



An investigation of the best-practices for implementing an Ecommerce software engineering project comparing two common methodologies, viz. Agile and Traditional.

Presented by

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Prepared for

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A thesis submitted in fulfilment of the academic requirements for the degree.

Master of Science

in the Department of Computer Science, University of the Western Cape.

2020

Key words

Agile project management, Traditional software development, Waterfall, Scrum, Linear approach, Iterative, Agilists, Traditionalists, Agility, E-commerce, Software engineering

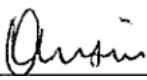
Abstract

In a world where technology is advancing at a very rapid pace, global competition has significantly increased, and this is putting pressure on software companies to produce quality software. It has therefore become critically important to manage well the implementation of software engineering projects by employing effective methods that ensure the best product is produced. The most popular software project implementation methodologies are the Traditional methods and Agile methods. This research explored these two methodologies by comparing the strength and weakness of both approaches. The research was conducted using a constructionist epistemology with a critical inquiry using the grounded theory methodology, applying both quantitative and qualitative methods to the case studies. Findings were collected through participant observation using a designed questionnaire targeting a selected sample of the study population. This sample of the population consisted of Ecommerce organizations in the Western Cape province of South Africa to establish which of the Traditional or Agile methods would best lead to the successful implementation of Ecommerce software engineering projects. The research results showed that the Agile methodology was the preferred and recommended approach. Very few participants of the research supported the Traditional approach to still be considered and used for projects with well-known end goals. An Ecommerce website prototype for a local Cape Town business was constructed as following the Agile approach to measure and validate the findings of the research. The prototype was built successfully from conception to the final delivery product and on time confirming the Agile approach as best for Ecommerce software development. In conclusion, the Agile methodology is the choice approach based on reviewed literature, the research results, and the prototype construction. These results will help in critical decision making regarding an appropriate development methodology to follow for the Ecommerce industry in the Western Cape.

Declaration

I declare that this thesis, *An investigation of the best-practices for implementing an Ecommerce software engineering project comparing two common methodologies, viz. Agile and Traditional*, is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full name...Octavia Chidiwa..... Date....28 May 2020.....

Signed..........

Acknowledgements

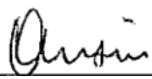
Firstly, I give praises and thanks to God, for His showers of blessings throughout my research from initiation to completion.

I would like to express my deep and sincere gratitude to my research Supervisor Dr. Michael Norman, and Co-Supervisor Professor Antoine Bagula for giving me the opportunity to work with him and providing invaluable guidance throughout. Dr Norman's enthusiasm, foresight, genuineness, and motivation have had a great impact and have been a true inspiration. It was a great pleasure and honor to work and study under his guidance.

I am very much thankful to my friend Trevor Mafu for his assistance with the analysis work for this research, I am grateful for his invaluable input. My special thanks go to Professor Renette Blignaut for her assistance and advice. To Dr Amos Barkai, I am forever indebted to him for his support and believing in my dreams.

I thank my family, my Granny, my brothers, and my little sis who have continuously been a source of motivation. Debra Chidiyiwa thanks for being such an encourager and my number one fan. Also, I am grateful to all my friends and sisters in Cape Town too many to mention by name, as well as my dear DIVAS for cheering me all the way and praying for me. Lauren Tsoka, Eleanor Ebobisse my prayer partners thank you! Jane Nshuti, Catherine Phiri thank you for believing in me. Roselyn Manduvi -Shenje my sister from another mother, my number one cheerleader thanks.

Finally, I am extremely grateful to my late parents for their love, prayers, care and sacrifices for seeing the value of education and having a successful future and I pay tribute to them by dedicating this achievement to honor their memory.

Mama I made it! 

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Chapter 1- Introduction

This chapter begins by giving context to the research, outlining the motivation and the idea behind the study to show why it is important to conduct this research work. It also gives some background literature which helped refine the topic and gives clarity to the research problem. The main aims of the research and questions which the study wishes to answer/investigate are also clearly stated. The chapter also gives an indication of the main assumptions of the study as well as how the research will be designed and structured and the steps to follow as well as the methods that will be used in the investigation. To conclude the chapter, a summary and outline of the full thesis will also be given showing the main topics and how the research will unfold.

1.1 Rationale/Background

In an era of rapid and regular technological change, several companies developing various Ecommerce software technologies have sprung up resulting in global competition. It is therefore imperative for companies to re-evaluate their processes to enable to keep up with the growth trends and limit potential backlog. Successful implementation of any given Ecommerce software development project is of vital importance because organisations lose time, resources, money and miss out on an opportunity in the market if they do not deliver quality products and on time (Stoica, Mircea, & Ghilic-Micu, 2013). It may seem obvious what needs to be done to get to the end goal, but it takes effort and discipline to be able to achieve desired deliverables hence most organisations introduce ways and methodologies that need to be adhered to with due diligence. It is consequently very important to choose the right method to implement software development projects to have successful outcomes. It will be advantageous for any organisation running an Ecommerce software development project to start by employing the right approach to tackle the project/s at hand. Once they establish the right approach that is suited to implement the project, success is largely guaranteed hence the

motivation for this research which aims to investigate this point. According to Salameh, since software project management largely has to satisfy the demands of scope, time, cost, risk and quality as determined by all stakeholders, it is important to apply the rightful methodology from project inception to completion to ensure successful delivery (Salameh, 2014).

Organisations face the need to adjust to a difficult business environment that is ever evolving thus making it of vital importance to adopt the rightful methodology to implement their software development projects in order to stay relevant and be successful in a competitive market (Stoica et al., 2013). In the last few years a lot of interest has been generated in trying to redefine the way software development projects are managed due to the new economic environment which is characterised by uncertain and ever-changing project situations (Fernandez & Fernandez, 2008). A study was conducted of more than 200 software development projects and the researchers could not find approximately half of the projects' original plans to use as baseline; this shows that organisations are risking failure when they do not use the right methodology to manage their projects (Highsmith & Cockburn, 2001). The dynamic nature of the Ecommerce software development industry requires continuous adaptation to better processes by organisations. According to (Nerur, Mahapatra, & Mangalaraj, 2005), Software development methodologies are continuously developing due to changing technologies and new demands from users. Today's dynamic business environment has given rise to up-and-coming organizations that are adapting their business strategies, and policies to suit the market changes. Such organizations need information systems that constantly evolve to meet their changing requirements. This research will look at comparing the project implementation methodologies that are employed for software projects within the Ecommerce industry in the Western Cape Province of South Africa. The reason why the research will concentrate on the Ecommerce organizations is mainly because Ecommerce in South Africa is growing and was estimated to have amounted to R10 billion according to

statistics released in 2017 by VISA (Fin24, 2018). *“The digital agenda is on top of the mind for many retailers and research showed customers want speed, simplicity and they want the process to be safe while shopping online”* (Fin24, 2018). More and more Ecommerce companies have been established to keep up with the retail trends. *“South Africa may currently attribute only a small portion of total retail sales in e-commerce, however the ever-increasing growth in Cape Town has dubbed the Mother City the Ecommerce hub of the country. According to the City of Cape Town’s Economic Performance Indicators (EPIC) Report for the third quarter of 2016, Cape Town has done exceptionally well in establishing itself as a seedbed for emerging Ecommerce companies, allowing it to become the tech and Ecommerce hub within the country”* (City of Cape Town Media, 2017). *“The appeal for companies to establish themselves in the Mother City is accredited to the extensive network of supporting companies and institutions, a strong supply of Information and Communication Technology (ICT) skills among the workforce and a better availability of start-up capital than in other countries”* (City of Cape Town Media, 2017).

1.2 Main aims of the research

This research serves to determine what is the best software engineering project implementation methodology or approach that can be used in the success of Ecommerce projects by comparing two of the established methods Agile and Traditional.

1.2.1 Main Objectives

This section explores the overall purpose of the study by addressing the objectives and questions to address the general intentions of the research to emphasize what the research expects to achieve. The research will seek to address the following: -

- To explore the Agile and Traditional methodologies for implementing Ecommerce software projects.

- To assess whether the Traditional approach is still applied in present day projects.
- To examine whether merging best practices from the two methodologies can bring better results than following one method and to determine if a combined approach is possible and desirable.
- Based on the literature and research that has been done, which methodology has more success stories or has been proven to be more successful. The research will seek to investigate what has been working for different Ecommerce organizations as they implement different software development methodologies.

1.2.2 Research Questions

Based on the research objectives mentioned above, the main research questions to be answered are as follows: -

- What is the choice approach for Implementing present day Ecommerce software development projects?
- Can the Traditional methodology still be applied to present day projects?
- What are the risks involved in choosing either of the approaches under investigation (Agile vs Traditional)?
- Can principles from the two methodologies be merged into one combined approach for better results?

1.3 Delimitation of study area and assumptions on which research rests

- The study population will be limited to Cape Town as this makes the research geographical area specific and focused. According to the City of Cape town media,

Cape Town has become the Ecommerce hub of South Africa (City of Cape Town Media, 2017).

- Ecommerce organizations to be approached (sample of the population) are only a sizeable number to be chosen from the greater study population. We can get a benchmark from previous studies such as the CHAOS Report of 2015 (Johnson, Crear, Lynch, Gesmer, & Poort, 2015).

- An online questionnaire will be used as data collection methods. Questionnaires provide a relatively cheap, quick, and efficient way of obtaining information from a large sample of people.

1.4 Research design / Research methodology

The research will be conducted using a constructionist epistemology with a critical inquiry using the grounded theory methodology and applying both quantitative and qualitative methods to the case studies. The main principles of constructionist epistemology state that constructors depend on observation (Ultanir, 2012). A careful observer structures the problem and how to comprehend it themselves, this is an active process in which they construct knowledge in the process of tackling the problem in question (Ultanir, 2012). A critical inquiry with the grounded theory uses systematic inductive methods, i.e. searching for a pattern from the observations and developing explanations or theories based on the outcome of the observations (Charmaz, 2003). This will provide a guideline for conducting qualitative and quantitative research while streamlining and integrating data collection and analysis (Charmaz, 2003). Both qualitative and quantitative case study approaches will be applied. Yin states that “*for case studies, five components of research design are especially important, 1.a study's questions, 2. Its propositions, if any, 3. Its unit(s) of analysis, 4. the logic linking the data to the propositions, and 5, the criteria for interpreting the*

findings”(Yin, 2006) . Yin also states that identifying the research questions is the most crucial step to be taken in a research study, so patience and ample time should be allowed for this undertaking (Yin, 2006). Research questions should have both substance and form, it is therefore important to ask the why, how, who, where and what questions to address the research problem (Yin, 2006). *“The case study as a research strategy comprises an all-inclusive method with the logic of design integrating specific approaches to data collection and to data analysis. In this sense, the case study is not either a data collection tactic or merely a design feature alone but a complete research strategy”* (Yin, 2006). A survey will be conducted using a structured questionnaire, a Google form to collect data which relates to the decision variables to be measured. The online questionnaire will be used to collect data from various Ecommerce organisations. A company called Lead Feeder specialising in generating business leads from the LinkedIn website, will be used to obtain company email addresses of the IT project managers, Scrum masters, Product owners, Team leads and Business analysts for various Ecommerce companies who are the target sample population. The captured data will then be analysed quantitatively and qualitatively to gain insights for the findings and conclusions.

1.5 Prototype construction

As a case study to validate the findings of the research, a prototype Ecommerce platform will be designed and the best practices as per research findings employed to show the practicality of the research findings. The main intention of this prototype is to demonstrate or prove that the findings of the research have merit. The Ecommerce platform prototype will be constructed and developed to solve a practical real-life problem. The problem will be clearly defined, and a solution implemented using a methodology (best -practices) obtained from the findings of the research.

1.6 Research Outline

The **first chapter** of this research outlined the background and motivation of the research. It has also outlined the main research aims and objectives and developed the foundation of the rest of the research. The chapter also briefly discussed the research framework i.e., the main assumptions.

The **second chapter** will be the **literature review** and will focus on the key points on which the research is built and will go deeper into the available literature to draw conclusions from other scholars' views on the same research topic exploring as per outline below: -

- Traditional methodology
- Agile Methodology
- Weakness and strengths of Agile approach
- Weaknesses and strengths of Traditional approach
- Similar studies and conclusion
- Summary of main points

The **third chapter, research design and implementation** are the heart of the research which will articulate the research hypotheses. The research tools and data collection processes will be clearly outlined. Measures that will be used to minimise errors as well as countercheck by constructing a prototype to measure the findings will also be included. Finally, the rationale behind the data analysis process, discussion of potential constraints and gaps in the data will conclude the chapter. Some of the subtopics to be discussed are as follows:

- Choosing population sample for study
- Research Hypotheses
- Data collection procedure

- Data Analysis
- Limitations and gaps
- Prototype construction

The **fourth chapter, results presentation** will look at the real sample and its attributes. A summary of the key results will also be given, and all the results will be summarised for both positives and negatives. The topics to be discussed in the chapter are listed below: -

- Sample characteristics
- Summary of main results
- Results Summary

The **fifth chapter, Prototype construction** will seek to measure the validity of the research results based on the outcome. The problem will be clearly defined, and a solution implemented using a methodology (best -practices) obtained from the findings of the research.

The **final chapter, chapter six, conclusion, and recommendations** will summarise and discuss important points and findings from the literature review. The bigger picture and relevance of the study will be highlighted, and we will propose potential further work. The possible implications of the study will be discussed too. List of topics to be discussed are below: -

- Summary of main points and findings
- Relevance of the study and future work
- Possible implications of the study

Chapter 2- Literature Review

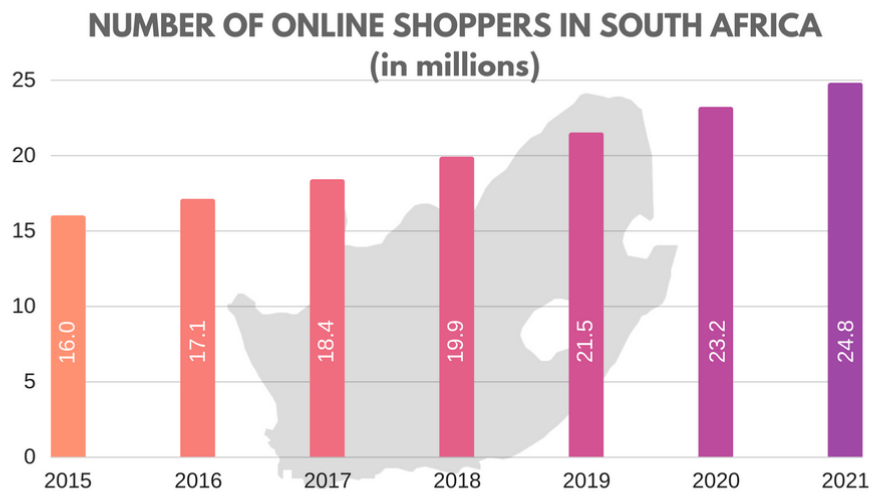
This Chapter delves into the key points of the study based on the available literature. The scope of the research will be informed by the literature review. This chapter will also demonstrate how the current study fits into the existing framework of research and how it fills a gap in the literature. Conclusions will be drawn from the literature and used as benchmarks for the research. Since every available literature cannot be reviewed, the selection of literature to review for this research will be based on the following guiding boundaries: -

- How current the article/source of literature is; it is important to know when it was published to focus more on the most recent and updated literature.
- Also, how often the article is cited by other scholars this gives a good indication of its relevance.
- Lastly, how well the article addresses the topic and is relevant to the study topic.

2.1 Ecommerce in South Africa

There are 18.43 million Ecommerce users currently in South Africa and forecasts predict exponential growth of these numbers 4 years forward to be 24.79 million generating significant revenue (“Insights into the growth of South African eCommerce with payment methods, target audiences, marketing, social media, economy and logistics all profiled,” 2017). Ecommerce has greatly advanced in the South African retail space, particularly in places that are a great distance away where traditional distribution channels are too costly (“South Africa - ECommerce,” 2018).

Many more retailers now have a web presence as online shopping is becoming more prominent than traditional shopping (“South Africa - ECommerce,” 2018). Figure 1 below shows the exponential growth of online shoppers since 2015 and projections going forward to 2021.



Source: Statista, e-Commerce South Africa, User in millions



Figure 1: Number of online shoppers in South Africa (“Insights into the growth of South African eCommerce with payment methods, target audiences, marketing, social media, economy and logistics all profiled,” 2017)

“Online retail in South Africa represented 1.4% of total retail sales in 2018, surpassing the R14-billion mark for the first time, according to new research. Ecommerce in South Africa is starting to go mainstream, according to the findings of Worldwide Worx’s Online Retail in South Africa 2019 study, released in October 2018” (“E-commerce growth in South Africa outstripping forecasts,” 2018). Figure 2 below shows the Ecommerce landscape in Cape Town and shows Cape Town based companies accounted for all 10 of the most visited Ecommerce websites in South Africa in 2014 (City of Cape Town Media, 2017).

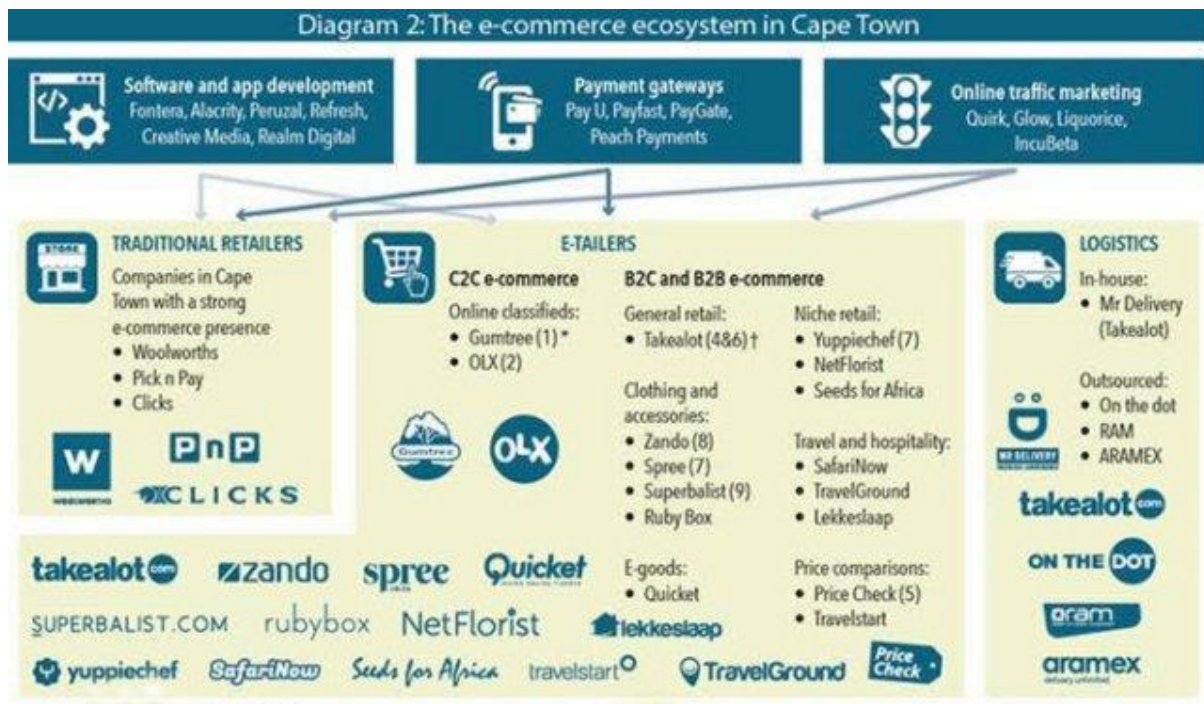


Figure 2: The Ecommerce ecosystem in Cape Town (City of Cape Town Media, 2017)

2.2 Key characteristics of the Traditional Methodology

According to (Nerur et al., 2005), the Traditional software development approach is process-centric, directed by the principle that sources of divergences are identifiable and may be eliminated by constantly assessing and refining processes. Hass (2007) specifies that Traditional software development has a very linear approach whereby all the components of the project are defined, and the planning is done at once. There are very distinct parts or phases of the project life cycle which can be done one at a time. The main assumption with the Traditional approach is that things will not change in the middle of the project so once you have defined the various parts of the project upfront tasks will flow through the defined stages of the software development life cycle with little or no hiccups. The Traditional approach assumes projects are linear and predictable with well-defined steps to get to the end goal without any changes (Špundak, 2014). Author Boehm states that Traditionalists promote using wide-ranging planning and ordered techniques to make software development

an effective and predictable activity that gradually develops toward perfection (Boehm, 2007). Traditional methodologies assumed that if we just tried harder, we could narrow down the full set of requirements early and reduce the cost by eliminating change (Highsmith & Cockburn, 2001). According to (Leau, Loo, Tham, & Tan, 2012), Traditional methods like the Waterfall method, V-Model and RUP are all grouped as heavyweight methodologies. For the purposes of this research Traditional methodologies refer to the Waterfall method. Traditional methodologies are built on a gradual series of steps such as requirements definition, solution building, testing and deployment. The Traditional software development approach are dependent on a set of specified processes and continuous documentation which is written as the work progresses and used as a guide for additional development (Leau et al., 2012).

2.2.1 Strengths of the Traditional Approach

- Since the Traditional approach follows a set of defined processes which are not altered as the project moves, this makes it simpler to determine the costs of the project, set a timetable and apportion resources appropriately (Leau et al., 2012).
- Traditional projects are plainly outlined with well documented and understood features, roles and requirements are focused on optimisation and productivity in following an initial comprehensive project scope (Fernandez & Fernandez, 2008).

2.2.2 Weaknesses of the Traditional approach

- The main assumption with the Traditional approach is that things will not change in the middle of the project so once you have defined the various parts of the project upfront tasks will flow through the defined stages of the software development life cycle with little or no hiccups. This assumption made by Traditionalists is biased as things do not flow smoothly in reality (Hass, 2007).

- According to Boehm, Traditional methods are more efficient when developers can fully determine the project scope up-front including the use of prototyping and when the requirements remain fairly constant, with change rates as little as one percent per month, however this is rarely the case as requirements are fluid (Boehm, 2007).
- The Traditional assumption of being able to eliminate change at the beginning means being indifferent to business conditions and as a consequence leads to business collapse (Highsmith & Cockburn, 2001).
- Traditional methods strain on contracts, plans, processes, documents, and tools (Leau et al., 2012). The deficiency of the Traditional methodology is that the development teams build the system in a one-shot fashion leaving no room for adapting to changes.
- A common issue that is usually faced by Traditional project management approach is late delivery, over budget or an inadequate product being delivered to the customer (Rudnick, 2013)

2.3 Key characteristics of the Agile methodology

Agility is described as the capability to act proactively in a dynamic, subjective and constantly changing environment and structural agility is an organization's ability to adjust to the changing situations without being compelled to change (Salameh, 2014). According to Nerur, Agile methodologies have become more and more popular but this has resulted in two disparate camps being formed in the software development community, Traditionalists versus Agilists with each side upholding and appealing to be the more superior approach as the two methodologies are largely based on opposing concepts (Nerur et al., 2005). As opposed to the Traditional approach, Agile methodologies have their strength in being able to deal with change by using people and their creative ability rather than following an agreed process. Many organizations are considering migrating to a more Agile approach, but this entails that

various changes need to be made at a management level, roles of project people, processes and technology used (Hass, 2007). The Agile methodology is iterative and all the parties involved, developers, customers and stakeholders continuously collaborate together to refine requirements and prioritise the work (Hass, 2007). Change is inevitable, so Agile approaches allow for changes and acknowledge that it is not feasible to create a thorough project plan in the early stages of the project (Špundak, 2014). Agile software development emphasizes on quality in design while Agile methods are all about the integrity of working code and how people can work together collaboratively (Highsmith & Cockburn, 2001). Agile development is centred on the knowledge of incremental and iterative development, in which the phases within a development life cycle are re-evaluated in continual cycles. This approach iteratively enhances software by using client/user opinion to converge on solutions (Leau et al., 2012). Agile project management is a blend of Traditional project management principles incorporating lightweight, collaborative, adaptable to frequent change, yet highly methodical practices (Salameh, 2014). Agility, in the end is about creating and act in response to change. What is exceptional about Agile approaches is not the procedures they use, but their appreciation of people as the drivers of project success, tied with a prevailing focus on productivity and flexibility (Cockburn, 2000).

2.3.1 Strengths of the Agile Approach

- The software development environment is dynamic and ever changing so Agility is a need in order to stay relevant on the market as it allows fast response to client demands and market opportunities (Stoica et al., 2013).
- Agile project management has arisen as a new method for managing high risk and time sensitive projects as it has proven to provide better productivity, higher quality, and more effective decision making (Stoica et al., 2013).

- Agile methodologies are recognized for the value given to collaboration and continuous client interaction (Stoica et al., 2013).
- Agile approaches acknowledge people as the drivers of project success, tied with a fundamental focus on proficiency and adjustability (Cockburn, 2000).
- An Agile organisation adapts fast to client needs and market opportunities, gaining good benefits on the market (Stoica et al., 2013).
- Agile methods considerably reduce the volume of documentation and even rest on the assertion that the code itself should act as a document meaning developers have to put a lot of comments in the code (Leau et al., 2012).

2.3.2 Weaknesses of the Agile approach

- It is noted that a lot of ambiguity exists when defining the finer details of the Agile method, its processes, tools and approach when compared to the methods and processes of Traditional project management (Salameh, 2014).

2.4 Mixed approach (Agile and Traditional principles)

Several scholars' debate on whether there is a "best" methodology that can possibly represent an ideal solution for all projects in a particular environment. There are pros and cons to both the Traditional and Agile approaches so it is impractical to uniformly assert that one approach is better than the other (Špundak, 2014). Špundak also states that a growing number of authors highlight that "one size does not fit all". Change is unavoidable, so new approaches incorporate changes and recognize that it is not feasible to create a comprehensive project plan at the on-set of the project (Špundak, 2014). Both the Agile and Traditional approaches have well defined processes that guarantee success if followed but taking principles from both approaches could result in some desirable outcome (Boehm, 2007). Cross approaches

that combine both methods are possible and essential for projects that combine a mix of Agile and plan-driven home ground characteristics. A more hybrid approach to project management with both Traditional and Agile methodologies may be the most valid approach (Fernandez & Fernandez, 2008). The development approach chosen whether Traditional or Agile is not completely proof as the processes involved are prone to error which is why testing and validation are very key (Stoica et al., 2013).

2.5 Available Research Reports that can be used as benchmarks.

In the year 2015, The CHAOS Report was released by the Standish_Group, the report contained results of a study of 50 000 projects worldwide from very small to complex ones (Johnson et al., 2015). The focus of this research project at The Standish Group was to identify the following:

- The scope of software project failures.
- The main factors that lead to failure of software projects.
- The main components that can reduce software project failures.

Across all project sizes Agile approaches resulted in a greater number of successful projects and less absolute failures, as shown in the table in Figure 3 below: -

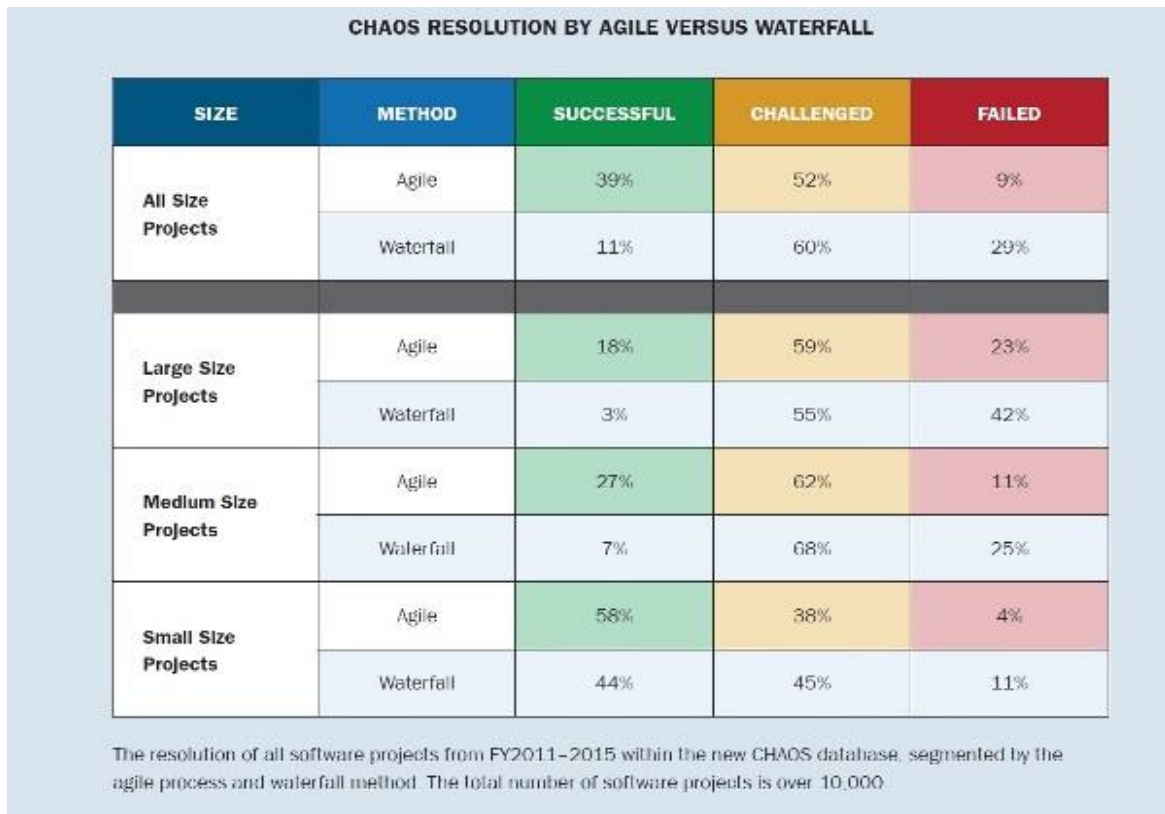


Figure 3:Chaos Resolution by Agile vs Waterfall (Johnson et al., 2015)

2.6 Prototype Construction in research

A prototype refers to a simplified program that serves as a miniature representation or example of the complete system (Olivier, 2009). They are simple to develop and have characteristics of the full system (Olivier, 2009). When constructing a prototype you concentrate on the aspects that need to be studied and leave out other aspects (Olivier, 2009).

Prototypes allow us to look at design problems and determine solutions. By choosing the focus of a prototype, it helps us identify the key design questions (Houde & Hill, 1997).

2.6.1 What is the role of a prototype in research?

In research, prototypes play a number of roles but the most essential use and contribution is that they provide simple but less abstract objects to study than just the system description (Olivier, 2009). Constructing a prototype does not constitute the research but plays various

roles (Olivier, 2009). A prototype is the object to test through experimenting in order to figure the design knowledge. (Wensveen & Matthews, 2015). There are usability tests that can be prototyped, some experiential trials to assess the design attributes such as user interface or prototypes can be treated as a physical theory (Wensveen & Matthews, 2015). Prototypes can be built in stages to represent different parts of the design work in progress. It is however not feasible to create a prototype of the complete design in the early stages of a project (Houde & Hill, 1997). For the purposes of this research, the prototype will be used as a case study to validate the findings and demonstrate the concept works (Olivier, 2009)

2.6.2 Chapter Summary

This chapter explored the available literature looking into key points on which this research is built upon by drawing conclusions from other scholars' views on Agile vs Traditional method. This literature that has been reviewed is what informs and guides the research and will be used as a yardstick in the research investigation. The following Chapter 3 will now look at the research design and method.

Chapter 3 - Research Design and Methodology

This Chapter gives finer details of how the research is carried out. To begin with, the research method is stated and why it was chosen. The instruments used for the data collection and analysis are clearly defined and the processes outlined. Also, the population and sample for the study is selected using appropriate sampling methods.

3.1 Research Method

This research is conducted using a constructionist epistemology with a critical inquiry using the grounded theory methodology and applying both quantitative and qualitative methods to the case studies. This method is preferred because it employs quantitative and qualitative data generation techniques to derive some theory from the data to be analysed using statistical analysis. The objectives that have been set out for this study seek to answer questions regarding best practices regarding software development in the E-commerce industry therefore a questionnaire is a logical and easy way to gather information from people. The questions are designed to allow participants to answer the research questions of this study as best as possible and to support the realization of the research objectives earlier outlined in the introductory Chapter 1.

3.2 Research instruments

The research data is collected by conducting a survey using an online questionnaire, a Google Form. The questions in the survey are structured as open ended and some closed ended. Here is the link to the survey:-

https://docs.google.com/forms/d/e/1FAIpQLSc3IcCqRE4EeHDuxyQSpCdMgJNmCMlk-KZ8-t8YhAB4bIgsQw/viewform?usp=sf_link.

Prior to this main survey, a pilot survey was sent to five participants among them project managers and IT professionals who helped refine the questions and point out any improvements that can be made to the survey before sending it out to actual participants. This pilot survey was sent out on the 6th of July 2019 and all the feedback was received by the 26th of July 2019. Link to the pilot survey:

https://docs.google.com/forms/d/e/1FAIpQLSft_veY7u9Am3rrw7TrEJ7QYjkcFHRKtWmLcPzEyytPBgqkQA/viewform?usp=sf_link.

Based on the feedback of this pilot survey the final survey version was improved for sending out to a wider audience of participants. The online questionnaire is used to collect data from various Ecommerce organisations using closed and open-ended questions which are then analysed quantitatively and qualitatively using the R Studio statistical software package. The research is designed to find out from a cross-section of companies or organisations their views and observations from experience with regards to Ecommerce project implementation methodologies, Agile vs Traditional. The Western Cape Province constitutes the region from which the Ecommerce companies have been selected as the study population. Questions in the survey are randomised to avoid survey bias. The survey questions flow in order from general to specific to avoid response bias. It was noted that if participants begin the survey by being asked very specific questions it may influence the respondent's answers to subsequent questions, and this results in bias (DeFranzo, 2011).

The online survey questionnaire data collection method was chosen because questionnaires are the most affordable way to gather quantitative data and qualitative data. Secondly, questionnaires are also a practical way to gather data allowing one to target specific groups and gather vast amounts of data from a larger audience. Questionnaires also offer a quick way to get the results, you can gain insights much quicker depending on the scale and reach of the survey. Another reason is that when data has been quantified, it can be used to compare to

other research and may be used to measure future changes. Online surveys also provide a simple inbuilt visual analysis of the results and allow respondents to maintain their anonymity and respondents do not have time constraints so they can take their time to complete the questionnaire. Finally, with a questionnaire you can ask as many questions as possible (Debois, 2019).

3.2.1 Construction of research Questionnaire

In the process of building up the questions that were used in the survey, certain key considerations were made to minimise systematic biases and misleading results. Principles for constructing survey questions were applied to maximise the reliability and validity of the respondents' answers. The questions were also constructed with the research questions and objectives in mind.

The order in which the questions are asked affects people's responses therefore the survey questions flowed from general to specific questions. By starting with general demographic questions, the participants can ease into the survey before being asked questions where they need to think hard.

The questionnaire contained both open-ended and closed-ended questions. The questions were structured with the research objectives and questions in mind so that participants could provide answers that would address these. The questionnaire was divided into 9 sections.

Link to survey:

https://docs.google.com/forms/d/e/1FAIpQLSc3IcCqRE4EeHDuxyQSpCdMgJNmCMIk-KZ8-t8YhAB4bIgsQw/viewform?usp=sf_link

Section one contained 3 short general demographic information questions. The following section 2 went into more detail in trying to understand the background information of the organisation the participant represents and their role in the company as well as their level of

involvement with the development team. Moving onto section 3, it contained one closed-ended question which sort to figure out what software development methodologies the participant was familiar with, this question would then determine which set of questions to present next to the user. Section 4 had a set of closed-ended questions and some open-ended questions related to the participant's experience with the Agile method in their Ecommerce projects. Section 5 then followed up with more specific closed-ended questions on the impacts of the Agile methods in Ecommerce software development. Section 7 and Section 8 also had a set of closed-ended questions some open-ended questions which related to the participant's experience with the Waterfall method and its impact on Ecommerce projects. Section 9 contained open-ended question to try and find out if the participant's organisation had any other process other than Agile or Waterfall that they followed to ensure the success of their projects. Finally, section 9 had one open-ended question to provide participants the opportunity to say any other thoughts they may have regarding the use of Agile and Traditional method

3.3 Sample Design, Sampling Techniques and Sample size

A sample design is the road map that is followed when choosing a survey sample from the greater target population, therefore the sample is the group of individuals who will actually participate in the research (Singh, 2006). Figure 4 below shows the sampling breakdown. As shown in the diagram, the population selection for this study follows the same logic as illustrated. The population is defined as well as the target sample group within the population. The sample size is determined, and data collected from the participants within the selected sample population.

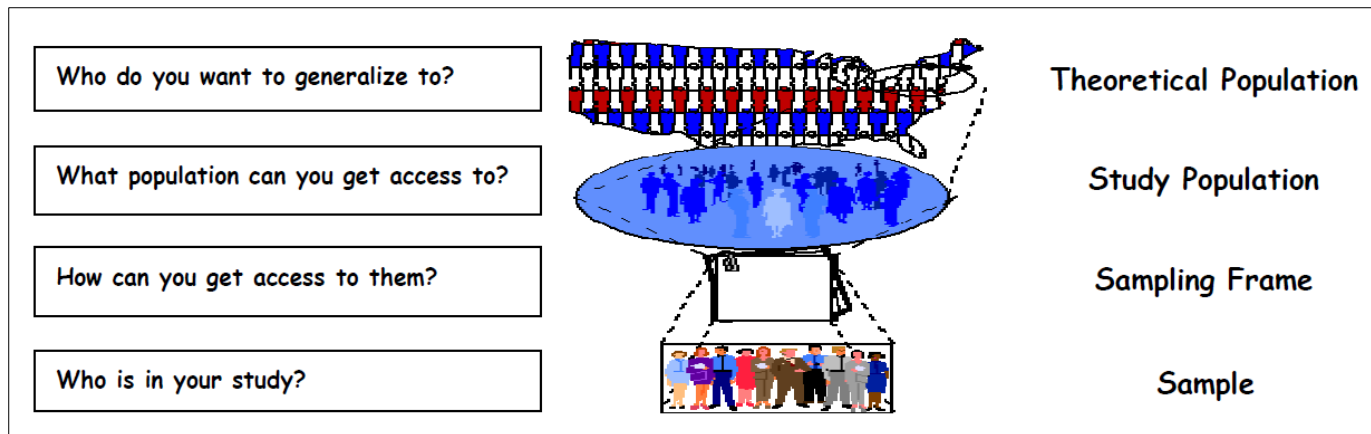


Figure 4 :Sampling Breakdown (Singh, 2006)

3.3.1 Defining the population.

For the purposes of this research, the target population which is Ecommerce companies in Cape Town were chosen. Due to time and financial constraints that affect the collection of the data the research had to focus only on Ecommerce companies in Cape Town. A random sampling technique is applied to select from the greater population of all possible Ecommerce organizations that are the target sample population as outlined in the discussion that follows on how the sample was obtained. With this technique, every Ecommerce organisation has an equal chance of getting selected to be part of the sample ensuring that the sample represents the overall population and is free from bias (Gravetter, 2011). Target groups or individuals from the sample are Project managers, Team leads, Scrum masters, Product owners and Business Analysts. A third-party organisation was contacted to help out in sourcing the list of Ecommerce companies and contacts from the LinkedIn website in order to obtain company details (Company name, Location, Company website, Phone number) as well as target individuals contacts (Name, Email, Title,) i.e., IT Project managers, Scrum masters and/or Product owners, Team leaders and Business analysts for the various Ecommerce companies who are the target individuals in the sample population. A hundred (100) participants are reached. For the purposes of this study and looking at the geographic size of Cape Town as a

city, we estimate logically there are no more than (500+-) Ecommerce companies therefore the 100 companies/participants whom the survey is sent to, are a statistically significant representation of the population as with a 10% margin of error.

3.4 Data collection processes

The potential participants are contacted telephonically ahead of time inviting them to participate in the study. The researcher made at least 10 calls each week to the different potential participants, 100 in total. The calls are made from the week starting from the 9th of October 2019 until the survey was sent out. Following this, the online questionnaire, in the form of a Google Form, with a supporting letter from the researcher is sent to the contacted participants as a link via email. This letter and survey are sent out on the 24th of October 2019. Below is the letter that is sent out together with the survey link:

https://docs.google.com/forms/d/e/1FAIpQLSft_veY7u9Am3rrw7TrEJ7QYjkcFHRKtWmLcPzEyytPBgqkQA/viewform?usp=sf_link

Dear Survey Participant

The purpose of this survey is to determine what project management methodology is being employed by your organisation for the success of your E-commerce development projects. The information obtained will help us to propose the best project management practices for E-commerce software development projects as part of an MSc study in Computer Science at the University of the Western Cape. The researcher is Ms Octavia Chidiyiwa (3862396@myuwc.ac.za) and the supervisor is Dr Michael Norman (mnorman@uwc.ac.za) as well the co-supervisor Professor Antoine Bagula (abagula@uwc.ac.za)

Please complete the questions from your viewpoint. Your responses will be considered as your own and will not be considered as that of your company or organisation. You were approached to share your knowledge as a software development practitioner, manager, development team leader, business analyst or similar role.

Ethical Clearance has been provided by the University of the Western Cape Ethics committee, reference number: (HS18/10/38)

All responses will be treated as confidential and cannot be linked to a specific person or company. You can discontinue at any point if you so wish by closing the survey window. Only aggregated results will be reported in this research. All records will be destroyed after 5 years. It should not take more than few minutes to complete this survey.

Thank you for your voluntary participation and time.

Sincerely,
Octavia Chidiyiwa

Figure 5: Email sent to participants.

The letter in the figure above explained the objectives and relevance of the study, assured the respondents of anonymity together with an ethics statement and gave them the option of not participating in the study if they so wish. The respondents are requested to complete the online questionnaire but not given a designated date to complete the survey by. Reminders are sent to participants two weeks after sending out the survey. Responses are trickling in very slowly. Follow up calls are made a couple of weeks after sending out the survey to remind the participants. This still yielded very low responses. By the end of November 2019 only 6 response had come back, and this was more than a month since sending out the survey which is less than 10% of the overall number of participants in the survey. Efforts are then undertaken to improve the response rate.

3.4.1 Challenges during the data collection process

3.4.1.1 Calling to get to the right candidate to send the survey.

The list of contact numbers obtained contained some general phone numbers not direct lines since most organisations do not give direct numbers for their contacts. When making the calls sometimes the receptionist or switchboard operator was not always willing to direct the call to the right person and would only give out an email address. Sometimes the right person would not be available, and I would need to call a couple or more times to reach them resulting in delay to send out the survey to them. Since the target participants (Project managers, Scrum masters, Team Leads, Business analysts) were very specific it was important to reach the right people to get quality and valuable responses.

3.4.1.2 Targeted individual no longer with the company

From the obtained list of Ecommerce companies contacts, a handful of the targeted individuals had moved from the organisation and the researcher had to enquire further to get details of the right individual who is now a replacement or someone else of a similar role. Some organisations are reluctant to give this information.

3.4.1.3 Poor response rate addressed and yielded improved responses.

The responses have been coming in very slowly despite the follow up calls and emails to the participants. Less than 10% of the responses came back after a month. Due to time constraints and lack of real expertise in getting responses for surveys and work commitments the researcher is not able to do the follow ups. A third party who is a digital marketing expert (<https://www.fiverr.com/hinaishaque1>), with vast experience in market research who works as a freelancer is then involved to do the follow ups and ensure the participants are reminded to send through their responses. This helped a lot to have someone who is an expert doing the follow ups and within a month a lot more responses came and by 23 December 2019. Thirty-one out of 100 participants (31%) responded to the survey. The responses from the participants are captured unanimously.

3.4.1.4 Finding correct leads.

The researcher outsourced the work of finding the Ecommerce companies on Cape Town to a B2B marketing company as it was necessary in this instance to have an expert on how to find the right contacts on LinkedIn. There are some metrics and algorithms employed which are known by experts so it may take longer for someone without the right knowledge. When you send out an email to someone you have not yet contacted telephonically before, this may lead the email to be flagged as spam and being ignored. It proved difficult to extract the data

without assistance as I was getting half of the information whereas the expert who does B2B lead generation and targeted LinkedIn lead generation could get all the required information.

3.5 Data editing and data-coding procedures

Responses of Agile approach users are compared to those of Traditional approach users and participants that used both approaches responded separately for each approach. Comparative analyses of Agile versus Traditional responses are performed in R Studio version 1.2.5033 running R statistical software version 3.6.2 (R Core Team, 2018) and Statistica® v13.2.

In preparation for the analysis, the raw data is extracted from the Google form and imported into an excel spreadsheet. Basic data checks are done to check for outliers and edit the raw research data to identify and clear out any data points that may hamper the accuracy of the results. Two such respondents are identified who left most of the fields empty and questions unanswered and their records are eliminated from the data.

Fisher's exact test and Chi-Square analyses are used to evaluate differences in the categorical responses between Agile and Traditional approach users. Fisher's exact test is a statistical test used to determine if there are non-random links between two categorical variables and it is normally used to test small samples. (Weisstein, 2020). For example, in this research we are comparing the responses of participants who are for the Agile method versus those who are for the Traditional method. One nominal value is increased team productivity, and another is improved product quality. The percentage of participants who indicate that Agile method helps to increase team productivity is higher than those for the Traditional method. The fishers test tells us whether this difference is statistically significant. The Chi-Square statistic is commonly used for testing if there are any associations between categorical variables, i.e., if the variables are independent or related. The data must be raw and random and from a large enough sample. The null hypothesis of the Chi-Square test is that no

relationship exists on the categorical variables in the population; they are independent”(Statistics solutions, 2019).

Closed-ended questions are analysed quantitatively to determine patterns and trends. Open-ended questions are analysed qualitatively (content analysis) to detect relevant criteria which are then placed (coded) in new or existing categories (items with similar characteristics).

These categories are then quantitatively analysed by frequency to identify the dominant ones and relationships using the R Statistical software.

Natural language processing is used to qualitatively analyse text data for the open-ended questions. Text data are sorted using the text mining R package “tm” version 0.7-7 and analysed using R package “word cloud” version 2.6. Descriptive data were presented as percentage frequencies with actual counts in parentheses.

R package “ggplot2” version 3.2.1 is used to produce all bar graphs. The level of significance was set as $P < 0.05$. *“The value of p-value varies from 0 to 1 and is interpreted in the following way, if the P-value ≤ 0.05 it means there is strong evidence against the null hypothesis and to the contrary if the P-value > 0.05 , this indicates weak evidence against the null hypothesis”* (Wasserstein & Lazar, 2016).

English “stop words,” which are very common words with little meaning, were filtered out along with obvious words or words that did not add any useful knowledge such as: "can", "usually", "like", "approach", "development", "method", "methodology", "project" and "projects." Such words were used to articulate concepts related to or refer to the keywords of the questions. The word "Agile" was removed in responses that were directed to the Agile approach, while the words “Traditional” or “Waterfall” were removed from responses directed to the Traditional approach as these most common words would mask high quality information from the text. Synonyms and different forms of the same word were converted to

one chosen form and in the case of different forms of the same word, the minimal form was chosen for convenience in the natural language processing operations. For example, where the words “iterations” and “iteration” were used, the former was converted to the later. The minimum word frequency for word clouds was chosen to highlight the most common terms. For wordclouds for Reasons for choosing Agile, Traditional shortfalls, Reasons for recommending Agile and Reasons for recommending Traditional, which returned 5 – 29 terms of frequency ≥ 2 , we chose the lowest limit of 2 as the minimum frequency cut-off. In contrast, for the Agile shortfalls wordcloud, which returned 101 terms with frequencies ≥ 2 , we increased the minimum word frequency cut-off to 3.

3.6 Possible Gaps and Limitations in the data

3.6.1 Issues with sample and selection

The sample was randomly chosen however the full list of the population concerned could not be obtained. Various statistics boards and government entities like StatsSA, Wesgro, DTI and SITA were contacted to try and obtain the comprehensive list of Ecommerce companies in Cape Town but to no avail. There was limited capability to access the geographic scope of participants. The participants who responded to the survey questions may not truly be a random sample. However, judging by the size of Cape Town, the sample size of 100 companies is believed to be statistically significant to conclude a valid research result. If a much larger sample had been obtained, the more precise the results will be and a truer reflection of the population.

3.6.2 Time constraints

The specified time available to thoroughly study a research problem and to carefully analyse the change over time is constrained by stated research goals and deadline to submit the work.

The researcher had to try and obtain all the data for a set period between October and December 2019. This may have negatively impacted the study and there may be a necessity for a future study (a longitudinal study) to further explore this research problem.

3.6.3 Prototype Construction

An Ecommerce platform prototype will be constructed to solve a real-life problem. The findings from the research will be employed to prove the preferred methodology works and can be applied to solve a real-life problem. This is a case study to determine if the results of the research can be applied. A case study Ecommerce project will be implemented and the best methodology according to the research results either Agile or Waterfall will be used in the development of a prototype Ecommerce site. Project at hand is to construct an Ecommerce website prototype for a shoe selling business in Cape Town called “**HeelsFrenzy Cape Town**” from requirements gathering to completion of the website prototype.

3.6.4 Chapter Summary

This chapter of the research articulated the research hypotheses. The research tools and data collection processes were an online survey Google form. The rationale behind the data analysis process, discussion of possible limits and disparities in the data were outlined. The data collected/results will now be further analysed and discussed in the following Chapter 4.

Chapter 4 – Survey Results: Presentation and Discussion

This Chapter presents the results of the research survey conducted in the previous Chapter 3.

The results' data is presented in tables and figures together with its interpretations.

The sample consisted of 100 participants randomly selected from the greater population who were then contacted, and the survey sent to them. Although the exact total population of Ecommerce companies in Cape Town could not be determined, many statisticians agree that the minimum sample size to get meaningful or substantial results is believed to be 100 participants (Bullen, 2013). "A 10% margin of uncertainty can be achieved with a sample of only 100" (Conroy, 2014). The table in the figure below shows the sample sizes based on the size of the population with the acceptable margin of error.

Acceptable margin of error	Size of population					
	Large	5000	2500	1000	500	200
±20%	24	24	24	23	23	22
±15%	43	42	42	41	39	35
±10%	96	94	93	88	81	65
±7.5%	171	165	160	146	127	92
±5%	384	357	333	278	217	132
±3%	1067	880	748	516	341	169

Figure 6: Sample sizes (Conroy, 2014)

The demographics and characteristics are summarised in the table below showing participants age range, main spoken language, highest educational qualification, years of experience as well as their position /role.

4.1 Actual Sample Characteristics

Table 1: Participants demographics and characteristics

	%Frequency (n)
<u>Age (years)</u>	
< 20	3.2 % (1)
20-29	41.9 % (13)
30-39	48.4% (15)
40-49	6.5% (2)
<u>Sex</u>	
Female	54.8% (17)
Male	45.2% (14)
<u>Main language</u>	
Afrikaans	19.4% (6)
English	22.6% (7)
Northern Sotho	6.5% (2)
Southern Sotho	6.5% (2)
Tsonga	3.2% (1)
Tswana	6.5% (2)
Venda	3.2% (1)
Xhosa	12.9% (4)
Zulu	19.4% (6)
<u>Highest qualification</u>	

Industry certification	25.8% (8)
Diploma	12.9% (4)
Bachelors' degree	25.8% (8)
Post graduate degree	35.5% (11)
<u>Years of experience</u>	
≤4	38.7% (12)
5 – 9	45.2% (14)
10 – 19	16.1% (5)
<u>Position or role</u>	
Application support specialist	3.2% (1)
Business analyst	22.6% (7)
Customer support agent	3.2% (1)
Director	3.2 % (1)
Internee (IT department)	3.2% (1)
Product owner	3.2% (1)
Resource director	3.2% (1)
Scrum master	12.9% (4)
Software developer	9.7% (3)

Software development projects manager	16.1% (5)
Software development team leader	19.4% (6)
<u>Team leader</u>	
No	41.9% (13)
Yes	54.8% (17)

Table 1 above shows the demographic information of the 31 participants. Most of the participants were aged between 30 and 39 (48.4%). Also, there was a larger percentage of female participants (58.4%) compared to the male respondents and many possessed a post graduate qualification. The main languages of the respondents were English (22.6%) followed by Afrikaans (19.4%) and Zulu (19.4%).

Many of the participants had experience in their roles from between 5 to 9 years with most playing the roles of Business Analyst (22.6%), software development team leader (19.4%). And software development projects manager (16.1%). A great number of the participants indicated they played a team leader role (54.8%).

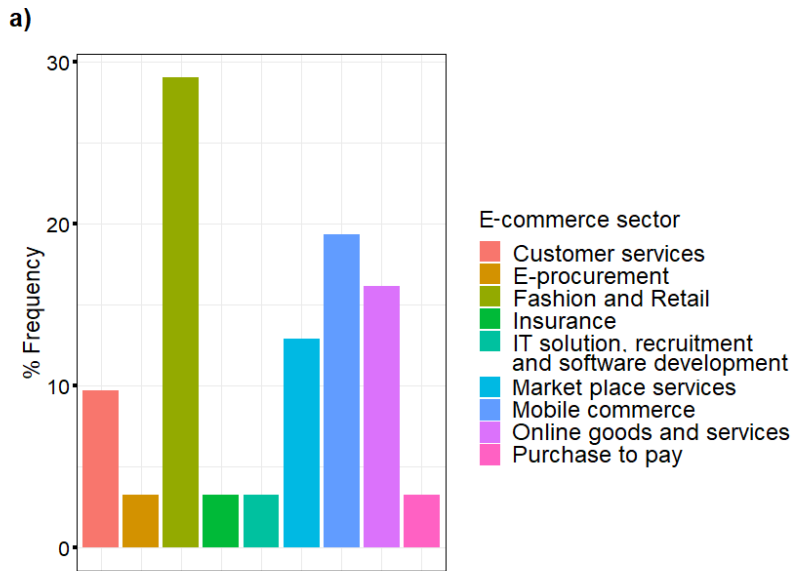


Figure 7: Participants Company/Organisation sector

Figure 7 above shows that most participants were from the Fashion and Retail Ecommerce sector followed by Mobile commerce and Online goods and services.

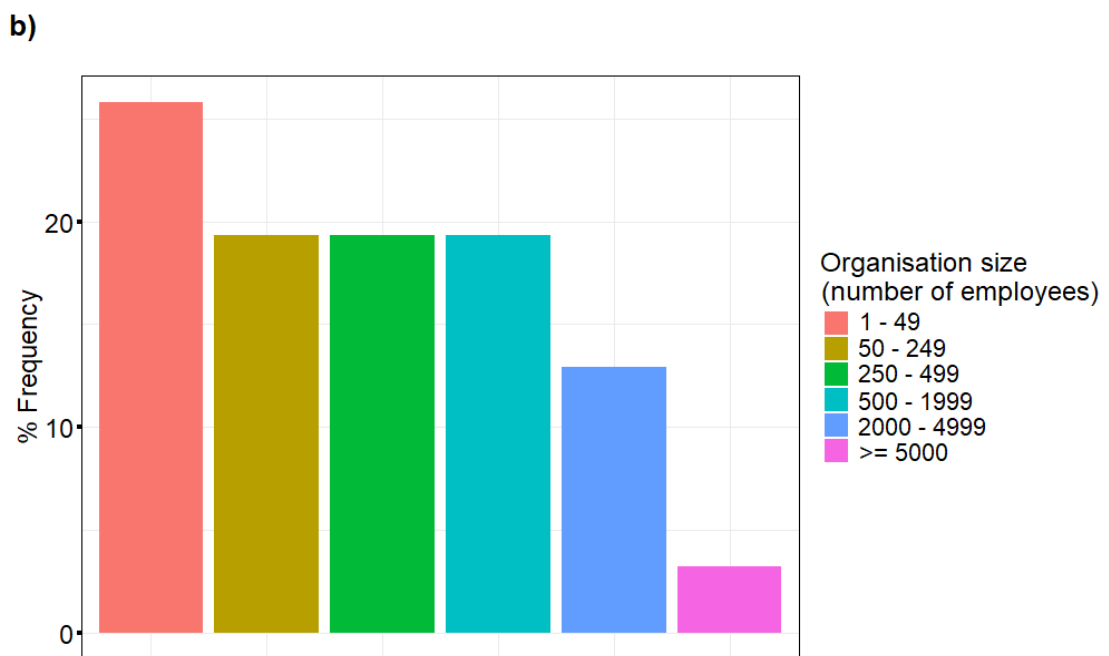


Figure 8: Participants Organisation size

Figure 8 shows the organisations were mostly small companies with fewer than 50 employees and a few mid-sizes greater than 50 but not more than 500. A very small number were larger than 2000 employees.

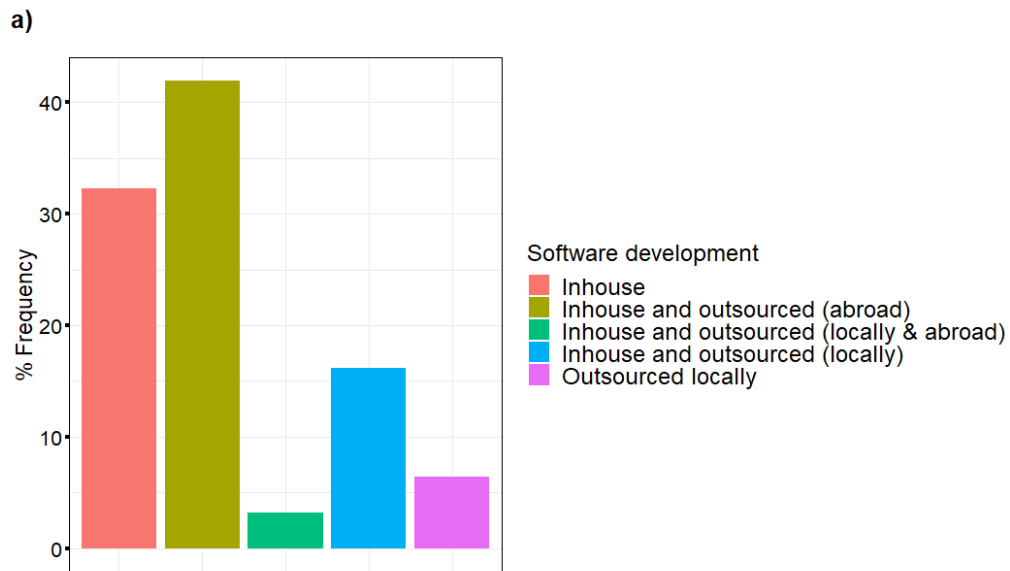


Figure 9: Participants' Company/Organisation software development work

As shown on Figure 9 above participants indicated that most of the development work was done in-house and equally also outsourced abroad.

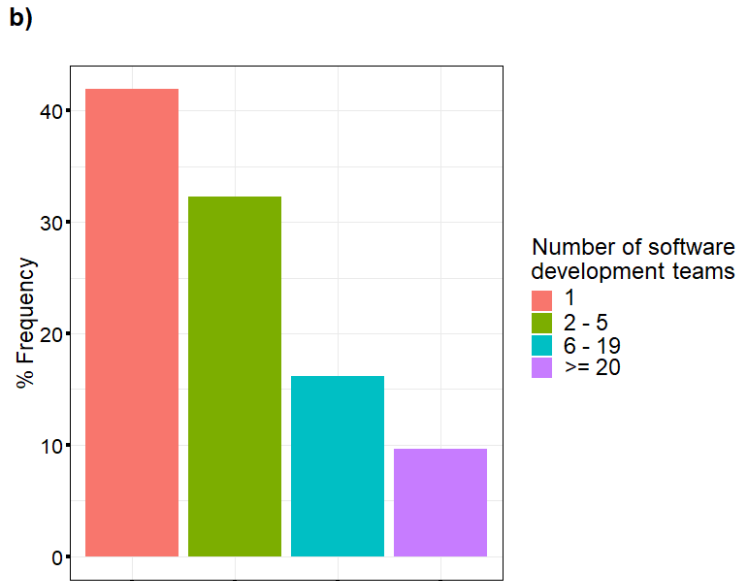


Figure 10: Participants' Company/Organisation software development teams

As shown in Figure 10 above, most participants organisations consisted mostly of 1 software development team and a few with 2-5 development teams.

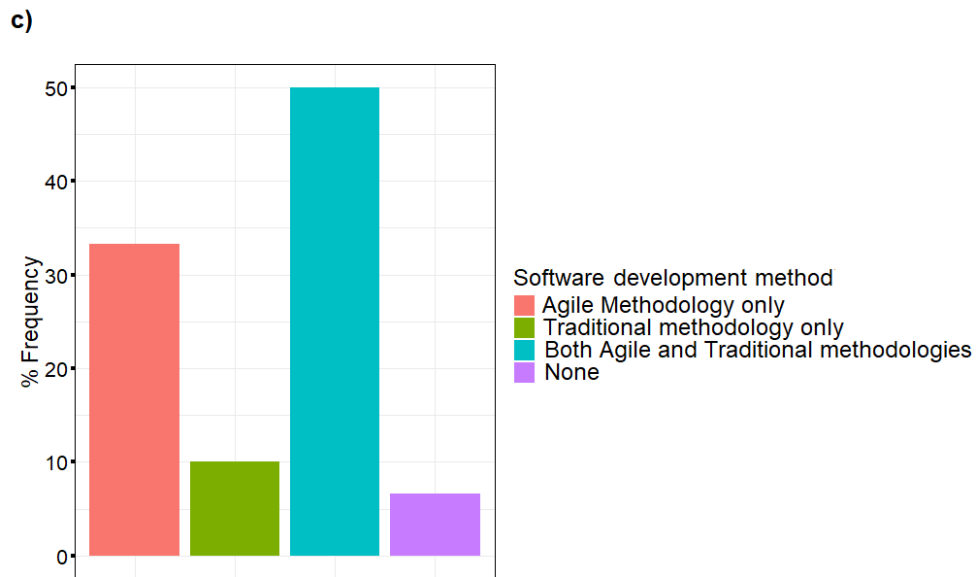


Figure 11: Participants' Company/Organisation software development method

Figure 11 shows that with regards to the methodology familiarity based on present and previous projects they have been involved with, 50% indicated they are familiar with both

Agile and Traditional methodologies, about 33% indicated they are familiar with only the Agile approach with 10% indicating they are familiar with Traditional only.

4. 2 Comparative analysis Agile responses vs Traditional responses

For all the figures, bold p-values are global and normal font p-values are post-hoc tests. In all the tables F stands for **Fisher’s exact test** and M-L stands for **Maximum likelihood Chi square test**. “The value of p-value varies from 0 to 1 and is interpreted in the following way, if the **p-value** ≤ 0.05 it means there is strong evidence against the null hypothesis and to the contrary if the **p-value** > 0.05, this indicates weak evidence against the null hypothesis” (Wasserstein & Lazar, 2016).

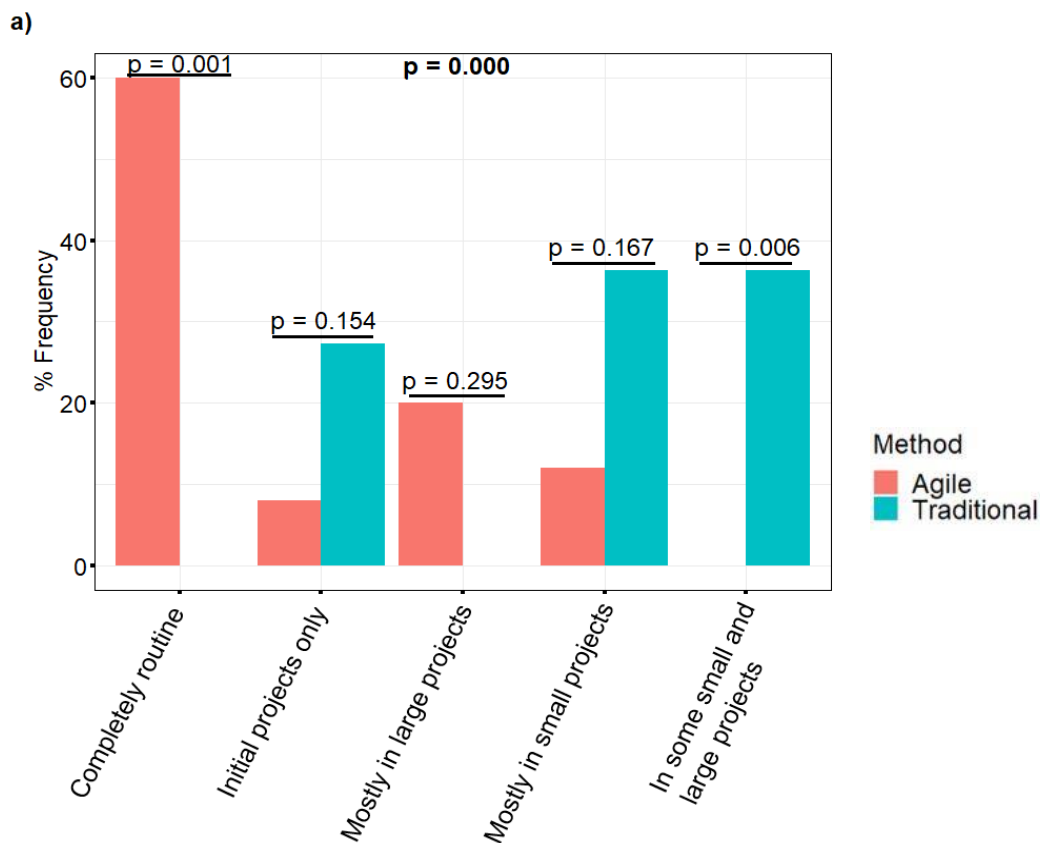


Figure 12: Agile vs Traditional comparison of main method use.

Figure 12 shows that most participants use Agile methodology as completely routine for all projects.

Approach main use in project managemnt

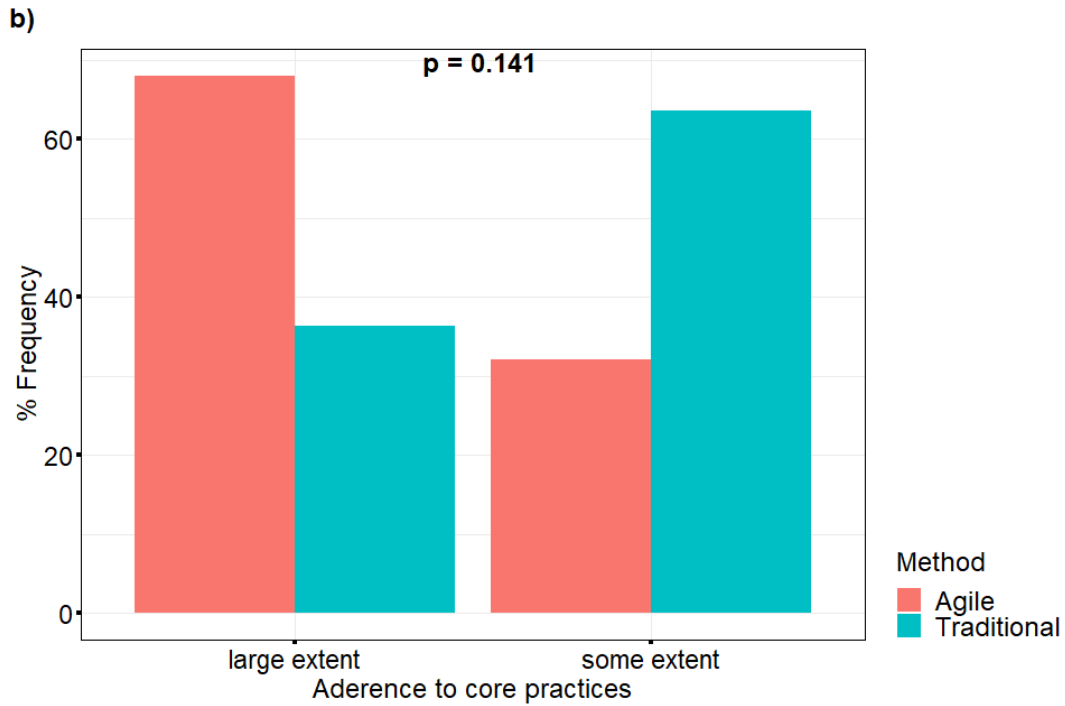


Figure 13: Agile vs Traditional comparison of main method use.

Figure 13 shows that participants adhered to the Agile core practices to a larger extent and to some extent for the Traditional methodology.

Table 2: Resulting comparative frequencies for Agile vs Traditional main use.

	Agile	Traditional	p-value	Test
	% (n)			
Method main use			0.00001	M-L
Completely routine	60.0% (15)	0.0% (0)	0.001	F
Initial projects only	8.0% (2)	27.3% (3)	0.154	
Mostly in large projects	20.0% (5)	0.0% (0)	0.295	
Mostly in small projects	12.0% (3)	36.4% (4)	0.167	
In some small and large projects	0.0% (0)	36.4% (4)	0.006	
Adherence to core practices			0.141	F

To a large extent	68.0% (17)	36.4% (4)		
To some extent	32.0% (8)	63.6% (7)		

The summary Table 2 above also shows most participants used the Agile method as completely routine in their projects (60%) and adhered to Agile core practices to a large extent. For those who follow the Traditional methodology 63.6% indicated they adhered to its core practices to some extent.

4.2.1 Differences in aspects of work effectiveness between Agile and Traditional method users

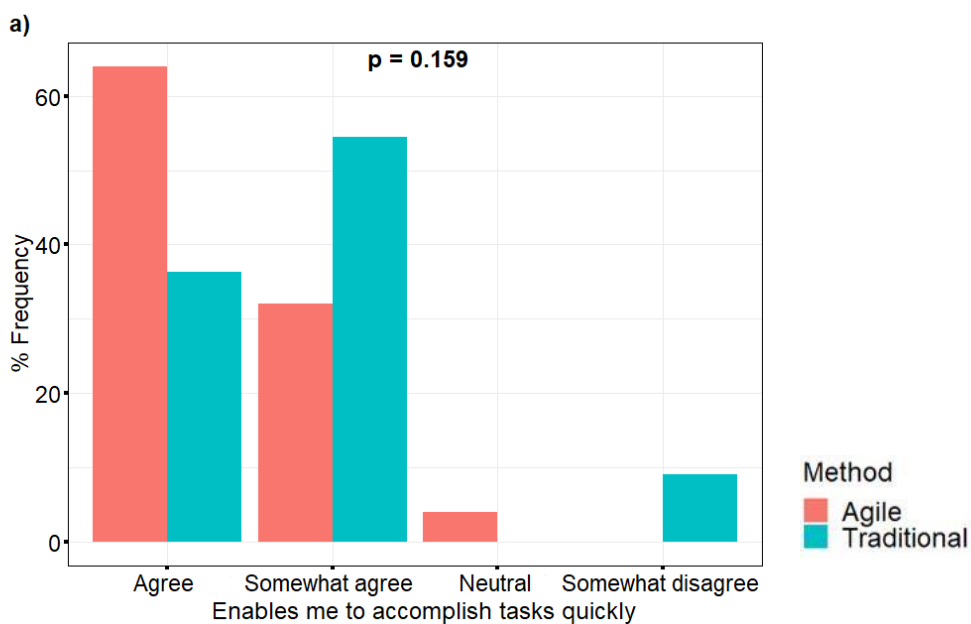


Figure 14: Ability to accomplish tasks quickly Traditional vs Agile.

Figure 14 shows that participants do agree that the Agile method enables them to accomplish tasks much quicker. It also shows participants somewhat agree to the Traditional approach also enables them to accomplish tasks quicker.

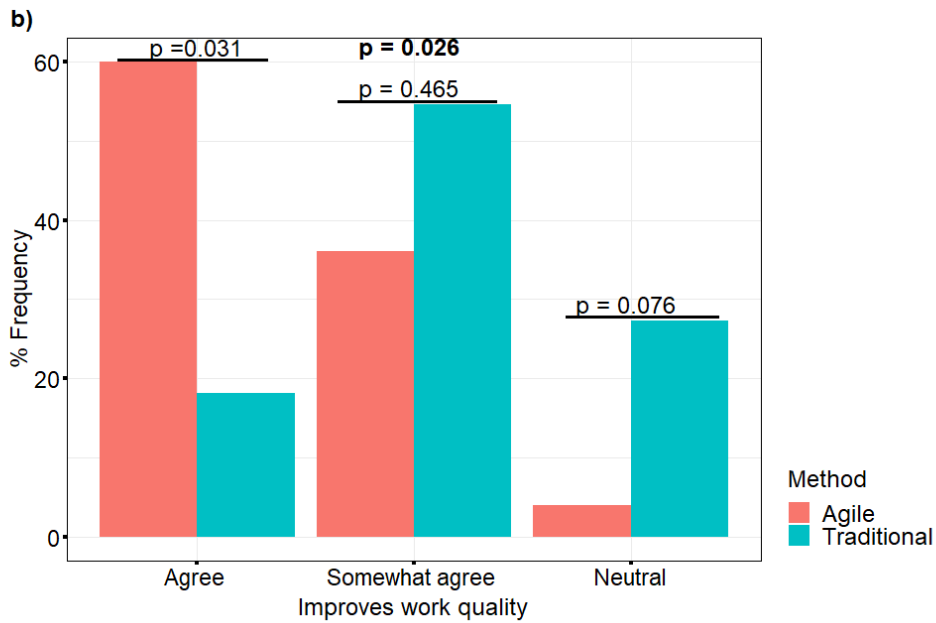


Figure 15: Work quality improvement Traditional vs Agile

Figure 15 shows that participants Agree that using the Agile method improves their work quality. Participants also somewhat agree that the Traditional approach improves their work quality.

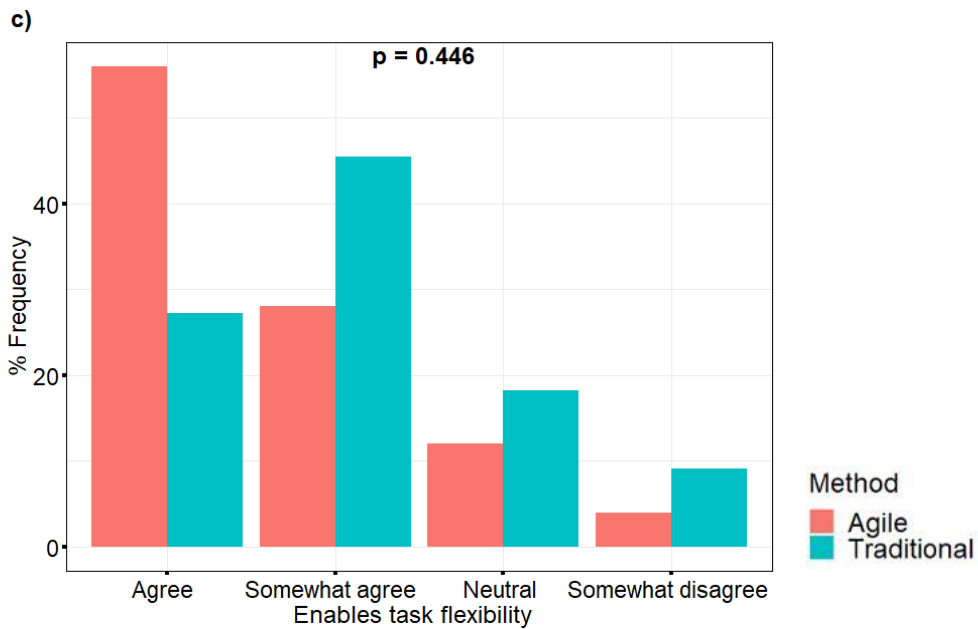


Figure 16: Task flexibility Traditional vs Agile

Figure 16 above shows that participants largely agree that the Agile method enables task flexibility. Participants do also indicate that the Traditional method somewhat also enables task flexibility.

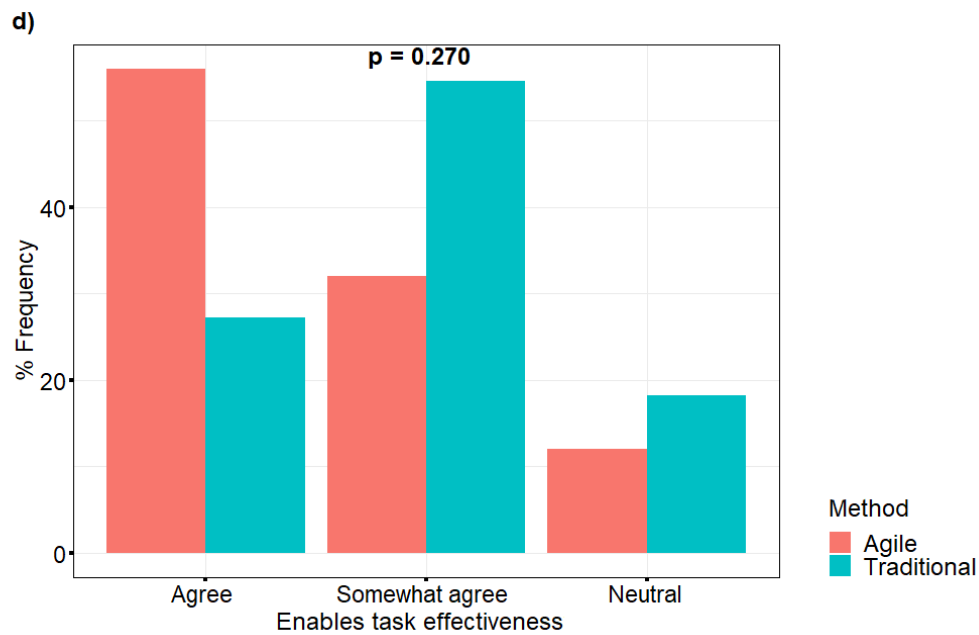


Figure 17: Task effectiveness Traditional vs Agile

Figure 17 shows that participants largely agreed that the Agile method enables task effectiveness with some participants somewhat agreeing to the Traditional method enabling task effectiveness too.

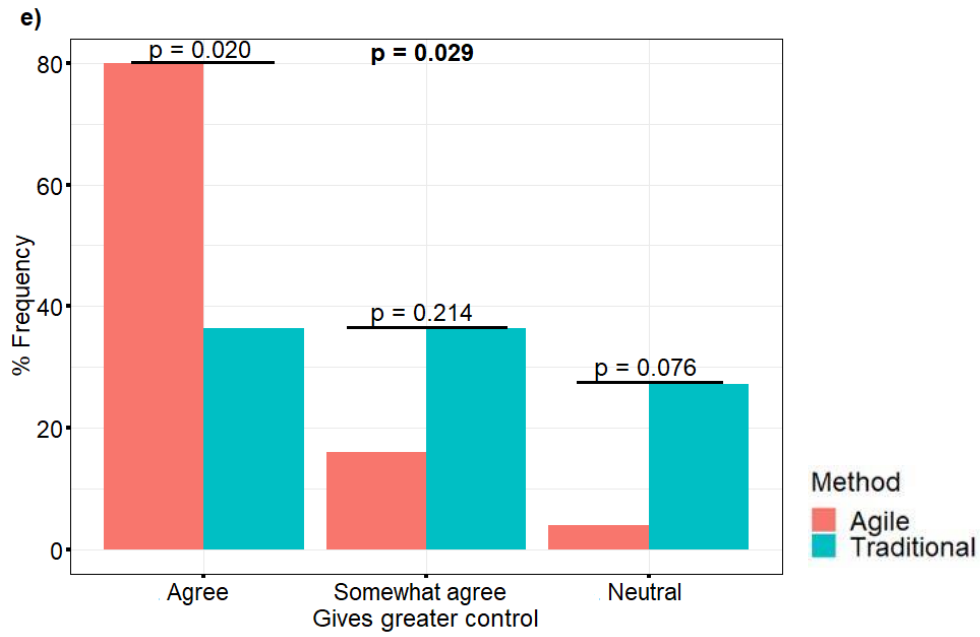


Figure 18: Work control Traditional vs Agile

Figure 18 shows that participants largely agreed that using the Agile method gives them greater control of their work.

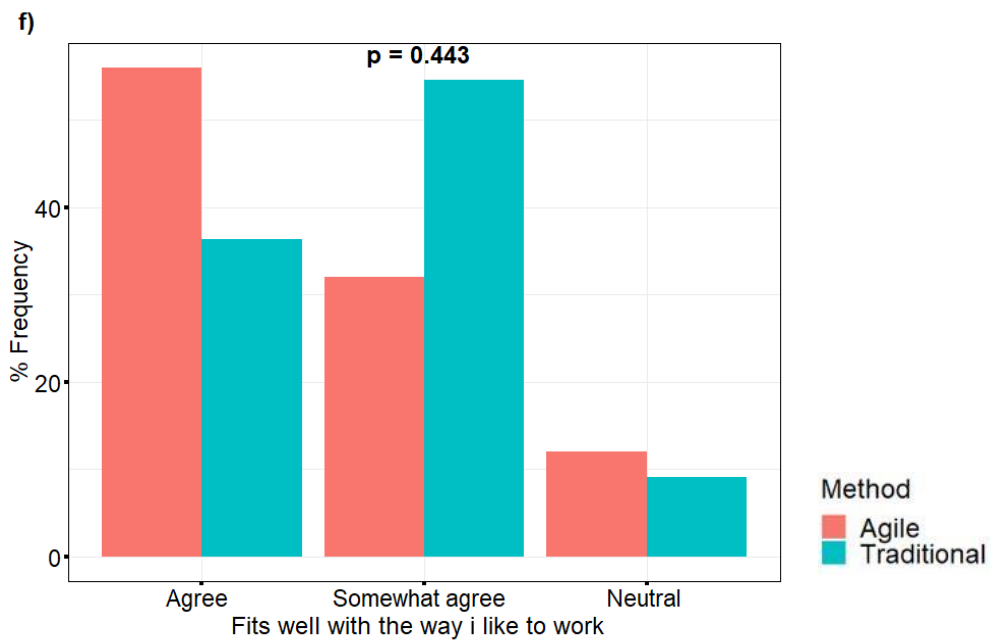


Figure 19: Working style Traditional vs Agile.

Figure 19 above shows that participants agreed that the Agile method fitted well with the way they like to work. Participants also indicated that they somewhat agree that the Traditional method fits well with the way they like to work.

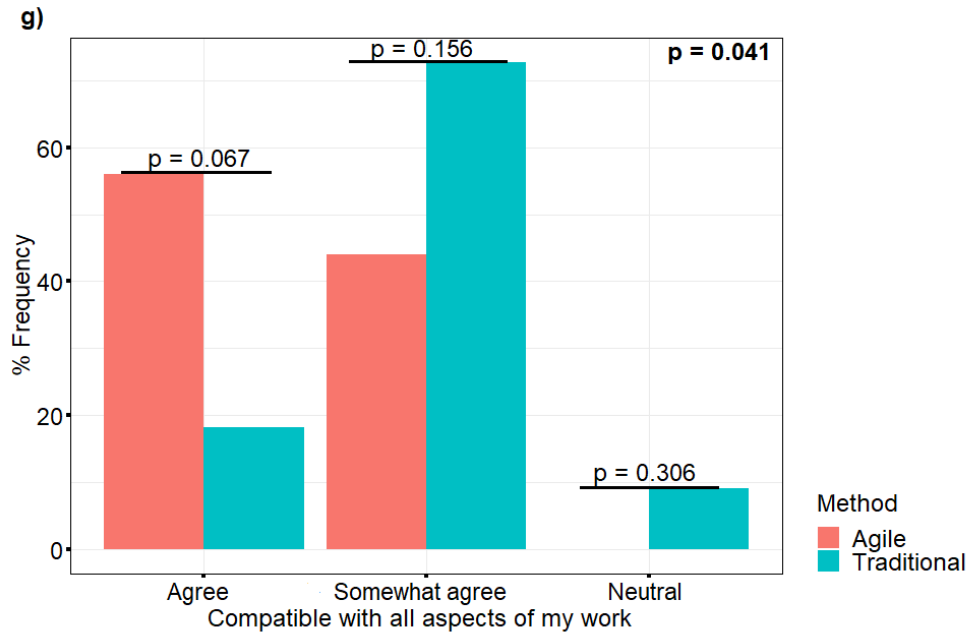


Figure 20: Compatibility Traditional vs Agile

Figure 20 shows that participants agreed that the Agile method was compatible with all aspects of their work. Participants also somewhat agree that the Traditional method is compatible with all aspects of their work.

Table 3: Resulting comparative frequencies effects work quality Traditional vs Agile.

	Agile	Traditional	p-value	Test
	% (n)			
Enables to accomplish tasks quickly			0.159	M-L
Agree	64.0% (16)	36.4% (4)		
Somewhat agree	32.0% (8)	54.6% (6)		
Neutral	4.0% (1)	0.0% (0)		
Somewhat disagree	0.0% (0)	9.1% (1)		
Disagree	0.0% (0)	0.0% (0)		
Improves work quality			0.026	M-L
Agree	60.0% (15)	18.2% (2)	0.031	F
Somewhat agree	36.0% (9)	54.6% (6)	0.465	
Neutral	4.0% (1)	27.3% (3)	0.076	
Somewhat disagree	0.0% (0)	0.0% (0)	1.000	
Disagree	0.0% (0)	0.0% (0)	1.000	
Enables task flexibility			0.446	M-L
Agree	56.0% (14)	27.3% (3)		
Somewhat agree	28.0% (7)	45.5% (5)		
Neutral	12.0% (3)	18.2% (2)		
Somewhat disagree	4.0% (1)	9.1% (1)		
Disagree	0.0% (0)	0.0% (0)		
Enables task effectiveness			0.270	M-L
Agree	56.0% (14)	27.3% (3)		
Somewhat agree	32.0% (8)	54.6% (6)		
Neutral	12.0% (3)	18.2% (2)		

Somewhat disagree	0.0% (0)	0.0 % (0)		
Disagree	0.0% (0)	0.0% (0)		
Gives greater control over work			0.029	M-L
Agree	80.0% (20)	36.4% (4)	0.020	F
Somewhat agree	16.0% (4)	36.4% (4)	0.214	
Neutral	4.0% (1)	27.3% (3)	0.076	
Somewhat disagree	0.0% (0)	0.0% (0)	1.000	
Disagree	0.0% (0)	0.0% (0)	1.000	
Fits well with the way I like to work			0.443	M-L
Agree	56.0% (14)	36.4% (4)		F
Somewhat agree	32.0% (8)	54.6% (6)		
Neutral	12.0% (3)	9.1% (1)		
Somewhat disagree	0.0% (0)	0.0% (0)		
Disagree	0.0% (0)	0.0% (0)		
Compatible with all aspects of my work			0.041	M-L
Agree	56.0% (14)	18.2% (2)	0.067	F
Somewhat agree	44.0% (11)	72.7% (8)	0.156	
Neutral	0.0% (0)	9.1% (1)	0.306	
Somewhat disagree	0.0% (0)	0.0% (0)	1.000	
Disagree	0.0 % (0)	0.0% (0)	1.000	

The summarised results in Table 3 above show that a large number of participants do agree that the Agile method enables them to accomplish tasks quickly (64%) while only 54.6% of those who use the Traditional method indicated for the same. The responses show that 60% of participants using the Agile method agreed it improves the work output quality (60%).

About 56% also agreed that Agile methodology enables ask effectiveness and flexibility. A good number of participants 80% agreed that the Agile methodology gave them greater control over the work to be done. Participants also agreed that the Agile methodology fits well with the way they liked to work and was compatible with all aspects of their work.

4.2.2 Differences in team characteristics between Agile and Traditional users

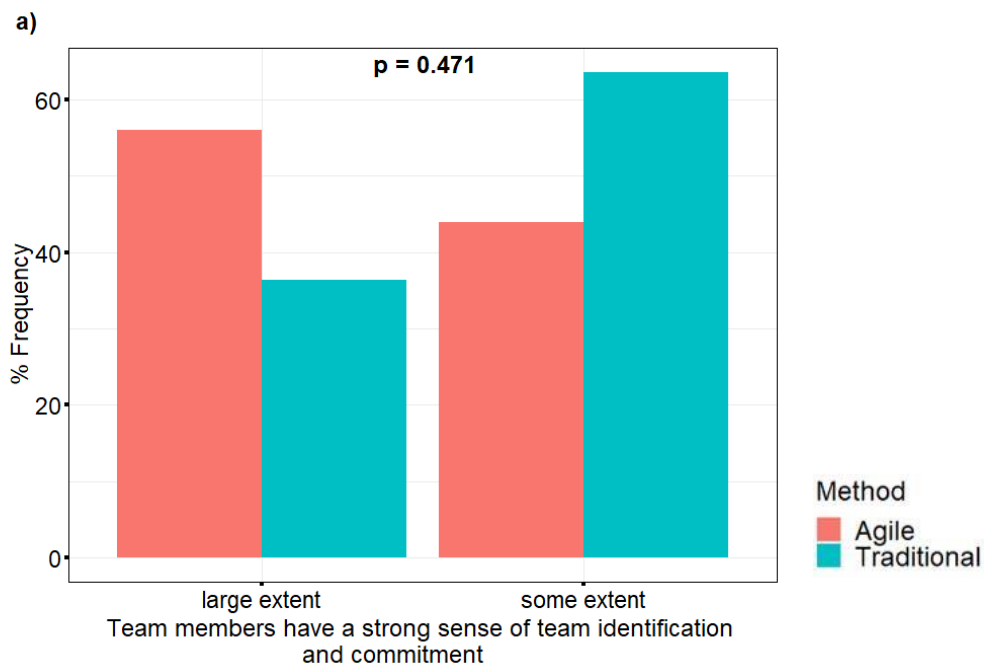


Figure 21: Team members team identification and commitment, Agile vs Traditional

Figure 21 above shows participants indicated that team members using the Agile method have a strong sense of team identification and commitment to a large extent while team members who use the Traditional method felt a strong sense of team identification and commitment only to some extent.

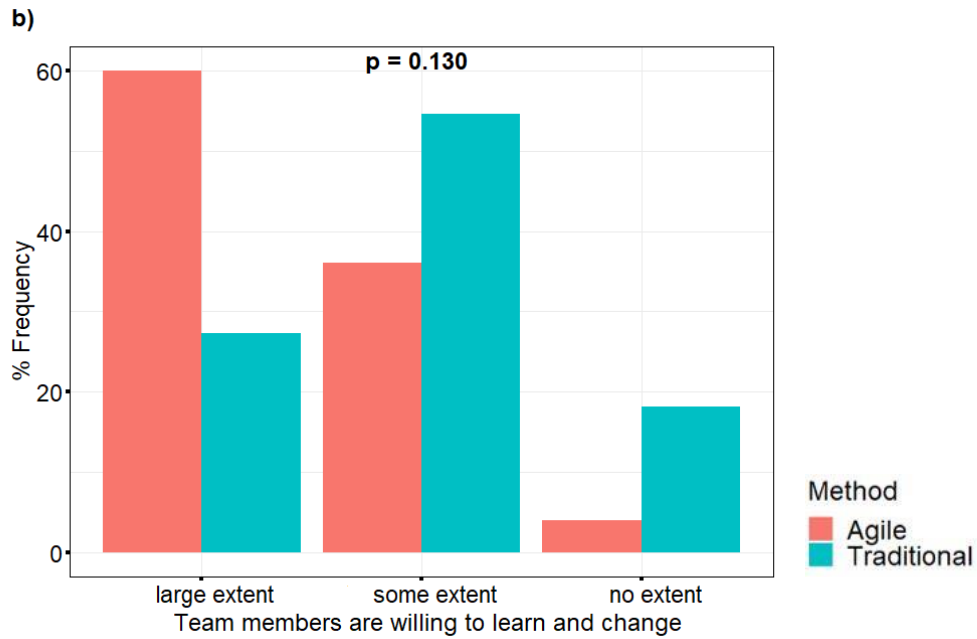


Figure 22: Team members willingness to change and learn, Agile vs Traditional.

Figure 22 shows that participants who use the Agile method indicated that team members are willing to learn and change to a large extent, a good number also indicated to some extent. For those who use the Traditional method they indicated that team members are willing to learn and change only to some extent and with some indicating to no extent at all.

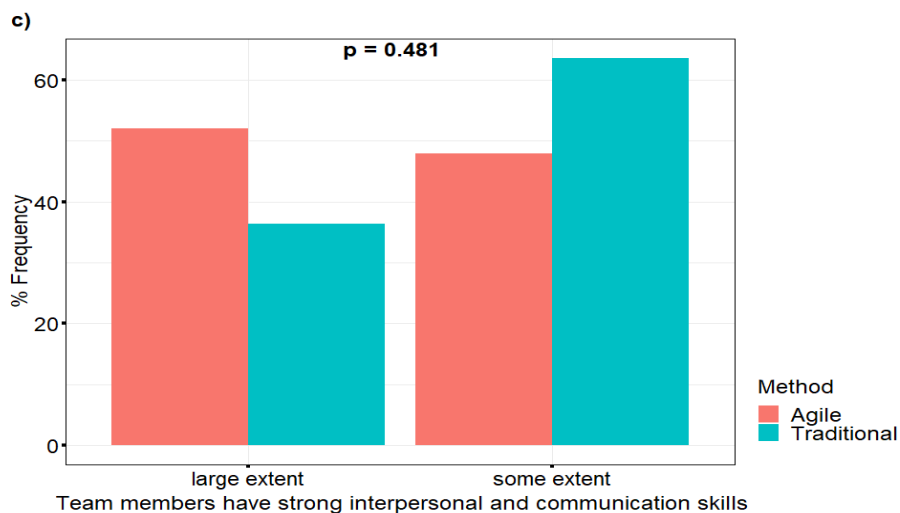


Figure 23: Team members interpersonal and communication skills, Agile vs Traditional

Figure 23 shows that participants using the Agile method indicated that team members have strong interpersonal and communication skills to a large extent with some indicating this is the case to only some extent. Participants using the Traditional method indicate that team members have strong interpersonal and communication skills to a fairly large extent with some indicating only to some extent.

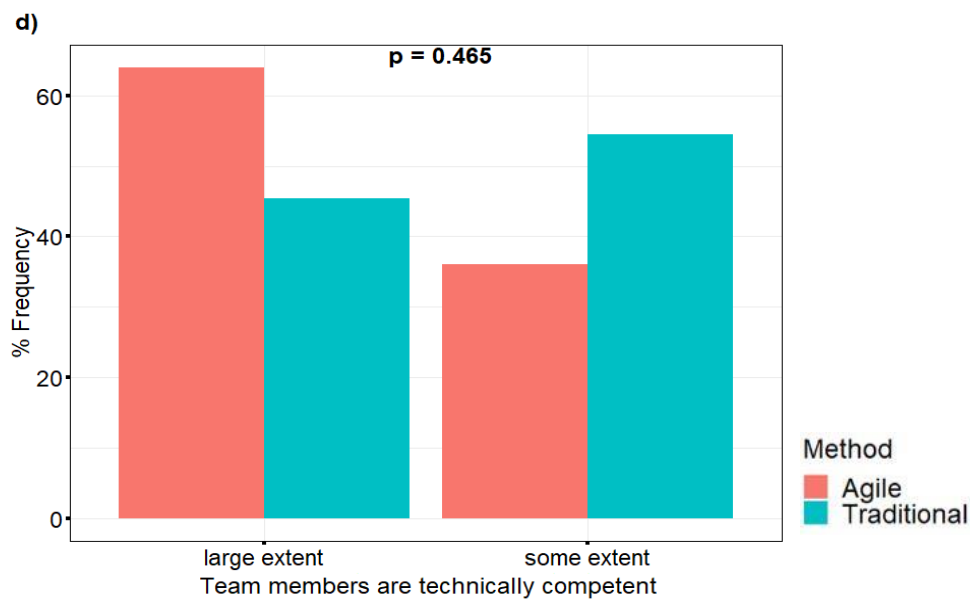


Figure 24: Team members technical competence, Agile vs Traditional

Figure 24 shows that participants who use the Agile method indicated to a large extent that team members are technically competent with some indicating this is then case only to some extent. For those using the Traditional method, the participants indicated that team members are technically competent to a fairly large extent and some indicating only to some extent.

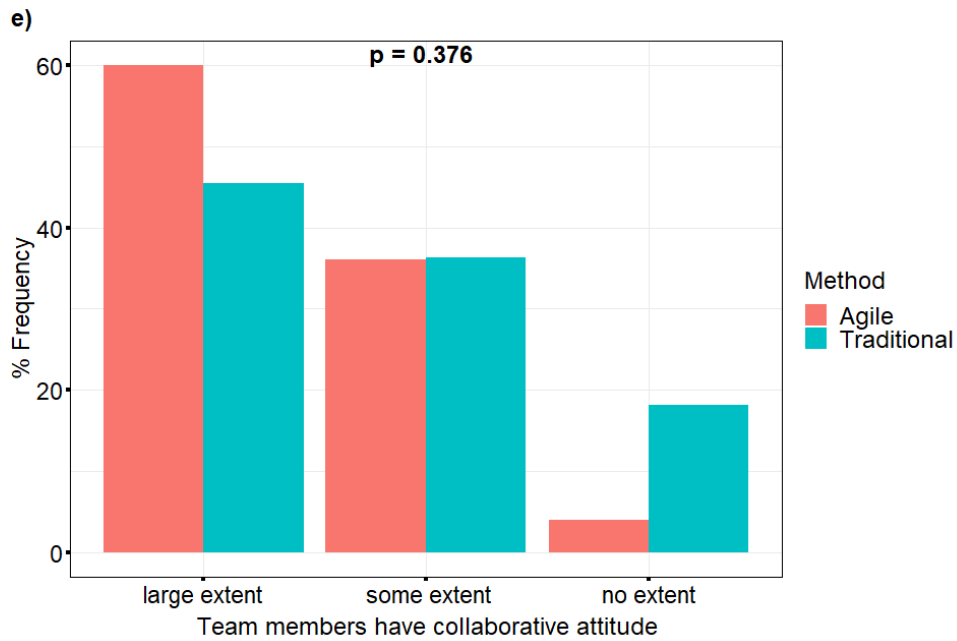


Figure 25: Team members collaborative attitude, Agile vs Traditional

Figure 25 shows that participants who use the Agile method indicated that team members have a collaborative attitude to a large extent with some also indicating this was the case only to some extent. For those using the Traditional method they indicated that team members had a collaborative attitude to a fairly large extent with some indicating this was the case to some extent and few others indicating to no extent.

The summary in Table 4 below shows that 56 % of the participants who use the Agile methodology felt a strong sense of team identification. Notably 63.7% of the participants who follow the Traditional methodology indicated that to some extent they felt a strong sense of team identification too. Participants using the Agile method indicated that to a large extent team members were more willing to change and learn and exhibited strong interpersonal and communication skills. More than 60% of the participants following the Agile methodology indicated that the team members were technically competent and more collaborative

Table 4: Resulting comparative frequencies on team member characteristics depending on method in use.

	Agile	Traditional	p-value	Test
	% (n)			
Strong sense of team identification and commitment			0.471	F
To large extent	56.0% (14)	36.4% (4)		
To some extent	44.0% (11)	63.6% (7)		
To no extent	0.0% (0)	0.0% (0)		
Team members are willing to learn and change			0.130	M-L
To large extent	60.0% (15)	27.3% (3)		
To some extent	36.0% (9)	54.6% (6)		
To no extent	4.0% (1)	18.2% (2)		
Team members have strong interpersonal and communication skills			0.481	F

To large extent	52.0% (13)	36.4% (4)		
To some extent	48.0% (12)	63.6% (7)		
To no extent	0.0% (0)	0.0% (0)		
Team members are technically competent			0.465	F
To large extent	64.0% (16)	45.5% (5)		
To some extent	36.0% (9)	54.6% (6)		
To no extent	0.0% (0)	0.0 % (0)		
Team members are collaborative			0.376	M-L
To large extent	60.0% (15)	45.5 % (5)		
To some extent	36.0% (9)	36.4% (4)		
To no extent	4.0% (1)	18.2% (2)		

4.2.3 Differences between Agile and Traditional method users in software development aspects

4.2.3.1 Product Development predictions

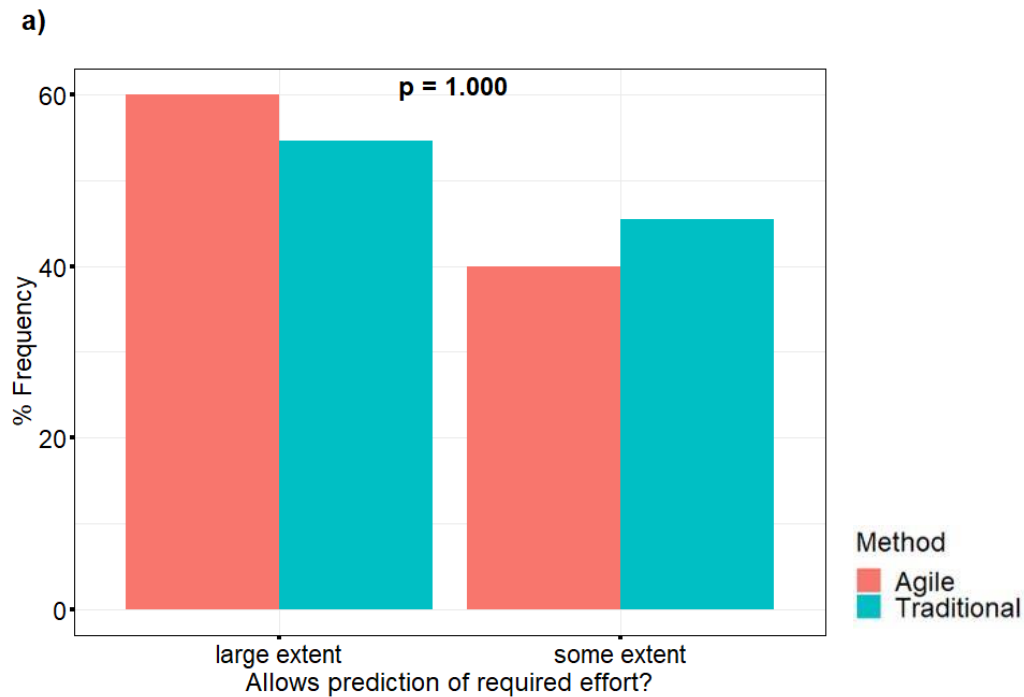


Figure 26: Method used Agile vs Traditional effects on prediction of required effort.

Figure 26 shows that participants using the Agile method indicated that it allowed prediction of required effort to a large extent and a fair number indicating to some extent. Similarly, those using the Traditional method also indicated that it allowed prediction of required effort to a large extent with some indicating only to some extent.

b)

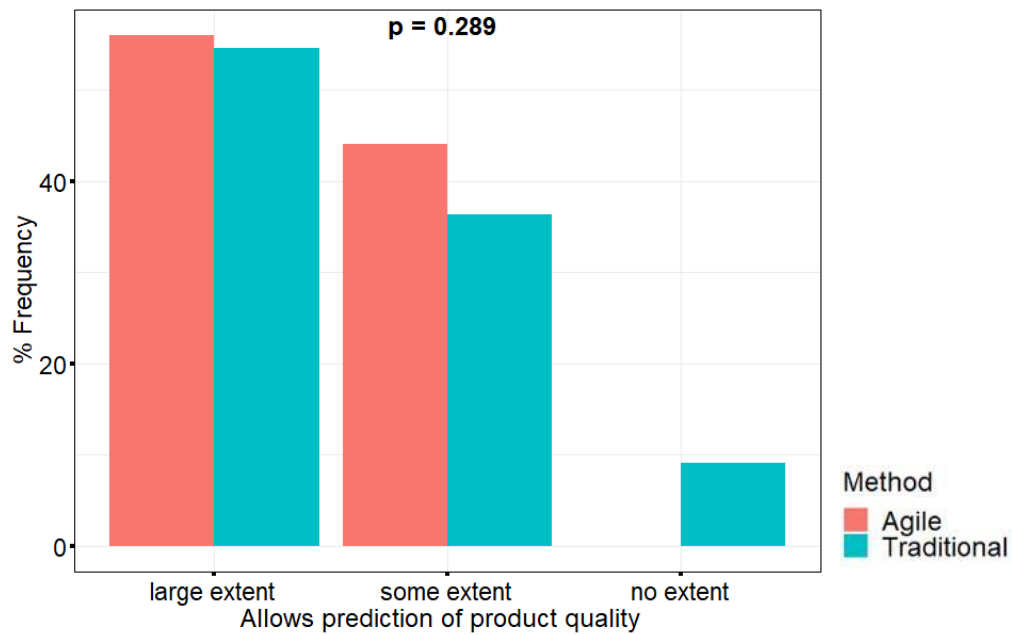


Figure 27: Method used Agile vs Traditional effects on prediction of product quality.

Figure 27 shows that participants using the Agile method indicated that it allowed prediction of product quality to a large extent and a fair number indicating to some extent. Similarly, those using the Traditional method also indicated that it allowed prediction of product quality to a large extent with some indicating only to some extent and a few others indicating to no extent at all.

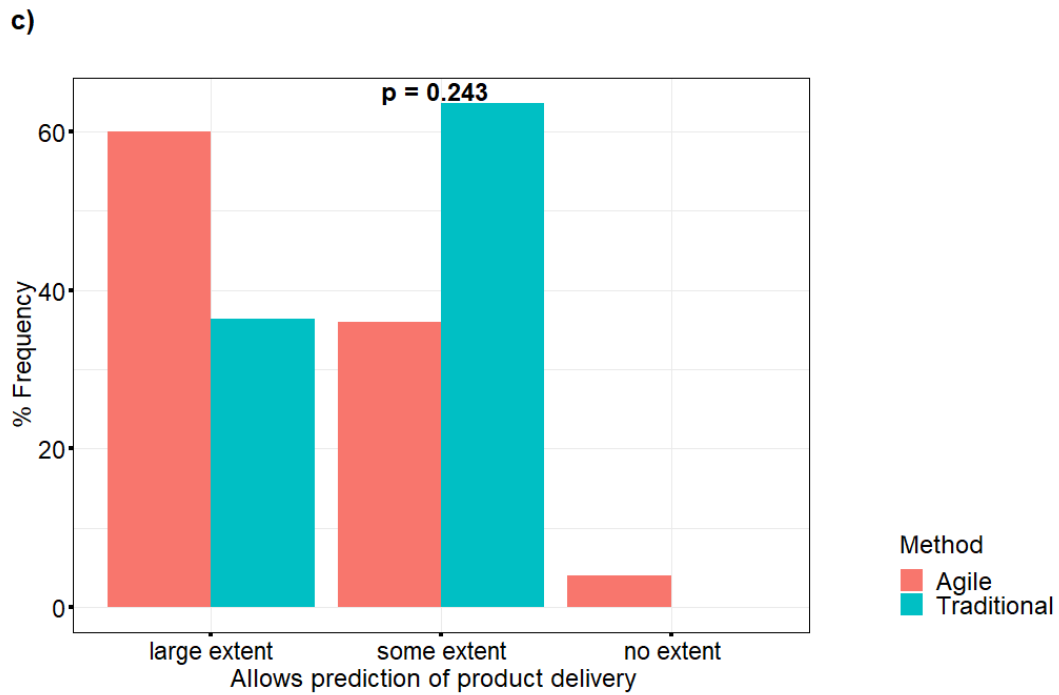


Figure 28: Method used Agile vs Traditional effects on prediction of product delivery.

Figure 28 shows participants who used the Agile method indicated it allowed prediction of product delivery to a large extent with a fair number indicating this is the case to some extent. Those who use the Traditional method indicated that it allowed prediction of product delivery to some extent with a fair number indicating to a large extent.

4.2.3.2 Effects on Product Quality

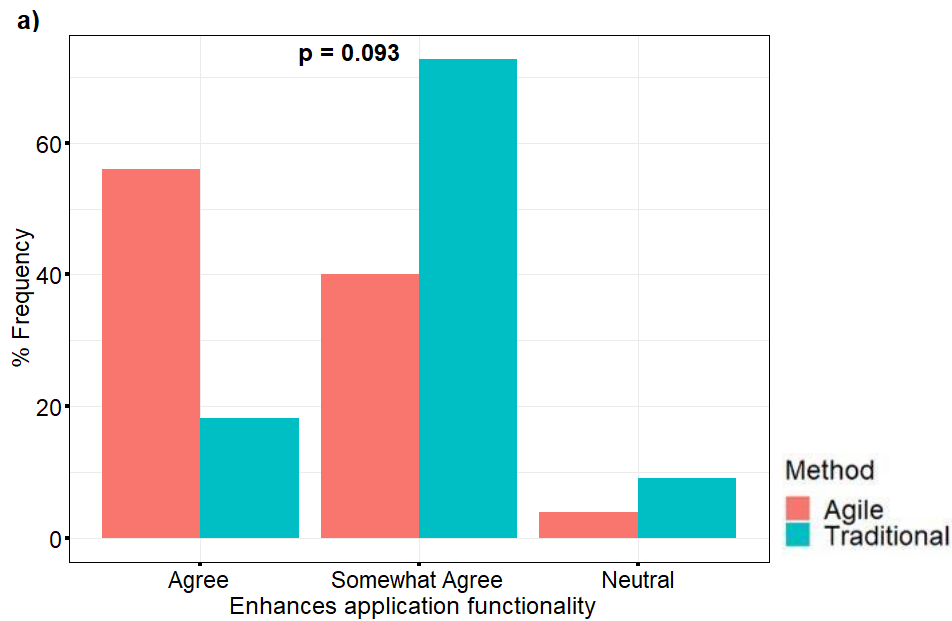


Figure 29: Method used Agile vs Traditional effects application functionality.

Figure 29 shows that the participants who use the Agile the method largely agreed it enhanced application functionality to with a fair number somewhat agreeing. For those who use the Traditional method, a larger number somewhat agreed that it enhanced application functionality.

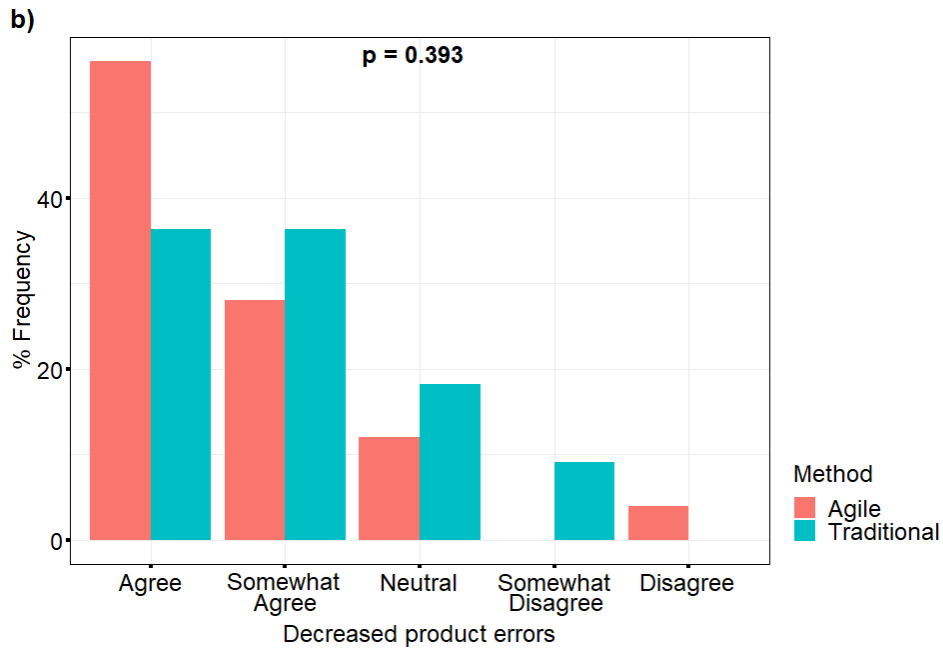


Figure 30: Method used Agile vs Traditional effects on product errors.

Figure 30 shows that participants who use the Agile methodology largely agreed that it helped decrease product errors. A fair number of participants somewhat agreed, and a few were neutral. For those who use the Traditional method, an equal number of participants fully agreed and somewhat agreed that it helped decrease product errors however, a small number also disagreed to this notion.

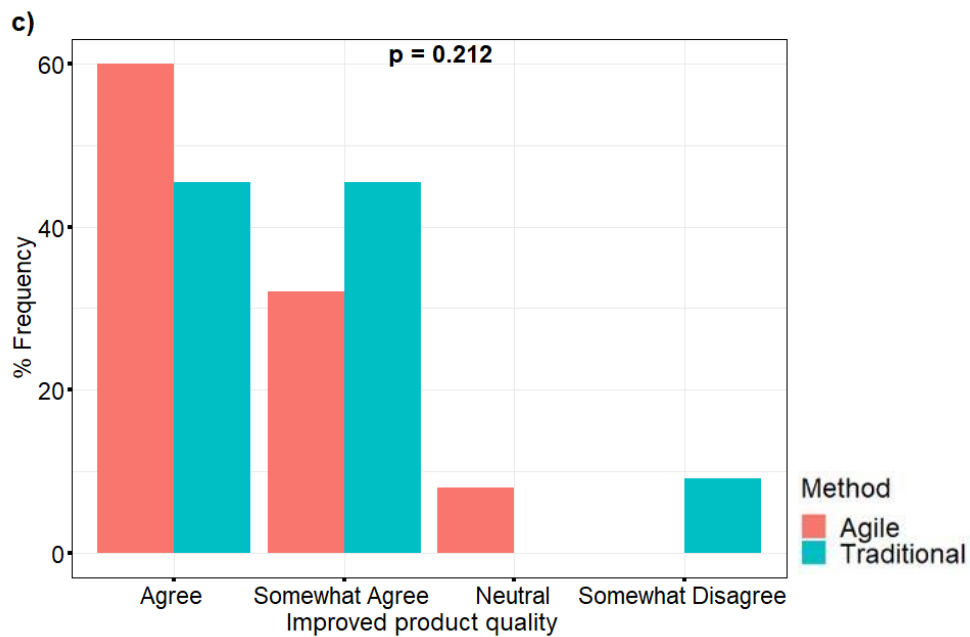


Figure 31: Method used Agile vs Traditional effects on improved product quality.

Figure 31 shows that participants who use the Agile method largely agreed that Agile improved product quality. A fair number somewhat agreed to this notion and a small number were neutral. For those who use the Traditional method an equal number of participants agreed or somewhat agreed that it improved product quality. A small number disagreed that the Traditional method improved product quality.

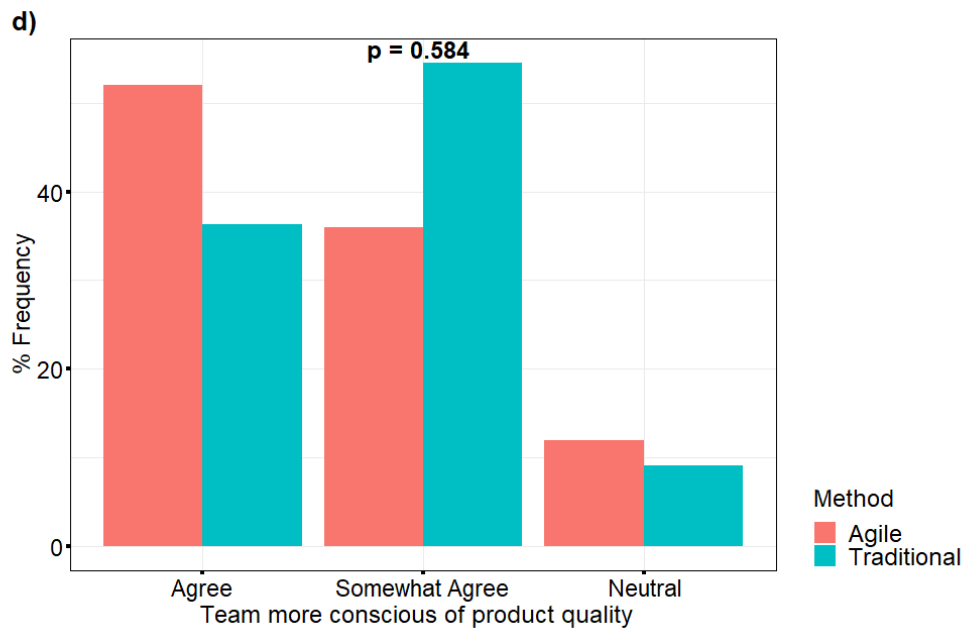


Figure 32: Method used Agile vs Traditional effects on team being conscious of product quality.

Figure 32 shows that an equal number of participants who use the Agile method largely agreed or somewhat agreed that it made the team more conscious of product quality. A few participants were neutral. For those who use the Traditional method more participants somewhat agreed it made the team more conscious of product quality with a fair number fully agreeing. A small number of participants were neutral on this notion.

The summarised results in Table 5 below show participant’s responses with regards to product quality depending on methodology being followed. Comparatively 60% of those who follow the Agile methodology indicated that following Agile helped them predict the required effort while 54.6% of those who followed the Traditional agreed also to the same notion.

Table 5: Resulting comparative frequencies on product quality Agile vs Traditional.

	Agile	Traditional	p-value	Test
	% (n)			
Allows prediction of required effort			1.000	F
To large extent	60.0% (15)	54.6% (6)		
To some extent	40.0% (10)	45.5% (5)		
To no extent	0.0% (0)	0.0% (0)		
Allows prediction of product quality			0.289	M-L
To large extent	56.0% (14)	54.6% (6)		
To some extent	44.0% (11)	36.4% (4)		
To no extent	0.0% (0)	9.1% (1)		
Allows prediction of product delivery			0.243	M-L
To large extent	60.0% (15)	36.4% (4)		
To some extent	36.0% (9)	63.6% (7)		
To no extent	4.0% (1)	0.0% (0)		
Enhances application functionality			0.093	M-L
Agree	56.0% (14)	18.2% (2)		
Somewhat agree	40.0% (10)	72.7% (8)		
Neutral	4.0% (1)	9.1% (1)		
Somewhat disagree	0.0% (0)	0.0% (0)		

Disagree	0.0% (0)	0.0 % (0)		
Decreased product errors			0.393	M-L
Agree	56.0% (14)	36.4% (4)		
Somewhat agree	28.0% (7)	36.4% (4)		
Neutral	12.0% (3)	18.2% (2)		
Somewhat disagree	0.0% (0)	9.1% (1)		
Disagree	4.0% (1)	0.0% (0)		
Improves product quality			0.212	M-L
Agree	60.0% (15)	45.5% (5)		
Somewhat agree	32.0% (8)	45.5% (5)		
Neutral	8.0% (2)	0.0 % (0)		
Somewhat disagree	0.0% (0)	9.1% (1)		
Disagree	0.0% (0)	0.0% (0)		
Made team more conscious of product quality			0.584	M-L
Agree	52.0% (13)	36.4% (4)		
Somewhat agree	36.0% (9)	54.6% (6)		
Neutral	12.0% (3)	9.1% (1)		
Somewhat disagree	0.0% (0)	0.0% (0)		
Disagree	0.0% (0)	0.0% (0)		
Greatly sped up new application development			0.175	M-L
Agree	64.0% (16)	45.5% (5)		
Somewhat agree	28.0% (7)	45.5% (5)		
Neutral	8.0% (2)	0.0 % (0)		
Somewhat disagree	0.0% (0)	9.1% (1)		
Disagree	0.0% (0)	0.0% (0)		

Made team more productive			0.405	M-L
Agree	60.0% (15)	36.4% (4)		
Somewhat agree	20.0% (5)	36.4% (4)		
Neutral	20.0% (5)	27.3% (3)		
Somewhat disagree	0.0% (0)	0.0% (0)		
Disagree	0.0% (0)	0.0% (0)		
Reduced software/systems development time			0.436	M-L
Agree	60.0% (15)	54.6% (6)		
Somewhat agree	24.0% (6)	27.3% (3)		
Neutral	16.0% (4)	9.1% (1)		
Somewhat disagree	0.0% (0)	9.1 % (1)		
Disagree	0.0% (0)	0.0% (0)		

More or less of the same percentage of participants, 50% for both the Agile and Traditional methods indicated that it allowed them to predict product quality. A lot more participants, 60%, indicated that the Agile method allowed prediction of product delivery and 56% indicated the Agile methodology enhances product functionality resulting in decreased product errors. Also, 60% of those using Agile method agreed that helped improve product quality with 52% agreeing it made the team more aware of product quality. 64 % of the participants who use Agile methods noted it greatly sped up new application development and 60% of the participants indicated it made the team more productive and reduced software/systems development time.

4.2.4 Customer satisfaction with products

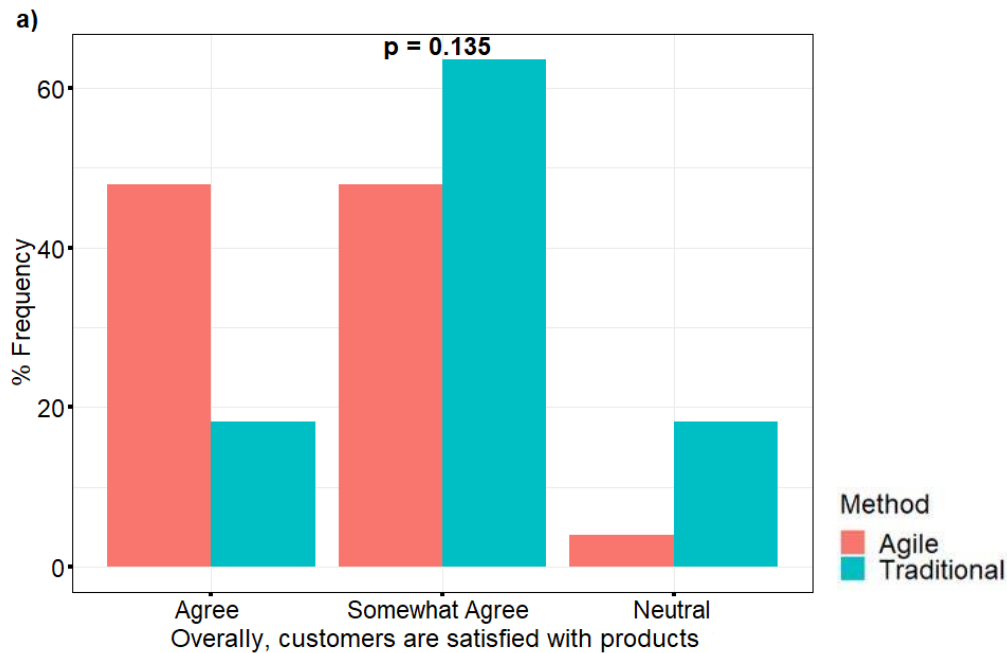


Figure 33: Method used Agile vs Traditional customer satisfaction with products.

Figure 33 shows that an equal number of participants who use the Agile method agreed or somewhat agreed that overall customers are satisfied with products. A small number were neutral about this notion. For those who use the Traditional method many participants somewhat agreed that overall customers are satisfied with products. An equal but small number of participants agreed or were neutral with regards to this notion.

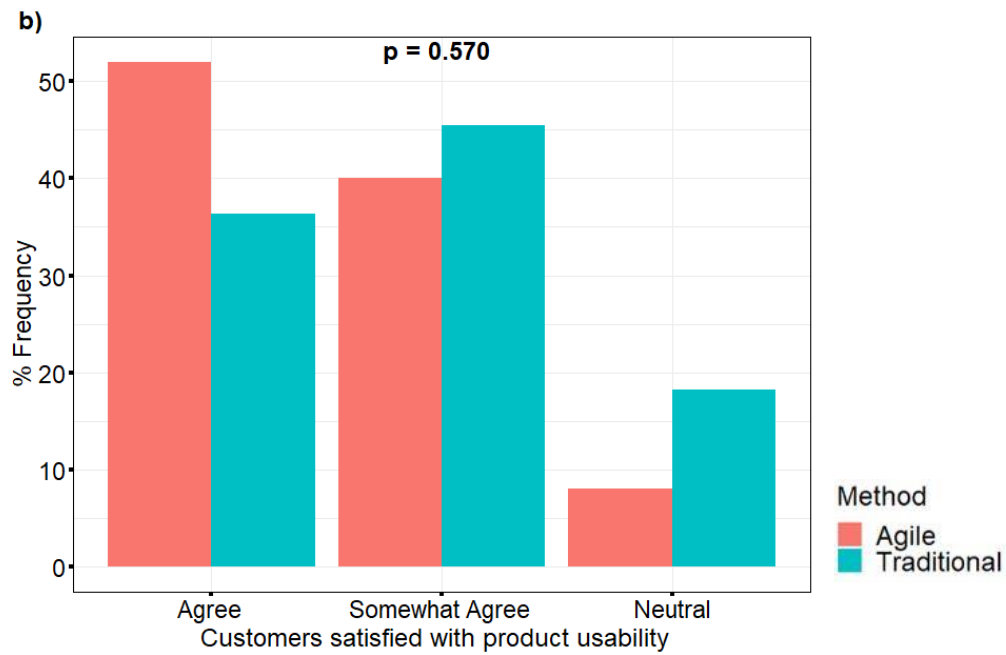


Figure 34: Method used Agile vs Traditional customer satisfaction with product usability.

Figure 34 shows that participants who use the Agile method largely agreed that customers are satisfied with product usability. A fair number somewhat agreed, with a small number who were neutral to this notion. For those who use the Traditional method more participants somewhat agreed customers were satisfied with product usability. A good number fully agreed with a smaller number of neutral participants.

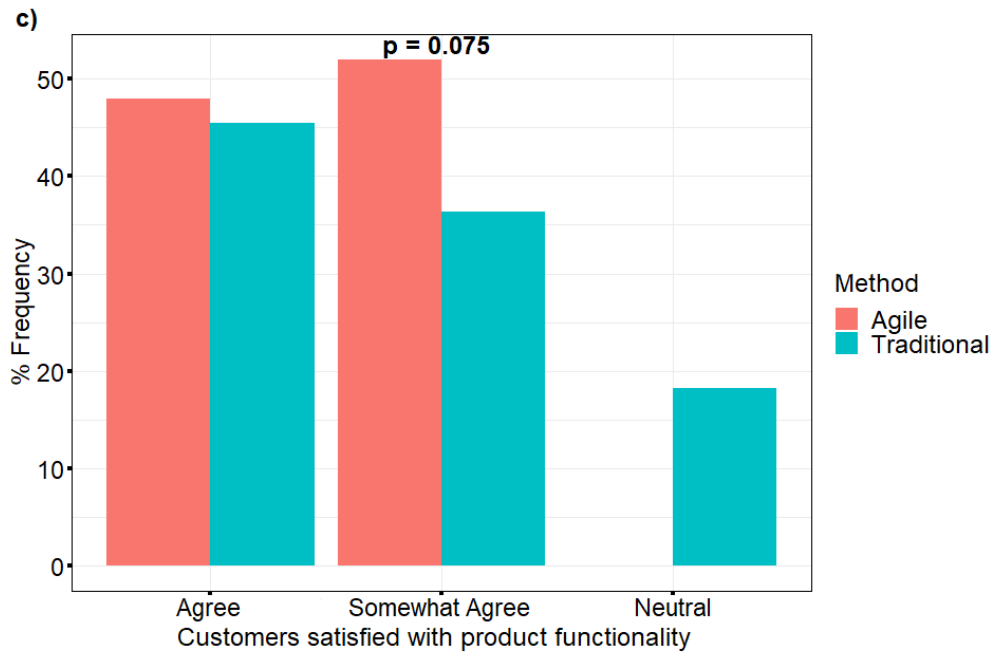


Figure 35: Customer satisfaction with product functionality, Agile vs Traditional

Figure 35 shows that participants who use the Agile method largely somewhat agreed or agreed that customers are satisfied with product functionality. For those participants who use the Traditional method they largely agreed, or somewhat agreed customers are satisfied with product functionality. A few were neutral with regards to this notion

Table 6 below show the participants’ responses when it comes to customer satisfaction depending on methodology being followed; 48% of those who follow the Agile methodology did agree that overall customers were satisfied with their products. 63.6% of those who follow the Traditional methodology somewhat agreed to the same notion. 52 % of the participants using the Agile method agreed that customers are satisfied with product usability. 48% of those using the Agile method agreed that customers are satisfied with product functionality yet 52% only somewhat agreed.

Table 6: Resulting comparative frequencies customer satisfaction because of method in use Agile vs Traditional.

	Agile	Traditional	p-value	Test
	% (n)			
Overall, customers are satisfied with our products			0.135	M-L
Agree	48.0% (12)	18.2% (2)		
Somewhat agree	48.0% (12)	63.6% (7)		
Neutral	4.0% (1)	18.2% (2)		
Somewhat disagree	0.0% (0)	0.0% (0)		
Disagree	0.0% (0)	0.0% (0)		
Customers are satisfied with product usability			0.570	M-L
Agree	52.0% (13)	36.4% (4)		
Somewhat agree	40.0% (10)	45.5% (5)		
Neutral	8.0% (20)	18.2% (2)		
Somewhat disagree	0.0% (0)	0.0% (0)		
Disagree	0.0% (0)	0.0% (0)		

Customers are satisfied with our product functionality			0.075	M-L
Agree	48.0% (12)	45.5% (5)		
Somewhat agree	52.0% (13)	36.4% (4)		
Neutral	0.0% (0)	18.2% (2)		
Somewhat disagree	0.0% (0)	0.0% (0)		
Disagree	0.0% (0)	0.0% (0)		

4.2.5 Open Ended Questions

Participants were asked to indicate their choice of an approach between Agile and Traditional methods as well as the reasons for choosing that approach. In Figure 20 below graph (a) shows the frequencies in choice, a comparison for the Agile and Traditional methods. The wordcloud (b) in the figure highlights the reasons given for choosing the Agile method. Only 1 participant out of 6 that chose either Traditional or Both methods gave a reason in favour of the Traditional method.

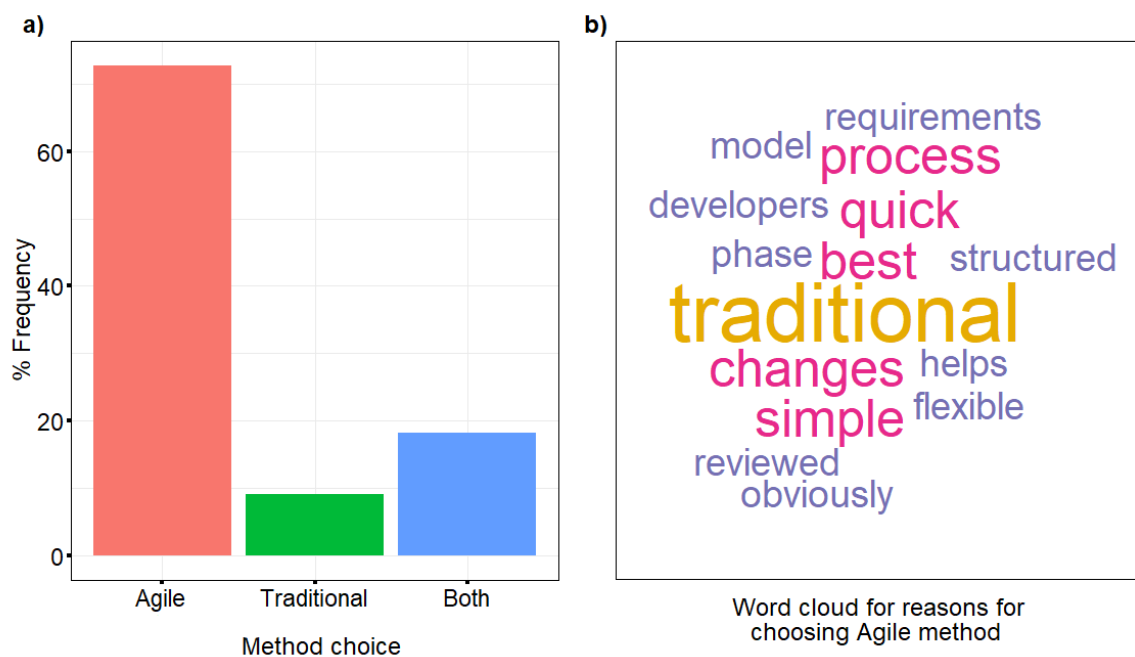


Figure 36: Method choice and reason

As per results represented in Figure 36 as well as Table 7 below, it is shown that more than 60% of the respondents indicated that given a choice they would choose the Agile approach, and most of them gave reasons that are supported by literature. The Agile methodology is iterative, and all the parties involved, developers, customers and stakeholders continuously collaborate to refine requirements and prioritise the work (Hass, 2007). *“Change is unavoidable, so Agile approaches embrace changes and recognize that it is almost impossible to create a comprehensive project plan at the beginning of the project”* (Špundak,

2014). It is also interesting to note that the participants responses to why they chose Agile were all stating first the reason they will choose Agile over the Traditional method by stating the shortfalls of the Traditional method which is why the word traditional appears large on the wordcloud for reasons for choosing Agile it was mentioned by many participants. Only one participant gave a reason in favour of the Traditional approach.

Table 7: Responses from participants choice approach Agile vs Traditional

Reasons for choosing Agile	Reasons for choosing Traditional
I am business analyst in my organization so according to my opinion I can just say that Agile methodology is better because it can provide rapid response to changes in the organization	Traditional, works well for the Support environment. Agile is not feasible.
I will go with the Agile approach because the best part of Agile is it allows teams to get easily side-tracked.	
Agile is quick than traditional approach and each phase of the development process is properly documented and reviewed when using the traditional approach. On the other hand, due to the quick delivery time required with the agile method, changes are usually made directly on the code, with the developers just adding comments and annotations.	

<p>I will pick Agile because Waterfall is theoretically excellent, but like all linear-hierarchical processes has multiple single-points-of-failure that are only explored or located at the very end.</p>	
<p>I will choose Agile approach because it helps to stay within the 80% and is more flexible to changes.</p>	
<p>I will go with Agile. Agile promotes some of the best practices found in development environments. Some of the risk in a project should be reduced as the output of developers is reviewed early and constantly during development.</p>	
<p>Obviously Agile because when projects are genuinely new, they usually require creativity. Requirements can then emerge as understanding matures and grows.</p>	
<p>Agile of course. It is an easy method as it is well and clearly structured and depends on finishing each phase separately that helps in concentrating on each one with its specific requirements and deliverables.</p>	
<p>Waterfall software development model is structured and often rigid. Our team also</p>	

prefer Agile as a more flexible model.	
Agile. Market deems it useful.	
Agile approach as it has become the industry standard with a lot more support	

Table 7 above shows participants actual responses to the question: **Given a choice, would you go with the Agile approach or Traditional approach or none? Provide us with your reasons.**

4.2.6 Recommended approach and reasons

Participants were asked to indicate why they recommend the chosen approach. The question asked was: **Would you recommend the Waterfall methodology/ Agile methodology as the choice approach to manage present day E commerce software projects?** In Figure 37 below Picture (a) shows the frequencies in comparison between those that recommended Agile vs those that recommended Traditional approach. Picture(b) is the wordcloud analysis of the main key words based on the reasons for recommending Agile method as indicated by the participants. Picture(c) is the wordcloud analysis of the main key words based on the reasons for recommending Traditional method as indicated by the participants.

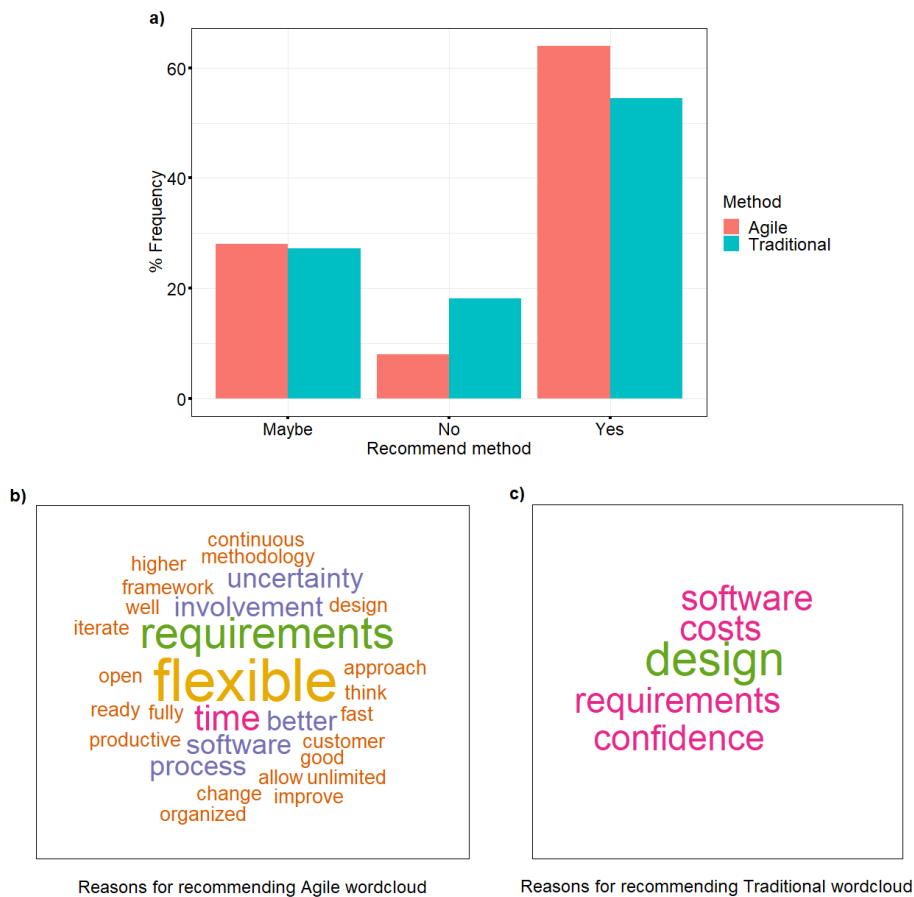


Figure 37: Recommended approach Agile vs Traditional

Table 8: Recommended approach

Reasons for recommending Agile approach	Reasons for recommending Traditional approach
Easier for flexibility in terms of changing requirements and receiving constant feedback	It has been used successfully for years
Agile is a framework that allows you to be more productive and spend most of	The best part of waterfall methodology which I like the most is incredibly rigid and flexible

your time doing relevant productive work.	that is why I can recommend to others.
When everyone understands what they want, Agile helps get the best software out in good time	Costs can be estimated with a fairly high degree of accuracy once the requirements have been defined.
Fast delivery and automation	According to my experience in waterfall method even before the software development starts, the design is hammered out in detail which makes the needs and the outcome clear to everyone.
I think in general agile methodologies are a much better choice. It has a focus on continuous improvement of your process, continuous working software, and tight communication between the people involved. I think each of these is will always benefit any team regardless of size and domain.	Waterfall is very feasible as it provides more confidence of what will finally be delivered earlier in the life cycle
Agile methodologies are better suited for situations with higher levels of uncertainty because they allow taking a flexible and incremental approach to resolve uncertainty as a project is in	Waterfall model is a progressive design process which in the software development industry goes through stages such as Conception, Initiation, Analysis, Design, Construction, Testing, Implementation, and Maintenance and

process.	steadily moves downwards similar to a waterfall flowing down
Because it provides good and organized involvement of customers and stakeholders	Waterfall can provide more confidence on well planned or managed projects
I think in general agile methodologies are a much better choice. It has a focus on continuous improvement of your process, continuous working software, and tight communication between the people involved. I think each of these is will always benefit any team regardless of size and domain.	
Because it provides good and organized involvement of customers and stakeholders	
Responding to Change, Accepting, Uncertainty, Faster Review Cycles, Greater Flexibility in Releasing Features.	
Agile provide higher collaboration	
I would highly recommend agile	

because the process is methodical and well documented.	
Maybe the reason is because in Agile its end goal is determined from the beginning.	
Due to open mindedness and flexibility	
due to unlimited benefits of Agile Methodology	
I do like the flexibility of Agile and the just in	
Less re-work on projects	
Because it creates a minimum viable product (MVP), then iterate to improve it	

As per results shown in Figure 38 and Table 8 above, a significant number of respondents recommended the Agile approach was just over 60%. A good number also recommended the Traditional approach with just over 50%. This indicated that the Agile method is still more highly recommended, but the Traditional method is still being used in the industry too. The reasons given by the respondents as to why they recommend Agile or Traditional are similar with what is in literature e.g., Agile software development stresses quality in design and Agile methods stress two perceptions: the unforgiving honesty of working code and the

efficacy of people working together with benevolence (Highsmith & Cockburn, 2001). “Agile development is based on the knowledge of incremental and iterative development, in which the phases within a development life cycle are revisited in repeated cycles. This approach iteratively improves software by using client/user feedback to converge on solutions” (Leau et al., 2012). Since the Traditional approach follows a set of defined processes which are not altered as the project moves, this approach makes it easier to determine the costs of the project, set a schedule and apportion resources appropriately (Leau et al., 2012)

4.2.7 Shortfalls per methodology

Participants were required to answer based on their experience the shortfalls of each method/approach. The question was: **What are the shortfalls/risks of the Agile approach based on your experience and working with Agile teams?** Figure 38 picture (a) below shows a wordcloud highlighting key words based on the responses given by the participants stating the shortfalls of the Agile approach. Picture (b) on the figure the wordcloud highlighting what the participants deemed as the shortfalls of the Traditional approach.

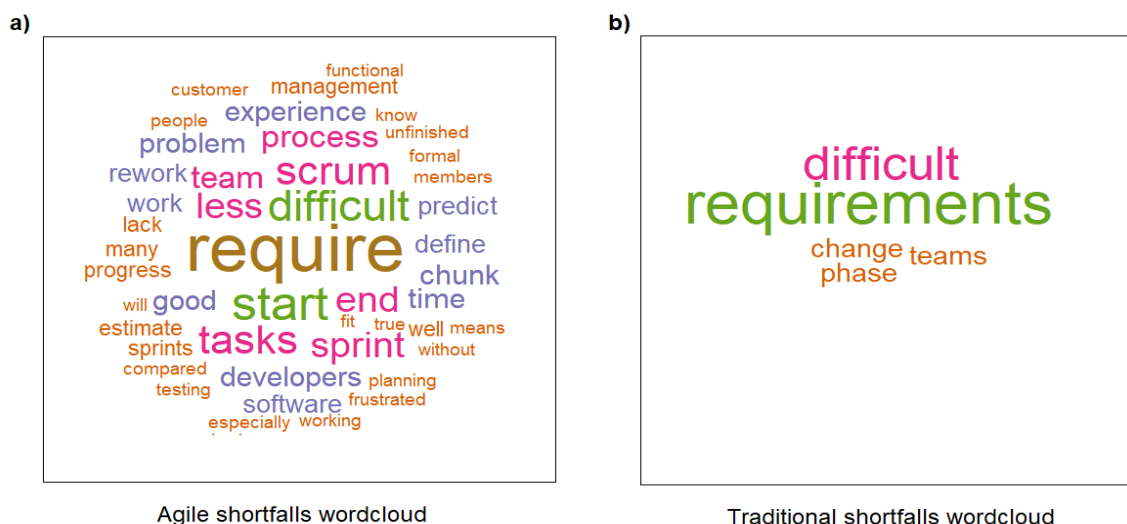


Figure 38: Shortfalls of each method

In as much as in the previous question there was indication that the Agile approach is the more popular or desired approach there were more shortfalls that were raised in Figure 39 and Table 9 below it also shows that there are more shortfalls being noted for the Agile approach in comparison to the Traditional method. Note also that respondents who use the Scrum Agile methodology indicated the shortfalls of the Scrum process not so much the Agile approach itself and this highlighted the principle of Agile approach is widely accepted but the process itself has weaknesses as indicated in the responses.

Table 9: Shortfalls of each approach/method

Shortfalls of the Agile approach	Shortfalls of the Traditional approach
Commitment from all team members	It is very difficult to go back and change something that was not well-documented.
if prioritization of work items is not done correctly and the end dates are not firmly communicated then the project could end up taking a lifetime due to the fast and continuous feedback loop.	Our clients find it challenging to conceptualise their needs in terms of a functional specification during the requirements phase. I mean sometimes we worry about that they change their minds once they see the end product, which is difficult to address if the application needs to be re-engineered to any large extent.
Lack of flexibility at the start from product owners	Needs can be difficult to define in Waterfall methodology
No documentation	Projects may take longer to deliver, compared to using an iterative methodology such as Agile.

<p>Compared to more formal methodologies, Agile lacks many of the checks and balances that safeguard less experienced developers and team members. Because Agile does not have a formal design phase, long-term project development can be more problematic.</p>	<p>Waterfall projects do not have to be but tend to be made up of 'teams within teams'.</p>
<p>As per my experience in software testing company during this year, I have found below risks that are often involved while managing projects in Agile model.</p>	
<p>I cannot speak for other agile implementations, but I have some experience working in scrums and being a scrum master. The following is the biggest disadvantage I personally experienced with the process.</p> <p>The biggest problem with scrums is the fact that the tasks included in a scrum are only as good as how well they have been defined. Unfortunately, it is very difficult to define tasks that are new and nobody on the team has a good idea of how long it takes to complete. This is especially true when working on new products or features that do not have precedents. It is also true for tasks that require research and analysis.</p> <p>By definition, tasks included in a scrum should be completed by the end of that sprint without requiring any rework. This is great in principle but when you throw in tasks that have not been defined properly, it begins to fall apart pretty quickly. Estimating tasks that have never been done before is almost like estimating the run time of a database query without actually executing it. There is always a good chance that the initial estimate turns out to be wrong by several magnitudes. This consequently results in tasks going unfinished in a sprint. But with scrums, the scrum master is not taught to take unfinished tasks into account when planning future sprints. Consequently, when you start having unfinished tasks, he is either forced to fit them into the next sprint or leave them in the backlog for a future</p>	

<p>sprint. This creates more delays and/or work in progress, in direct contrast to the agile methodology's objective of reducing both. Furthermore, when this starts happening regularly, it makes sprint planning harder and makes people involved in the sprint grow progressively more frustrated, eventually making the sprints burdensome without any real benefits over other methodologies.</p>	
<p>Agile methodologies are less predictable in determining the cost and schedule for completing a project prior to the start of the project.</p>	
<p>As agile is based on the idea that teams will not know what their end result (or even a few cycles of delivery down the line) will look like from day one, it is challenging to predict efforts like cost, time and resources required at the beginning of a project (and this challenge becomes more pronounced as projects get bigger and more complex).</p>	
<p>Agile delivers in increments, tracking progress requires us to look across cycles. And the “see-as-we-go” nature means we cannot set many KPIs at the start of the project. That long game makes measuring progress difficult.</p>	
<p>It is less predictable what will be delivered at the end.</p>	
<p>It is really challenging when there is a supplier-customer relationship.</p>	
<p>It is very intensive for both developers and users.</p>	

<p>1: In case of some software deliverable, especially the large ones, it is difficult to assess the effort required at the beginning of the software development life cycle.</p> <p>2: There is lack of emphasis on necessary designing and documentation.</p> <p>3: The project can easily get taken off track if the customer representative is not clear what final outcome that they want.</p> <p>4: Only senior programmers are capable of taking the kind of decisions required during the development process. Hence it has no place for newbie programmers, unless combined with experienced resources</p>	
<p>Agility is always a good thing, in theory, but most of "Agile" development is an attempt to patch closed allocation, which is broken from the start. Also, enforcing an Agile style of development, communication, and work allocation means adding more management, not less. Usually, it becomes a justification for yet more micromanagement. For example, Scrum is probably good for turning the uninitiated into reliable, useful junior developers. For senior developers and higher, it is miserable. After 5 years, if you are any good, you get to a point where you are only interested in longer-term projects with some architectural meat and a long-term focus. People like that do not enjoy working on Scrum teams and, paradoxically, often end up as under performers because it means they must suffer under more micromanagement, and typically have less autonomy. Now, your best people feel like they are micromanaged and not learning much except how to game a process, and they tend to get angry and leave.</p>	
<p>Less predictability and more time commitment that in the end, will lead the project falls off track. I think these two are the major drawbacks of Agile.</p>	

My problem with agile is the amount of rework and the rework comes in many forms.

1) Since things are being broken up in smaller chunks to fit into sprints, non-value work is needed to put it back together at some point to have a fully functional process.

2) Because of #1, you have repeated steps to rebuild test data and test environment because of the need to retest as you add on to a fully functional process that was broken up to be smaller just so it can fit into a sprint.

3) Dependencies are typically not defined well as you do work in functional chunks but do not know enough about the entire system you are building. So, Chunk A is built in an early sprint, but you find out later that Chunk B had a dependency on Chunk A. The dependency causes part or all of Chunk A to have to be reworked.

4) The constant sprints require more version control and reconciliation management. This results in not only the lost time of building constantly, but developers chasing ghost bugs resulting in this endless churn of code deploys and reconciliations.

5) Regression testing increases because all of the above.

6) Implementation management and release planning increases because all of the above.

Undefined before starting and it can be very challenging on much larger projects

As with other development models, the agile software development process has its fair share of common problems. Requirement management as well as customer involvement is a challenge while using agile. This is especially true in terms of language barriers, challenges in establishing the credibility of the agile software company with the customer, as well as timing and long feedback intervals from the team to the client.	
--	--

4.2.8 Other recommended methodologies besides Agile and Traditional

Participants were asked to indicate if there were any other approaches they follow to ensure the success of their projects. The question asked was: **Describe any other processes you follow as an organisation to ensure success of your Ecommerce development projects excluding Agile or Traditional.** The table below shows the participants responses.

Table 10: Other approaches possibly used.

Lean practices, Kanban, and Six Sigma

No have wasted man years of unnecessary effort building the wrong product customers did not buy, going through weeks of integration hell after months of development, must find bugs quarters after creating them, etc.

Currently we are using only Agile and traditional waterfall method in all projects.

We usually used agile methodologies and traditional waterfall methodology.
--

I have used a well-recognised waterfall methodology PRINCE2, which was created by the UK Government and is still held in high regard in the public sector.
--

I think Waterfall and Agile are the two main yet reliable methodologies for developing software products.

The responses in Table 10 above show that most of the Ecommerce organizations have adopted either the Agile or Waterfall methodology and do not seem to indicate any other approach outside of those main ones. Participants stated different methods they use but still fall under the umbrella of Agile or Traditional.

4.2.9 General comments from participants

Participants were given the opportunity to give their general comments to address anything else in case it was not covered by the previous questions. The responses are shown in the table below.

Table 11: General Comments

Agile is just a framework and must be flexible enough to adapt to differing needs.

Application Support primarily involves incident management, service requests and changes/fixes and help with business operations tasks. Most of these have a short turnaround time, so it has an element of unpredictability which makes it hard to adapt agile practices around it.

I like the Agile approach as it follows an iterative process where projects are divided into sprints of the shorter span.

The best part of Agile is it is not tiring nor time consuming.

Agile might be everywhere these days but Agile is not for everyone.

Agile itself is not a PM framework and it is not a “methodology”. It is a set of principles and values relating to product development, specifically producing software. There are, however, methods based on Agile principles, and these are Product Development methods, not project management frameworks.

Overall, I like both approaches they are equally good and helpful.

I think when choosing between the two approaches the decisive factor should be how well we know the end goal and the path.

The Agile Methodology is newer and better than the waterfall model that follows an incremental way of finishing tasks. In this method, Developing and testing are concurrent and in a continuous iteration, unlike the Waterfall method. It also depends on the collaboration between the team members and the end-users. It also allows the changes during the development cycle without affecting the progress of the process.

Table 11 above shows the participants general comments and thoughts. The Agile method still stands out as a preferred approach but does not apply for everyone e.g., Application support which involves incident management, service requests and changes/fixes that apply to the business operations. Agile is described as a framework or a set of principles and values but is not itself a “methodology”. A key thought also was mentioned that the decisive factor when choosing which approach to take between the two Agile vs Traditional is how well we know then end goal and path.

4.3 Results Summary

This chapter presented the results of an online survey done amongst Ecommerce organisations the Western Cape region. This survey found that, the Agile methodology is the most popular and recommended approach for Ecommerce software development projects. It also revealed that the Traditional approach is still applicable to some Ecommerce organizations especially for big projects needing a budget specified upfront. In as much as the Agile is deemed best in the Ecommerce Industry because it presents many advantages and flexibility required when developing software products, there are also several shortfalls of this popular approach. Chapter 5 which now follows will be the prototype construction as a case study based on the survey results.

Chapter 5 - Ecommerce Website Prototype Implementation

This Chapter presents a case study Ecommerce project that is implemented using the Agile approach that has been highlighted in the research results from Chapter 4 as the most recommended approach in the Ecommerce Industry.

5.1 Background -Case Study

HeelsFrenzy Cape Town is a shoe selling business based in Cape Town. The company name used for the purposes of this case study is an alias. They would like to take their business online and therefore would like an Ecommerce website constructed to sell shoes online. They currently sell their products on social media but would like to setup an online Ecommerce shop. This provides a platform for the business to sell more of their products online seamlessly and increase reach to dedicated customers. Creating this prototype for their business fits with the research being conducted as we are employing the Agile methodology recommended by participants of the study as the choice approach.

5.1.1 Case Study considerations

A case study is a general term for the evaluation of an entity, group, or phenomenon. It is a comprehensive description of an individual case and its analysis, i.e., the classification of the case and the events, as well as a description of the discovery process of these features that is the process of research itself (Yin, 2006). The research results informed the decision on which methodology to employ for this case study i.e., Agile. The researcher explained the processes followed for both the Agile and Traditional methods to justify why the recommended Agile method would be more suited for the project to build an Ecommerce website prototype. Based on the scope given by the business owner the requirements were clear and the researcher explained to the business owner how at each phase of the

implementation of the Agile approach how an application of the Traditional phase could have differed.

5.2 Project Prototype Scope

The scope of this project for the prototype is as provided by the business owner. The following features will be integrated into a new website prototype.

- An easy- to-use interface, with 3 pages: **Home, Contact Us, Shop**
- A product catalogue
- A shopping cart
- Customer registration and login

The prototype interface is developed with Adobe XD (<https://www.adobe.com/products/xd.html>). Adobe XD is any easy-to-use platform that helps create designs for websites. The interactive version of the prototype was developed using figma (www.figma.com). Figma is a vector graphics editor and prototyping tool which is primarily web-based.

5.3 Project Plan

Agility calls for some best practices like sprint plans, deliverables, retrospectives, production visioning and creating a roadmap very different from the Traditional approach. With the Traditional approach, the entire project is planned upfront without any scope for changing requirements. Agile divides a project into parts (called iterations) where each release is sent to the customer after every single iteration, this eliminates the need for upfront planning completely. Since we are following the Agile methodology in the development of the prototype, to keep the project progress transparent and measurable, the main deliverables are outlined below.

- **Vision Statement** – Summary of the product goals
- **Roadmap** - It includes a high-level view of the product requirements as provided by the business owner to achieve the product vision. A general timeframe is outlined of the development and release the specified requirements.
- **Product Backlog** – This is the detailed list of tasks in the scope for the Ecommerce website prototype, ordered by priority.
- **Release Plan** – Estimated time frame for the release of the Ecommerce website prototype.
- **Sprint Backlog** - This will include user stories, the goals, and tasks associated with the on-going sprint.
- **Increment** - The working functionality of the product that will be demonstrated at the end of the sprint.

5.3.1 Product Vision Statement

A prototype Ecommerce website for selling shoes online consisting of three pages Home, Contac Us and Shop loaded with products and payment options.

5.3.2 Product Roadmap

Table 12: Product roadmap

Feature	Development time estimate	Estimated release date
Website Interface Design	5 hrs	29-03-2020
Home Page	3hrs	30-03-2020

Customer Login Page	4hrs	31-03-2020
Contact Us Page	2 hrs	01-04-2020
Product catalogue	8hrs	07-04-2020
Shopping Cart and checkout	3hrs	15-04-2020

5.3.3 Product Backlog in order of priority

Table 13: Task List

Development Task List
Choose colour scheme and website template
Add Home page and content
Add Customer registration/login page with relevant fields (Email, Password)
Add option to sign in with Facebook on Customer login page
Add a Contact Us page with the following fields (Name, Email, Subject, Message)
Add a Shop page with product catalogue each product must have a picture and price
Create shopping cart for users to load products from catalogue and checkout option for payment

5.3.4 Release Plan

Table 14: Release plan

Feature	Sprint	Sprint Start Date	Release date
Home Page, Customer Login, and registration, Contact Us Page	Sprint #1	23-03-2020	31-03-2020
Shop Page with Product Catalogue, Shopping cart and checkout	Sprint #2	03-04-2020	15-04-2020

In Traditional planning, instead of developing in iterations as you would in Agile process as shown in Table 14, you track change management in sequential phases, so team members complete each phase of a plan before beginning the next phase.

5.4 Implementation and Development of the prototype

5.4.1 Sprint #1

5.4.1.1 Task user Stories

Table 15: User Stories Sprint#1

User Story	Acceptance Criteria
As a customer I want to see information about the business on the Home page	-See company logo on top left corner. - see company introduction on

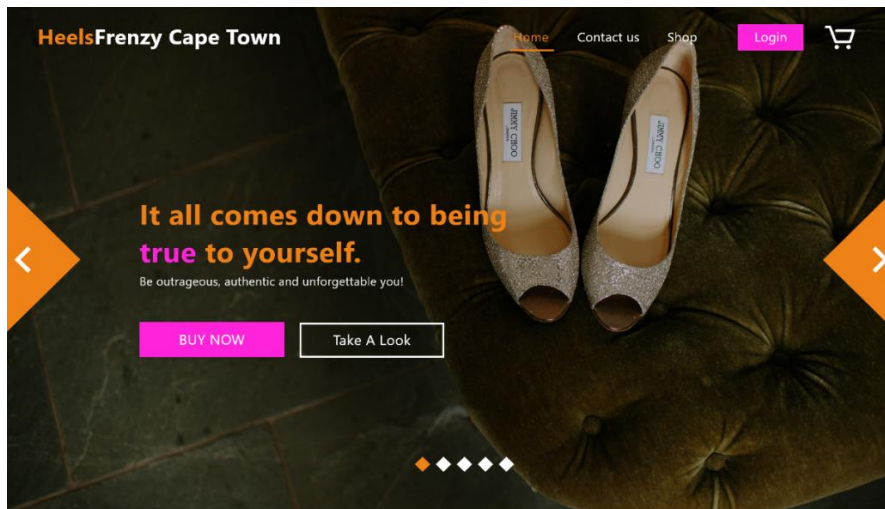
	page
As a customer I want to be able to register/login on the website to buy shoes	-Login form with email and password fields for user to fill in
As a customer I want to be able to contact the business owner using a website form	-Contact form with few fields for customer to fill in: Name, email, subject and message

Table 15 above shows all the tasks/user stories together with their acceptance criteria, all the work to be done for sprint 1. A user story describes a desired feature (functional requirement) in narrative form.

5.4.1.2 Sprint Deliverables

Sprint #1 is now completed the following features have been delivered.

1. Home page with content



ABOUT US

I have worn a ring for years that says To Thine Own Self Be True, which is a famous quote by William Shakespeare. That's where our passion for Heels really comes from advocating all ladies to be their best self at all times and in all places. We know we are not alone in looking for just the right style to help you shout to the world, "Here I am!" There's nothing better than a really flattering pair of shoes and all these limited edition Heels are just that! Each pair was created with love and better yet genuine leather! What's so special about these is that unlike other products both the outer and the lining are 100% genuine leather, making them soft, comfortable and polished. We hope you enjoy them as much as we enjoyed creating them for you



[Read More](#)

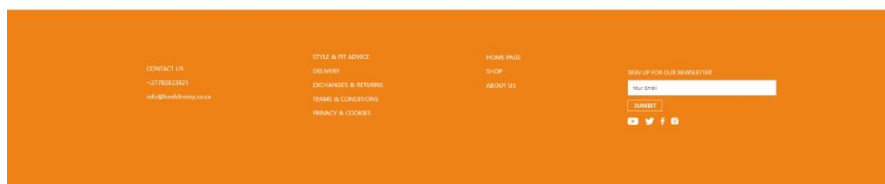


Figure 39: Home page

The figure above shows the Home page for the customer's site with all its contents.

2. Customer login/registration form

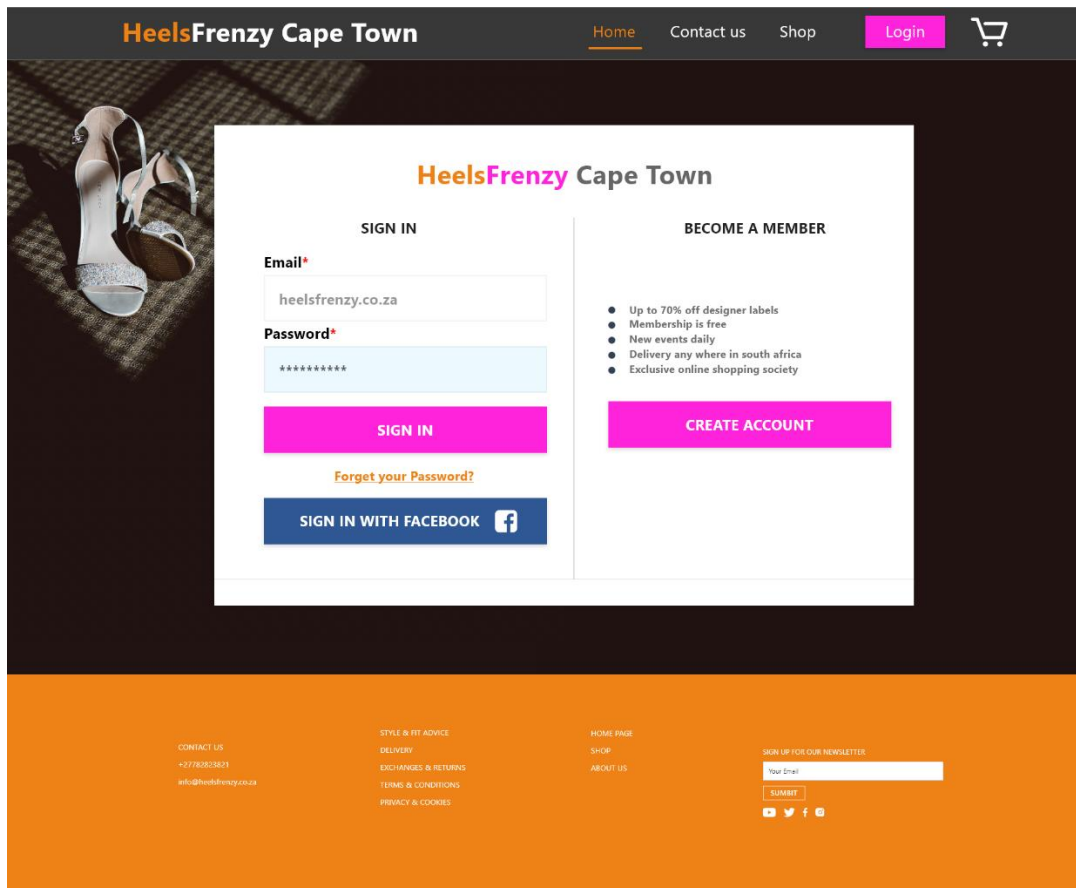


Figure 40: Registration/Login form

The figure above shows the customer login/ registration page for the website.

3. Contact Us form

The image displays a contact form for HeelsFrenzy Cape Town. The form is centered on the page and features the following elements:

- Header:** "CONTACT US" in orange text.
- Fields:** Four input fields labeled "Name", "Email", "Subject", and "Message". The "Message" field contains a placeholder text: "Give as many details as possible...".
- Button:** A pink button labeled "SEND FEEDBACK" with a right-pointing arrow.

The background of the page shows a red high-heeled shoe on a wooden surface. The footer contains navigation links and a newsletter sign-up form.

CONTACT US
+27 82823821
info@heelsfrenzy.co.za

STYLE & FIT ADVICE
DELIVERY
EXCHANGES & RETURNS
TERMS & CONDITIONS
PRIVACY & COOKIES

HOME PAGE
SHOP
ABOUT US

SIGN UP FOR OUR NEWSLETTER
Your Email
SUBMIT
YouTube, Twitter, Facebook, Instagram icons

Figure 41: Contact Us Form

The image above shows the site contact form for customers to communicate with the business owner.

5.4.1.3 Sprint Review

The first sprint goals have been met; we are still moving along according to plan. The Traditional approach would only have a final review right at the end of the project so will not accommodate any change in scope in the middle of the project.

5.4.2 Business owner comments

Question: Are you happy with the first delivery from Sprint 1 and how do you feel about the Agile method we are following to manage the project based on your experience on this mini project?

Answer: So far so good, I am happy with the timeous delivery and that we are moving according to plan. The value I get from the process we are following is the fast delivery of the features. I can see the product evolving and able to suggest changes sooner. Being involved and being part of the build makes me feel more confident in the desired outcome. I appreciate the continuous communication to keep me in the loop of how things are going, there is visibility and transparency in the Agile process we are following.

5.4.3 Sprint #2

5.4.3.1 Task user Stories

Table 16: User stories Sprint #2

User Story	Acceptance Criteria
As a customer I want to view a list of products so I can select some to purchase	-Image for each product -Click to view product. -View the price of the product
As a customer I want to review my shopping cart so I	-View quantities and items in

can adjust prior to checkout	cart -See total cost. -Change quantities. -Remove items
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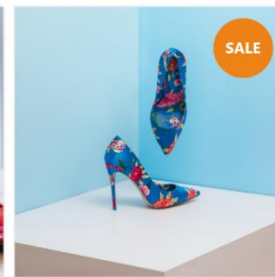

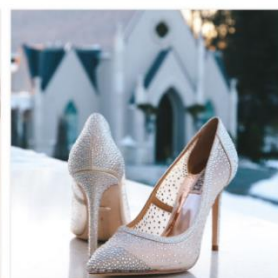

Table 16 above shows a list of user stories and their acceptance criteria. This is all the work to be done for Sprint 2.

5.4.3.2 Sprint Deliverables

Sprint #2 is now completed, and the following final features have been delivered: -

1. Product Catalogue

PRODUCTS

 <p>Heels Gold ★★★★★ (50) Short Description Here</p> <p>100 BUY</p>	 <p>Ankle Heels ★★★★★ (50) Short Description Here</p> <p>320 330 BUY</p>	 <p>Heels blue ★★★★★ (50) Short Description Here</p> <p>250 330 BUY</p>
 <p>Gladiator Heels ★★★★★ (50) Short Description Here</p> <p>450 BUY</p>	 <p>Ankle Heels ★★★★★ (50) Short Description Here</p> <p>650 330 BUY</p>	 <p>Heels black ★★★★★ (50) Short Description Here</p> <p>265 330 BUY</p>

1 2 3 4 5 6 [More](#)

	<p>Pink Heels 650 </p> <p>★★★★★ (50)</p> <p>NEW ARRIVAL</p> <p>BUY NOW</p>
---	--

Figure 42: Product catalogue

The image above shows the list of products that will be sold on the site.

2. Shopping cart

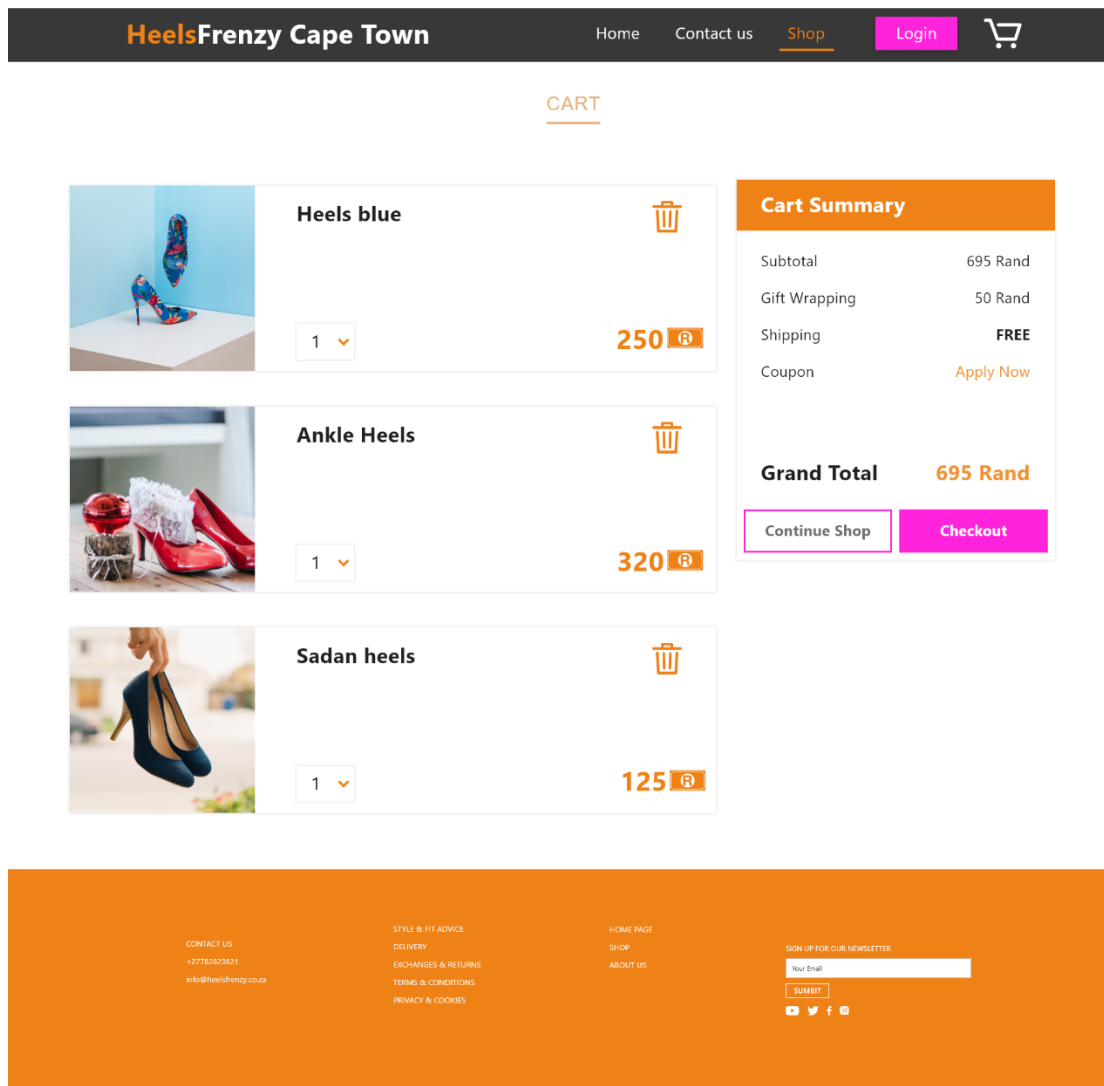


Figure 43: Shopping cart

The image above shows the shopping cart with some few products for purchase by customer.

5.4.3.3 Sprint Review

All of sprint #2 goals have been met and we have now completed the development of the prototype according to plan.

5.4.4 Business owner comments and final review of website created using the process identified by the research.

Question: Please give your overall comments and view on the Agile process and your final website delivered

Answer: I liked the Agile approach to this project because we followed an iterative process, the project was divided into sprints of a shorter span of time and there is a visual outcome to review and comment on and clear goals. After each sprint there was opportunity to review the delivery and re-adjust the plan so that provides flexibility which is very valuable for decision making. We could already visualise how the final delivery would be like based on the first sprint. The process is very much client focused as we could direct the development by giving feedback at each stage and we had a good sense of ownership of the project deliverable. The final delivery was as expected so overall a good experience from initiation to completion of the project.

5.5 Discussion and Conclusion

The development of the prototype Ecommerce website has been completed following the Agile methodology to plan, implement and deliver the final product based on the requirements outlined by the business owner. Here is the link :

<https://www.figma.com/proto/eebU5UDQDrTkVrdHkxLoJz/Heels-Frenzy?node-id=1%3A7&viewport=164%2C418%2C0.10428756475448608&scaling=scale-down> to the interactive prototype. Following the Agile approach allowed for the tasks to be clearly defined and could measure potential work involved from the onset. Visibility of the work is crucial for development hence the product backlog and release plan acted as good radars. By dividing the work into sprints, this allowed for deliveries of some features to be delivered

after each sprint which gives a good sense of progress as there was something to see and test. After each sprint, the work was reviewed, and this allowed for checking if everything was still according to plan or if there is need for any rework or new ideas/changes to be made. The Traditional approach would not have offered the client the same level of visibility and collaboration on the work conducted. Continuous feedback keeps the customer on the loop and informed, they can see pieces of the finished work as development progresses, this is not so with Traditional approach as the customer must wait until the very end to see the final product. This could pose risk in case the requirements were not interpreted correctly, and the product is not as was originally perceived. Therefore, we can conclude in support of the results gathered from the research as well as the comments from the client we built a prototype for that the Agile methodology can be recommended for the Ecommerce development projects. Chapter 6 which follows, will be a further discussion of the research results to draw conclusions and recommendations for future work.

Chapter 6 - Conclusions and recommendations

This chapter discusses the main findings, effects, and constraints of this research study. First, the observed results will be compared with the literature review that motivated the study. Next, the anomalies and surprise findings of the study will be discussed. The chapter will conclude with the larger relevance of the study and directions for future research. Chapter 4 presented results from the research survey conducted with selected Ecommerce companies in Cape Town. Chapter 5 was the prototype construction using the survey findings as a case study. The results will now be discussed in terms of the research questions posed at the beginning of the research investigations in Chapter 1.

6.1 Summary and discussion of main points

For each research question, the results are discussed in terms of salient points that came across from the participants of the research survey conducted and compared to the literature reviewed. The outcome of the prototype construction experience using the Agile method will also be discussed.

6.1.1 What is the choice approach for Implementing present day

Ecommerce software development projects?

The results of the research show that 60% of the participants indicated the Agile methodology as the choice approach for implementing their Ecommerce projects. The key reasons given by participants with supporting literature from early reviews in the research for this choice are as follows: -

- The market deems Agile methodology as useful and has become the industry standard with a lot more support. *“In a complex and always changing environment, organization agility is no longer a need but a condition to access or persist in the*

market. An Agile enterprise adjusts fast to client demands and market opportunities, gaining good advantages on the market” (Stoica et al., 2013).

- When projects are relatively new, they require a higher level of creativity. Requirements can then become apparent as understanding develops and expands.
- Agile supports some of the best practices used in development environments. Some risks in a project are reduced as the output of developers is continuously reviewed during the development. *“Agile project management has emerged as a new method for managing high risk and time sensitive projects as it has proven to provide better productivity, higher quality, and more efficient decision making” (Stoica et al., 2013).*
- Agile methodology is preferred because it can provide rapid response to changes in the organization and it is a more flexible method. Agile approach provides good communication and organized involvement of customers and stakeholders. It has a focus on continuous improvement of your process, continuous working software, and tight communication between the people involved. *“What is outstanding about Agile approaches is not the practices they use, but their acknowledgment of people as the drivers of project success, tied with a prevailing focus on efficiency and manoeuvrability” (Cockburn, 2000)*
- Agile creates a minimum viable product, then iterate to improve it.
- Agile is a framework that allows you to be more productive and spend most of your time doing relevant productive work.

6.1.2 Can the Traditional methodology still be applied to present day

Ecommerce projects?

Participants gave several supporting views that indicated the Traditional approach still has its place even in present day Ecommerce projects. There are organisations that still run their

projects following the Traditional approach only. The key points in support of a Traditional approach for Ecommerce software development projects are as follows: -

- It has been used successfully for years.
- Costs can be estimated quite accurately once the requirements have been specified.
- With the Traditional method, way before the software development commences, the design is fleshed out in detail resulting in the needs and the outcome being made clear to all stakeholders. Traditional projects are plainly outlined with well documented and understood features, roles and requirements focusing on optimization and efficacy in following an initial project outline (Fernandez & Fernandez, 2008)
- Waterfall can provide more confidence on well planned or managed projects. (Hass, 2007) specifies that Traditional software development has a very linear approach whereby all the components of the project are defined, and the planning is done at once. There are very distinct parts or phases of the project life cycle which can be done one at a time.

6.1.3 What are the risks involved in choosing either of the approaches under investigation (Agile vs Traditional)?

The following risks were put forward by the research participants. There were a lot more risks for the Agile approach vs what was indicated as risk by participants for the Traditional approach. Major supporting points from the research literature review are also included.

6.1.3.1 Main risks noted for the Agile approach.

- If prioritization of work items is not done correctly and the end dates are not firmly communicated then the project could end up taking a lifetime due to the fast and continuous feedback loop.

- Compared to more conventional methodologies, Agile does not really have of the checks and balances that help the less experienced developers and team members. Agile does not have a formal design phase, so long-term project development can be trickier. Agile methods greatly reduce the amount of documentation, and rely on the notion that the code itself should act as a document implying that developers need to put a lot of comments in the code (Leau et al., 2012).
- Agile assumes that teams will not know what their end result (or even a few cycles of delivery down the line) will look like from project initiation, it is much harder to predict efforts like cost, time and resources required at the start of a project (and this challenge becomes more apparent as projects get larger and more complex).
- Agile deliverables are incremental so tracking progress requires us to look across cycles. And the “see-as-we-go” nature means we cannot set many Key Performance Indicators (KPI’s) at the beginning of the project and that makes gauging progress complicated. *“A great deal of ambiguity exists in defining the details of Agile methodology, processes, tools, and approach, especially when being compared with traditional project management methods and processes”* (Salameh, 2014) .

6.1.3.2 Main risks noted for the Traditional approach.

- It is very difficult to go back and change something that was not well-documented. The main assumption with the Traditional approach is that things will not change in the middle of the project so once you have defined the various parts of the project upfront tasks will flow through the defined stages of the software development life cycle with little or no hiccups. This assumption made by Traditionalists is biased as things do not flow smoothly in reality (Hass, 2007).
- Clients find it challenging to clearly spell out their needs in terms of a practical specification during the requirements gathering phase. The clients can sometimes

switch their minds once they see the end-product, which is hard to address if the application needs to be re-engineered to any large extent.

- Waterfall projects do not necessarily have to be but tend to be made up of 'teams inside teams'.

6.1.4 Can principles from the two methodologies be merged into one combined approach for better results?

None of the participants indicated a merge of principles could be viable but rather the ability to switch between both approaches in their projects. Decision makers and managers can weigh each project independently to see if a more Traditional approach can be used or rather the Agile approach. When choosing between the two approaches the decisive factor should be how well we know the end goal and the path. The reviewed literature does however give some very valid points for consideration. According to (Fernandez & Fernandez, 2008) a more hybrid approach to project management with both Traditional and Agile methodologies may be the most valid approach. *“Regardless of which model is chosen for developing software applications, this action involves complex processes that are often subject to errors. That is why, beyond Agility or Traditionalism, an important role goes to testing and validation”* (Stoica et al., 2013).

6.2 Prototype construction and findings

Based on the results of the research presented in Chapter 4, the Agile approach was the preferred choice and most recommended. A prototype was constructed as a case study to validate the findings and demonstrate the Agile approach. In Chapter 5, a prototype Ecommerce site for an existing company based in Cape Town was constructed applying the Agile principles from initiation to completion. There was continuous engagement with the business owner and the final delivery was as expected and this was proof of how the Agile approach is the ideal and recommended approach to be used in Ecommerce software development.

6.3 Anomalies, Surprise findings and deviations

Although the Agile approach was the choice approach for Ecommerce software development projects as per research results, there were more cons than pros that were raised by the participants in this research study. Some of the disadvantages were also highlighted for the Scrum methodology. Some of the key ones noted are as follows: -

- Agility is always a good thing, in theory, but most of "Agile" development is an attempt to patch closed allocation, which is broken from the start. Also, enforcing an Agile style of development, communication, and work allocation means adding more management, not less usually and it becomes a justification for yet more micromanagement.
- Agile might be everywhere these days but Agile is not for everyone. Agile itself is not a Project Management framework and it is not a "methodology". It is a set of principles and values relating to product development, specifically producing software. There are, however, methods based on Agile principles, and these are

Product Development methods e.g., Scrum, Kanban, and Scaled Agile Framework (SAFE).

- Scrum is probably good for turning the uninitiated into reliable and is useful for junior developers. For senior developers and higher, the scrum process is limiting because the sort of projects that senior programmers want to take on, once they master the basics of the craft are often ignored, because it is hard to justify them in terms of short-term business value. After 5 years, if you are any good, you get to a point where you are only interested in longer-term projects with some architectural meat and a long-term focus.
- People that do not enjoy working on Scrum teams and, paradoxically, often end up as under performers because it means they must suffer under more micromanagement, and typically have less autonomy and your best people feel like they are micromanaged and not learning much except how to game a process, and they tend to leave.
- Since tasks are being broken down up in smaller pieces to fit into sprints in the Scrum process, non-value work is needed to put it back together at some point to have a fully functional process. Because of that you have repeated steps to rebuild test data and test environment because of the need to retest as you add on to a fully functional process that was broken up to be smaller just so it can fit into a sprint.
- In the Scrum method, dependencies are typically not defined well as you do work in functional chunks but do not know enough about the entire system you are building. So, Chunk A is built in an early sprint, but you find out later that Chunk B had a dependency on Chunk A. The dependency causes part or all of Chunk A to have to be reworked. Regression testing increases because all the dependencies in the different builds released on different sprints.

- Software Application Support primarily involves incident management, service requests and changes\fixes and help with business operations tasks. Most of these have a short turnaround time, so it has an element of unpredictability which makes it hard to adapt Agile practices around it.

6.4 Relevance of study and possible implications

Ecommerce organisations and companies look for “silver bullets” i.e., a simple and seemingly magical solution with regards to software development methodologies. This research has shown that there is no one size fits all solution, each organisation will have to weigh the pros and cons in terms of what will work best in their environment. In summary, the results of this research indicate that the organizations should overall expect the effects of Agile method use on project success to be mostly positive but although there is significant support for the Agile methodology we did show in the previous sections that there were some significant cons to that approach too. The research highlights the advantages and disadvantages of using either approach Agile vs Traditional based on the experiences of the representative study group of chosen experts in the Ecommerce industry. This leaves it open to decision makers within organisations in Cape Town to consider what is the best Methodology to employ guided by the views and recommendations from this research.

6.4.1 Considerations for future work

It will be worthwhile for Ecommerce organisations to consider switching between these two standard methodologies for their various projects and be more adaptive in their approach than prescriptive. There are factors that were highlighted in the research that would make the Agile process more suitable or the Traditional approach. For instance, if the cost and end goal are clearly outlined from the beginning or it is a small-scale project then in that case a Traditional approach can be used for that project. If the project is big and costs are hard to

estimate as well as all the requirements then Agile which has an iterative approach breaking work into smaller chunks and continuous refinement of requirements.

1. Further research and investigation need to be done to help Ecommerce companies that want to adopt a more Agile approach especially if they did not previously follow any defined process in their Ecommerce software development projects. The research has shown the Agile approach to be more supported in the Industry so if companies and policy makers consider making the change, there is a need to investigate how best they can do so looking at all the implications, benefits, and challenges for their business as well as their teams. If the transition is done abruptly that may cause more harm than good.
2. There is need to investigate the Agile as well as the Traditional approach not as a methodology but a set of principles. Can we then take only principles and not follow stringent outlined ways for either Traditional /Agile? Further research needs to be done on how best these principles can be mapped out and merged and used for the success of Ecommerce projects.

6.4.2 Conclusions

The results of the research as well as the prototype constructed as a case study have shown that the Agile approach is more preferred for Ecommerce software development projects. The research also highlights the importance of continuous feedback and investigation in managing the ambiguous nature of the Ecommerce software development processes. However, the findings indicate a considerable need for additional research on the impacts of both Agile and Traditional methodologies. While this research study has been primarily exploratory in nature using a constructionist epistemology with a critical inquiry with the grounded theory methodology and applying both quantitative and qualitative methods to the case studies, it

provides several new opportunities for future research. This study acts as a useful new data point for the research stream and provides evidence that more development and empirical research are required.

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