

**AGILE PROJECT MANAGEMENT SOFTWARE DEVELOPMENT AND ITS
UTILIZATION IN UGANDA: A CASE STUDY OF FLOCK OF BIRDS**

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Business needs for process improvement projects are changing. Organisations expect faster results from their investments; they want their improvement projects to adapt to and follow changing business needs and be more engrained with the organizational way of working. The agile way of working, used more and more in software development, contains several mechanisms that support these business needs. So, the question is: Could a process improvement project be performed in an agile way and what would be the benefits? (Linders, 2016). The advent of agile project management came into being in the year 2001, when some prominent software process practitioners arrived at a consensus on “How software development trends could produce better results?” The outcome was the Agile Alliance and the *Manifesto for Agile Software Development*, which states that: the “highest priority is to satisfy the customer through early and continuous delivery of valuable software.” (Agile manifesto, (2001), Beck et al., 2001a, 2001b)).

Flock of Birds, *FoB*, the case study for this study, is a Ugandan design firm with roots from the Netherlands. It was established in February 2012 as basically an Art Shop but in September 2013 the Information Communication Technology, *ICT*, strand of the organization was born (Flock of Birds, 2017). Our interest for this study is the Information Communication Technology of the organisation where they basically major in Software Engineering and they use mixture of methodologies in project management to ensure they achieve their product or project goals. One of the most common methods they employ is the Agile Methodology and in some cases where client needs so, they apply Waterfall. This case study is vital because they try to use different methods to achieve their goals making it a

more palatable organization to deal with by virtue they have experience with most of the methodologies in question that will help explain this study.

1.2 Background to the Study

1.2.1. Global Context

Agile project management software development has witnessed increased usage among multi-national information technology companies since its inception two decades ago. The main driving factor for adoption of methodologies such as scrum, lean and kanban etc is the emergence of self-organizing teams, reduction of the amount of documentation which translates to more time for productive tasks as well as collaboration.

Some big developers such as game studios have achieved successful production of their solutions courtesy of agile methodologies. Agile has enabled these studios to prioritize on the important features to develop, expected deadlines and effort required in terms of human resources.

Agile heavily depends and focuses on a face to face and active communication within collaborating teams. This has increased the interest in using agile approaches thus ensuring that a small firm is able to become a software powerhouse. This is because, through agility, the company can continuously develop software and make early deliveries as a result of teamwork (Alzoubi & Gill, 2014).

In a situation where there are distributed agile teams, ineffective communication may occur due to the need to regularly disseminate information. This is because, teams are combined based on individual abilities, one agile team may interpret communicated message compared to another team (Alzoubi, & Gill, 2014).

Although adoption of agile practices is well suited in a scenario where customers and developers are located in the same area or region, challenges have been experienced when

incorporating agile in such a scenario. The major challenges include culture, difference in the time zones of customers and agile teams, communication and knowledge management (Jalali & Wohlin, n.d.).

1.2.2 Regional Context

Regional companies have not been left behind in using agile methodologies. With the transformation of agile continuing to expand, new tools have emerged that help users to collaborate and keep track of the progress. The most popular include the code versioning tools such as Github and Gitlab. These have made it possible for groups of collaborators to improve on the capabilities of each other to produce top of the range solutions. However, there is yet to be announced a major regional software solution as a result of adoption agile methodologies. Therefore, this research will seek to understand why regional delivery of software has failed.

In the modern day of constant change, most regional organizations are lagging behind when it comes to adoption of agile. This is because new technologies keep being invented that change the delivery timelines as well as composition of teams. However, adopting dynamic processes in adopting changes will ensure that the organization will transition to new technologies while maintaining teamwork and continuous delivery (Goulven, 2015).

1.2.3 National Context

In Uganda, there exists technological development gaps such as affordable computing devices as well as infrastructural gaps such as power and affordable internet connection which is imperative for successful agile project management and software development. Therefore, continuous development and early delivery of software is largely inhibited which makes the available IT companies to adopt traditional methods such as waterfall. Such

methods encourage little or no teamwork since development is linear and there is no room for improvement or consultation because requirements hardly change.

However, the challenges are being addressed through training such as development of technical skills, communication and client engagement skills as well as teamwork and collaboration.

1.3 Statement of the Problem

Agile software project development has been in existence for a number of years. However, Flock of Birds is still using the historical and traditional approach. In this approach, the organization still uses same plan, methods and procedures to achieve different results through application to different software projects. This has in turn decreased the organizations' ability to continuously deliver their products on time due to inability to adapt and adjust continuously to the changing environment since their software products end up being inferior despite consuming resources (Flock of Birds, 2017). This study will therefore attempt to determine the factors influencing the use of agile project management software development at Flock of Birds.

1.4 Purpose of the Study

To study agile project management software development and its utilization in Uganda and use the results of the study to help organizations utilize agile in continuous development and promote teamwork for increased output and early delivery.

1.5 Objectives of the Study

- i. To investigate the influence of continuous development in utilization of agile project management software development in Uganda.

- ii. To determine how early delivery has influenced utilization of agile project management software development in Uganda.
- iii. To evaluate the influence of teamwork on utilization of agile project management software development in Uganda.

1.6 Research Questions

- i. What is the influence of continuous development on utilization of agile project management software development in Uganda?
- ii. What is the influence of early delivery of software projects on the utilization of agile project management software development in Uganda?
- iii. How does teamwork affect utilization of agile project management software development in Uganda?

1.7 Hypothesis of the Study

- i. Continuous development has a positive influence on utilization of agile project management in Uganda
- ii. Early delivery has a positive influence on utilization of agile project management in Uganda
- iii. Teamwork has a significant influence on promotion of utilization of agile project management in Uganda.

1.8 Conceptual Framework

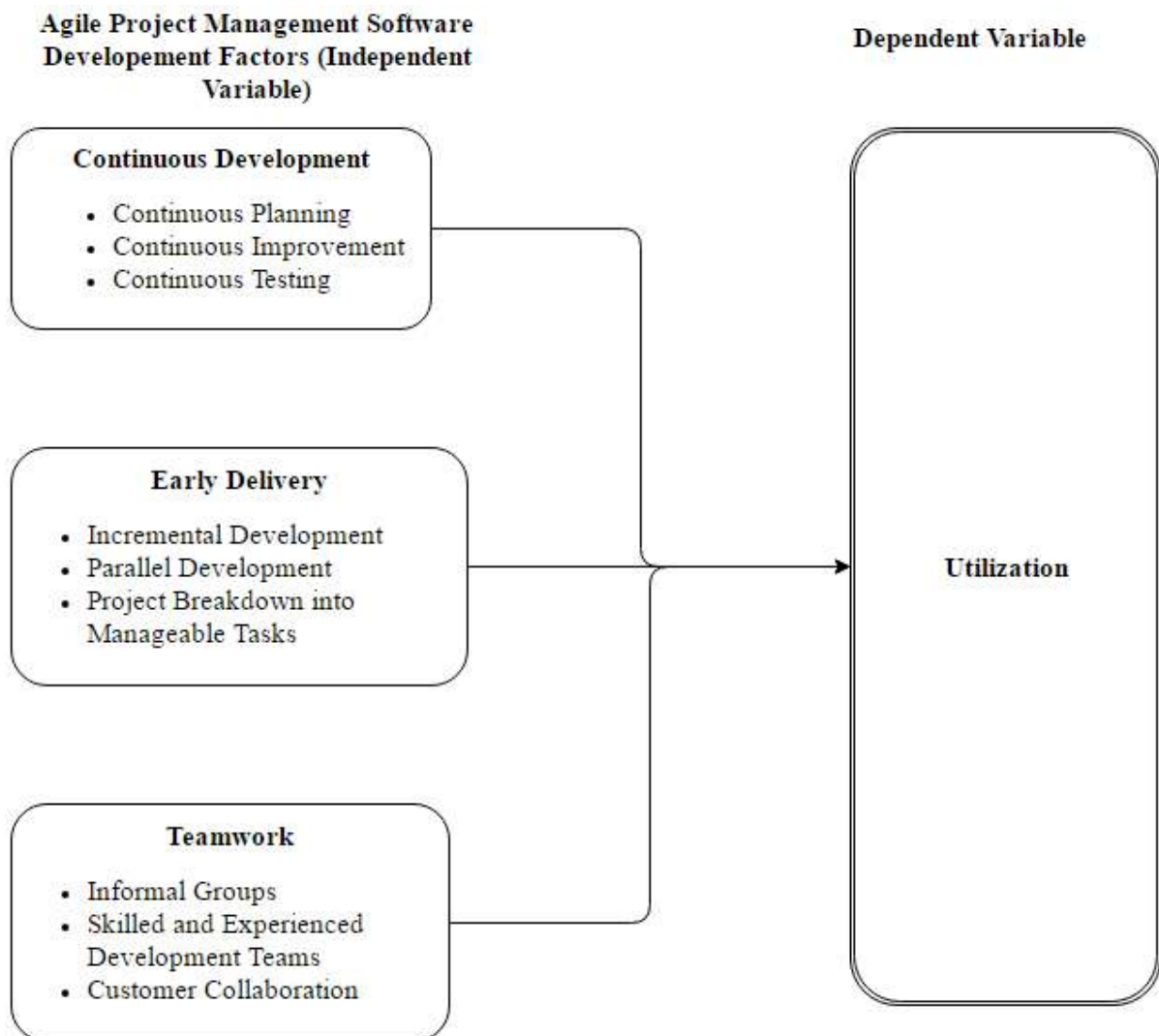


Figure 1-1: Conceptual Framework for Agile Project Management Software Development and its Utilization in Uganda. Source: this has been adapted from Kaur & Mehta (2011) “Agile Methodology: Embracing Change in Software Development”

The conceptual framework above explains how the independent and dependent variables are related to each other. In this study, agile practices through promotion of continuous development, early delivery and promotion of teamwork encourages utilization. If the output of adopting agile practices is positive, then project managers will prefer adoption of agile project management including investing in skills that ensure continuous development and early delivery and vice versa.

1.9 Justification of the study

It is critical that the factors that influence the utilization of agile software development are thoroughly examined and understood by the software development companies. Without clear understanding of these factors, organizations may continue relying on more traditional approaches which are less effective and efficient. This may affect the performance and profitability of the organizations. Given this background it is important to conduct a study to assess the factors influencing the utilization of agile project management software techniques in order to forestall the consequences of using the more traditional approaches to software development.

1.10 Significance of the study

This study will be of great help to project managers. It will enable them to develop project plans for running software projects while being able to adapt and adjust to new requirements and changes. It may also be beneficial to the human resource managers in ensuring productive use of skills within the organization.

1.11 Scope of the Study

This research will involve investigating the influence of continuous and early delivery as well as promotion of teamwork in utilization of agile management practices.

1.11.1 Geographical Scope

This study is limited to the geographical boundaries of Kampala in Uganda. Kampala provides an optimal location for this study because it is where most of the software companies are situated in Uganda as observed by the Ministry of ICT in 2016 and an implied version from a Kenya Newspaper, Daily Nation of 29th October 2009.

1.11.2 Time Scope

Considering that agile practices starting emerging about two decades ago while their increased usage has been for the last decade, this study contains literature content for the period between 2004 and 2017.

1.11.3 Content Scope

This research will touch upon continuous development, early delivery and teamwork as a result of using agile methodology in running software projects.

1.12 Operational Definitions

It is first important that some of the key concepts in this chapter be adequately defined, in an effort to remove some of the ambiguity from concepts which are often subject to a wide range of individual interpretations.

A project - A project is an organization of people dedicated to a specific purpose or objective. Projects generally involve large, expensive, unique, or high risk undertakings which have to be completed by a certain date, for a certain amount of money, within some expected level of performance. At a minimum, all projects need to have well defined objectives and sufficient resources to carry out all the required tasks.

Agile - means it is both light and sufficient

Agile Methods - Agile software processes are light-weight and attempt to minimize the project failure risk associated in the project by developing and releasing software in short iterations. The objective of using Agile Methods is to produce higher quality software in a shorter period of time. Agile methodologies were developed to streamline the development process and to remove barriers to accepting business requirement changes during the software writing stage

Agile software development - is an iterative way of planning and guiding a project.

Intervention - The intervention refers to a specific software technology that addresses a specific issue. Software technology could be any software tool, method or procedure, for example; a technology for performing specific tasks such as system testing

Project management - is the application of knowledge, skills, tools, and techniques to project activities in order to achieve the target goal of a project. A project is a combination of human and nonhuman resources pulled together in a temporary organization to achieve a specified purpose.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Based on the objectives of the study, this section provides the literature review on variables continuous development, early delivery and teamwork and their influence on utilization of agile project management software development in Uganda.

2.2 Theoretical Review

Agile is a manifesto for software development practitioners which contains ideals to aspire to when running software projects (Kiggundu, 2014). It offers an extremely simple means to arrange complex and difficult multi-participant analysis and development of software while at the same time achieving quick delivery of high quality software, ensuring that all customer requirements are met and most importantly, being able to cope with project changes effectively while maintaining coordination within the teams (Strode, 2012).

A host of methods and procedures that have varying degrees in adhering to the principles of the agile manifesto have emerged. They include eXtreme Programming (Beck and Andres, 2004), Scrum (Schwaber, 2009), Crystal method family (Cockburn, 2007), lean and kanban software development and FDD which means feature-driven development.

The motivation behind these methods was to address the core principles laid out by the manifesto. First in the manifesto, there appeared to be a distinct adoption of collaborative development in which people/team members were given more high value than processes and tools used in the development. This is because people are the ones who normally respond to business needs and therefore through their skills, they drive the development process. If instead the process and tools were given more high value in order to drive development, the

team would end up being less responsive to new changes and therefore less likely to meet customers' needs.

Second principle in the manifesto, a lean mentality was encouraged and advocated. Its intention was to reduce the amount of work and resources spent on the creation of documentation which at times was regarded as wasteful. Documentations before agile involved creation of technical specifications and requirements, interface design documents, test and documentation plans and also each document required approval thereby consuming a lot of time. A lean mentality ensured that documentation was only done for absolutely necessary requirements and nothing more.

Third principle of the manifesto gives a description of a customer who is involved as well as collaborates throughout the development period of the project they had requested. This makes it extremely easier for the development team to meet the requirements of the customer exhaustively since the customer usually is a daily part of the team which includes attending all team meetings.

The fourth and final principle of the manifesto states that changes always improve a project and provide more value to that project. Traditionally before agile became popular, change was regarded as expensive and was highly avoided. The intention was to develop plans that were detailed and elaborate and with all the features having been defined thus ensuring that results were delivered in a certain order. Therefore, a consideration was made that it was necessary to accept the fact that uncertainty in software development ought to be part of the plan hence an open mindset to change ought to be adopted (Dingsøy et al, 2012).

The study will also be informed by the technology acceptance model (TAM) of Davis (1989). TAM is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a

number of factors influence their decision about how and when they will use it, notably: Perceived usefulness (PU) – This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance" and Perceived ease-of-use (PEOU) – Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989).

Venkatesh and Davis (2000) extended the original TAM model to explain perceived usefulness and usage intentions in terms of social influence (subjective norms, voluntariness, image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, perceived ease of use). The extended model, referred to as TAM2, was tested in both voluntary and mandatory settings. The results strongly supported TAM2 (Venkatesh & Davis 2000).

TAM has been widely criticized, despite its frequent use, leading the original proposers to attempt to redefine it several times. Criticisms of TAM as a "theory" include its questionable heuristic value, limited explanatory and predictive power, triviality, and lack of any practical value, as for Integrated Product and Process Development (IPPD), its practical means user acceptance is a factor for system implementation promoting activities such as end user computing by managers. TAM has been used in Information Communication Technology (ICT) adoption and use research as a fundamental theoretical framework, and it also has been combined with other theories and models. Both attitude and subjective norm were found to be important determinants of peoples' intentions to adopt and use ICTs.

In trying to understand the effects of agile methodologies, theories like Complex-Adaptive Systems theory (Alaa and Fitzgerald, 2013), Coordination theory (Strode et al., 2012) and Control theory (Persson et al., 2012) were developed to provide understanding. Other theories that have been developed recently to explain the agile methodologies phenomena include

Shared Mental Model theory (Yu and Petter, 2014) and Reflective Practice theory (Babb et al., 2014)

2.3 Conceptual Review

2.3.1 Continuous development

Continuous development is achievable if the software developers are motivated and empowered to utilize agile practices in their work (Dingsøy et al, 2012). Through technical excellence and simplified designs, continuous development is achieved through delivering working software solutions at short regular intervals. The principles in the agile manifesto (Beck et al., 2001a, 2001b) advocate practices that accommodate change in requirements at any stage of development thus ensuring that the final product is refined and timeless.

Customers are involved in the development process providing valuable feedback and insight that can lead to more and better outcomes over the course of development. To ensure continuous development, the development team must be aware that doing better takes time. When trying to solve a technical problem, the team should first determine the qualities that must be possessed by a solution so that development does not get terminated midway. This means that the software project must be regular as well as sustainable within the allocated budget (Balbes, 2013).

Continuous development through agile practices helps produce a clean build of code several times in a day or depending on the milestones set by the project manager. This ensures that the code is robust enough and therefore customers and other interested parties are able to use the resulting solution to provide better feedback to the development team. This ensures that the iterations that follow are far much better than the previous iterations (VersionOne, n.d.).

Agile practices promote shorter and faster cycle times. In turn, faster cycle times ensure that working and important features of a solution are available more quickly and timely.

Continuous development ensures that there is a natural progression in producing working features at a short time while ensuring that quality is maintained. Considering that there has been a heavy use of automation, modularization and availability of flexible infrastructure, each code change during iteration becomes a deployable solution.

Since manual testing in continuous development is normally too cumbersome, there is need to develop automated testing in order to quickly find defects in code, this quickens iteration and while at the same time helping to find defects prior to release for production (Reichert, 2015).

2.3.2 Early delivery

Due to the iterative nature of agile development, features are delivered in an incremental manner and therefore most benefits also are delivered early as the solution continues to be developed. Adoption of agile development philosophy increases revenue due to the incremental delivery and thus encouraging early and regular releases. Quality is maintained since the early release enables the product owner to request for adjustments if necessary and thus making sure that the development team sees early any quality issues. Early delivery enables solution owners and project managers to respond to risks that may be encountered in a timely manner since release is usually ahead of time (Waters, 2007).

One of the agile principles states that an agile organization's highest priority is to ensure customer satisfaction through early and continuous delivery of high quality software. This builds stakeholders confidence as well as reducing risks associated with implementation and re-working (Pounds, 2015).

To achieve early delivery through agile practices, an organization ought to adopt an open-ended architecture. This means that the organization as well as technical architecture should allow change and adoption of new and improved unforeseen architecture which might be

low-cost. Therefore, the project manager ought to be ready for changes and adopt them in the short term without affecting alignment of the project at hand in terms of goals and expectations. Delivering early is usually one of the most desirable outcomes of a project and in some cases, it is often the most recognized success factor among development teams and project managers (Gilb, & Gilb, 2015).

Since agile allows production and release of working software frequently, value is increased by being able to get customer's feedback early on which increases understanding of the project by the development team. Agile practices therefore encourage provision of results of the needed software to users in order for them to provide the feedback. This gives project manager a better insight into what the user or customer exactly wants (Bless, 2011).

2.3.3 Teamwork

It is usually a great thing when the development team, product and project managers, testers as well as writers build on one another's capability to create a solution that is unique and simple.

There are various modes of by which people work together: collaboration, cooperation and non-cooperation. Non-cooperation mode is due to people having differences in ideas and lack of proper communication. This contributes to teams that work against each other and thus no measurable output both in short and long term. In cooperation mode, responsibilities are divided among the participating individuals and therefore each person has a role to fulfil and nothing beyond or outside the roles assigned. In collaboration, the participants build on each other's skills and capabilities to produce an exceptional product which is beyond the abilities of each individual (Mahale, 2011).

However, collaboration is sometimes hard because one needs to give an explanation to the participating members as to what he or she is doing and the reason while being open to

criticism and willingness to change. For successful collaboration, there is need to suspend biases while trying to understand other people's viewpoints in order to be able to produce exceptional products. This is where an agile team becomes necessary. Through agile practices, teams are provided with the space and time to know each other as well as build productive relationships and collaborate (Mahale, 2011).

In order for agile practices utilization to be successful, the project manager should understand what the preferences of the team are and try to balance them. This will provide an immediate view of the strengths and weaknesses of the team. This ensures that the preferences of team members with respect to their roles are matched to the role they play in the product development (McCann, 2010).

2.4 Empirical Studies

The challenges associated with traditional software development methodologies such as waterfall have led to the switch and adoption of agile software methodologies which are modern and established as well as being relatively considered as quick compared to others. The current literature suggests that agile methodologies and practices are effective in project management especially when dealing with modern software complexity and the fast-changing business environment.

The critical nature of software development projects has placed a greater demand on project management and hence the need for project management methodologies. Agile methodology which has emerged to be popular ensures that emerging development issues are dealt with when ensuring rapid delivery and performing frequent changes during the development cycle.

2.4.1 Global Empirical Studies

Studies have shown that agile software development has gained a lot of interest among developers in the field of software engineering worldwide. Empirical studies related to agile

project management aim at giving a scientific and rational viewpoint of understanding the methods as well as techniques used in software engineering (Salo, & Abrahamsson, 2004).

Globally, agile methodologies are usually considered effective. One of the methodologies include scrum, which according to a recent survey titled The State of Scrum, there is 50% or more usage of this agile methodology in the organizations where these participants work, with 29% claiming to have used the methodology for more than 50% of the time. The agile practices have received more recognition and adoption worldwide due to innovation in development of software's and hence businesses have in turn become reliant on innovation in software solutions to be able to gain a competitive advantage (Denning, 2015).

According to a survey titled 'is agile the new norm?' most project managers and IT professionals prefer agile compared to other approaches like Waterfall. Adoption has been driven by the belief that agile is more customer-centric and promotes collaboration and teamwork. Vast majority of IT companies involved in the survey claim to primarily use agile practices in their software development projects. The motivating factors behind adoption of agile are it improves team collaboration, increases customer and satisfaction and ensuring that software quality is high (Jeremiah, 2015).

2.4.2 African Empirical Studies

Considering that agile methods are optimized to handle small teams, they are highly suitable in the African locale where most organizations are usually made up of small development teams. Adoption of an agile practice like scrum allows those small teams to break huge projects into small manageable feature sets and then focusing on developing these features as fast as they can (Adjei-Otchwemah, 2012).

According to study done by Mbelli & Hira (2010), software engineers in Africa prefer adoption of agile methodology with some claiming that there does not exist a single way to

practice such kind of methodology but if there is one, then it must be followed to the letter to prevent emergence of unforeseen consequences.

Nithila et al (2013) also conducted a similar study in South Africa and they found out that majority of the respondents favored the adoption of the agile methodology. In their study, they found out that only 31% of the respondents disapproved the agile methodology.

2.4.3 Ugandan Empirical Studies

While most of the availability literature materials mainly focus on the global adoption of agile practices including in Uganda, currently there is little or no research done in Uganda pertaining to its adoption and utilization of agile project management methodologies. This has been coupled with various challenges affecting the Ugandan software engineering scene which include little or no power and internet connection. Both of which are imperative for devices used in enabling the adoption of agile methodologies. There is low or no appreciation of the impact technology can make in the business environment including increasing competitive advantage of an organization, internal staff challenges as well as difficulty in making technological choices which are capable of robustly meeting client needs (Musoke, 2017).

In Uganda, studies show that the use of agile software development enhances innovations. Kwesiga (2012) in an assessment of how training that was aimed at developing students' skills in the use of agile software and management techniques found that indeed the training had enhanced their skills. Under this project, total of 50 software engineering students were trained in agile software development methodologies by ThoughtWorks a US-based ICT consultancy firm in partnership with the Grameen Foundation, Yo!Uganda and SMS media.

2.5 Synthesis and Gap Analysis

There exist a lot of opportunities in exploring the adoption of agile practices worldwide and more specifically in Africa. Considering the continent is regarded as the next economic giant, there is needed to conduct research and investigate on mechanisms to adopt to increase the usage of agile project management methodologies in Africa. There exist a lot of gaps between modern software engineering principles used in other continents compared to the ones in Africa as outlined in the literature. This is coupled by the fact that adoption rate and level in Africa is still low and therefore the continent is not benefitting from the advantages that come with adopting modern software development principles as outlined in the agile manifesto. This therefore calls for a study that will fill this contextual gap by studying the use of agile project management techniques and its application in the Ugandan context which is still faced with IT implementation and utilization challenges.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the research methodology that will be used to conduct the study. Its purpose is to provide a description of the research design, study population, determination of sample size, sampling techniques and procedure, data collection methods and instruments, reliability and validity, data collection procedure and measurement of variables. Each has been separately explained below.

3.2 Research Design

Ogula (2005) chronicles a research design as a structure, plan and strategy of investigation to obtain answers to research questions and control variance. Additionally, a study design is the set plan of action the researcher adopts for answering the research questions and it sets up the framework for study (Kerlinger, 1973). This study will therefore adopt a descriptive research design. The main purpose of this type of research design is giving a description of the state of affairs as they exist presently in the environment where the research is taking place. Thus, to know the utilization of agile project management software development in Uganda would require the researcher to go to the field of study to collect first hand data based on the present happenings in the area under study.

Due to the study population being extremely large to be observed directly, a descriptive survey research design is adopted. The benefit of descriptive research is that it is normally conclusive in nature such that the researcher can be able to make a statistical inference since information gathered is quantifiable.

Descriptive research is capable of assisting an organization or a researcher to better make measurements about the significance of a property about a selected group of respondents as well as the population they are depicting.

3.3 Study Population

A population is usually a set of objects with some observable characteristics common to them. This study targets a maximum of 50 IT companies operating within and in the outskirts of the city of Kampala which specifically comprises of project managers and developers/teams under the project managers. It is assumed that each company has a project manager and at least two developers under each project manager.

Respondent type.	Study population
Project Managers	50
Developers	100
Total	150

Table 3-1: Total Study Population

3.4 Determination of the Sample Size

The first thing one ought to understand when calculating the sample size is the confidence levels as well as the margin of error.

The confidence level refers to how sure the researcher can be that their study results are accurate.

The margin of error indicates the range the results of the study may fall between if the confidence level researcher held true. A confidence level of 95% and a %% margin level is usually the standard for a research study or survey.

The confidence level score consists of the standard deviation value that which goes with the researcher's confidence level. With a 95% confidence level, the score would be 1.96.

Distribution consists of reflecting how skewed on a topic the respondents in a study can be.

In the research field, the most conservative distribution to stick to is 50%.

Sample Size Calculation

$$\text{Sample size} = (\text{Distribution of } 50\%) / ((\text{Margin of error}\% / \text{Confidence Level Score})^2)$$

$$\text{True sample} = (\text{Sample size} * \text{Population}) / (\text{Sample Size} + \text{Population}-1)$$

$$\text{Sample size} = (0.5*(1-0.5)) / ((0.05/1.96)^2)$$

$$\text{Sample size} = 0.25/((0.02551020408)^2)$$

$$\text{Sample size} = 0.25/0.00065077051$$

$$\text{Sample size} = 384.16$$

Project managers sample size

$$\text{True sample} = 384.16*50 / 384.16+50-1$$

$$\text{True sample} = 19208.0000675 / 433.16000135$$

$$\text{True sample} = 44.34$$

$$\text{True Sample} = 44$$

Developers sample size

$$\text{True sample} = 384.16*100 / 384.16+100-1$$

$$\text{True sample} = 38416 / 483.16$$

$$\text{True sample} = 79.51$$

True Sample = 80

The sample must therefore return a minimum of 80 Completed Surveys. The table below shows how the calculation relates to sample size.

Respondent type	Target population	Sample size
Project Managers	50	44
Developers	100	80
Total	150	124

Table 3-2: Sample population to be studied. Source: (FluidSurveys, 2014 - <http://fluidsurveys.com>)

3.5 Sampling Techniques and Procedure

Researchers use various sampling techniques in order to select participants to be included in their sample. The benefit associated with the techniques is that they help in minimizing costs which would have been incurred in the absence of a sample while at the same time maximizing generalizability.

The researcher will use random sampling technique. This is because each and every IT company in study population has an equal chance of being in the sample. The selection of each IT company is independent of the selection of each and every other IT company. The selection of one IT company again does not affect the chances of selection of any other IT company in the study population. Random sampling technique gives a more accurate method of making conclusions since it lacks bias.

3.6 Data Collection Techniques

The researcher will mostly rely on primary data collection methods. These include administering a questionnaire survey and oral interviews and making notes.

3.6.1 Questionnaire

This is a set of predefined questions that have been assembled by the researcher and usually organized in a predetermined order. Questionnaires are handier especially when trying to gather information from a large study population. The questionnaires the researcher will adopt will be of two types; open ended and closed questionnaires. Open ended will comprise of a question and a blank space which the respondent is supposed to fill. The close ended will be made up of a question and a predefined range of solutions for the respondent to choose.

3.6.2 Interview

This comprises of a verbal communication between the researcher and respondent with the objective being collecting data from the respondent for the purpose of research. An interview helps in gathering detailed information about a specific topic including exploring experiences and feelings which cannot be observed through questionnaires. The researcher will involve the use of interview in the research to be able to collect qualitative data.

3.6.3 Observation

This will involve the researcher using his senses to investigate the study population in its natural setting. The researcher will be in the environment where the subjects under study operate in order for him to experience and observe the subjects from their own perspective.

3.6.4 Documentary Review

The researcher will review the existing documents in the environment where the subjects under study are situated. They will include both hard and electronic such as reports, meeting minutes, materials used for marketing, multimedia such as audios, videos and images etc. Document review will help the researcher to gather background information about the subjects, organization history and any documented approached about principles that are currently in use or used in the past. The documents will to some extent, act as the guide on

the type of questions to ask the respondents since the operations of their organizations may be different.

3.7 Data Collection Instruments

The researcher will use self-administered questionnaires (SAQs) and interview guide as the data collection instruments. The researcher will develop a standard list of questions which he will take to the respondents for them to fill. In the oral interview, the researcher will meet the respondents face to face and direct questions will be orally asked.

3.7.1 Self-Administered Questionnaire

Self-administered questionnaires will be passed on to the developers and project managers for filling. The said questionnaire will be set in accordance to the objectives of the study. Ordinarily, these are interspersed, distantly placed and the nature of their engagement is not practical for interview given the time available to complete the field study and subsequently the entire study. These samples are suggested because they make the results more dependable and reliable. The questionnaire will contain items aimed at obtaining responses about opinions and preferences in close-ended questions. The closed ended questions will allow the respondents to agree or disagree with the item in the questionnaire. This tool is believed to be the most appropriate in terms of convenience to both the researcher and the respondents because of the following reasons: a) offers a sense of security (confidentiality) to the respondent, b) it is objective method since no bias resulting from the personal characteristics (as in an interview), c) its potentials in reaching out to a large number of respondents within a short time and d) able to give the respondents adequate time to respond to the items (Owens, 2002).

3.7.2 Interview Guide

Face to face interviews with the help of an interview guide will be conducted among selected few developers, project managers, IT company owners and other Independent IT experts to establish their view on how effective and efficient agile software project management is. The researcher believes that these people can provide rich information in regard to the study.

Interviews will be used, since they are appropriate in providing in-depth data, data required to meet specific objectives, allows clarity in questioning and are quite flexible as compared to questionnaires (Cresswell, 1994).

3.8 Reliability and Validity

3.8.1 Validity

Validity is described as the measure of the extent to which a research instrument is capable of making measurements for which it is designed to measure for the purposes of providing validation (Amin, 2005). The instruments chosen such as questionnaires and oral interviews are valid since they are able to provide accurate feedback on the parameters intended to be investigated.

This study will adopt content validity to ascertain the validity of instruments. Validity of the research tools to be used for data collection will be achieved by repeated reviews with fellow students and with guidance from supervisor. The researcher will ask them to evaluate the items on the questionnaires for their relevance to the stated objectives of the study. The researcher will further ensure content validity of the instruments by making sure that questions or items in them conform to the study's conceptual framework and research questions. Then, assess the content validity by using the content validity index (CVI) to further ascertain their validity. A formula whereby the number of items rated as relevant is

divided by the total number of items on the questionnaire will be adopted to achieve the content validity index (CVI) thus:

$$\text{CVI} = \frac{\text{Total of items rated as relevant}}{\text{Total number of items in the questionnaire}}$$

If the outcome is 0.7 and above, then the instrument will be regarded as valid as suggested by Amin (2005).

3.8.2 Reliability of Research Instruments

Reliability is described as the measure of the extent to which a research instrument provides consistent outcomes or results after a set of repeated trials. Reliability is concerned with consistency, dependability or stability of a test (Nachmias and Nachmias, 1996). The data collection instruments are reliable since they are able to measure the parameters specified to be investigated.

In testing the reliability of instruments, the study will adopt Cronbach's Alpha coefficient value analysis. According to Dobson, (2002), reliability refers to the measure of the degree to which research instruments yield consistent results after repeated trials. A correlation coefficient greater or equal to 0.6 will be accepted (George and Mallery, 2003).

3.9 Data Collection Procedure

This refers to the collection or gathering of information during research in order to serve some facts. To ensure reliable and detailed data is collected, the researcher will use random sampling technique. The researcher will randomly select IT companies to study apart from

the case in mind, Flock of Birds. He will then introduce himself to the project managers of the companies selected after which he will explain the purpose of the study.

The researcher will then interview the project managers. He will also administer the questionnaire on each project manager after which he will administer a questionnaire to the developers. The researcher will take notes on the answers provided during the interview. He will lastly collect the questionnaires for analysis, conclusions and recommendations to be made based on the results of the study.

3.10 Measurement of Variables

To measure the variables in the study especially when administering the questionnaire, the researcher will adopt a scaling approach and in this case, a Likert scale will be used. It will be used to measure the scale of satisfaction, quality as well as likelihood and frequency etc. The Likert scale is more effective because they are easily understood by respondents as well as being universal.

Different variables can be measured at different levels (Bell, 1997). Both the nominal and ordinal scales of measurement will be used in the questionnaire. The nominal scale of measurement will mainly be used in the first part of the questionnaire (demographics) which comprised of items with some common set such as gender or sex, as well as age and qualification of respondents. According to Mugenda and Mugenda (1999), nominal scales are assigned only for purposes of identification but do not allow comparisons of the variables being measured.

The researcher will use ordinal measurement which categorizes and rank the variables being measured, for instance, the use of statements such as greater than, less than or equal to (Amin, 2005). The Likert scale will be used to collect opinion data and this will be used to measure the respondents' views on how people factors affect Agile software project

management the five scales: 5= strongly agree; 4 = agree; 3 = undecided; 2 = disagree; 1 = strongly disagree, (Amin, 2005). The numbers in the ordinal scale represent relative position or order among the variables (Mugenda & Mugenda, 1999; Amin, 2005). Both nominal and ordinal scales measure discrete variables and only the specified numbers such as 1,2,3,4,5, can occur (Amin, 2005). Qualitative variables will be measured using themes that will be developed from the conceptualization of a particular variable.

3.11 Ethical Considerations

The research process will be guided by sound ethical principles which include the following:

Voluntarism: the research team will ensure that respondents are not coerced or manipulated into participating in the study. Respondents will be told the purpose of the study and their consent to participate in the study will be sought.

Objectivity: The research team will also ensure objectivity when carrying out the research any attempt to bias results will be considered unethical and should therefore be avoided.

Reciprocity and Trust: ethical codes increasingly emphasize the importance of openness and honesty in communicating information about research (Bell and Bryman, 2007 and Wray Bliss, 2007). This will ensure all work that is not originally noted by the researcher and addressed by a different researcher or source, is well quoted and sources reciprocated.

Confidentiality: The respondents will also be assured of confidentiality and anonymity. Their names will not be written anywhere in the report and the information given will only be used for academic purposes.

Respect: The research team will ensure respect for the respondents. Respect will encompass respecting the opinion of the respondents including the opinion to terminate the interview

whenever they felt uncomfortable to continue, questioning style especially for very personal and sensitive questions.

Informed Consent: The researcher will ensure that all aspects of the research that will need approval are sought for before continuing with research.

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APPENDICES

Appendix I : Questionnaire for IT Company Employees

Dear respondent,

I am requesting you to fill this questionnaire, which is aimed at collecting data on “*Agile Project Management Software Development and Its Utilization in Uganda*”. You have been selected to be one of my respondents in this study. The information provided will be treated with strict confidentiality and shall not be used for any other purpose except for academic purposes. The study will ensure your anonymity and confidentiality. Thank you very much for your cooperation.

Yours faithfully,

Eugene Miheso Swinnerstone

Kindly tick { ✓ } where appropriate.

SECTION A: GENERAL INFORMATION ON THE RESPONDENTS

1. What is your gender?
 - a) Male { }
 - b) Female { }

2. What is your age?
 - a) 20-30 years { }
 - b) 31-40 years { }
 - c) 41-50 years { }
 - d) Above 50 years { }

3. How long have you worked in this institution?
 - a) Below 5 years { }
 - b) 6-10 years { }
 - c) Above 10 years { }

4. Academic certificate level currently held.
 - a) Untrained { }
 - b) Diploma { }
 - c) Degree { }
 - d) Masters { }
 - e) PhD { }

f) Others { }

5. Do you possess a certificate computer studies?

- a) Yes { }
- b) No { }

SECTION B: PAST EXPERIENCE IN PROJECT MANAGEMENT AND SOFTWARE DEVELOPMENT

1. Have you developed software before?

- a) Yes { }
- b) No { }

2. If yes above, how long have you been doing so?

- a) Below 5 years { }
- b) 6-10 years { }
- c) Above 10 years { }

3. Are you aware of project management techniques?

- a) Yes { }
- b) No { }

4. Of this Project Management Techniques, which one are you aware of? (You can Choose multiple options)

- a) Traditional { }
- b) Waterfall { }
- c) Rational Unified { }
- d) PERT { }
- e) Critical Path { }
- f) Critical Chain { }
- g) Extreme { }
- h) Agile { }

5. Do you have experience in agile?

- a) Yes { }
- b) No { }

SECTION C: DECISION MAKING

1. Agile project management has enhanced continuous development

- a) Strongly agree { }
- b) Agree { }
- c) Neither agree nor disagree { }

- d) Disagree { }
 - e) Strongly disagree { }
2. You are satisfied with the quality of results obtained from continuous development as a result of adopting agile project management
- a) Strongly agree { }
 - b) Agree { }
 - c) Neither agree nor Disagree { }
 - d) Disagree { }
 - e) Strongly Disagree { }
3. Continuous development is more effective and resource efficient when using agile project management
- a) Strongly agree { }
 - b) Agree { }
 - c) Neither agree nor Disagree { }
 - d) Disagree { }
 - e) Strongly Disagree { }
4. Rate agile project management software development in terms of enhancing continuous development
- a) Unacceptable { }
 - b) Fair { }
 - c) Good { }
 - d) Excellent { }

SECTION D: DELIVERY

1. How would you rate the time when the software project is delivered with respect to the deadline set while using agile project management
- a) Good { }
 - b) Fair { }
 - c) Poor { }
 - d) Very poor { }
2. Do you think adoption of agile project management promotes early and timely delivery of project
- a) Yes { }
 - b) No { }

3. If Yes to 2 above, early delivery has been improved with adoption of agile project management

- a) Strongly agree { }
- b) Agree { }
- c) Neither agree nor Disagree { }
- d) Disagree { }
- e) Strongly Disagree { }

4. Describe agile project management in terms of early delivery

- a) Efficient { }
- b) Fast { }
- c) Reliable { }
- d) Inefficient { }
- e) Slow { }
- f) Unreliable { }

5. Early delivery is

- a) Extremely important { }
- b) Very important { }
- c) Somewhat important { }
- d) Not very important { }
- e) Not important at all { }

SECTION E: TEAMWORK

1. Adopting agile project management promotes teamwork

- a) Strongly agree { }
- b) Agree { }
- c) Neither agree nor Disagree { }
- d) Disagree { }
- e) Strongly Disagree { }

2. Teamwork within an organization is

- a) Extremely important { }
- b) Very important { }
- c) Somewhat important { }
- d) Not very important { }
- e) Not important at all { }

3. Do you prefer working alone or as a team

- a) Yes { }
- b) No { }

4. Agile project management is more effective when adopted in a team setting

- a) Strongly agree { }
- b) Agree { }
- c) Neither agree nor Disagree { }
- d) Disagree { }
- e) Strongly Disagree { }

Appendix II: Interview guide for the Project Managers

1. In your own understanding, what is agile project management?
2. In your view, to what extent do you use agile project management?
3. What challenges do you encounter when using agile project management?
4. Can you estimate the expertise level of your staff in using agile practices produce projects?
5. What do you think is the role of the project manager in an environment utilizing agile project management?