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The influence of organizational culture on the efficacy of the Agile software development methodology. A Case study of one financial institution.

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A research article submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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DECLARATION

I, Rumbidzai Joyline Mapenzauswa, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

RUMBIDZAI JOYLINE MAPENZAUSWA

Signed at NORTHRIDING

On the 26th day of January 2023

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ABSTRACT

This study has been necessitated by the need for companies to adapt to changes in the fast-paced environments they are operating in. Software development is expanding daily at a global level. Software has merged into many diverse fields and is becoming more complex. Changing requirements from customers is making it even more difficult for systems to adapt to the ever-changing customer requirements. The old traditional software methodologies have not been able to satisfy the markets' ever-changing requirements anymore. Hence this study is therefore exploring how companies can adopt the Agile software development methodology which is more flexible and adapts to the changing customer needs easily. This study's main goal is to establish the influence of organizational culture on the efficient use of Agile Software Methodology by the financial institution that I work for. A survey was conducted and a sample of 190 participants from my organization was used to collect data. The Data was collected, the findings and recommendations are discussed in this paper. The biggest limitation was that my company refused to have its name published due to competition in the sector. Hence in my study I will refer to the organization of study as a financial institution. It is my hope that my study will add to the literature that already exist and that the findings will help organizations to make wise decisions when choosing new software to use.

KEYWORDS

Software development methodology, organisational culture, agile methodology, competing values model, systems development.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

Organizations have procedures and structures in place that they adhere to in order to achieve specific organizational goals. The organizational culture, which consists of shared behavior, values, norms, and beliefs among all employees of a business, can help to attain these goals (Schein 1988). Customer satisfaction, productivity, communication, teamwork, and, most importantly the effectiveness of developmental software methodologies may all suffer from poorly managed and monitored organizational cultures (Genç 2013). Hence, an organization's total performance would suffer, and some objectives would not be met. Organizational culture, including team performance, dedication to project goals, and resource allocation, are all factors that affect project success rate, according to Cameron (2011).

Wendorff (2002) shares the same view with Cameron (2011) and further explains that there should be an alignment between the software development approaches used by an organization with the organization's culture. Wendorff believes that the alignment is required because systems development is typically carried out within a certain organizational structure that incorporates the organization's culture. This implies that the software development approaches that an organization decides to use must fall within the acceptable confines of the organization’s culture.

Using the appropriate techniques is critical while creating software to guarantee that it is delivered on schedule, within budget, and meets user requirements (Geambaşu, Jianu, Jianu, & Gavrilă, 2011). Before implementing a new methodology, a thorough examination of its effectiveness is required because there are situations in which a methodology can be used successfully and there are other situations in which the methodology has failed (Geambasu et al, 2011).

According to Wendorff (2002), the traditional business models required significant preparation, had rigid structures, and bureaucratic obstacles that hindered creativity and made it difficult to adapt to change or adeptly handle the unexpected. As a result, software developers started fusing traditional concepts with fresh ones until they discovered one that was effective in their circumstances (Vailshery,2022). Due to the success of this new, flexible technique, developers made the decision to create a framework to aid others in utilizing Agile software

development methodologies, a methodology that places an emphasis on collaboration and adaptability.

Information systems departments in many organisations have adopted the Agile software development technique in response to the failure of traditional methodologies as businesses and technological environments are becoming more unpredictable and dynamic (Larson & Chang, 2016). Agile software development methodologies are therefore easy to use in response to the ever-changing environment and customer needs. According to Vailshery (2022), the Agile methodology is being implemented by 71% of firms in South Africa and 82 percent of these businesses have benefited from the Agile deployment. It is well known and widely accepted that corporate culture plays a critical role in the success of any new procedure being implemented by an organisation (Desouza & Evaristo, 2006).

This research will give a detailed background on the Agile software development methodology and further investigate the literature on how other researchers view the aspects of organisational culture and the software development methodologies being used by firms. The Competing Values Framework developed by Cameron and Quinn (2011) was used to distinguish the different cultures that influence the Agile Methodology.

1.2 Background to study

According to research, organizational culture is a key factor that influences the overall organizational performance. Devoted personnel who share the organization's values and standards have the ability to increase productivity and this will result in a spiral effect of boosting organizational performance. The increase in productivity and performance will help the organisation to achieve its long-term goals (Shahzad, Luqman, Khan, & Shabbir,2012). Organizational culture is crucial in managing all the interactions resulting from the implementation and configuration of systems, because some software is produced in-house, and some is outsourced. While some of the software is imported from overseas (Walsham, 2002). Researchers have widely acknowledged that, the development of an innovative culture is crucial to a company's long-term survival since research indicates that the absence of a supportive culture inhibits many firms from being innovative (Kashan, Wiewiora, & Mohannak, 2021).

According to prior studies, organizational culture may be the major reason for the low acceptability of new software development techniques. Traditional software development techniques and their connections to organizational culture were examined by Livani &

Huisman in 2007. Their research suggests that whereas IT managers were more concerned with performance, efficiency, and goal attainment, while Information system developers were more closely associated with a hierarchical culture that was geared toward quality assurance, organizational culture, and centralization. This research therefore reflects there is a mismatch of performance indicators from the point of view of the IT personnel and from the point of view of Information systems developers (Livani & Huisman, 2007).

There has been, a lot of research which has gone into describing the ideal Agile culture, as people-centred, participatory and collaborative (Cockburn & Highsmith, 2001). The ideal Agile culture has a suitable reward mechanism, democratic approach, is less structured, and non-hierarchical (Storey, Zagalsky, Figueira Filho, Singer, & German, 2016).

1.3 The Research Problem

One of the major challenges that organisations are facing today is that software development is expanding daily, and companies are finding it difficult to cope with the ever-changing environment. Software has merged into many diverse fields and is becoming more complex. Changing requirements from customers is making it even more difficult for software developers to adapt to the ever-changing customer requirements (Tarrell, 2007).

When a company's culture does not support agility, its information systems become redundant in this digitally competitive era where there is a greater reliance on information systems by firms. Companies with advanced and effective information systems tend to have a competitive advantage over other firms in the industry. According to McKinsey & Company (2022), companies that had implemented Agile methodology before the COVID-19 epidemic were adaptative and were better equipped to respond to the crisis. As a result, they outperformed those businesses which had not embraced Agile methodologies.

The results of the survey by McKinsey & Company (2022) show that there is need for an alignment between the software development methodologies and the organisation’s culture otherwise firms will be adversely affected. In earlier research, the culture of the Information Systems department has been identified as a significant hindrance to the application of agile methodologies (Fruhling & Tarrell, 2007; Cao, Mohan, Xu, & Ramesh, 2009). Integration of Agile Software Development has also been identified as a major impediment to a firm’s success due to an organization's incapacity to adjust its culture. (Ambler, 2014).

The agile methodology is characterised by its emphasis on people and organisational culture on the other hand has a substantial impact on people and their capacity to connect and collaborate, it is therefore crucial to strike a balance between the two for sustainability (Kong,2007). There is therefore a need to investigate the culture that works for and against the effective implementation of software using the Agile software development methodology.

1.4 Aim of The Study

The main goal of this research is to investigate how organizational culture affects the effectiveness of the Agile software development methodology in an organisation.

1.5 Research Objectives

1. To investigate the influence of organisational culture on the successful implementation of the Agile software development methodology at the workplace.
2. To explore the relationship between cultural factors and the Agile software development methodology.
3. To assess the perceptions of IT professionals on cultural factors within a firm that uses Agile software development methodologies.

1.6 Research Questions

1. How does organisational culture influence the efficiency of the Agile software development methodology?
2. What is the relationship between the cultural factors and the Agile software development methodology?
3. What are the perceptions of IT professionals on the cultural factors within a firm that uses the Agile software development methodology?

1.7 Significance of The Study

This study has been necessitated by the fact that today's organisations must be very competitive to survive. They must establish a competitive edge in their industries by ensuring that their information technology systems are robust and efficient. Their systems need to keep up with current trends otherwise the systems will become redundant and may cause the firms to lose their clients. Different cultural values, according to Cameron and Quinn (2011), can improve

an organization's capacity for flexibility and agility, but when values conflict, this may result in less efficiency of software systems. This research therefore seeks to explore how best an organisation can ensure that there is alignment of cultural values with the software techniques that a company develops.

The main objective of this study is to explore the influence of organisational culture on the efficient implementation of Agile software systems by companies. The research also seeks to understand IT professionals' perceptions on the cultural values and how they influence successful implementation of Agile software development methodologies. It is also expected that the outcome of this research would help firms in the software Industry, to come up with recommendations to improve the alignment between the software development methodologies and the organisation's culture thereby improving the firms' competitive advantage.

During this study, I noted that a lot of research has been carried out to establish the relationship between corporate culture and software development systems. There is indeed a vast amount of literature on the topic of corporate culture and software development methodologies, especially the Agile methodology. The goal of the research is to elicit more discussion and debate about the influence of corporate culture on the Agile software development methodology.

1.8 Summary of the Chapter

This chapter has provided the setting, introduced the study by providing the background to the study, outlining the problem statement and the significance of the study. It has explained the study's goals and objectives, given the research questions, and described how the work fits into a larger body of knowledge. The study's distinctiveness is explained in the chapter, along with how it fills in knowledge gaps regarding how organizational culture affects software development, namely the Agile software methodology, in businesses.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter two reviews the specific literature important to the study. It also considers the conceptual and theoretical underpinnings of this research. A literature review, according to Merriam (2008), is a summary of what has already been written about a subject. This review will provide an overview of the influence of corporate culture on Agile software development methodologies. It will also analyse existing literature to act as a benchmark for comparing the study's findings to those from other studies. The review seeks to reveal how corporate culture can influence the successful implementation of Agile software methodologies in organisations.

2.2 Definition of Key Terms

Software Development Methodology: It is a set of procedures, tactics, tools, and requirement documentation that will enable software developers in the implementation of a new information system (Aveson & Fitzgerald, 2006). It is also defined as a set of detailed instructions for completing each stage of the Software Development Life Cycle's activities (Satzinger, Jackson, & Burd, 2015). Simply put a Software development methodology is a process or a series of processes followed by developers as they design, implement and test new computer programs (Beck et.al 2009).

Software Development Life Cycle: It is a well-defined and methodical technique to developing a dependable, software system of high quality (Rastogi, 2015).

Agile Software Development Methodology: It is a conceptual model for software development that commences with a planning process and progresses through incremental and iterative interactions to the deployment phase across the project's life cycle (Al-Saqqa, Sawalha, & AbdelNabi, 2020). Jackson (2015) further explains that that the Agile techniques are a collection of system development processes that share a same philosophy, set of values, and objectives. Jackson (2015) believes that the main objectives of all agile approaches are to produce software quickly and react to changes in the environment, the product, the process, or other project contingencies. techniques take this transition into account by using a quick iterative and incremental development process with lots of customer input.

Agile is a catch-all phrase for recommended practises as outlined in the Agile Manifesto. According to Tarrel, (2007) it is a collection of beliefs and guiding principles that places a strong emphasis on teamwork, flexibility, and self-organizing work environments. It is based on the understanding that the same approaches won't work in every circumstance and the capacity to act quickly in the face of change and uncertainty.

Organisational Culture: Is defined as a combination of conventions, beliefs, values, and ways of behaviour that, when combined, give each organization its own unique personality (Willcoxson & Millett, 2000). While Pinto (2010) defines organisational culture as the way individuals work and function, making it a crucial element of a company's success. As a result, Pinto (2010) emphasises that many companies seek to create cultures that are productive and foster a positive work environment.

2.3 Software Development Methodologies

There are many software development methodologies that are being used nowadays, they are grouped as traditional methodologies and agile models. Examples of traditional methodologies are the Waterfall model, Rational Unified Process and V Model, these methodologies put emphasis on thorough planning, precise documentation, and a large-scale design (Alshamrani & Bahattab, 2015). With the traditional methods, work begins with the elicitation and documenting of a "full" set of requirements, followed by architectural and high-level design, development, and inspection (Beck, et al., 2009).

The challenges firms using traditional methodologies face are that changes in the technological industry move rapidly, and requirements also change at fast rates. Sometimes the business users also tend to not clearly define their requirements and yet expect the software to deliver beyond their requirements, all this then causes traditional methods to be swamped and unable to meet customer expectations (Highsmith & Highsmith, 2002).

The other challenge with the traditional Waterfall model is that when requirements change in the middle of a development it is difficult to pause the whole development to accommodate the new changes. This model was meant to disallow requirement changes but then this has always proven to be inevitable as unanticipated issues always arise (Lindvall, et al., 2002). The agile methodology uses the rapid, iterative approach where there is heavy dependence in team expertise, communication, and customer involvement rather than documentation (Awad,2005).

2.4 The Agile Methodology

Agile software development refers to a software development team's flexibility to act to changing user needs through a continuous readiness process (Conboy, 2009). The short, iterative development cycles are used to help businesses better accommodate change and improve the software development process' flexibility (Lee & Xia, 2010). When compared to traditional methodologies, the Agile methodologies are faster to market, have greater software quality, and increased customer satisfaction. These are all benefits of the Agile methodology. It is crucial to remember that each Agile method, like any other system development methodology, consists of a cogent philosophy, a set of methodologies, a progression of development phases, and recommendations for proper application. The focus of each Agile methodology, however, makes it unique from the others (Overhage, 2012). According to Beck (2022) Agile methodologies at their core are guiding principles for how to deal with situations that are unpredictable, and these are:

1. Unwaveringly confront any ambiguity.
2. Choose a potential solution and try it out.
3. Elicit feedback.
4. Correct as necessary.

Hence, the framework of conventions, techniques, and procedures a team choose to use for a certain project and circumstance is known as the agile approach. These techniques will vary from team to team and even from project to project, but they will all follow Agile concepts and ideals.

2.4.1 Benefits of the Agile Software Development Methodologies

The major advantage of the Agile methodology is that it is flexible. The world around us is evolving at a very fast pace and this is making firms unstable and volatile hence the need for firms to be agile in order to be responsive (Sherehiy, Karwowski, & Layer, 2007).Another benefit of Agile techniques is being people centric and collaborative (Cockburn and Highsmith,2001), its described as a people-cantered approach to software development, because it emphasizes accelerated iterative interpersonal relationships between and among varied individuals involved in the process. The Agile methodology has a suitable reward mechanism (Derby,2006), it is also democratic, less structured, and non-hierarchical (Storey, Zagalsky, Figueira Filho, Singer, & German, 2016). The key benefits of agile-based software development include better team member coordination and communication, quick releases,

design flexibility, and a more rational approach (Choudhary & Rakesh, 2016).The researcher will focus on the Agile software development methodology. Derby (2006) summarised the key benefits of the Agile Methodologies as follows:

- Considerably better handling of requirements changes throughout the planning stage. First, because clients directly influence project processes through on-site interaction, they are participating in the development process.
- Fault Diagnosis: While testing is carried out throughout each iteration, flaws are discovered earlier and can be corrected before they worsen compared to a roadmap process model. Increased performance and daily stand-up meetings provide an opportunity to exchange valuable information and to fine tune improvements continuously.
- Design flexibility is the capacity to make swift course corrections. Agile methodology's primary characteristic is handling changes in requirements; hence design must be adaptable in order to manage changes with ease.
- Delivery that is incremental and iterative Little functional releases are used for project delivery.

2.4.2 Limitations of using Agile Software Developmental Methodologies

According to Jivan et.al (2020) more time and commitment is needed to implement Agile techniques. Although teamwork and communication are great, the frequent interaction between customers and IT staff requires more time and effort from everyone. Beck (2015) shares the same opinion and explains that clients and developers are under more pressure than before. For the Agile Process to be successful, everyone involved must be committed. The quality of a project can suffer from anyone who isn't on board. Because tasks are frequently finished just in time for development under the Agile Method, some traditional programmers have also critiqued the Agile software development process, claiming that it fails to provide the required documents for a traceability. There is sometimes insufficient depth in documentation, which can lead to future misunderstandings and issues as well as derail initiatives (Rodrigue et al. 2019). Projects can quickly wander from their initial course or extend beyond the parameters of the project life cycle because of the less regimented nature of the agile methodology. (Rodrigue et.al 2019).

2.5 Scrum Method

The company employs Scrum as a project management method for managing software development projects. Scrum is an Agile framework-based iterative software development approach (Schwaber & Beedle, Agile software development with Scrum, 2002). It is a team-based Agile technique that establishes the roles of each team member, plans system development across distinct time periods known as sprints, and concludes each sprint with the creation of a special artefact intended to help the team work together (Schmidt, 2016). Scrum is one of the most well-known agile techniques and is generally suitable for use by all industries due to its simplicity. It focuses on software management difficulties rather than technical software development practises (Rodrguez, et al., 2019). The first stage of the Scrum life cycle is the initial planning phase followed by the development or sprint phase then lastly the project closure phase (Abrahamson, Pekka, Salo, Ronkainen, & Warsta, 2017).

2.6 Organizational Culture

Culture is defined as the common views, values, conventions, and priorities that lead to a specific type of behaviour by the people in the organisation and it allows for innovation (Shein,2017; Holbeche,2018). Organizational culture creates a set of common ideals from which norms emerge, and the norms present themselves in specific behaviours (Alvesson, 2012). Organisational Culture is deemed an important element for successfully implementing any new process (Desouza & Evaristo, 2006).

2.7 The Competing-Values Model- Theoretical Framework

Quinn & Rohrbaugh's (1983) Competing-values model (CVM) will be used in this study as a conceptual framework for identifying the impact of cultural values on the agility of an organisation, including how and when value tensions aided or hindered firms' ability to innovate. Quinn and Rohrbaugh's (1983) suggest that while multiple cultural values can improve an organization's ability to operate in a flexible and agile manner, when values compete, efficiency suffers. By organizing the different patterns of shared beliefs, assumptions, and interpretations that constitute an organization's culture, the model combines strategic, political, interpersonal, and institutional components of organizational activity (Quinn & Rohrbaugh, 1983).

Internal attention measured against exterior emphasis: and flexibility measured against stability are the two contrasting characteristics that the CVM is cantered on according to Quinn and Rohrbaugh,1983. While one dimension varies between values pertaining to employee welfare -internal focus and firm welfare -external focus, the other differentiates firms based on the

extent of structure that is flexibility versus stability. The two distinctions for the CVM are change and stability. Stability promotes control, continuity, and order, whereas change fosters improvisation and adaptability. On the CVM The crossings of the contrasting dimensions produce four quadrants, each subculture is represented by a separate symbol: hierarchical, rational, group, and developmental (Quinn & Rohrbaugh, 1983).

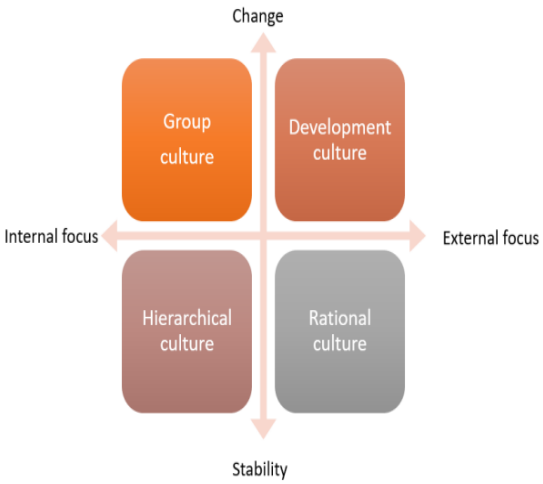


Figure 3.1. The Competing Values Framework for Organisational Culture

The group's culture places a strong emphasis on flexibility and interpersonal relationships. Its key ideals are involvement, belonging, and trust. The development of human potential and member commitment are effectiveness criteria. The group culture works perfectly within the Agile framework as the ideal agile culture, is described as people-centred, collaborative, it emphasizes accelerated iterative, and interpersonal relationships between various individuals involved in the process (Cockburn & Highsmith, 2001). This is also supported by the notion that Agile is democratic, less structured, and non-hierarchical (Storey, et al., 2016). The principles that group culture upholds are consistent with the culture required to encourage the application of social agile methods.

Development culture is future-focused and considers what might be. The effectiveness criteria place a strong emphasis on development, resource acquisition, inventiveness, and environmental adaptation. This culture is also prevalent within firms using the Agile methodology as the framework works well within firms that have a suitable reward mechanism (Derby,2006).

The rational culture emphasizes production, efficiency, and goal achievement and is achievement oriented.

The stability and internal focus of the hierarchical culture are focused on routinization, security, and consistency. With rules, it places an emphasis on control, stability, and effectiveness (Quinn & Rohrbaugh, 1983).

Even though some cultural types may be more prevalent than others, CVM emphasizes a reasonable balance between the opposing orientations. The requirements this imposes on efficient organizations are counterintuitive. Instead of having a single, uniform culture, large companies frequently create several subcultures (Gregory, 1983; Smircich,1983).

2.8 Organizational Culture and The Agile Methodology

Each software company has its own distinct corporate culture and compatibility issues that can arise if these do not align. The Agile methodology aligns to other cultures and at the same time clashes with other cultures as well. Organizational features, according to a prior study, have a significant impact on the spread of an innovation within a company (Chan, 2009). The Agile methodology's focus on social connections and constant readiness to adapt to requirements was shown to cause major changes in more hierarchical organizational structures (Beck et al., 2001; Conboy, 2009).

The creators of the agile methodology make it apparent that the culture of the organization in which it is implemented may affect the success of the process. They also make it apparent that it's extremely difficult to implement an agile methodology in a given cultural setting. (Chan,2009) For example, according to Beck (2013) If an organization's culture prioritizes openness, transparency, collaboration, and respect, implementing a new system that expresses the opposing ideals through a set of new practices is likely to backfire.

Agile methodologies have been described as compatible with chaotic environments, while plan-driven methodologies are suitable with orderly cultures (Boehm & Turner, 2003). To support this notion Naranjo-Valencia et al. (2011) stipulated that the chaotic cultures are more likely to inspire invention, whilst Hierarchy cultures are more likely to encourage imitation (Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2011). Another author also supported this by describing the agile methodology as being successful in organisations that have the culture of informal communication (Beck,2000).

On the other hand, Highsmith (2002), brought forward three aspects as requirements for Agile development software to thrive as follows:

a) the agile methodology complements the competency and collaboration culture.

b) the development culture is compatible with either hacking or not having a formal approach

c) the strict methodology accords a controlled culture. Research carried out before having demonstrated that when deploying an efficient system, firms frequently go through a cultural transition. (Felipe, Roldán, & Leal-Rodríguez, 2017); (Yusuf, Sarhadi, & Gunasekaran, 1999).

Duggan, 2004 argues that different systems engineering approaches are suitable for different areas and have diverse applicability depending on the organisational environment comprising of organizational culture, structure, and commercial strategy.

Some authors put the notion that leaders are the ones to foster an environment that encourages creativity, information dissemination, collaborative efficiency, and employee development and incentives for agile personnel (Kraśnicka, Głód, & Wronka-Pośpiech, 2016). To support this Agile development software has been described as efficient in organisations where leaders use the collaborative leadership style (Schwaber & Beedle, 2002). Crocitto and Youssef, (2003) shared the same sentiments when they said that the Agile development software performs better in an environment where leaders promote innovation and collaboration amongst staff members in an organisation.

The Agile methodology has been described as thriving in organisations that have the culture of eliciting feedback, empowering employees, and continuous learning among the employees (Cockburn,2006). Teamwork culture also plays an important role in the effective implementation of the Agile methodology (Beck,2000, (Schwaber & Beedle, 2002); (Beck, Extreme programming explained: embrace change, 2000). In addition, organisations which support collaboration and social interactions and competency have been seen to be doing well in the agile framework (Wendorff,2002).

2.12 Summary of the Chapter

This chapter has provided an overview of the literature on the theoretical and conceptual frameworks on how organizational structure can influence the efficacy of the Agile software development methodology in an organization. In order to justify the research niche in which this study is situated, the chapter has provided significant insight into the literature written prior to this study on software development methodologies and in particular the Agile methodology. The review also aimed at highlighting the benefits of using the Agile methodology and the review helped to highlight cultural factors that are compatible with the Agile development software for it to perform at its best.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter addresses the research approach, paradigm, design, and area of study. It also furnishes the sample procedures utilised, the data collection methods used, and how the data was analysed in detail. This section will also focus on the research methodology and design that was utilized to conduct this study. According to Wilson (2009), "research methodology is the process by which data is collected for business decision making" (p.90). It will discuss the rationale behind all the research methodology processes which is controlled by the study aim and objectives.

3.2 Research Paradigm

The study is quantitative in nature. This type of research paradigm has the aim of determining how many people think, act, or feel in a particular way. Unlike the aim of a qualitative research that is more focused on gaining emotional insight, a quantitative research design involves large sample sizes of research participants, and it concentrates on the quantity of responses (Welman, Kruger, & Mitchel, 2005). The basic or standard format in quantitative research is that all research participants are asked the same set of questions which ensures fairness in terms of accurately analysing research data. By utilization of statistical methods, the researcher can analyse data gathered and present it in a numerical format that can be easily presented and interpreted.

3.3 Research Design

According to Bush (2010), a research design is a set of guidelines for conducting research that may be used to collect and analyse data. According to Malhotra (2010), a research design is a framework that is used to carry out a research project and provides instructions on how to collect the necessary data and information to achieve the goals of the study.

This study uses a descriptive research methodology to ascertain the effect of corporate culture on software development methodologies. According to Sekerani (2003), the goal of a research study might be exploratory or descriptive with the intention of doing a case-study analysis or hypothesis testing. A descriptive research design cannot answer what why a particular phenomenon can occur, instead, it answers what the causes are. Data obtained from descriptive studies can be used in examining relationships or correlations between research variables. Descriptive research is quantitative in nature since it entails collecting of data and information

and then analysing it. With the help of statistical analysis, descriptive research can be a very powerful research tool that allows the research to collect and describe the demographics of a certain group under study (Kent,2007). Therefore, it is a quantitative research method.

The researcher considers a descriptive research design as appropriate for this study because the research participants will be surveyed or questioned in a natural setting such as at home or at company or work premises, the adoption of a descriptive research design can help in identifying areas that need additional research and relationships among research variables that will require future study. Moreover, using this research design, the research data can be used to identify the prevalence of research problems and the need for new or additional services to address the research problems. However, a descriptive research design comes with its own share of criticisms.

According to Malhotra and Birks (2010), a descriptive research approach cannot be utilised to show cause-and-effect correlations between variables because most respondents may lie when answering survey questions or may only provide socially acceptable answers. Moreover, a descriptive research approach frequently results in findings that do not generalise a trustworthy and correct explanation of the target population, depending on the sample size and type.

3.4 Research Approach

To analyse the efficacy of organisational culture on the agile software development methodology used by a firm the survey methodological approach was used. A survey research methodological approach refers to the process of carrying out research using surveys that researchers give to research participants (Wiid & Diggines, 2010). The data collected from research participants was analysed statistically and then presented in a manner that's understandable where meaningful research conclusions can be drawn. The researcher recruited individuals that carried out the surveys, collected the data and eventually analysed the data. The researcher sent the questionnaires via email.

The use of survey research is appropriate for this study because of its ability to help the researcher gather the most authentic and reliable sets of data in a very systematic way and since survey research is a gateway when it comes to collection of specific data and information from a particular target population first-hand (Martin, 2006). Additionally, surveys frequently combine many question types, which facilitates the researcher's ability to gather a wealth of information from respondents. However, survey research comes with its own share of criticisms. Use of close-ended questions in survey research could lead to a very low validity

rate than any other type of questions and some research participants might interpret certain response options incorrectly. For example, the option such as somewhat agree may represent different meaning to different set of respondents.

3.4.1 Case study Research Approach

The researcher focused on one company hence the research method will be a case study. A researcher can carefully evaluate the data within a particular context using the case study method. Case study research is an in-depth look at a specific event, situation, organization, or group of people (Schoch, 2020). A case study provides the researcher with the opportunity to collect different kinds of information about the case, such as interviews, paperwork, observations, survey data, and more. It also offers the chance to learn more about an organization or person, including how it works and how people interact with it (Schoch, 2020).The case study approach however is criticized for not being a robust research instrument it lacks rigor, there are difficulties with data processing, and a paucity of evidence for generalizing findings and conclusions (Soy,2003).

3.5 Sampling Method and Sample Size

However, because targeting the whole population is close to impossible, the researcher drew a sample of close to 190 respondents for this study and 190 questionnaires were distributed to research participants to participate in the study. The participants targeted are listed in table 3.1 below. In situations when it is not practical, and impossible to study the whole population for research maybe due to time and budget constraints, a researcher is mandated to draw a sample through which a study can be based on (Du Plooy, 2009).

A sample, according to Sekeran and Bougie (2010), is a segment of the entire population. Moreover, these authors also suggest that a larger sample size entails the findings of a study to be more reliable in terms of interpretation of the findings. There is an argument that it has a significant advantage to study the whole population instead of selecting a sample since data collected from the whole population will always be more reliable than data collected from a sample (Albaum & Smith, 2012). The study made use of non-probability sampling, which is categorised as a group of sampling techniques having distinguishing characteristics that allow for the possibility of subjectivity in sample selection.

To determine the efficacy of organisational culture on Software development methodologies, quota sampling a non-probability sampling method was adopted for this study to select research participants. This sampling strategy typically depends on the researcher's judgment, and the

population under consideration's components do not have equal opportunity for selection (Howitt & Cramer, 2017). The researcher ensured that careful steps are undertaken to obtain a sample that is very similar to the population of the study. It is of utmost importance that population of interest is defined as closely and precisely as possible.

Table 3.1: Research Participants.

Participation group	Description	Number of Participants
1	Development Managers	21
2	Business Analysts	15
3	Software developers	76
4	Test analysts	22
5	Product owners/Project Managers	19

3.6 Measuring Instrument

A self-administered questionnaire was used to collect quantitative data from the Information Technology (IT) professionals at the insurance firm. According to Saunders, Lewis, & Thornhill (2007), Interviews, observations, questionnaires, 141 standardized exams, archival documents, and documentations are some of the research tools that can be used to acquire primary data. For this study, a questionnaire link was sent to participants for data collection purposes, and they were given a turnaround time of two to three days. According to (Martin, 2006) the production of a questionnaire entails judgments about phrasing, question sequence, response option selection and wording, formatting, and question administration method. He goes on to say that for this instrument to be a useful tool for data gathering, it must be properly prepared and administered.

3.7 Questionnaire Construction

The questionnaire was structured into three sections and is attached on the appendices section of this report. The first section is for biographical and work details such as age, gender, level of education, number of years using the agile methodology and so on which will help in evaluating the understanding of the agile methodology and the culture around it.

The second section is for organisational culture which is subdivided into (group culture, development culture, hierarchical culture, and rational culture questions) and the last one speaking to the agile software development methodology principles. This section will help to answer the research questions. These sections are crucial since they ensure that the research's objectives are met. The research questions in these parts were written in such a way that the researcher might respond to the research questions.

The Likert scale, created by Likert in 1932, was used in the study. It is a rating technique that broadens the range of possible ratings that a respondent might select from. With a 5-point Likert scale, respondents can select from strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, and strongly agree on their responses. The questionnaire consistently employed the Likert scales.

3.8 Data Analysis

The Statistical Package for Social Sciences (SPSS) was used to analyze the data collected. Descriptive statistics was used in this study to present data in a comprehensible fashion, as recommended by (Zikmund, Babin, Carr, & Griffin, 2013) for a study like this one. Inferential statistics were used to draw conclusions and generalize about the population based on the results of the sample of IT professionals (Mendenhall, Beaver, & Beaver, 2020). Inferential statistics such as the variance analysis (ANOVA), Chi square test, correlation analysis, and factor analysis were utilized for data analysis.

Manipulation, arranging, summarizing, categorizing, and describing data in more relevant terms are all part of data analysis. (Malhotra, Birks, & Wills, 2010). According to (Ader, Mellenbergh, & Hand, 2008) it's the procedure of clean-up, inspecting, manipulating, and modelling data to reveal important information, aid decision-making, and offer conclusions. Wilson, (2010) add on by the notion that data analysis is the methodical organization of research data and the use of that data to test research hypotheses. In this present study, quantitative data from the IT professionals was analysed following quantitative procedures and the data obtained will be analysed using quantitative procedures.

3.9 Validity and Reliability

To ensure reliability of the measuring instruments, the researcher utilized the Cronbach's Alpha technique. Bearden et al. (2011) defines reliability as the extent to which a chosen data collection approach can collect at least 153 accurate and consistent findings (Aamodt, et al., 2011). Malhotra (2010) also indicates that a reliability test is important for guaranteeing consistent data collection throughout multiple administrations of a measuring scale. It indicates how the measures of the instrument are free from random error.

According to Creswell ,2009 validation is the process of ensuring that the surveys were accurately conducted and are free of bias or fraud (Creswell & Zhang, 2009). Sekaran & Bougie (2010) describe validity as an indicator of how well a concept is measured with the research instrument. It comprises of internal and external validity. According to Saunders et al, 2007 external validity refers to the extent to which results of the study can be transferred (Saunders, Lewis, & Thornhill, 2007). The rigor of the research process and the extent to which the researcher has investigated alternate hypotheses for any causal linkages they explore are referred to as internal validity.

The following measurements were used to improve the questionnaire's validity and reliability:

- A pilot study was carried out with at least 20 questionnaires distributed to the research participants to improve the reliability the measuring instrument.
- A sample of 190 participants for the study is large enough and satisfy the validity condition of the study unlike if a small sample is utilized.
- The questionnaire's closed-ended questions were developed directly from the study's objectives and aims.
- Questions on the questionnaire were made very short, precise, and specific to avoid boredom that arises when long and complicated questions.
- Pre-testing of the research instrument provided information that aided in the instrument's structuring and increase the validity of the results.

3.10 Reliability and Validity Test

To measure and ensure reliability of the questionnaire the Cronbach's Alpha measurement was used. Cronbach's Alpha is an alpha coefficient with a value between 0 and 1. Values of 0.7 and above show that questions on the same scale measure the same thing. Reliability is about how strong the research questionnaire is, especially how consistent the results are at different times and places (Saunders, 2016).

Table 3.2 Cronbach's Alpha

Construct	Cronbach's Alpha Coefficient	Number of items
Group Culture	0.575	3
Development Culture	0.717	3
Hierarchical Culture	0.725	3
Rational Culture	0.658	2

It is apparent from table 3.4 that all the Cronbach's Alpha coefficient values are either close to the threshold value of 0.7 or above (rational culture, development culture as well as hierarchical culture) except the one of group culture which is 0.575 suggesting that the questionnaire is reliable.

3.11 Ethical Considerations

Ethical values were greatly observed in this study. Research participants were not under any circumstance be forced into taking part in the study. Willingness to participate was completely voluntary. Research participants were notified of their rights to choose not to participate or to withdraw from participating in the survey at any given time. The researcher and the research assistants were informed of the research aim and objectives. The researcher started the survey by reading a letter of informed consent and giving assurance of anonymity and confidentiality to the respondents. The Chief Information Officer granted the researcher's written formal email request for authorization to conduct the research at the company; a copy of the letter is included in the appendices.

3.12 Summary of the Chapter

In summation, this chapter concentrated on the methodology employed for this investigation, outlining the procedures used for data collecting and analysis. For gathering data, the researcher used structured questionnaires. The 190 people who took part in the study were chosen from a sample by the researcher using a straightforward random sampling technique. The research results and an interpretation of the data from the fieldwork are presented in the chapter that follows.

CHAPTER FOUR

RESEARCH RESULTS

4.1 Introduction.

The analysis, interpretation, and presentation of the study's findings are the main aims of this chapter. Tables, graphs, figures, and charts are used to summarize the information. Using both descriptive and inferential statistics, the data was examined. The inferential statistics have been used for concluding the research questions and objectives while descriptive statistics was used to summarise ordinal, categorical, and continuous data using charts and graphs obtained from the first part of the questionnaire.

4.2 Response Rate

The study intended to get questionnaire responses from 190 employees from IT professionals at an insurance firm, out of these 153 responses were returned, which yields a response rate of 80.5% and non-response rate of 19.5%. This response is very good for analysis, for analysis and reporting, a response rate of 50% is deemed adequate, one of 60% is good, and one of 70% or higher is very good (Mugenda & Mugenda, 2003).

Table 4.1: Response Rate

Item	**Percentage/Size**
Sample size	190
Questionnaires sent out	190
Questionnaires received from respondents	153
Response rate	80.5%

4.3 Descriptive Statistics

Descriptive statistics can be a very powerful research tool that allows the research to describe the demographics of a certain group under study (Kent,2007). This section will present descriptive statistics in form of frequencies and custom tables. Frequencies will be illustrated to present the demographic variables of the study which are job title, highest educational qualification, gender, experience using the agile methodology, experience using other software development methodologies and overall experience in IT. Custom tables were employed to assess the perceptions of IT professionals on group culture, development culture, hierarchical culture, and rational culture.

4.3.1: Gender

Table 4.2: Gender

	Frequency	Percent
Male	118	77.1
Female	32	20.9
Non-binary/third gender	2	1.3
Prefer not to say	1	.7
Total	153	100.0

Most of the participants were males with a frequency of 118 as shown on Table 4.1.

4.3.2: Age

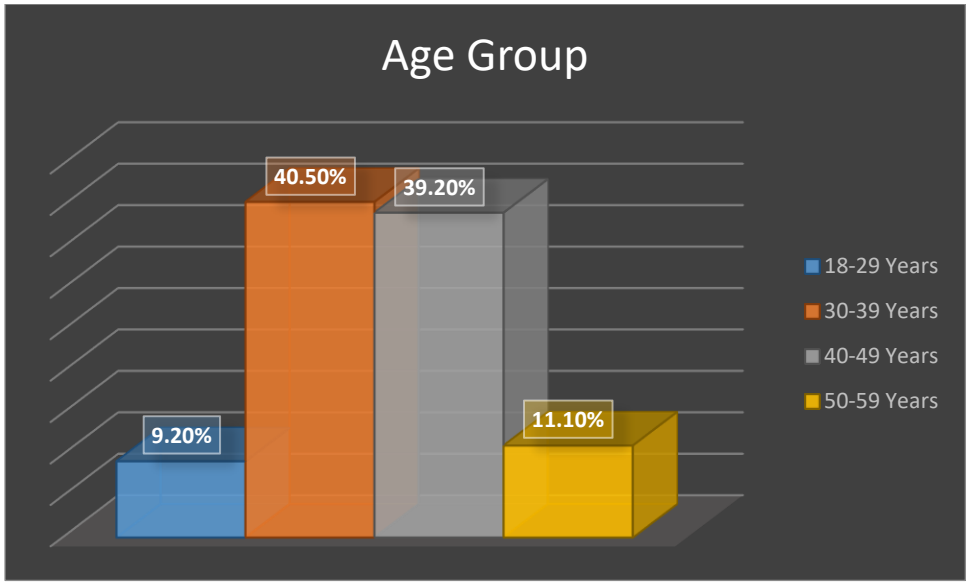


Figure 4.1 Age

The modal age is 30-39 years for the IT professionals, the age group of 18-29 had less respondents as shown on Figure 4.1.

4.3.3: Education

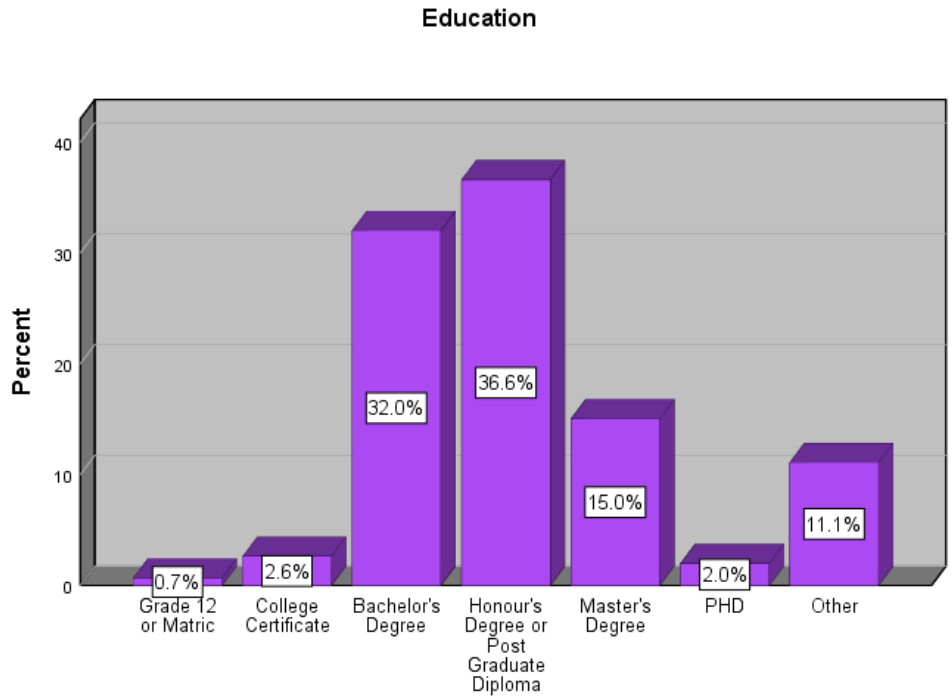


Figure 4.2 Education

It is evident from Figure 4.2 that most of the IT professionals' highest qualification is an honour's degree or post graduate diploma, just 0.7% have the lowest qualification which is Grade 12 or Matric certificate only. This indicates that most respondents had sufficient literacy to complete the surveys.

4.3.4: Job Title

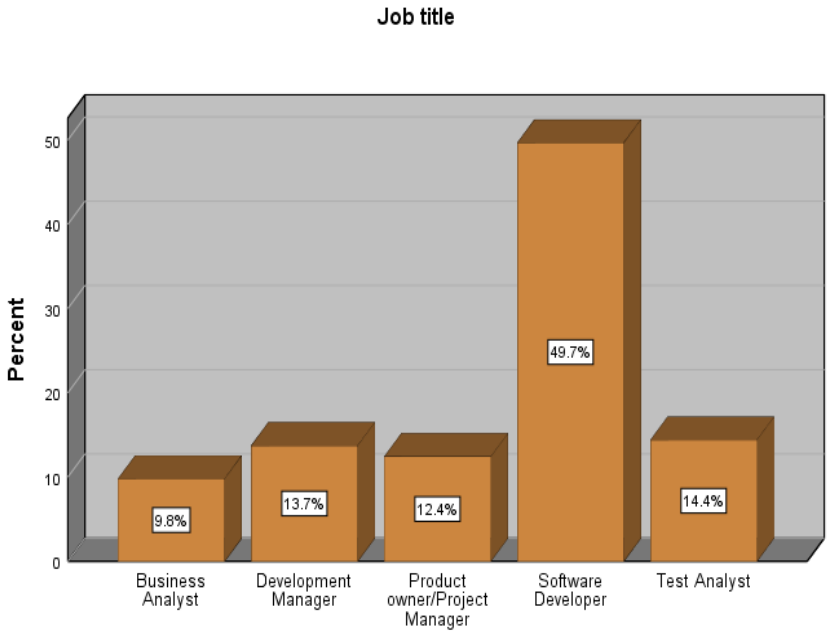


Figure 4.3: Job Title

Figure 4.3 shows that most of the participants were software developers constituting 49.7%,14.4% were test analysts, 13.7% software development managers, 12.4% product owners or project managers and lastly 9.8% business analysts.

4.3.5: Agile Experience

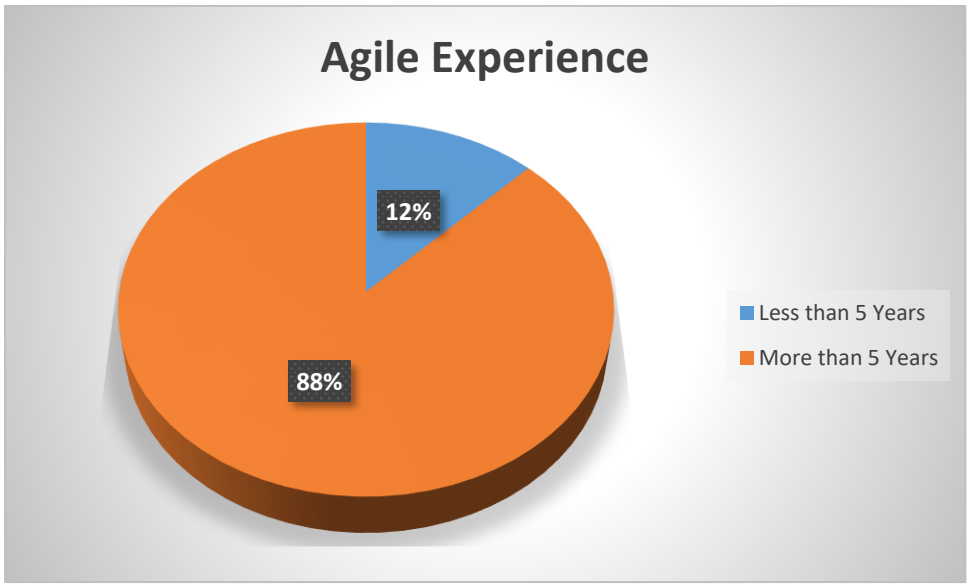


Figure 4.4 Agile Experience

Figure 4.4 shows that 88% of the respondents have more than 5 years' experience on using the Agile software development methodology, while only 12% have less than 5 years' experience. This is good since most of the respondents really understand the Agile software development methodology.

4.3.6: Other Software Development Methodologies Use

Table 4.3: Other Software Development Methodologies Use

	Frequency	Percent
Less than 5 Years	27	17.6
More than 5 Years	126	82.4
Total	153	100.0

It is evident from Table 4.3 that 82% of the respondents have more than 5 years' experience on using the other available software development methodologies, while only 18% has less than 5 years' experience on these. This is good since most of the respondents have a clear understanding of the difference between the Agile software development methodology and the other software development methodologies.

4.3.7: IT Experience

Table 4.4: IT Experience

	Frequency	Percent
Less than 5 Years	12	7.8
More than 5 Years	141	92.2
Total	153	100.0

As shown on Table 4.4 above, 92% of the respondents have more than 5 years' IT experience, while only 8% have less than 5 years' experience. This is good since most of the respondents really understand the IT software development world.

4.4: Custom Tables

Research question one -What are the perceptions of IT professionals on the cultural factors within a firm that uses the Agile software development methodology?

Custom tables were used to answer this question. The custom tables were employed to assess the perceptions of IT professionals on group culture, development culture, hierarchical culture, rational culture, and the Agile Software development methodology. The tables will present the frequency count, percentage responses, mean and standard deviation for each of the items measuring culture and the agile software development methodology. The responses were measured using a 5-point Likert scale, however, to make the results easier to understand, the two lower and upper scales were merged (Morgan, Reichert, & Harrison, 2017).

4.4.1: Group Culture

Table 4.5 Group Culture

Group Culture Items		Strongly disagree/ Somewhat disagree	Neither agree nor disagree	Somewhat agree/ Strongly agree	Mean	Std
GC1: I believe that interpersonal interactions at work are valued in my department.	Count	0	0	153	4.97	0.160
	Row N %	0.0%	0.0%	100%		
GC2: I value teamwork, working together gives teams the confidence to make the creative leaps necessary to create truly revolutionary software	Count	0	0	153	4.99	0.081
	Row N %	0.0%	0.0%	100%		
GC3: The emphasis in the department I work in is on keeping staff members happy, healthy, and safe.	Count	0	3	149	4.78	0.499
	Row N %	0.0%	2.0%	97.4%		
GC4: Loyalty and tradition serve as the glue that ties the department I work in together.	Count	3	7	141	4.70	0.762
	Row N %	2.0%	4.6%	92.7%		

With reference to Table 4.5 all the observed variables had positive responses to group culture as evidenced by mean scores that are all above 3%.100% of the participants agreed or strongly agreed that interpersonal interactions are valued in the department as well as that teamwork is

valuable for the creation of valuable software. Table 4.5 furthermore depicts that 97.4% of the respondents agreed or strongly agreed that there is emphasis on the happiness, health, and safety of employees at the organisation.

4.4.2: Development Culture

Table 4.6 Development Culture

Development Culture Items		Strongly disagree/ Somewhat disagree	Neither agree nor disagree	Somewhat agree/ Strongly agree	Mean	Std
DC1: The systems department has a fast-paced, entrepreneurial environment.	Count	3	2	148	4.78	0.628
	Row N %	2%	1.3%	96.8%		
DC2: I get recognized and incentivized for performing exceptionally. There is a fair reward system in my department.	Count	7	11	135	4.36	0.832
	Row N %	4.6%	7.2%	88.2%		
DC3: People just want to get the system working and there are no interpersonal relations with teammates.	Count	135	7	11	1.45	1.026
	Row N %	88.2%	4.6%	7.2%		
DC4: There is an environment that promotes innovation and knowledge sharing is encouraged.	Count	4	1	147	4.76	0.690
	Row N %	2.7%	0.7%	96.8%		

It is very clear as shown from table 4.6 that the respondents agreed or strongly agreed that the systems department of the firm has an environment that is fast paced and entrepreneurial as shown by the mean higher than 3.In the same regard 88.2% of the respondents strongly agreed or agreed that they get incentivised for performing well and 96.8% alluded to the notion that there is an environment that supports innovation and knowledge transfer in the firm. From Table 4.6, 88.2% of the respondents disagreed or strongly disagreed that system functionality is the only priority in the firm there are no interpersonal relations.

4.4.3: Hierarchical Culture

Table 4.6 Hierarchical Culture

Hierarchical Culture Items		Strongly disagree/ Somewhat disagree	Neither agree nor disagree	Somewhat agree/ Strongly agree	Mean	Std
HC1: It's better to work in an IT department were rules and regulations are clear and following these ensures completion of tasks.	Count	2	6	144	4.62	0.690
	Row N %	1.3%	3.9%	94.7%		
HC2: In the department where I work, stability and permanency are stressed for smooth, effective operations.	Count	5	7	141	4.65	0.823
	Row N %	3.3%	4.6%	92.1%		
HC3: Items in my department are prioritized for high productivity, that results in organizational success.	Count	2	2	149	4.80	0.589
	Row N %	1.3%	1.3%	97.4%		

It is apparent from Table 4.6 that most of the respondents strongly agreed or agreed that it is better to work in a well-regulated environment for the completion of tasks as shown by a mean above 3. There is also agreement on the emphasis of stability and permanency for smooth and effective operations in the firm as shown by 92.1% of the respondents. Another high percentage of respondents (97.4%) strongly agreed or agreed that prioritization of items results in organizational success.

4.4.4: Rational Culture

Table 4.7 Rational Culture

Rational Culture Items		Strongly disagree/ Somewhat disagree	Neither agree nor disagree	Somewhat agree/ Strongly agree	Mean	Std
RC1: Everyone shares the same values in my department.	Count	2	11	140	4.47	0.717
	Row N %	1.4%	7.2%	91.5%		
RC2: The division where I work, places a strong emphasis on competitive behaviours, outcomes, and accomplishment. Setting measurable objectives is crucial.	Count	4	11	138	4.68	0.749
	Row N %	2.7%	7.2%	90.2%		

It is evident that rational culture is prevalent in the organisation as seen by all the mean values that are higher than 3 on Table 4.7. There is an agreement or strong agreement that everyone shares the same values in the department as depicted by the response percentage of 91.5%. A very significant number of respondents (90.2%) believed that setting measurable objectives is important for organisational success.

4.4.5: Agile Methodology

Table 4.8 Agile Methodology

Agile Methodology Items		Strongly disagree/ Somewhat disagree	Neither agree nor disagree	Somewhat agree/ Strongly agree	Mean	Std
AM1: Our highest priority is to satisfy the customer through early and continuous delivery of valuable software	Count	2	0	150	4.87	0.523
	Row N %	1.3%	0.0%	98.7%		
AM2: I welcome changing requirements, even late in the development phase. Agile processes harness change for the customer's competitive advantage.	Count	5	13	134	4.55	0.860
	Row N %	3.3%	8.6%	88.2%		
AM3: I preference delivering software frequently in shorter timescale, from a couple of weeks to a couple of months.	Count	3	4	146	4.78	0.620
	Row N %	2.0%	2.6%	95.5%		
AM4: Throughout the project, businesspeople and developers must collaborate every day.	Count	4	1	147	4.82	0.599
	Row N %	2.7%	0.7%	96.7%		
AM5: When given the environment and support I need, I get motivated to get the job done.	Count	1	0	152	4.90	0.410
	Row N %	0.7%	0.0%	99.4%		
AM6: Face-to-face communication is the most effective and efficient way to share information with a development team.	Count	5	11	134	4.36	0.943
	Row N %	5.3%	7.2%	87.6%		
AM7: The primary measure of progress is a working software.	Count	3	0	149	4.84	0.541
	Row N %	2.0%	0.0%	98.0%		
AM8: Sustainable development is promoted through agile methodologies. It should be possible for the sponsors, developers, test	Count	3	1	149	4.76	0.593
	Row N %	2.0%	0.7%	97.4%		

analysts, and users to keep up a steady pace indefinitely.						
AM9: Agility is improved through constant focus on technical perfection and smart design.	Count	2	0	150	4.82	0.557
	Row N %	1.3%	0.0%	98.7%		
AM10: The art of simplicity, which maximizes the amount of effort not done, is crucial.	Count	1	4	147	4.66	0.597
	Row N %	0.7%	2.6%	96.8%		
AM11: The best requirements, designs, and architectures emanate from self-organizing teams.	Count	1	4	147	4.82	0.533
	Row N %	0.7%	2.6%	97.7%		
AM12: The team often considers how to be more effective, then adapts and modifies its behaviour in response.	Count	1	5	145	4.78	0.600
	Row N %	0.7%	3.3%	95.4%		

The Agile methodology principles are greatly followed in the organisation as shown with all the mean values being greater than 3. From Table 4.8, 99.4% of the respondents strongly believed that when given the environment and support they need they get motivated to get the job done. As there are now other options, such as virtual meetings or emails and chat messages, the percentage of respondents who believe that face-to-face communication is the most effective and efficient way to convey information with a development team was only 87.6%. It is evident that customer satisfaction through early delivery of a working software is a priority with firms that use the Agile software development methodology as seen with 98.7% of respondents agreeing or strongly agreeing to this notion.

4.5 Correlation Analysis

The research question two - What is the relationship between the cultural factors and the Agile software development methodology?

This question was answered using the correlation analysis. A bi-variate statistical test called the Pearson correlation test was engaged to assess the relationship between the independent variables (group culture, development culture, hierarchical culture, rational culture) and the dependant variable (agile software development methodology). The term correlation analysis refers to the study of the relationship between two (or more) quantitative variables, it assesses both the direction and the strength or extent of the relationship between the variables. (Gogtay & Thatte, 2017). Correlation is measured using a correlation coefficient (r), which has values between -1 and +1. Where -1 indicates a perfect negative correlation and +1 a perfect positive correlation. According to (Hinkle, Wiersma, & Jurs, 1979), correlation coefficient values between 0 and 1 or 0 and -1 are interpreted as follows:

Table 4.9 Correlation Coefficient Effect Sizes.

0.90 to 1.00	Very high correlation
0.70 to 0.90	High correlation
0.50 to 0.70	Moderate correlation
0.30 to 0.50	Low correlation
0.00 to 0.30	Little if any correlation

Source: (Hinkle, Wiersma, & Jurs, 1979)

Table 4.10 Pearson's Correlation Analysis

Correlations						
		Group Culture	Development Culture	Hierarchical Culture	Rational Culture	Agile Methodology
Group Culture	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	153				
Development Culture	Pearson Correlation	.712**	1			
	Sig. (2-tailed)	.000				
	N	153	153			
Hierarchical Culture	Pearson Correlation	.747**	.614**	1		
	Sig. (2-tailed)	.000	.000			
	N	153	153	153		
Rational Culture	Pearson Correlation	.905**	.747**	.708**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	153	153	153	153	
Agile Methodology	Pearson Correlation	.788**	.758**	.760**	.796**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	153	153	153	153	153
**. Correlation is significant at the 0.01 level (2-tailed).						

As shown on Table 4.10 above, there is a statistically significant (p-value < 0.05) high positive correlation (r = 0.788) between group culture and the agile software development methodology. There is a statistically significant (p-value < 0.05) high positive correlation (r = 0.758) between development culture and the agile software development methodology. There is also statistically significant (p-value < 0.05) high positive correlation (r = 0.760) between hierarchical culture and the agile software development methodology. From table 4.10 it can also be noted that there is statistical significance (p-value < 0.05) high positive correlation (r = 0.796) between rational culture and the agile software development methodology.

4.6 Multiple Linear Regression Analysis

Research Question three - How does culture influence the efficacy of the Agile software development methodology?

The Multiple linear regression analysis was used to answer the research question -How does culture influence the efficacy of the Agile software development methodology? The analysis was employed in this study to establish if group culture, development culture, hierarchical culture and rational culture do have an influence on the agile software development methodology. Multiple linear regression shows how a dependent variable, and several independent variables are related, estimation and inference, variable selection in model building, and assessing model fit are all important parts of this method (Brown, 2009).

4.6.1 Significance of the model

Table 4.11 ANOVA Table

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	24.223	4	6.056	112.774	.000[b]
	Residual	7.947	148	.054		
	Total	32.171	152			
a. Dependent Variable: Agile Methodology						
b. Predictors: (Constant), Rational Culture, Hierarchical Culture, Development Culture, Group Culture						

Table 4.11 indicates that the model is statistically significant as denoted by p- value < .001.

4.6.2 Evaluating each of the independent variables.

Table 4.12 Coefficients Table

Coefficients[a]										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.951	.293		3.241	.001	.371	1.531		
	Group Culture	.149	.121	.127	1.232	.220	-.090	.388	.157	6.356
	Development Culture	.238	.050	.299	4.775	.000	.140	.337	.425	2.352
	Hierarchical Culture	.255	.051	.315	5.044	.000	.155	.355	.427	2.344
	Rational Culture	.168	.074	.234	2.285	.024	.023	.313	.159	6.295
a. Dependent Variable: Agile Methodology										

Table 4.12 indicates that development culture, hierarchical culture and rational culture were statistically significant in the model as denoted by the p-values < .001 level of significance. These results suggest that development culture, hierarchical culture and rational culture does have an influence on the agile software development methodology.

4.6.3 Evaluating of the model.

Table 4.12 Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.868[a]	.753	.746	.23173
a. Predictors: (Constant), Rational Culture, Hierarchical Culture, Development Culture, Group Culture				
b. Dependent Variable: Agile Methodology				

In this model the r2 value = 0.753, suggesting that the model explains 75.3% of the variance in Agile methodology.

CHAPTER FIVE: RESULTS DISCUSSION

5.1 Introduction.

The main purpose of this research was to explore the influence of organizational culture on the efficacy of the Agile software development methodology, within a South African-founded financial services organisation.

The following were the research objectives:

1. To assess the perceptions of IT professionals on the cultural factors within a firm that uses the Agile software development methodology.
2. To measure the relationship between the cultural factors and the agile software development methodology.
3. To investigate the influence of cultural factors on the agile software development methodology.

5.2 Discussion of results

5.2.1 Perceptions on Organizational Culture and the Agile Software Development Methodology.

All the cultures (group, rational, hierarchical and development) are suited for the successful implementation and adoption of the Agile software development methodology.

a) Group culture: Group culture places a strong emphasis on flexibility and interpersonal relationships. Its key ideals are involvement, belonging, and trust. As depicted from table 4.5 100% of the participants agreed or strongly agreed that interpersonal interactions are valued in the department as well as that teamwork is valuable for the creation of valuable software. To further investigate interpersonal relationships in an organisation (Sarker, Ahuja, Sarker, & Kirkeby, 2014), a social network analysis was used to analyse the relationships between people and groups, as well as the patterns and effects of these connections. They put emphasis on the project trust and communication as essential for organisational success. To support the notion when measuring the relationship between an organisation's culture and an Agile Software Development project project's success, (Anjani, Raharjo, Hardian, & Suhanto, 2021) revealed that both Rational Culture and Group Culture have a positive effect on the success of an Agile Software Development project. Another research discovered that cultural factors that focused on the people involved had a far greater impact than those that were more directly related to the output (Harper & Utley, 2001).

b) Developmental culture: Development culture is prevalent in the firm. It is very clear as shown from table 4.6 that the respondents agreed or strongly agreed that the systems department of the firm has an environment that is fast paced and entrepreneurial. Development culture focuses on external factors such as resource acquisition, adapting to the external environment as well as fostering creativity (Iivari & Huisman, 2007).Similarly it was also formulated that Development culture if used as a mediator would have a positive effect on the success of an agile software development project (Anjani, Raharjo, Hardian, & Suhanto, 2021).

c) Rational culture: Based on the interpretation of the results rational culture plays an important role in the firm. More than 90% of the respondents responded with strongly agree or agree on both the questions measuring this variable. Rational Culture has been described as having a positive effect on the success of Agile Software Development projects (Anjani, Raharjo, Hardian, & Suhanto, 2021).However, for rational culture to prevail, team members should pursue to attain well defined goals and leaders are supposed to be structured and goal oriented (Nieminen, Biermeier-Hanson, Roebuck, & Denison, 2019).

d) Hierarchical culture: From the study more than 90% of the respondents responded with agree or strongly agree to the questions that support having rules and regulations for project success. It is advised however that leaders should be very cautious and pay special attention to technical details when implementing the order, security and regulations (Tjandera & Hariandja, 2019). On the contrary (Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2011) concluded that a culture that puts a high value on formal rules, policies, and control hurts innovation. To support this notion hierarchical culture was depicted as hurting the success of an agile project on a research on measuring the relationship between an organisation's culture and an Agile Software Development project project's success, (Anjani, Raharjo, Hardian, & Suhanto, 2021).

e) The Agile Software Development Methodology: The Agile Software development methodology was the dependant variable in the study. The twelve agile principles from the Agile Manifesto,2001 were used to measure if the firm is entirely agile and the results from this study prove the firm operates on the Agile principle. For there to be an alignment of the agile software development and the organisation's culture firms need

to be very innovative. Modern software development projects are carried out in ever-more-chaotic business contexts characterized by unpredictability in the markets, shifting consumer demands, deadline challenges, and quickly developing information technologies thus the introduction of the Agile software development methodology (Baskerville, Levine, Pries-Heje, & Slaughter, 2001). The importance of organizational culture as a decisive factor, such as learning, resilience, reconfigurability, and other qualities that enable organizational agility towards an innovative orientation, is frequently emphasized in the literature on organizational agility (Schein, 2017). To support this notion agile business aims to respond to change more quickly, keep its leaders vigilant about the environment, and produce market-creating innovations that propel profitability for the firm (Denning & Tedre, 2019). The agile journey does not have an end so a firm needs to continue being innovative and moving as fast as they can to gain competitive advantage.

5.2.3 Relationship between Cultural factors and the Agile Software development methodology.

My second research question was to assess the relationship between the cultural factors and the agile software development methodology, and a relationship was seen to be prevalent from the study as deduced from the Pearson correlation test. There is indeed a relationship between group culture, development culture, hierarchical culture, rational culture, and the agile software development methodology as denoted by the p-value being less than 0.05 and a high correlation value greater than 0.7 for all the variables. This means that culture plays an important an important role in the successful implementation or failure of the Agile Software Development methodology. To support this notion, it was resolved that the connections between operational excellence, organizational culture, and organizational agility have the potential to be more closely tied together to help promote long-term, sustainable operational excellence initiatives (Carvalho, Sampaio, Rebentisch, Carvalho, & Saraiva, 2019).The authors emphasized that long-term success for organizations can be helped by promoting organizational agility and a flexible culture.

5.2.4 The influence of Organisational culture on the Agile Software development methodology.

My third research question was to assess the influence of cultural factors on the agile software development methodology, the results shown on Table 4.2 of the study suggest that development culture, hierarchical culture and rational culture do have an influence on the agile software development methodology. The culture of the organisation does play an important role on the adoption and implementation of the Agile software development methodology. Similarly another research carried out proposed that having a cultural fit in an organisation is the best way to create and keep business value and a competitive edge in agile software development (Siakas & Siakas, 2007).To add to this, another study found that the adoption of agile practices in an organization is affected by five aspects of its culture: management control, teamwork, the industry, values, and innovation (Wendorff, Organisational culture in agile software development, 2002). Before putting Agile practices into place, organizations need to know the current cultural profile of their IT departments and the desired cultural profile needed for Agile Software Development, this helps them build the readiness that is essential for the success of the adoption of the methodology (Cameron & Quinn, 2011).

5.3 Recommendations.

This study provided evidence regarding the relationship between organizational culture and how it influences the effective use of Agile developmental software. We found a statistically strong correlation between organizational culture and the effective use of Agile techniques. The following are recommendations I would lie to suggest, and the organization can implement to align these two aspects:

- Encourage Managers to master the art of Team Building- Since the Agile techniques work best in cultures that encourage collaboration and teamwork, I recommend that leaders in our organization are encouraged to use democratic styles of leadership which promote teamwork and collaboration. The Company should consider introducing several team building exercises and outreach trips. Any team building activity conducted will get the team members together for a fun, creative and jolly time. Team members will get to know each other better and this helps to strengthen relationships amongst staff members. Playing games or team activities, get the team members out of their professional workspace and engage with each other in a different fun environment.

This helps the staff to get to know each other better even on a personal level. They will learn to respect each other, and this will motivate staff to produce more. In such a strong environment the Agile techniques will lead to increased production and growth of the organization

- Training staff on the benefits of Agile Development software -One of the quickest ways to get staff to cooperate is when they are trained on the benefits and use of Agile methodologies. When staff are equipped with the knowledge, they need to understand the new methods and how useful the techniques are to them and the company, everyone will pull towards the same goal. When staff are not well informed of what is going on in the organization the Agile techniques become an IT project and with no support from the other departments. I therefore recommend that the company introduces several training programs on the use of Agile techniques and ensure that everyone in the organization appreciates the benefits of using the Agile techniques.
- Providing financial support towards Continuous Learning in leadership- In addition to training I would recommend that the directors consider offering financial support to those willing to study Information Systems at higher levels such as the degree and master's level. at universities. Financial incentives should be given to staff willing to complete a degree program in this field. This improves the staff's knowledge of information systems, and more people will be able to use them effectively, leading to higher productivity in the organization. From the study very few women knew about IT related issues. This means priority should be given to women in the organization. A skilled employee is a better asset than a non-skilled one.
- Transparency in all critical areas of the organization helps to build trust within staff and remove uncertainties. Managers should be encouraged to clearly explain the organization's vision and objectives and any new big technological systems they wish to purchase, so that everyone understands and pulls in the same direction. Managers should proactively give feedback to complaints raised by staff that improves communication. Management should also be transparent about whether the company is performing well or not. When staff understand the challenges, an organization is going through, they are a lot more patient. These efforts will in turn help improve productivity.

- Managers to empower their subordinates. Agile methodologies work well when the environment is full of empowered people. Managers should delegate work to their

subordinates as a way of empowering them. Employees love to feel that their voice is being heard and that their contributions are valuable to the organization. Managers must empower employees by allowing them to perform tasks without supervision so that they develop confidence. For that to happen successfully managers should organize training for staff so that they can carry out tasks well with minimal supervision. Related to the issue of empowering is mentoring. Managers should mentor their subordinates and equip them with skills they need to take up opportunities when they arise particularly in the IT field department. The more staff know about IT the easier it is for the software to function effectively.

5.4 Limitations

The response rate for women was very low there was insufficient gender diversity, the software development department of the firm is male dominated. Many companies have insufficient gender diversity in the Information Technology industry, out of 236 000 Information Communication and Technology roles, women hold 56 000 positions, or only 23% of all tech occupations in South Africa (Women in tech za, 2023).The data collection was only done one large company so it would have offered more data for comparison if there was a mixture of small, medium, and large companies because cultures might be different so there is a recommendation for further study. Since the data is from one company, it is therefore important to use caution when extrapolating the findings of this research. The researcher assumed that following the fourteen principles of Agile means the firm is entirely following the Agile methodology, but more can be elucidated from the Agile software development methodology.

5.5 Conclusion

The study sought to investigate the influence of organizational culture on the efficacy of the Agile software development methodology within my organisation. The study discovered that organisational culture plays a pivotal role in the entire agile development life cycle. The study sought to investigate the types of culture that works well within a firm that develops software systems using the Agile Methodology. The findings were that companies need to make sure that the organisation's culture is aligned with the software that it is being used. The four culture types from the CVM were all proven to be dominant in the organisation that was studied. The culture of the organization is seen to have a significant impact on how well employees perform. Given the results of the study, my organisation should consider taking note of the findings in

this study and adopting the recommendations given in this study for it to realize increased productivity.

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APPENDICES

Appendix A: Permission to Conduct the Study



20 SEPTEMBER 2022

To whom it may concern,

I, **James Stuart-Watson** from **Discovery VitalityLife Systems**, hereby confirm that I understand the nature of the research project, and that permission is granted for **Rumbidzai Joyline Mapenzauswa** to conduct their MBA Research study with title "The influence of organizational culture on agile software development methodologies" within VitalityLife where willing employees will participate on a questionnaire survey.

It is understood that the researcher WILL NOT use the name of our organization in their Final Research paper and furthermore

- No group or employee names are to be used in the study / dissertation,
- Where the researcher specifically needs to quote the organization or an interview

participant, a pseudonym will be used,

- No code may be copied or Group links used,
- No product or service specific information may be used or any other IP

I can be contacted on **JAMESS@discovery.co.za** / (+27724654473)

Yours sincerely

James Stuart-Watson
Deputy Chief Information Officer
VITALITYLIFE

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VLY0007_10_2018

APPENDIX B: QUESTIONNAIRE

The main aim of this study is to explore the influence of organizational culture on the efficacy of the Agile software development methodology.

- This Survey will be Private and Confidential
- This activity will involve answering questions based on whether you agree with the statement or not and will take around ten minutes of your time.
- All the data collected in this **will not** be shared with third parties, the questionnaire and final report will be used only for academic purposes, and only aggregate or the combined results will be reported in the final report.
- Your participation will be valuable to my studies and will assist towards investigating the influence of organizational culture on the efficacy of the Agile software development methodology.
- You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating.
- You may withdraw at any time or not answer any question if you do not want to.

The survey will be completely confidential and anonymous.

STATEMENT BY PERSON AGREEING TO PARTICIPATE IN THE STUDY

I have read this informed consent document and I freely and voluntarily choose to participate in this study.

Yes, I Consent	**1**	
No, I do not Consent	**2**	

SECTION A: BIOGRAPHICAL AND WORK DETAILS.

1. What is your gender?

Male	1	
Female	2	
Non-binary/third gender	3	
Prefer not to say	4	

2. What is your AGE?

18-29 Years	1	
30-39 Years	2	
40-49 Years	3	
50-59 Years	4	
60 and above		

3. What is your highest level of education?

Grade 12 or Matric	1	
College Certificate	2	
Bachelor's Degree	3	
Honour's Degree or Post Graduate Diploma	4	
Master's Degree	5	
PHD	6	
Other	7	

4. What is your job title?

Development Manager	1	
Software Developer	2	
Test Analyst	3	
Business Analyst	4	
Product owner/Project Manager	5	

5. What is your experience using Agile?

Less than 5 Years	1	
More than 5 Years	2	

6. What is your experience using other software methodologies (years).

Less than 5 Years	1	
More than 5 Years	2	

7. What is your experience in IT (years).

Less than 5 Years	1	
More than 5 Years	2	

SECTION B: Organisational Culture: What kind of culture works well within firms that use the Agile software development methodology?

	GROUP CULTURE					
		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
GC1	I believe that interpersonal interactions at work are valued in my department.	1	2	3	4	5
GC2	I value teamwork, working together gives teams the confidence to make the creative leaps necessary to create truly revolutionary software.	1	2	3	4	5
GC3	The emphasis in the department I work in is on keeping staff members happy, healthy, and safe.	1	2	3	4	5
GC4	Loyalty and tradition serve as the glue that ties the department I work in together.	1	2	3	4	5

	DEVELOPMENT CULTURE					
		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
DC1	The systems department has a fast-paced, entrepreneurial environment.	1	2	3	4	5
DC2	I get recognized and incentivized for performing exceptionally. There is a fair reward system in my department.	1	2	3	4	5
DC3	People just want to get the system working and there are no interpersonal relations with teammates.	1	2	3	4	5
DC4	There is an environment that promotes innovation and knowledge sharing is encouraged.	1	2	3	4	5

	HIERARCHICAL CULTURE					
		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
HC1	It's better to work in an IT department were rules and regulations are clear and following these ensures completion of tasks.	1	2	3	4	5
HC2	In the department where I work, stability and permanency are stressed for smooth, effective operations.	1	2	3	4	5
HC3	Items in my department are prioritized for high productivity, that results in organizational success.	1	2	3	4	5

	RATIONAL CULTURE					
		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
RC1	Everyone shares the same values in my department.	1	2	3	4	5
RC2	The division where I work, places a strong emphasis on competitive behaviours, outcomes, and accomplishment. Setting measurable objectives is crucial.	1	2	3	4	5

SECTION C: Agile Methodology-The Agile Manifesto -flexible, responsive, and adaptive to changes culture.

		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
AM1	Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.	1	2	3	4	5
AM2	I welcome changing requirements, even late in the development phase. Agile processes harness change for the customer's competitive advantage.	1	2	3	4	5
AM3	I preference delivering software frequently in shorter timescale, from a couple of weeks to a couple of months.	1	2	3	4	5
AM4	Throughout the project, businesspeople and developers must collaborate every day.	1	2	3	4	5
AM5	When given the environment and support I need, I get motivated to get the job done.	1	2	3	4	5
AM6	Face-to-face communication is the most effective and efficient way to share information with a development team.	1	2	3	4	5
AM7	The primary measure of progress is a working software.	1	2	3	4	5
AM8	Sustainable development is promoted through agile methodologies. It should be possible for the sponsors, developers, test analysts, and users to keep up a steady pace indefinitely.	1	2	3	4	5
AM9	Agility is improved through constant focus on technical perfection and smart design.	1	2	3	4	5
AM10	The art of simplicity, which maximizes the amount of effort not done, is crucial.	1	2	3	4	5
AM11	The best requirements, designs, and architectures emanate from self-organizing teams.	1	2	3	4	5
AM12	The team often considers how to be more effective, then adapts and modifies its behavior in response.	1	2	3	4	5

Covering Letter

Good day,

I hope you are doing well. My name is Rumbidzai J Mapenzauswa, a Master's in Business Administration student at the University of the Witwatersrand, Johannesburg. As part of my studies, I am undertaking a research project to explore the influence of organizational culture on the agile software development methodology, which is used by firms in the Software Industry, in the greater Johannesburg metropolitan area.

As part of this project, I would like to invite you to take part in answering an online survey. This activity will involve selecting relevant options and will take around five to ten minutes. The questionnaire will be completely confidential and anonymous and will only be used for this research purpose only.

Please click on the link below to access the survey: to be provided

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below.

Best Regards,

Rumbidzai J Mapenzauswa (1801538@students.wits.ac.za)