issues and results for previous sprints to create a new sprint backlog. This also assists when updating a product backlog.
- The daily scrum meetings are conducted to rationalize the collaboration of the team members through effectively discussing the previous deliverables and what needs to be done going forward.

5.1.3 Project AAA Theme C: Factors that contribute to project success

- Make techniques and tools available to support practices and adoption approaches of agile to project members.
- Dedicated project team members and business subject matter experts to assist with application and successful adoption approaches of agile.
- The executive member's support to ensure that there is increase in project success through agile methods.
- Agile project team members' performances are measured through triangle constraints such as Time, Scope and Budget. This is by means of creation of value adds.
- In most cases, small teams adapt and succeed well within the settings of agile as long as there is a dedication one project per team (Jeffries, 2004).

Jeffries (2004) believed that if the there is a commitment and dedication amount the development team and business experts, and then it would be easy to adopt agile approaches to deliver a successful project.

Lastly, the factors that contribute to poor project delivery

- If there is limited knowledge of using agile methods and tools, delivering good product cannot occur.
- If there is limited sharing of information and iteration between project development team and business users.

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5.1.4 Project AAA Theme D: The business user satisfaction

The business users were satisfied with the overall implementation however the other business users from other units were not hundred percent satisfied. This is due to the fact those business units did not trust the new system and some of the re-works that needed to be done for customized system.

- **Business unit A** – was satisfied even though the implementation took some time. In overall the business users were happy with the new delivered system. The delay was caused due to business stakeholder from business unit B, changing requirement in the middle of the project. This resulted into splitting the business requirements to cater to each business unit's needs.
- After the project was resumed, the digital support service team and business unit A, agreed to apply agile project management tools and methods to cater for their specific needs and requirements.
- The project team has lots of meetings to ensure that all the stakeholders were in agreement and happy with approach to be taken. This approach resulted into positive outcomes and business user satisfaction. The following item highlights highs of the project.

Table 9: Elements of the business user's satisfaction through project success

Elements	Business User's satisfaction through project success
Business Unit	- Proper support from business unit's executive. - The Project sponsors were committed. - Agile project management approaches were accepted. - Face to face meetings are regarded as the organizational culture.
Team Members	- The project team members were greatly motivated. - Digital support service team with high agile expertise and competence. - Self-organizing project team.
Processes	- Allow customer to have full authority. - Proper and good commitment of the customer and presence. - Daily face to face communications. - Apply agile project management approaches. - Agile oriented project management tools and methods.

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Technical	• Up front proper defined standards of coding.
	• Following easy design.
	• Produce sufficient documents.
	• More often deliver critical features of software first.
	• Proper testing integration.
Agile Project	• Few resources within the project.
	• Independent teams
	• Up front project cost evaluation.
	• Up front risk analysis done.
	• Flexible project team.

• **Business unit B** – due to some of the re-works done to cater for each business unit needs and it was not so impressed and satisfied. There was no team work and support from Business unit B, this made things difficult for Digital Support Service teams to deliver the best project at a targeted timelines. These issues were the results of the following items:

Table 10: Elements of the business user's frustration through project

Elements	Business unit B's frustration through project
Business Unit	• Poor business unit's executive commitment.
	• Business unit's culture supports waterfall methodology.
	• Business units being too political.
Team Members	• Poor necessary agile skill set.
	• Poor team work and support from the business unit.
	• Poor customer relationship.
Processes	• Poor customer presence.
	• Poor agile support to track mechanism.
Technical	• Poor practices of agile.

In overall even though there were issue beyond the digital support service –project team, both project were successfully implemented with a good system that works best.

5.1.6 Summary Data Findings: Project AAA

The success factors of the project are depended on the proper application and use of agile project management tools and methods. The challenges and benefits of using agile project engineering management are identified in the main literature. The implementation was successfully been done through the use of agile methods and tools. All the impacted stakeholders were involved from the project initiation through to implementation. The findings are in line with the literature review.

The first finding was if the project team does not have good knowledge and application of agile methods and tools, project deliverables are delayed and end up producing poor quality of systems and inefficient processes.

The second finding was that if there is a lack of support and proper communication between project team and business users, challenges are faced when certain business unit initially provided specific requirements to the project team and throughout the project, they suddenly changed their requirement and needed to apply waterfall project methodology to implement their requirements. This is a resulted from poor communication and departmental politics.

The third finding for Project AAA was that the business users were involved from the project initiation to implementation. There was a proper communication between the project development team and the business users, this made things easy to build proper system which was a user friendly and at the same time does what the user required for the system to do.

Applying the proper agile knowledge, tools and methods were the contributing factor to deliver the good project and ensure that business users were satisfied. The strong working relationship between project development team and business users enabled knowledge sharing, mutual understanding, business users satisfaction got so high when there was more interaction which took place during the implementation of the software project. If there was poor communication and less interaction, the business users were not going to be satisfied.

5.2   Data Results for Project XXX

The completed questionnaires by the participants and collected data produced four themes for Project XXX. These identified themes are shown below at table 11.

Table 11: Themes of Project XXX

Theme	Theme Description
Theme A	The knowledge of applying the agile methodology and tools.
Theme B	Factors contributing to proper use of agile methods and tools.
Theme C	Factors that contribute to project success
Theme D	The business user satisfaction

These themes are discussed in more details in below sections.

5.2.1   Project XXX Theme A: Knowledge of the applying agile methodology and tool

The project team applied the agile methodology to implement the project. The study literature detailed out various number of challenges and benefits of using agile project engineering management to deliver project goals and deliverables on time at the best quality to satisfy the customer which are the various business units within the organization. The first challenge that was faced by the project development team was the lack of support from some business units, these business units prepared waterfall methodology.

The project team had various meeting with all the impacted areas to address issues within waterfall methodology. They educated the business units that if they want the project team to apply waterfall, then business units would not have an option to change requirement along the project because it is not flexible to accommodate the continuous changing business requirements. Finally business units agreed with the project development to use agile to cater for their requirements.

A total number of almost 90% responded and agreed with what has been detailed in the literature. This shows a positive sign that good knowledge of applying agile methods and tools may assist the team to deliver best quality of work. A participant's distribution percentage is clearly shown on table 12, of this study. Twenty participants stated that this

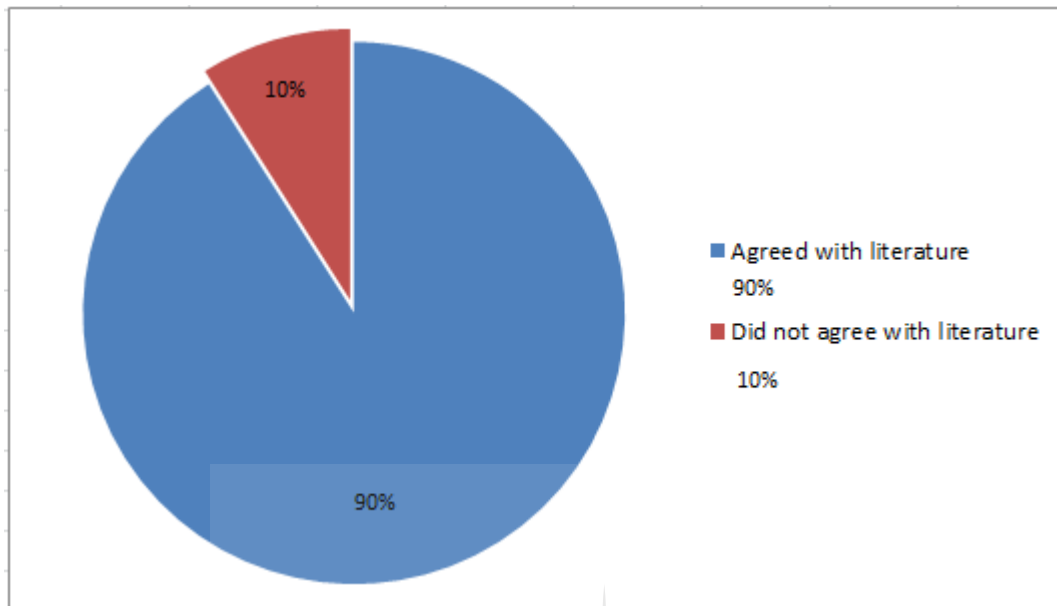exercise was critical and they playing the important roles to ensure that project were delivered on time.

Figure 13: Project XXX, Percentages of participants support the use of agile

The members of Project XXX fully agreed with the finding found on the literature that good knowledge of applying agile methods and tools have good impact in delivering the project. This suggests that if limited knowledge of agile tools and methods is applied, the business solutions will not be complete. The solution team should acquire more knowledge to deliver quality requirements using the agile methodologies to build a system / application that will work as required by the business.

5.2.2 Project XXX Theme B: Factors contributing to proper use of agile methods and tools.

Out of many practices of agile, the project team mostly used scrum method during the project development and also shares the important patterns as stated below:

- Hire a Product Owner which will be committed to the success of the product and be in a position to dedicate his or her time for the development of it, this consists of defining the overall vision of the product, features and prepares the requirements.
- Then a development team is then assembled by the scrum master to manage members of the team with the focus of driving the process so smooth.
- The process of development normally split into incremental iterations which are sprints of 2- 3 weeks, they mainly focus on delivering a product in small portions.

- Based on the delivering product in small portion, the business users can look and feel like and be in a position to provide feedback to technology team to initiate changes where applicable.
- The development team, stakeholders and product owner makes use of sprint planning when they conduct meetings to discuss issues and results for previous sprints to create a new sprint backlog. This also assists when updating a product backlog.
- The daily scrum meetings are conducted to rationalize the collaboration of the team members through effectively discussing the previous deliverables and what needs to be done going forward.

5.2.3 Project XXX Theme C: Factors that contribute to project success

- Agile project team members' performances are measured through triangle constraints such as Time, Scope and Budget. This is by means of creation of value add.
- The executive member's support to ensure that there is increase in project success through agile methods.
- Make techniques and tools available to support practices and adoption approaches of agile to project members.
- Dedicated project team members and business subject matter experts to assist with application and successful adoption approaches of agile.
- In most cases, small teams adapt and succeed well within the settings of agile as long as there is a dedication one project per team (Jeffries, 2004).

Jeffries (2004) believed that if the there is a commitment and dedication amount the development team and business experts, and then it would be easy to adopt agile approaches to deliver a successful project.

Lastly, the factors that contribute to poor project delivery

- If there is limited knowledge of using agile methods and tools, delivering good product cannot occur.
- If there is limited sharing of information and iteration between project development team and business users.

5.2.4 Project XXX Theme D: The business user satisfaction

The business users were satisfied with the overall implementation however the other business users from other units were not hundred percent satisfied. This is due to the fact those business units did not trust the new system and some of the re-works that needed to be done for customized system.

- **Business unit C** – was satisfied with the implementation. Business users were happy with the new delivered system.
- Digital support service team and business unit D, agreed to apply agile project management tools and methods to cater for their specific needs and requirements.
- The project team had held many meetings to ensure that all the stakeholders were in agreement and happy with approach to be taken. This approach resulted into positive outcomes and business user satisfaction. The following item highlights highs of the project.

Table 13: Elements of the business user's satisfaction through project success

Elements	Business User's satisfaction through project success
Business Unit	• Agile project management approaches were accepted. • Face to face meetings are regarded as the organizational culture. • The Project sponsors were committed. • Proper support from business unit's executive
Team Members	• Self-organizing project team. • The project team members were greatly motivated. • Digital support service team with high agile expertise and competence.
Processes	• Apply agile project management approaches. • Proper and good commitment of the customer and presence • Allow customer to have full authority. • Daily face to face communications. • Agile oriented project management tools and methods.
Technical	• Produce sufficient documents.

	• More often deliver critical features of software first
	• Up front proper defined standards of coding.
	• Following easy design.
	• Proper testing integration.
Agile Project	• Up front project cost evaluation.
	• Up front risk analysis done.
	• Independent teams
	• Flexible project team.
	• Few resources within the project.

- **Business unit D** – due to some of the re-works done to cater for each business unit needs and it so impressed and satisfied. There was strong team work and support from Business unit C, this made things easy for Digital Support Service teams to deliver the best project at a targeted timelines. These were minor issues as shown below:

Table 14: Elements of the business user's frustration through project

Elements	Business unit B's frustration through project
Business Unit	• Business unit's culture supports waterfall methodology.
Team Members	• Poor necessary agile skill set.
Processes	• Poor agile support to track mechanism.
Technical	• Poor practices of agile.

Digital support service project team implemented both project successfully and ensured that the built systems were working well.

5.2.6 Summary Data Findings: Project XXX

The challenges and benefits of using agile project engineering management are identified in the main literature. The implementation was successfully been done through the use of agile methods and tools. All the impacted stakeholders were involved from the project initiation through to implementation. The findings are in line with the literature review. The success factors of the project are depended on the proper application and use of agile project management tools and methods.

The first finding was a lack of support and proper communication between project team and business users, challenges are faced when certain business unit initially provided specific requirements to the project team and throughout the project, they suddenly changed their requirement and needed to apply waterfall project methodology to implement their requirements. This is a resulted from poor communication and departmental politics.

The second was that if the project team did not have good knowledge and application of agile methods and tools, project deliverables would be delayed and end up producing poor quality of systems and inefficient processes.

The third finding for Project XXX was that the business users were involved from the project initiation to implementation. There was a proper communication between the project development team and the business users, this made things easy to build proper system which was a user friendly and at the same time does what the user required for the system to do.

The strong working relationship between project development team and business users enabled knowledge sharing, mutual understanding, business users satisfaction got so high when there was more interaction which took place during the implementation of the software project. Applying the proper agile knowledge, tools and methods were the contributing factor to deliver the good project and ensure that business users were satisfied. If there was poor communication and less interaction, the business users were not going to be satisfied.

5.3   Case Study Analysis for both Projects

The collected research data for both Project AAA and XXX are compared to find out and identify any differences and similar patterns on the cross case. The below table 15 summarizes the data gathered from each case study regarding the cross case patterns.

Table 15: Summary of the Cross Case Study

Elements	Project AAA	Project XXX
Good Knowledge of agile project engineering.	• A dedicated project team was assembled to build the required system.	• A well-organized team was established to develop and implement a

		Jira system.
	• There was strong relationship between all the involved project stakeholders. • Within the project implementation, the business users were involved to expose them to agile.	• The project team built a good relationship with the business users. • The daily communications and iteration were done within the project development to implementation.
Poor Agile project engineering management.	• The business units were more familiar with waterfall methodology.	• The business units were more familiar with waterfall methodology.
Customer Satisfaction	• The business users were involved from the project initiation through to implementation. • The Jira system which is built for various business units was implemented successfully.	• The business users were involved from the project initiation through to implementation. • The Jira system which is built for various business units was implemented successfully even though some business unit needed come functionality to be more customized to suite the individual business units.
Customer Dissatisfaction	• The project did not stay according to planned time-lines due to some of the business units that had to add new requirement in the middle of the project.	• The project took a bit longer than expected due to some business units which continuously added new requirement in the middle of the project.

The first identified pattern was the good knowledge of applying the correct agile methods and tools within the project development. A well organized and committed project implementation team had numerous iterations with business users to deliver the project.

The second identified patterns were the factors contributing to project success which included the quality business requirements. Then the project team had a well -established agile project management process in place to cater for each business unit's individual business requirements. If there was poor communication and less iteration, the development team was not going to deliver quality projects and products.

The third pattern identified was the poor agile project management due to limited and less iteration. The business unit B on Project AAA preferred the traditional waterfall project methodology. Project XXX teams were happy use agile project engineering tools and methods to cater for any continuous business requirements.

The final pattern identified was the satisfaction of the customer and business users through getting them involved with the project from the initiation to implementation. The constant iterations and communication which took place through-out the life cycle of the project.

5.4   Conclusions

The identified patterns were analyzed and presented as cross case study to determine the findings. The proposition of the case study was then confirmed that "if the project team has good knowledge of applying the correct agile project methodology, tools and techniques, then quality projects are delivered." The research findings gathered from both case studies proved that iterations, good communication and applying the correct agile tools, methods and techniques contribute positive towards delivering a successful projects and satisfaction of the customer. To ensure that there was a proper implementation, the project team built a strong relationship with the business users.

The chapter 6 of the research study focuses on research's contribution.

CHAPTER 6: RESEARCH CONCLUSIONS

The research conclusion allows the researcher to review and determine if study objectives were obtained. This includes the discussions about the study findings, conclusions and recommendations.

6.1 INTRODUCTIONS

The main focus of the study was to identify challenges and benefits of using agile project engineering management during the software project development and implementation. The study was conducted to understand the impact of applying the good knowledge, right agile tools and methods on project failure or success. The research study also determined the relationship between agile project team's knowledge and applying the right tools and methods to identify challenges and benefits of using project engineering management. The results of the study identified the factors that contribute to success of the project to deliver the quality product and services. This study needed to confirm the relationship between applying the good agile knowledge to identify the challenges and benefits of agile methodology. This confirmed that if the agile team was clueless about applying the right agile tools and methods, then the project team would implement an unsuccessful project and product.

6.2 FINDINGS

The obtained results of the research prove that if agile teams apply the good knowledge, agile tools, and methods to build strong relationships with the business users, then the development team would implement a successful project and deliver the project goals and deliverables on time. The below figure 12,
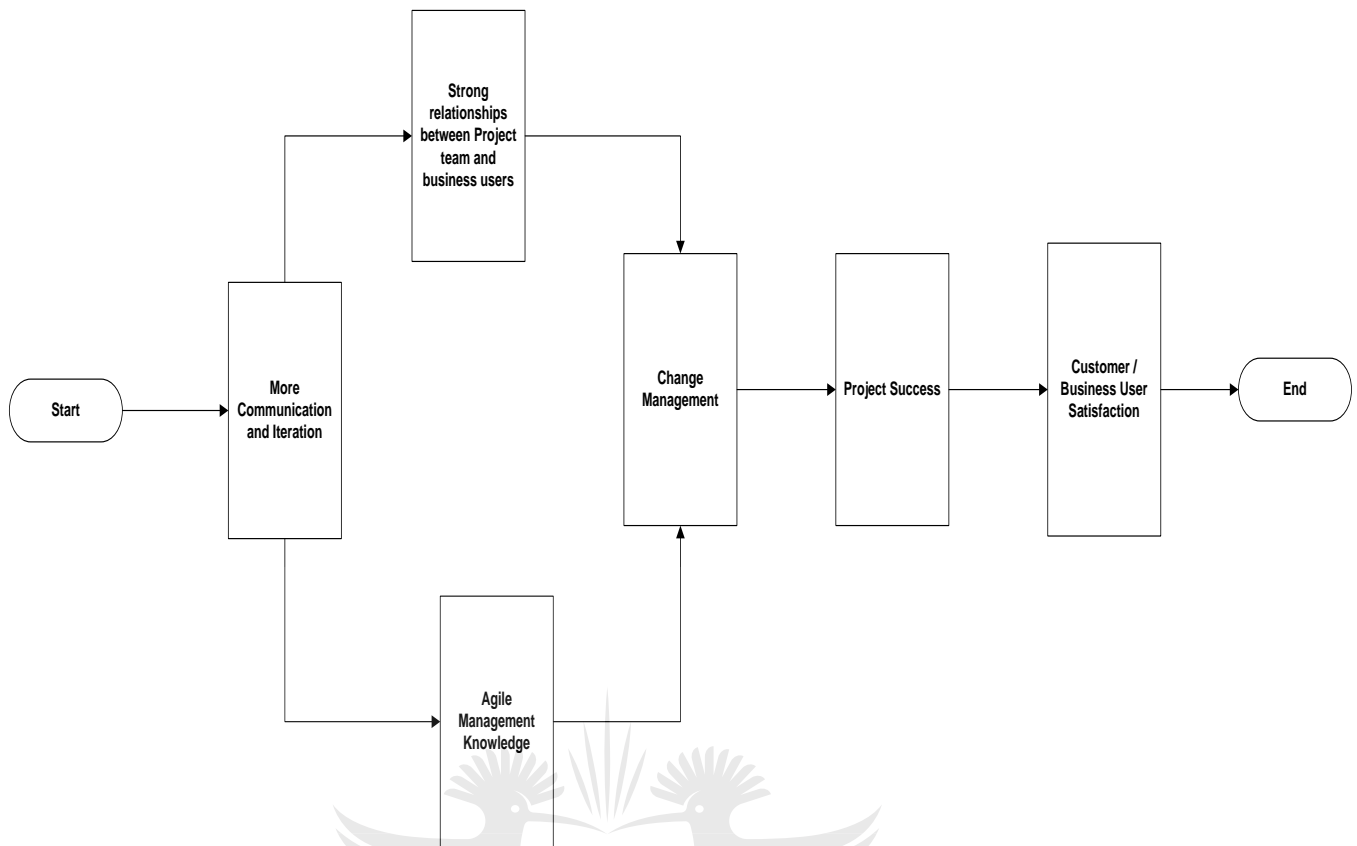
Figure 12: Influence of more iteration and communication towards project success

It is essential for the project development team to build proper and strong relationships with the business users. The knowledge sharing is mostly transferable if there is a good relationship between the business users and project development team. Without the shared and transferable knowledge of agile, the project would fail (Cervone, 2014).

The challenges and benefits of using agile project engineering management emerge from either poor communication and less iteration or vice versa between the project team and the business users (Cockburn, 2001). To ensure that the project team produces the quality of projects and products, the scrum master should assemble an agile project team that has healthy agile knowledge. This knowledge assists the team to apply the correct agile tools and methods when working in a software development project. More open and regular communication requires the project team and business users to have continuous and more iteration (Michael, 2014).

The knowledge of agile project management contributes more to the development of the project. This requires the project team members to trust each other and also involve the customers which are the business user for the system. When this is created, more

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communications and regular iteration should take place which will help to understand the business environment and the existing issues. If the project team gets this right, then there would be chances of sharing the agile knowledge so that the project implementation team can manage to identify all the possible issues and their potential influences (Crawford and Richardson, 2007).

The project development team is responsible to initiate and manage communication, if this is not done regularly, the project may result into failure. The poor agile project engineering management can put the project deliverables at risk and producing an unsuccessful software implementation. The following section suggests the approaches and recommendation that could be investigated to assist in terms of communication facilitation.

6.3   LIMITATIONS AND RECOMMENDATION

The agile knowledge sharing and regular communications can be learned and be adopted to form part of the business organizational culture. The agile tools and methods exist for managing and implementing agile projects. A project team that does not know how to share agile knowledge through communication and iteration drives the project team to implement an unsuccessful software development and implementation (Cooke-Davies, 2002).

The dynamic nature of agile project engineering management process, the approach to apply system thinking is required to understand what to communicate and when to conduct iteration sessions to accommodate the business requirements (Cervone, 2014).

The targeted project deliverables are to satisfy the business users' needs, deliver the measurable results and lead a project team. The agility is focused on admission not everything is known at the beginning of the project. All the things that we might think we are aware of will need a revision as project progresses forward and things changes due to legislature, technology or within competitors. The methodology of agile is simple and teaches the teams that when processes are not always stable and project outcomes are not predictable in the sufficient acceptance (Fernandez, 2008).

Observations are the best tools and teams needs to adjust processes to guide to create desired project outcomes. If the project team is lucky enough, they may have group of good people and a very engaging product owner which supports a team with high degree of independence. Within the agile project management, there are always assumptions that there are lot of multi skilled, self-disciple and self-organized project teams and project

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managers. In reality human resources are just assigned to the project because they are available and maybe good resources are not available due to involvement to other complex projects (Highsmith, 2004).

The need to adopt the agile methodology tools in agile project system development is for the teams to become more iterative, mature and use collaborative methodology to split the general development process into fairly small parts or sprints. The banks have a growing number in terms of adopting the agile tool. For system development projects, it is believed that agile tool is an effective and efficient method to design robust system applications which are resilient to cyber-attacks. The good way to have a clear understanding of worldwide diffusion of development of agile is to conduct surveys development trainers, teams and consultants which may highlight the take-away (Cockburn, 2001).

Most of the business organizations are more and increasingly going towards management by the means of agile projects that are named project based business organizations. The agile project management capabilities are to enhance flexibility and encourage an organization to become more adaptive to business needs and major changes. Agile project engineering management is remained the sole mechanistic in natural world of organizations to have detailed planning, hierarchy and splitting of work and this is still playing an important role towards the delivery of project goals and unforeseen project constraints due to environmental and client changes (Vera and Cunha, 2005).

The practical implications associated with traditional project management will keep being used in large business organizations due to nature of some projects. This depends on the complexity and to the large project with requires the full waterfall and system development life cycle methodology. For quick fix project and small projects aimed at satisfying the business users' needs, agile is the right method to be used (Hatch, 1998).

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APPENDIX A: QUESTIONNAIRES

The below third data collection approach for questionnaire was used.

Project:

Participant's Name:

Completed date:

General Participant's Feedback within the Project	
1.0	• What is your role / job title?
1.1	• How long have you been working at your current business unit?
1.2	• How long have you been working within Agile Software development projects?
1.3	• What sector does your organization operate in?
1.4	• How many people are in your project team?
1.5	• How many people are involved with agile software development or Maintenance?

1.6	• What kinds of applications are developed by your project team?
	Section B
2.0	• What was the nature of project
2.1	• What was the project length from Initiation to implementation?
2.2	• How many resources that were involved?
2.3	• Which agile development tools and the methods were used on your project?

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