ADDIS ABABA UNIVERSITY

School of Commerce

An Assessment of Software Project Management Practices in Commercial Bank of Ethiopia

A project work submitted to Addis Ababa University College of Business and Economics School of Commerce in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Project Management (MAPM)

By

Berhanu Temesgen

June, 2020

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY

School of Commerce

An Assessment of Software Project Management Practices in Commercial Bank of Ethiopia

Approved by:

Advisor	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date
_____	_____	_____

Declaration

I, Berhanu Temesgen Mehiret, declare that this project work entitled "An Assessment of Software Project Management Practices in Commercial Bank of Ethiopia" is entirely my own except where states otherwise by reference or acknowledgment. I confirm that this project work presented for the partial fulfillment of the degree of Masters of Art in Project Management (MA) and it has not been submitted for any other degree or professional qualification.

By: Berhanu Temesgen

Signature _____

Date_____

Statement of Certification

This is to certify that this project work entitled "An Assessment of Software Project Management Practices in Commercial Bank of Ethiopia" that is being submitted by Berhanu Temesgen Mehiret in partial fulfillment of the degree of Masters of Art in Project Management (MA) to Addis Ababa University is a record of original work carried out by him under my guidance and supervision.

The results embodied in this study have not been submitted to any other University or Institute for the award of any degree or professional qualification.

Advisor: Dr. Solomon Markos

Signature _____

Date_____

Acknowledgment

First and foremost, I would like to thank God Almighty for giving me the strength to undertake this project work. I wish to express my deepest gratitude to my advisor Dr. Solomon Markos of the School of Commerce at Addis Ababa University, for his intellectual guidance, supervision and academic support. I would also like to thank employees of Project Office of Commercial Bank of Ethiopia for their participation in the survey who supported my work in this way and helped me get results of better quality.

Finally, I must express my very profound gratitude to my family and friends for providing me with unconditional support and continuous encouragement throughout my years of study and through the process of researching and writing this study.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Acronyms

AAU – Addis Ababa University

ATM - Automated Teller Machine

CBE – Commercial Bank of Ethiopia

CBE Birr - a mobile based banking whereby the bank selects, trains and authorizes agents to provide banking services on behalf of the bank

CBE – PMO – Commercial Bank of Ethiopia – Program Management Office

CRM – Customer Relationship Management System

CTS – Check Truncation System

EDRMS – Electronic Document and Record Management System

ERP - Enterprise Resource Planning

IT – Information Technology

ITIL – Information Technology Infrastructure Library

PMBOK – Project Management Body of Knowledge

PMI – Project Management Institute

PMO – Program Management Office

PRINCE1 or 2 - Project IN Controlled Environments

Abstract

Software technology changes the way companies conduct business. It has an important role for banking and finance as it alters systems and processes for improved service delivery and customer satisfaction. In cognizant of this fact, many companies in Ethiopia (including banks) currently undertaking software projects. The objective of this study is to assess software project management practices in the case of Commercial Bank of Ethiopia. Project management frameworks, guidelines/tools and knowledge areas were used to assess the current practices of Commercial Bank of Ethiopia and to ensure its efficiency and uniformity in delivering software products. A total of 64 project managers and project team members in four different software projects were selected as respondents for the study with census survey. In order to gather the primary data, self-administered questionnaire was employed and IBM SPSS Statistics 22 was used for descriptive statistics with quantitative analysis to answer the research questions and objectives. The findings of the study indicate that various types of project management frameworks have been chosen by the respondents for software projects. Regarding project guidelines/tools, the combination of various guidelines/tools were used. With currently used frameworks and guidelines, 76.2% of respondents indicated that software projects in the bank were behind the schedule, 42.9% of respondents beyond the cost plan, 19.0% rejected quality and 7.1% totally failed & closed. As a result, this study recommended to use compatible software project management frameworks/tools that will effectively manage software projects, especially to iteratively recheck the fulfillment of project needs.

Keywords: *Software project, project management framework, guidelines/tools, knowledge areas, practices*

Chapter 1: INTRODUCTION

1.1. Background of the Study

A project is an endeavor which has typical qualities from routine and daily activities in that it is a one-time exertion and unique group of activities to result in a product or service that has not existed before (Watt, 2014). By PMI (2017:13), it is defined as "a temporary endeavor undertaken to create a unique product, service, or result" (PMI, 2017). In any organization, the fundamental building blocks for design and execution of strategies are projects which provide an organizational focus for creating and implementing organizational processes regarding the strategies so that the successful organization maintains a portfolio of projects centered on the operational and strategic needs of the organization (Cleland, 2004). Meanwhile, information technology has transformed the business in a corporate organizations and information technology strategies are emerging to replace the traditional way of business in an organization (Tsai, 2003).

Organizations are implementing latest IT applications so as to reinforce their operations and to supply the optimum value to their customers. For controlling processes and activities while implementing these IT applications, IT project management is conducted that deals with Information Technology infrastructure, information systems or Software projects (Almgren, 2014). Information Technology project management is the process of adequate planning, determination and vision of success of IT projects with leadership, know-how, motivation and a clear vision of what each project will produce, what it'll cost, and when it'll end (Phillips, 2010).

Explicitly, software is a collection of computer programs and associated documentation that tell the computer how to work and software development is the process of software production for a client based systems requirements to solve problems and create value (Sommerville, 2016). Consistent with IBM Research (2020): "Software development refers to a group of computing activities dedicated to the method of making, designing, deploying and supporting software" (IBM, 2020). It includes structured sequence of stages starting from the conception with requirements to the ultimate manifestation of the intended software product and series of steps called the software development life cycle (SDLC) that is used to design and develop a software product efficiently (Sommerville, 2016).

Nowadays, a custom software development (which is software product re-design and adjustments with respect to particular kind of clients or organizations) is preferred to follow by organizations for a plus of a reliable and efficient technical support plan. Therefore, software is re-adjusted or customized consistent with their unique requirements after purchasing generic software packages (Pollock & Cornford, 2004).

Project management is pivotal for software project success. Therefore, software project management comprises of a number of tools, techniques, and knowledge essential for processes of managing, allocating and timing resources for completing the project efficiently and effectively (Hazra, 2012). It is essential to assess specific project type compatibility with tools and techniques.

In endeavoring to boost the probability of software project success, different inquire about has risen that specialize in the improvement of software development processes, methodologies, frameworks and therefore the technology utilized (Barghoth, et al., 2020). A wide assortment of frameworks has created consistently, each with its own clear characteristics and inadequacies. In reality, projects are different in numerous was in order that one software project management framework is not really reasonable to be employed by all types of projects. For this reason, project management frameworks are intended to be fit explicitly to varied sorts of projects (Pandey, 2011).

Within today's rapidly changing business environment, better performance to software project success could not be attained with practical separation of project management aspects from the technical or engineering ones (Ralph & Kelly, 2014). It requires both dimensions which are project management and software engineering. A software project is considered to be successful if it delivers the product as it meets the software engineering and project management objectives. Therefore, it is advisable to spot critical factors that cause projects' success/failure. There are various factors that affect the failure of software projects related with both project management and software engineering (Saputra & Arman, 2015).

1.2. Background of the Organization

The Commercial Bank of Ethiopia is a publicly owned commercial bank in Ethiopia. Its history goes back to the foundation of the State Bank of Ethiopia in 1942 and then it was legally established as a share company in 1963 (Commercial Bank of Ethiopia, 2017). In 1974, it

merged with the privately owned Addis Ababa Bank. From that point forward, it has been playing indispensable roles in the development of the country (combanketh, 2020).

The bank currently employs around 37,894 permanent employees and not less than 22,000 outsourced jobs as of June 30, 2019 with more than 1456 branches stretched across the country. It has more than 22 million account holders and therefore the number of Mobile and Internet Banking users also reached more than 2.5 million as of June 30th 2019. Active ATM card holders reached more than 8 million (combanketh, 2020).

Its stated vision is "to become a world-class Commercial Bank by the year 2025." The business strategies of the bank focus on the stakeholder it serves. It dominates the market in terms of assets, deposits, and capital and customer base and branch network, despite the growing completion from private banks over the last 15 years (Freezer, 2018). For customer fulfillment, a combination of processes, technology and management has been employed to facilitate the work in order that value are often added and then aggregated for service delivery to the customer.

In order to introduce various sorts of modern banking services, the Program Management Office of Commercial Bank of Ethiopia was established in 2010 (Ethiopia , 2017). The Core Banking System project (connecting all the branched of the Bank through broadband network) was one among the projects initiated to realize the target. Likewise, Program Management Office (PMO) has implemented many large projects within the past ten years and a few of the main ones are: - Enterprise Resource Planning (ERP); Customer Relationship Management System (CRM); Anti Money Laundering (AML) Project; Learning Management System (LMS) Project; Electronic Document and Record Management System; Information Technology Infrastructure Library (ITIL) Framework; Upgrading Core and Card Banking systems; IFB System, Implementation Project. The personnel working within the IT projects were come and brought together from various functional departments of the bank depending on the nature of the projects.

The bank currently undertakes various IT projects through its Program Management Office. These are eight (8) active projects running at different project management life cycle stages, such as LAN upgrade, Core banking (T24) upgrade, Datacenter, Customer Relationship Management system (CRM), Check Truncation System (CTS), Electronic Document and

Record Management System (EDRMS), Information Technology Infrastructure Library (ITIL) and Reconciliation projects.

The main focus of this research study is, therefore, assessing the practice of Software Project Management in the Commercial Bank of Ethiopia, identifying challenges and issues facing the teams at the bank from adopting common software project management frameworks, and pinpoint the areas of improvements.

1.3. Statement of the Problem

As it is stated clearly on the official website and strategic documents, the commercial Bank of Ethiopia has a vision to be a world class bank by the year 2025 (CBE's 75th Adversary Profile, 2017). For this vision to become true, the bank has implemented many IT projects in the past ten years. Some of the major ones are: - Core Banking, Network & IT Infrastructure, Enterprise Resource Planning (ERP), CBE Birr, Contact/Call center project, and so on.

According to Cornelia & Georgiana, 2011, there are three reasons why financial institutions have been and still are vigorously putting resources in technology and thus IT projects. They are to scale back operating costs with information technology efficiencies; to serve their current customers and attract new customers by offering new products and services; and to implement sophisticated information management system and techniques (Cornelia & Georgiana, 2011) However, satisfactory research had not been done in examining the viability of project management processes and practices on performance of projects in Ethiopia (Hailu, 2016 cited in (Freezer, 2018)). This includes information technology projects run in various sectors in Ethiopia.

Moreover, from the preliminary interview with Director of Program Management Office of Commercial Bank of Ethiopia and Project managers of various software projects, the bank has suffered from software projects' failure and it has been found that software project management is challenged for various reasons as it compares with infrastructure projects. These software projects fail to satisfy customer' needs as per the parameters of time, quality and cost. Some of its challenges are related with uniqueness of software and lack of skill, knowledge and tools for software project management and software development or customization. This study aimed to further assess the practice of software project management and its challenges and give a relevant recommendation.

Now a days, non-Project driven organizations have also embarked in project management since projects have become a common phenomenon for many businesses (Kerzner, 2009) (Wysocki, 2014). However, according to Standish Group research, only 36 percent of software projects in 2017 were successful, 45 percent challenged and 19 percent were failed (Standish Group, 2018). It is advisable to address best practices and compatible project management frameworks, guidelines or tools for project successes.

Moreover, there is an abundance of recommendations for performing the various processes of project management, including scope estimation, activities definition and sequencing, cost determination, risk management, and so on. However, the challenge is how to combine standalone techniques into a practical and workable process. In other words, the appropriate approach is a balanced process that covers the entire project management. Unfortunately, adequate research had not been done in illustrating how to integrate techniques in this way.

Therefore, the purpose of this study was to gain a better understanding of the issues and challenges regarding software project management emphasis on practices in Commercial Bank of Ethiopia and to investigate the effectiveness of current trends of software project management and the problems that face to active software projects.

1.4. Research Question

- ✓ What is the current software project management practice in Commercial Bank of Ethiopia?
- ✓ What are the challenges in practicing software project management in Commercial Bank of Ethiopia?
- ✓ What are the areas of improvements in Commercial Bank of Ethiopia software development and/or customization projects?

1.5. Research Objectives

General Objective

The general objective of the study was to assess software project management practices in the case of Commercial Bank of Ethiopia.

Specific Objectives

Below were the specific objectives of this study;

- To determine the most commonly used software project management practices and framework at Commercial Bank of Ethiopia
- To identify challenges and issues facing the teams at the bank from adopting common software project management frameworks.
- To assess the practices of project management knowledge areas in Commercial Bank of Ethiopia in software development and/or customization projects.
- To pinpoint the areas of improvements in Commercial Bank of Ethiopia software development and/or customization projects.

1.6. Significance of the study

The major significant of this study was assessment of software project management practices in Commercial Bank of Ethiopia and knowledge advancement in the area. Although there have been many studies on software projects in Commercial Bank of Ethiopia, they were mostly done on specific project management knowledge areas and only limited to experiences on individual projects. So this study made cross comparison of findings by further studies in the area and it would enable the bank to get information regarding the issue and to identify the gaps in managing software projects. This would help to improve software project management practices in the bank. Additionally, it could be used as a reference for other researchers who want to make further investigation in the area.

1.7. Scope of the study

In this study, the researcher looked at software project management practice in Commercial Bank of Ethiopia and provided details about the processes the bank had in place to manage software projects. It was limited to assessing the overall existing software project management practices of software development and/or customization projects. The main target population of the research was four software projects which were running at different project management life cycle stages.

The five most relevant knowledge areas within software project management was emphasized and assessed. They were scope management, time management, cost management, quality

management and risk management. It did not looking at areas of project management where the differences of software project management with other project types are less significant. Regarding the project management life cycle, in Commercial Bank of Ethiopia, it was fairly standard to use the generic life cycle having five main stages: Initiation, Planning, Execution, Monitoring & Controling and Closure.

1.8. Limitation of the study

In the course of the study, there were some limitations encountered. The aim of the study was on measuring the perceived value of factors in practicing Software Project Management. However, some technical terms and processes was not clearly understandable by the research participants since some participants were not familiarized with the terminologies and processes.

In addition, since Commercial Bank of Ethiopia is a financial institution, a few employees misunderstood the aim of the study or unable to access the questionnaire via internet Google form and hesitated to deliver relevant information for the purpose of the study. This reduced the response rate.

1.9. Organization of the paper

This study is structured into five chapters; Chapter One gives a brief introduction to the subject of the study. It starts by presenting the background of the study. It continues by providing the statement of the problem of the study, highlights the objective of the study, the basic research questions, hypothesis, significance, limitation and scope of the study. At the end of the chapter the organization of the study is be described. Chapter Two discussed the theoretical and empirical literature review.

Chapter three presents the study methodology and discusses the procedures used to obtain the research design, population of the study, sample size, sampling procedure, sampling technique, data source & type, data collection instrument, the reason for using this method, reliability and validity of the study, data analysis method, ethical issue and reference. Chapter four contains the analysis of the data gathered by means of data collection methods and instruments indicated in the methodology part. The last chapter discusses about summary, conclusion and recommendation. The references used in the study are listed at the end. Questionnaire used and reliability test results are included in the Appendix part.

Chapter 2: LITERATURE REVIEW

Source references in this study were adapted from books, scientific papers (thesis, journals, proceedings, and articles), frameworks, models, standards, guidelines and regulations/rules which are related with general project management and software project management.

2.1. Theoretical Framework

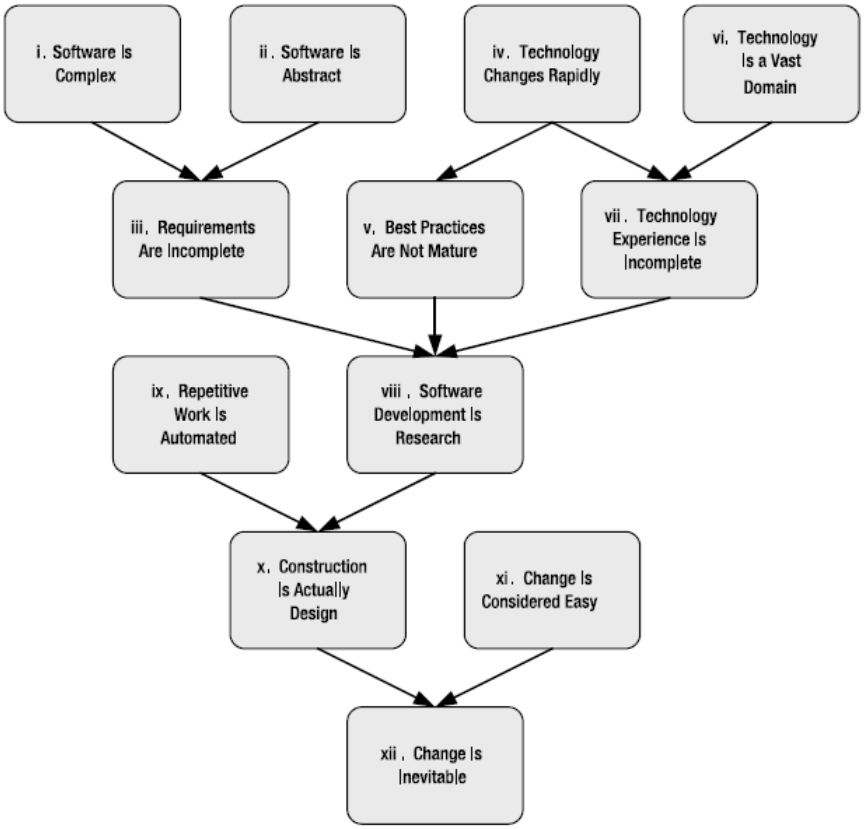
2.1.1. Software Project Management

A Software project deals not just only with the necessary composition of computer programs and rather it has numerous other elements associated with and three sequential processes (i.e. feasibility study, project planning and project execution) (Kundu, 2014). Essentially, it has two main co-related aspects of disciplines: engineering and project management (Jalote, 2002). The engineering attribute deals with constructing the framework and centers on issues, for instance how to plan, test, code, and so on. The project management attribute is about knowing just what the project goals are for cost, schedule, and quality; then properly sorting and managing the engineering activities.

"Software project management is the process of planning, organizing, staffing, monitoring, controlling and leading a software project." (ANSI/IEEE Std 1058.1-1987 cited in (Hodgson, 2002)). It facilitates software development activities so as to deliver software products on time and without defects (Chemuturi & Cagley Jr., 2010). It requires processes of managing, allocating and timing resources for completing the project efficiently and effectively (Hazra, 2012). In this manner, software project management is functioning on to empower a group of developers to work effectively towards the various project goals including timely completion of the project.

However, software project management is not an easy task and management of software projects is much more complex than management of many other types of projects. For better understanding of this, the corresponding features of project management and software development should be examined (Stepanek, 2005). In analyzing the interactions, there are unique characteristics of software development as shown in the following figure.

Figure 2.1 Unique Characteristics of Software development



Source: (Stepanek, 2005)**,** Software Project Secrets: Why Software Projects Fail

Software is Complex: Complexity is derived from a nature of software having the number of lines of code. The instructions of software interact with each other in a nonlinear fashion. They sometimes span two or more lines and the complexity of the whole increases.

Software is Abstract: It is intangible because of its nonphysical nature. Therefore, it is hard to visualize and draw blue prints.

Requirements are Incomplete: Software is typically designed for the needs of users and managers, not for developers. It is impossible to accurately draw up a complete set of requirements.

Technology Changes Rapidly: Projects are facing new opportunities, challenges and threats that represents the substantial and accelerated transformation in society, academics and science due to technology changes for present and future perspectives.

Best Software Project Management practices are not mature: A best practice is a process or technique that has a proven record of success in providing significant improvement to the results of an activity. However, best practices of most software development technologies are not mature enough.

Change Is Inevitable: The evolution of new technologies and applications are increasing today. To improve the performance of a system, new software and applications must be used. As a result, changes are required for the existing model of the system.

2.1.2. Project Management Assumptions

The basic purpose of project management is to plan, organize and control activities in order to accomplish specific goals through projects. Through organizing the tasks within a project, the responsibility and authority for the attainment of the goals are transfer to an individual or small group (Meredith & Mantel, Jr., 2009). Due to the growing market competition, Project Managers are expected to be able to avoid schedule and cost overruns in software projects. A critical function of project management frameworks, guidelines and tools is required for effective and efficient delivery of software products (Milosevic & Iewwongcharoen, 2004).

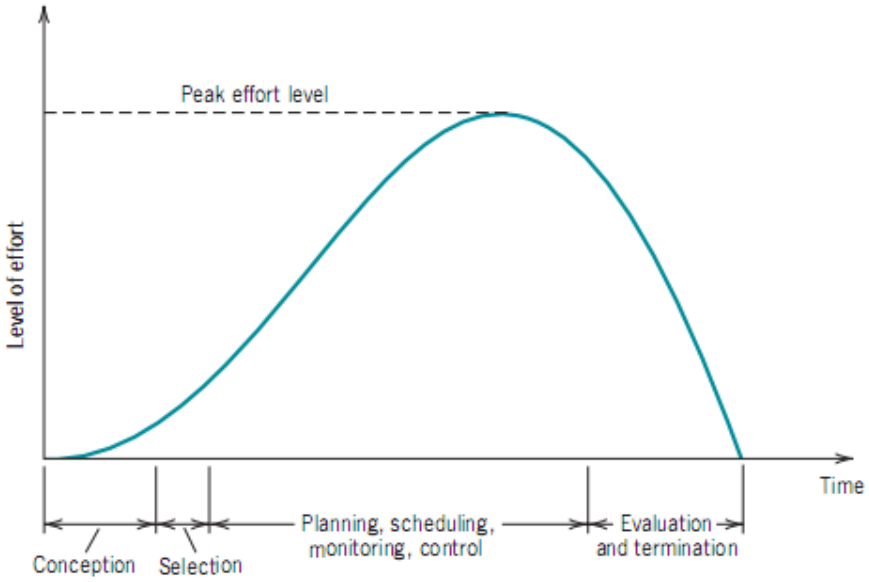
Jack Meredith and Samuel Mantel discussed the function of project management as defining the requirement of work, establishing the extent of work, allocating the resources required, planning the execution of work, monitoring its progress and adjusting deviations from the plan (Meredith & Mantel, Jr., 2009). Moreover, the interrelationship between four aspects (time, budget, scope, and quality) reveals how a change to one aspect will unbalance the others (Williams, 2008). Essentially, a set of skills and tools in project management will help to get the project right in every way.

Project Management Life Cycle and Processes

Each project is distinctive but the contrasts when overseeing a software project are particularly so, due to its particular life cycle processes (Bridges, 2014). Any program, project, or product has certain development phases known as life-cycle. A clear understanding of these phases allows project managers to have a better control on resources to achieve goals (Kerzner, 2009). These processes are performed by describing and organizing the work of the project; and by specifying and creating the project product (Lutaaya, 2019).

The generic project process groups are organized into: Initiating, Planning, Executing, Controlling and Closing processes (PMI, 2017). Initiating Processes are performed by defining a new project and by obtaining authorization to start. Planning processes are required to maintain a workable scheme to accomplish project tasks. Executing processes complete the work defined in the project management plan. Controlling process ensure that project objectives are met by tracking, reviewing and regulating the progress and performance of the project. Closing processes are conducted to formally terminate and conclude the project.

Figure 2.2 Time distribution of project effort



Source: (Meredith & Mantel, Jr., 2009) Project Management: A Managerial Approach

The process groups are overlapping activities which happen at shifting phases of the project (Munns & Bjeirmi, 1996). Specific processes are not necessarily appear in all types of projects (Lutaaya, 2019). The project manager works with the project team and other stakeholders to choose and use the reasonable generally perceived processes and good practices that are required to guarantee a project success (PMI, 2017). The project management framework and life cycle would be characterized with these processes and their interaction in between.

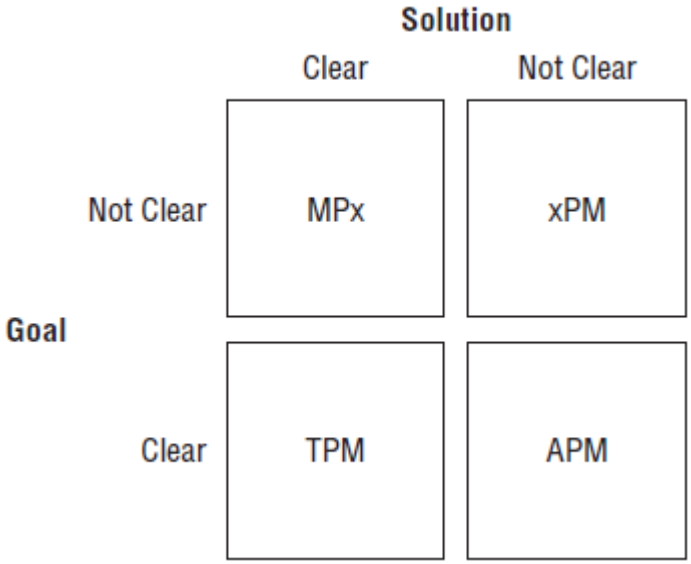
Project Management Framework

The diversity of project types and their complexity give rise to businesses, or indeed organizations within the same business sector, unable to agree on the project life cycle phases (Freezer, 2018). Therefore, various types of frameworks were developed in which the stages of project management life cycle were applied and they provide a basic structure for

undertaking project management. In software project management, selecting the appropriate framework is the first step in which the steps of Software Development Life Cycle (SDLC) are applied (IBM, 2020).

A project management framework maps out the processes, tasks, and tools used to take a project from start to finish (Scavetta , 2020). Robert K. Wysocki in his book identified four major frameworks and used the four-quadrant project landscape to categorize the project to a quadrant, and within that quadrant to select a best-fit Project Management Life Cycle (PMLC) model (Wysocki, 2014).

Figure 2.3 The Project Management Landscape



Source: (Wysocki, 2014) Effective Project Management: Traditional, Agile, Extreme, 7th Ed.

This two-by-two grid shows the four types of project management categories: Traditional Project Management (TPM), Agile Project Management (APM), Extreme Project Management (xPM), and a fourth category called Emertxe Project Management (MPx). Accordingly, there are five different project management life cycle (PMLC) models (Linear, Incremental, Iterative, Adaptive, and Extreme) to managing a project.

- Traditional Project Management
  - Linear PMLC Models
  - Incremental PMLC Models
- Agile Project Management
  - Iterative PMLC Models

- Adaptive PMLC Models
- Extreme Project Management
  - Extreme PMLC Model

The project type and the business or organizational environment in which the project undertaken are the two determinant factors for the best-fit PMLC selection (Wysocki, 2014).

Specific Linear PMLC Models
- Standard Waterfall Model
- Rapid Development Waterfall Model

Specific Incremental PMLC Models
- Staged Delivery Waterfall Model
- Feature-Driven Development Model

Specific Iterative PMLC Models
- Prototyping Model
- Evolutionary Development Waterfall Model
- Rational Unified Process (RUP) Model
- Dynamic Systems Development Model (DSDM)
- Adaptive Software Development (ASD) Model
- Scrum

Types of Adaptive PMLC Models
- Adaptive Project Framework (APF)

Overall, two broad project management lifecycle models were identified, traditional versus complex. Traditional Project Management is for managing projects whose goal and solution are both clearly understood whereas in the complex project world at least one of the goal or solution is not clearly known at the beginning of the project (Wysocki, 2014).

Project Management Knowledge Areas

In addition to process groups and categorizing in to generic frameworks, processes are also categorized by knowledge areas. Project knowledge area is recognized by its knowledge prerequisites and depicted in terms of its component processes, practices, inputs, outputs, tools, and techniques (PMI, 2017). There are ten project management knowledge areas which are: project integration management, project scope management, project time management, project

cost management, project quality management, project human resource management, project communications management, project risk management, project procurement management and project stakeholder management.

A project manager must be knowledgeable in each area. PMI recommends that these knowledge areas to be used as a guideline and tool by project teams in parallel with other knowledge areas specific to project types as appropriate.

George Stepanek recommends only assessing the most relevant project management knowledge areas regarding software development and/or customization which are Scope management, Time management, Cost management, Quality management and Risk management. It is not necessary looking at areas of project management where the differences with other types of projects are less significant (Stepanek, 2005). The remaining topics not covered are: Integration management, Human resource management, Communications management, Procurement management and Stakeholder management. Project Management Institute's Project Management Body of Knowledge (PMBOK) can be used as a reference to define these knowledge areas and to describe how project management is supposed to work.

Scope Management: Project Scope Management includes the processes of defining and then making sure all the work required, and only the work required, to complete the project successfully (PMI, 2017). The Project Scope Management processes are:

Plan Scope Management: The process of creating plan documents how the project and product scope will be defined, validated, and controlled.

Collect Requirements: The method of determining, documenting, and managing stakeholder needs and requirements to satisfy project objectives.

Define Scope: The method of developing an in-depth description of the project and product.

Create WBS: The method of breaking down the general project deliverables and project work into smaller, more manageable components.

Validate Scope: The method of formalizing acceptance of the finished and closed project deliverables.

Control Scope: The method of monitoring the status of the project and product scope and handling changes to the scope baseline.

Time Management: Project Time Management includes the processes required to manage the timely completion of the project (PMI, 2000). The Project Time Management processes are:

Plan Schedule Management: The procedure for establishing the policies and documentation to make sure the timely completion of the project.

Define Activities: The method of identifying and documenting an activity list to be performed to supply the project deliverables.

Sequence Activities: The process of identifying and documenting dependencies among the project activities.

Estimate Activity Durations: The process of estimating the amount of labor periods needed to finish individual activities with the estimated resources.

Develop Schedule: The process of making the project schedule model through analyzing activity sequences, durations, resource requirements, and schedule constraints.

Control Schedule: The process of monitoring the status of the project to update the project schedule and manage changes to the schedule baseline

Cost Management: Project Cost Management includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs in order that the project are often to be completed within the approved budget. The Project Cost Management processes are:

Plan Cost Management: The process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled.

Estimate Costs: The process of developing an approximation of the monetary resources needed to finish project work.

Determine Budget: The process of aggregating the estimated costs of individual activities or work packages to determine an appoved cost baseline.

Control Costs: The process of monitoring the status of the project to update the project costs and manage changes to the cost baseline.

Quality Management: Project Quality Management includes the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements in order to satisfy stakeholders. The Project Quality Management processes are:

Plan Quality Management: The process of documenting how the project will demonstrate compliance with quality requirements and/ or standards.

Manage Quality: The process of overseeing all activities and tasks to be accomplished consistent with the quality management plan.

Control Quality: The process of monitoring and recording the results of executing the quality management activities to assess performance and make sure the project outputs are complete, correct, and meet customer expectations.

Risk Management: Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project. The Project Risk Management processes are:

Plan Risk Management: The process of defining the way to conduct risk management activities for a project.

Identify Risks: The process of identifying individual project risks as well as sources of overall project risk, and documenting their characteristics.

Perform Risk Analysis: The process of prioritizing individual project risks and further analyzing the combined effect of identified individual project risks by assessing their probability of occurrence and impact as well as other characteristics.

Plan Risk Responses: The procedure of developing options, selecting strategies, and agreeing on actions to deal with overall project risk exposure, as well as to treat individual project risks.

Implement Risk Responses: The procedure of implementing agreed-upon risk response plans.

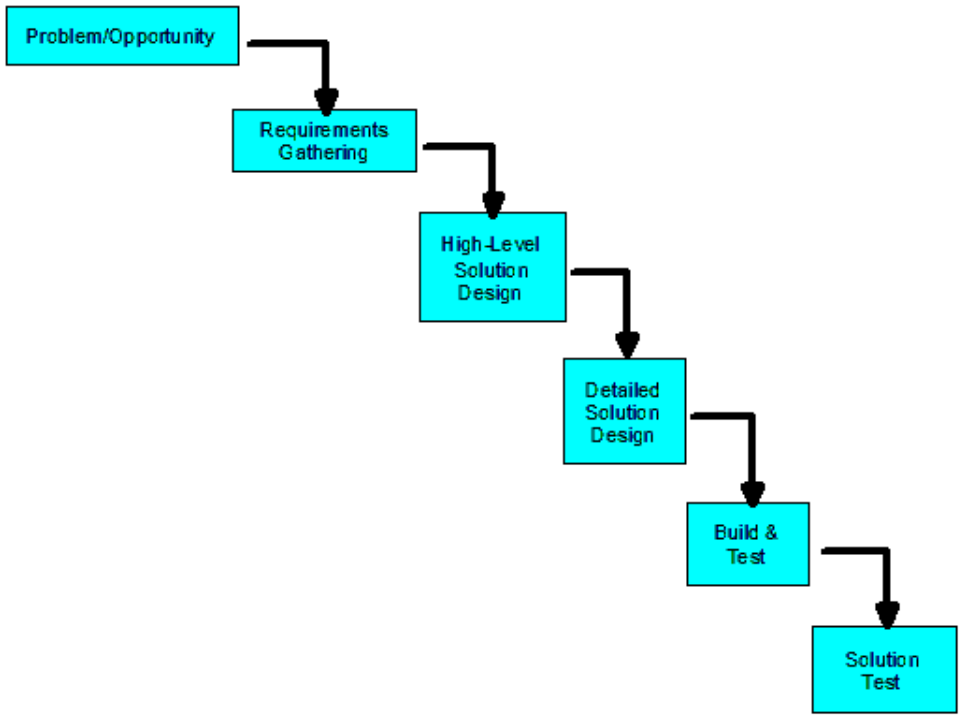
Monitor Risks: The procedure of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk process effectiveness throughout the project.

2.1.3. Best Practices and Frameworks in Software Project Management

Best practice refers to a technique, tool, method, or approach that has been generally accepted as effective ways to arrive at the desired outcome (Menon, 2015). Implementing best practices for project management can greatly improve a chance of delivering a valuable software product on time with minimal amount of stress and surprises. The concepts some commonly used frameworks and practices are discussed here and explain the software development process.

The **Waterfall Model** is a breakdown of project activities in a linear sequential flow in which progress is seen as flowing steadily downwards (like a waterfall) (Bassil, 2012). This means that any phase in the process depends on the deliverables of the previous one. The waterfall approach does not have a feedback process to the previous phase to handle changes in requirement.

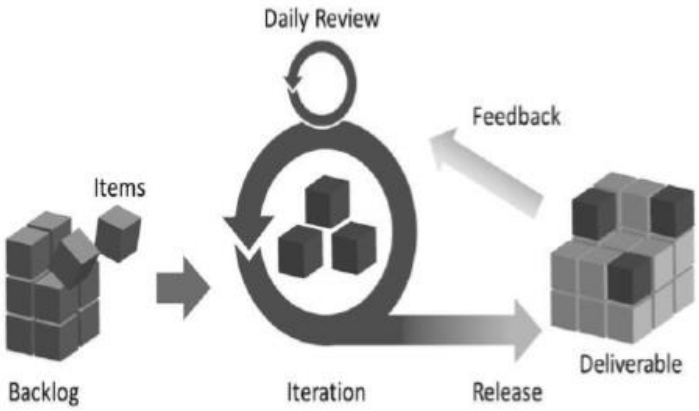
Figure 2.4 Waterfall Model



Source: (Wysocki, 2014) Effective Project Management: Traditional, Agile, Extreme, 7th Ed.

Agile Project Management is a set of tools, templates and processes for managing projects whose goal is clearly known but whose solution ranges from partially unknown to almost totally unknown (Wysocki, 2014). It involves a profoundly modern approach to decision making in software projects, since project teams deliver working software in short iterations, which comes about in more frequent, short-term decisions, compared with a traditional software development approach (Cunha, et al., 2016).

Figure 2.5 Agile Project Management Framework



Source: (Lutaaya, 2019) Project Management Theory and Software Development Project, Makerere University, Kampala, Uganda.

The Rational Unified Process (RUP) Model

Rational Unified Process Model is an iterative process for software development created by the Rational® Software in IBM (Anwar, 2014). Its goal is to ensure the production of high-quality software that meets the needs of its end-users, within a predictable schedule and budget. It has the following best practices (Kruchten, 2000):

1. Develop software iteratively
2. Manage requirements
3. Use component-based architectures
4. Visually model software
5. Verify software quality
6. Control changes to software

Adaptive Project Framework

Adaptive Project Framework is a structured and systematic framework in which project management relies on adopting goals and outcomes for continually improving decisions, management policies and practices through re-evaluating previous results and decisions (Virine , 2020).

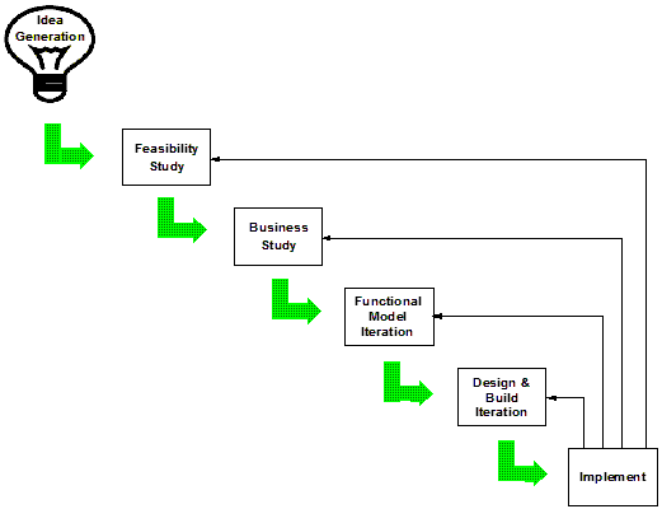
The Adaptive Project Framework is a five-step method (Think Thyme, 2020). The five steps include:

- Definition of the scope of the project
- The cycle plan
- Cycle completion
- Customer control point
- Final report

Other Well-Known Methodologies

Dynamic Systems Development Method (DSDM)

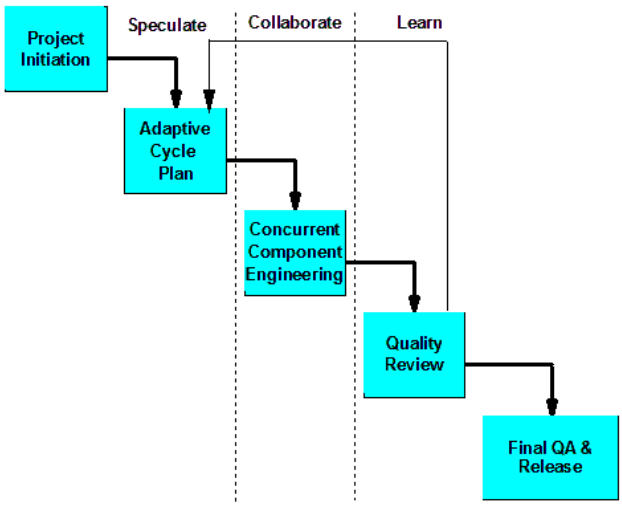
Figure 2.6 Dynamic Systems Development Method



Source: (Wysocki, 2014) Effective Project Management: Traditional, Agile, Extreme, 7th Ed.

Adaptive Software Development (ASD)

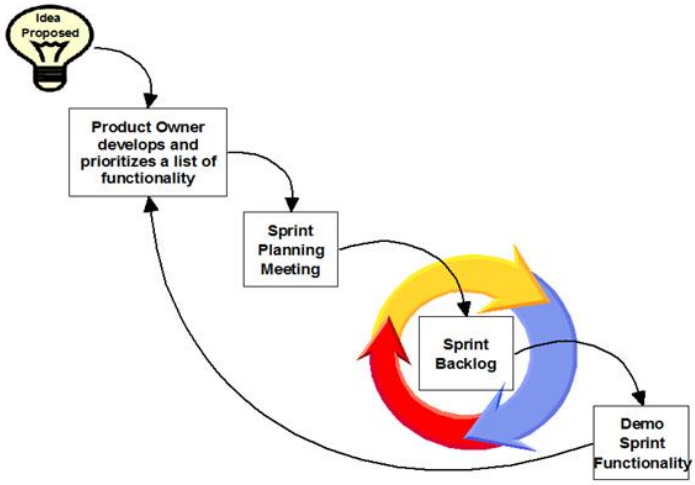
Figure 2.7 Adaptive Software Development



Source: (Wysocki, 2014) Effective Project Management: Traditional, Agile, Extreme, 7th Ed.

Scrum

Figure 2.8 Scrum



Source: (Wysocki, 2014) Effective Project Management: Traditional, Agile, Extreme, 7th Ed.

PMBOK

PMI defines the project management body of knowledge (PMBOK) as a term that describes the knowledge within the profession of project management (PMI, 2017). It is a set of standard terminology and guidelines (a body of knowledge) which consist of a subset of processes, best practices, terminologies, and guidelines that is generally recognized as good practice.

PRINCE 1 or 2

PRojects IN Controlled Environment (PRINCE1 or 2) was developed in UK as the de facto project management standard in the British Government (Hedeman, et al., 2009). It is a structured project management method which approaches project management from four angles: Principles, Themes, Processes and Tailoring the method.

2.2. Empirical Review

Nowadays, software plays an important role for various type of organizations. It changes systems and processes by improving service delivery and it triggers many organizations to undertake software projects (Saputra & Arman, 2015). High quality and functional software is always expected at the end of software development life cycle and companies are working to fulfil this expectation (Yabuuchi, et al., 2006). However, software quality control is difficult to apply since software is invisible and cannot be felt with our finger.

On the other side, software projects are so dynamic and uncertain and they are complex endeavors that quite often fail to satisfy their initial objectives (Damasiotis & Fitsilis, 2015). The problems are caused by delayed schedule, costs overrun and low quality of deliverables. According to Standish Group research, only 36 percent of software projects in 2017 were successful, 45 percent challenged and 19 percent were failed (Standish Group, 2018). With "pure success" which is the combination of high customer satisfaction with high return on value to the organization, related figures for the year 2017 are: successful: 14%, challenged: 67%, failed 19%. Scope, time, cost, quality, risk and other domains should be managed to solve the problems.

According to the research and studies cited in (Coronado & Jaén, 2002), the main failure elements in software projects are:

- inadequate project management;
- inadequate project planning and estimation; and
- Project management methods not suited for software projects.

Worldwide, several efforts have been done to improve software project management practices to solve this common problem. The generic or traditional way of managing projects is not suitable for software projects. The "traditional" methodologies can be successful for projects in which the requirements are clearly defined from the beginning of the project (GEAMBAªU, et al., 2011). Therefore, project managers across the world agree on the fact that using any other methodology for software projects other than the traditional methods.

On the other side, for software projects success, a coherent relationship between Project Management and Software Engineering practices is required and the practices are the cornerstone (Ebert, 2002). This relationship is becoming a limiting factor in software product development companies to get their products out in today's competitive market place. Various papers discussed Project Management and Software Engineering practices and implementation challenges for managing software product development. Project managers have to be flexible and to deal with various methodologies, and have to quickly recognize the pros and cons.

M. A. Saputra & A. A. Arman on Analysis of Software Project Management (Case Study: Government Agencies in Indonesia) has specifically analyzed the correlation between project management practices, software engineering practices and government project procurement

activities (Saputra & Arman, 2015). The analysis has been conducted by choosing and combining knowledge areas and procedures under PMBOK, SWEBOK and the Presidential Decree number 4/2015 of Indonesia Government to analyze software project management for government agencies and to find a preliminary framework of software project management for government agencies. Triangulation technique through direct observation, interview and the study of documents was used to find thirty-two (32) factors that cause the failure of software projects in Indonesia government agencies.

In parallel with analyzing failure factors, it is important to assess critical success factors of software project management. Abel Solomon, 2019 analyzed ten (10) success factors against the agency and gave recommendations on his MA Thesis - An Assessment of Critical Success Factors on Software Development Projects: A Case Information Network Security Agency (Abel, 2019). This study recommends that it is advisable to focus on minimizing failure factors of software projects in order to improve the overall success of projects. In addition to assessing success factors, this study identifies the nature of project life cycle and the guidelines used in the same company.

Software project management practices in organizations can be assessed by using the ten knowledge areas defined by the PMBOK of Project Management Institute (Mohammed, 2019). Each knowledge areas have activities and processes to be covered in the assessment process. Overall, it helps to determine the degree to which project management knowledge areas have been adopted in terms of project integration, scope, time, cost, quality, human resource, communication, risk, and procurement and to assess the current maturity level of project management as perceived by project managers.

Agile practices (such as the best practices in Extreme Programming and Scrum) offer an extraordinary method of observing and controlling quick product development cycles (Pikkarainen & Passoja, 2005). In Ethiopia, software project management practice assessment was done regarding practices related with agile solutions. Adoption level of agile project methodology in private banks was very low (Asegid, 2019). Training, management support and access to external resources are factors for successfully adoption agile methods (Livermore 2007 cited in (Asegid, 2019)). Besides, a case study of specific M-Birr software development project was also conducted for methods from agile in the development effort and recommended to find an optimal balance between waterfall and agile activities in the fintech project environment (Alazar , 2018). Similarly, the dependency of project success on the maturity level

of the adoption of the Scrum method was indicated in the paper of Agile Software Project Management Practices and Success Rates of Monitoring and Evaluation Software Projects in the NGO Sector – the case of PRIME: a scrum software project (Girum, 2018).

Commercial Bank of Ethiopia has implemented different IT projects to be competent in the banking industry, to increase accessibility of the bank throughout the nation and to achieve its vision to be "a world class bank by the year 2025". The business world has growing quick changes which prompted a great attention for Information Technology so that the bank has experience a range of Information Technology (IT) projects through corporate Program Management Office.

The implementation of a Program Management Office in the bank was not an easy task; it involves many challenges. From the findings in (Ethiopia , 2017), in Commercial Bank of Ethiopia, a list of eleven (11) PMO implementation challenges was identified. The top five challenges identified were (1) difficulty of staffing the PMO with necessary personnel (2) lack of systematic knowledge management (3) absence of standardized project management tools and templates (4) absence of documenting lessons learned and best practice and (5) frequent network failure (Ethiopia , 2017).

With these challenges, the bank has implemented many large projects in the past ten years. Through Project Life Cycles in Commercial Bank of Ethiopia, at the beginning of the project (initiation phase), there is a good project management practice even though they decline as the project move forward to project execution and other later phases. The result of not using proper tool and techniques has affected the project processes of IT projects in the Commercial Bank of Ethiopia (Freezer, 2018).

Chapter 3: RESEARCH METHODOLOGY

3.1. Research Design and Approach

The function of a research design is making research as efficient as possible to effectively deliver or produce appropriate information with minimal effort, time and money (Kotari, 2004). Research design depends on many factors such as research topic, audience of the research, time and resource availability and practical considerations like access to people and information (Greener & Martelli, 2015).

The research design adopted for this study was descriptive which aimed at finding out "what is," so observational and survey methods are frequently used to collect descriptive data (Borg & Gall, 1989). Since this study was planned to investigate the software project management practices, the descriptive design was the most appropriate type.

For this study, in order to present clear ideas about software project management practices in Commercial Bank of Ethiopia, the researcher has selected the quantitative research which relies on the collection and analysis of numerical data to describe, explain, predict, or conduct variables and phenomena of interest (Gay, et al., 2009).

3.2. Population of the Study

The population of the study was all software development projects that were undertaken and completed recently by the bank. According to the information collected from the program management office of the bank, it was found that there are eight (8) active projects running at different project management life cycle stages, such as LAN upgrade, Core banking (T24) upgrade, Datacenter, Customer Relationship Management system (CRM), Check Truncation System (CTS), Electronic Document and Record Management System (EDRMS), Information Technology Infrastructure Library (ITIL) and Reconciliation projects. From these projects, only four are software development and/or customization projects.

Accordingly, the target population of this study was all project managers, the team leaders and team members from the four software projects. The project managers and team leaders might get involved in more than one software projects in different times. According to the information gathered from these projects, the number of team members who have been working were fifty-three (53). Many of these staffs were transferred to other operational teams and some of them

were assigned to other projects. There were four managers and seven team leaders. The total target population was sixty-four (64). Therefore, unit of analysis was number of respondents. Since the population was small, census survey was used.

3.3. Data Collection and Type of Data

This study mainly relied on primary data. The primary data was collected through a questionnaire which is modified from related research by (Abel, 2019), in An Assessment of Critical Success Factors on Software Development Projects: A Case Information Network Security Agency, Ethiopia; (Tigest, 2017), in Assessment on Project Management Practices: a case study on Japanese Social Development Trust Fund Grant Project; and failure factors of software projects listed on (Saputra & Arman, 2015), in An Analysis of Software Project Management (Case Study: Government Agencies in Indonesia) as a main tool to meet the research aims and objectives.

The questionnaire consisted of both open ended and closed questions and made up of questions covering the general information about the respondents and questions seeking to answer the research objectives which were to assess software project management practices in Commercial Bank of Ethiopia.

Closed questions were prepared by only allowing responses which fitted into pre-decided categories of answers and this is nominal data. The category could be restricted to as few as two options, i.e., dichotomous (e.g., 'male' or 'female'), or include quite complex lists of alternatives from which the respondent could choose (e.g., list of project management frameworks). Closed questions were also provided as ordinal data (which can be ranked). This often involved using a continuous rating scale to measure the strength of attitudes or emotions. For example, strongly agree / agree / neutral / disagree / strongly disagree.

Open ended questions allowed the respondents to give replies in their own words and were intended to explore ideas than was conceivable in close-ended questions. Open-ended questions enable the respondent to answer in as much detail as they like. For instance, question on areas of improvement had a style to be replied freely using their own words without copying/selecting what the researcher had pre-defined.

During this project work was conducted, it was very clear that movements from office to office for data collection was difficult and some employees were working from home due to COVID-19. In the interest of reaching out many participants, a web-based survey was designed and developed for data collections using Google Forms.

3.4. Validity and Reliability

Validity refers to the extent of accuracy of the results of the study in which the results really measure what they are supposed to measure. Validity of the results can either be internal or external. Internal validity refers to the analysis of the accuracy of the results obtained and external validity refers to the analysis of the findings with regards to whether they can be generalized (Ghauri & Grønhaug, 2005).

In this study, validity was taken into consideration. For example, because the questionnaire was constructed by the researcher, it was designed on the basis of the researcher's needs in relation to the study topic and so brings advantages in the sense that it measures exactly what the researcher intends to measure. Literature review in the study area was conducted carefully before taking on the research. This enable theories and the questions in the questionnaire to be identified.

Reliability refers to the absence of random error, enabling subsequent researchers to arrive at the same insights if they conduct the study along the same steps again (Yin, 2014). To increase the reliability of the survey, five-scale system (Likert scale) questionnaire was used to closed-ended questions. Cronbach's alpha test was applied to check reliability, of the questionnaire using SPSS.

Cronbach's alpha is the most common measure of internal consistency in order to determine if the scale is reliable. It is most commonly used when researcher use multiple Likert scales in a questionnaire. This study devised a 5 Likert scales from "strongly disagree" to "strongly agree".

Table 4.1 Reliability Test Results of the Constructs

No.	Variables	Cronbach's Alpha	No. of Items	Scale	Internal Consistency
1	Project Scope Management Practice	**0.786**	**5**	**1-5**	Acceptable
2	Project Time Management Practice	**0.881**	**5**	**1-5**	Good
3	Project Quality Management Practice	**0.848**	**4**	**1-5**	Good
4	Project Cost Management Practice	**0.817**	**5**	**1-5**	Good
5	Project Risk Management Practice	**0.941**	**5**	**1-5**	Excellent
6	Software Project Management Challenges	**0.876**	**27**	**1-5**	Good

Furthermore, reliability analysis using Cronbach's alpha of 0.885 for all variables included in this study showed the score is acceptable.

3.5. Data Analysis Method

From questionnaires, numerical data was collected and analyzed quantitatively using descriptive statistical techniques. Descriptive statistics are used to describe the data collected and to accurately characterize the variables under observation within a specific sample (Marczyk, et al., 2005). The analysis refers to statistically describing, aggregating, and presenting the constructs of interest or associations between these constructs. For this study, unit of analysis was number of respondents. Therefore, the researcher studied the collected data and edited so that the data relevant to the research questions and objectives was retained. Then the data was analyzed using descriptive statistics like mean and standard deviation, simple linear regression analysis was used to assess software project management practices. The results was presented by use of tables and charts. SPSS or Ms-Excel was used depending on the data complexity and the tool relevance.

3.6. Ethical Issue

The main ethical principles that was considered in conducting this study were honesty, carefulness, openness, and respect for intellectual property, confidentiality and legality. They provided guidelines for the responsible conduct of research.

Honesty and Integrity

This means that for using in the research, data and procedures was honestly reported. First the participants be informed for the purpose of the research clearly, and then they gave adequate time to consider their participation in the study. Therefore, no fabricated, falsified, or misrepresented data.

Carefulness

The research used full potential to avoid careless mistakes and also to review the work carefully & critically to ensure that the results were credible.

Respect for intellectual property

The researcher never plagiarized or copied and needed to respect copyrights and patents, together with other forms of intellectual property, and always acknowledged contributions to the research.

Confidentiality

In this ethical principle, the researcher had to protect sensitive company data and used the data in proper way for only the research purpose.

Legality

The researcher was always aware of laws and regulations that govern the research work and be sure that be conformed to them.

Chapter 4: RESULTS AND DISCUSSIONS

4.1. Introduction

To complete this study properly, it is necessary to analyze the data collected in order to address the research objective and answer the research questions. This chapter comprises the analysis, presentation and interpretation of the findings resulting from this study. It is carried out in a single phase which is based on the results of the questionnaire, deals with a quantitative analysis of data. As already indicated in the preceding chapter, data is interpreted in a descriptive form.

In this study, two kinds of data were collected such as nominal and ordinal. Nominal data is analyzed by calculating the frequency or percentage (Corporate Finance Institute, 2020). Then, the data can also be presented visually such as by using a pie chart. The response categories in Likert scales (Strongly Disagree to Strongly Agree) have a rank order (ordinal data), analysis can be done using a median or a mode (not a mean or a standard deviation as it is ordinal scale data); the mode is probably the most suitable for easy interpretation (Jamieson, 2004). However, the Likert scale is usually treated as an interval scale in numerous social work researches, where arithmetic operations is conducted (Wu & Leung, 2017). In this project work, mean and standard deviation were used for Likert scale responses.

4.2. Response Rate

A research survey is often the best and fastest way to acquiring people knowledge and information; and response rate is viewed as an important indicator of measuring research survey quality (Jamil, et al., 2019). According to Jack (2008) cited in (Jamil, et al., 2019), response rates approximating 60% for most research should be the goal of researchers and it is calculated as (z/x)*100, (i.e., x = Survey out; z = Number of respondents who completed the survey).

Table 4.2 Response rate by survey mode

Survey Mode	**Response Rate**
In person	80-85% good
Phone	80% good
Mail	50% adequate, 60% good, 70% very good
Email	40% average, 50% good, 60% very good
Online	30% average

Source: A Primer on Survey Response Rate (Saldivar, 2012)

In this study, due to COVID-19, in person survey was not possible. Therefore, a web-based survey was designed and developed for data collections using *Google Forms.* Among the total of 64 questionnaires sent through email, 42 filled questionnaires were collected which results 65.7% response rate. This was assumed to be acceptable for further analysis.

4.3. Quantitative Interpretation of Results

Of a total of 64 questionnaires, a subset of 42 participants completed the survey and were the base for computing the results. Data gathered through the questionnaire was subjected to frequency counts. In other words, the subjects' responses for each individual question were added together to find the highest frequency of occurrence (i.e. the number of times that a particular response occurs). These responses to the questions, which are quantified, are then presented in percentage forms. This analysis is presented in tabular form. The researcher uses tables containing a variable and in some cases, combines two or more variables in a single table.

4.3.1. Demographic information of the Respondents'

Table 4.3 below shows the demographic categories of respondents who took part in the completion of the questionnaires. The percentage in this table shows that the allocation of questionnaires to various groups was in no way influenced by bias. It is a true reflection of the researcher's impartiality in the distribution of questionnaires.

Table 4.3 Demographic Ratio of Respondents

Parameters		**Frequency**	**Percentage (%)**	**Total**
Sex	Male	35	83.33%	42
	Female	7	16.67%	
Age	less than 20	0	0.00%	42
	21 - 30	19	45.24%	
	31 - 40	19	45.24%	
	41 - 50	3	7.14%	
	Above 50	1	2.38%	
Educational Level	Phd	0	0.00%	42
	MA/MSc	15	35.71%	
	BA/BSc	26	61.90%	
	Diploma	1	2.38%	
	Other	0	0.00%	
Position	Director - PMO	0	0.00%	42
	Project Manager	5	11.90%	
	Team Leader	4	9.52%	
	Team Member	32	76.19%	
	Other	1	2.38%	
Service period in the project work	Below 3 years	12	28.57%	42
	3-5 years	24	57.14%	
	5-8 years	3	7.14%	
	Above 8 years	3	7.14%	

As shown in Table 4.3, of respondents from research survey of assessing software project management in Commercial Bank of Ethiopia, 16.67% were female while 83.33% were male. In general, there are more males than females who participated in this study. Furthermore, the respondents of participated in this study reviewed the highest percentage of age distribution in two ranges of 21-30 and 31-40 with equal percent of 45.24%. This covers 90.48% of the total response.

This paper mainly gives perspectives of project managers, projects team leaders and project team members who participate software projects in the bank. 76.19% were team members, 11.9 % were project managers and 9.52% were team leaders from this research survey participants. It is important to get as many perspectives on the practice and challenge of Software Project Management in the Commercial Bank of Ethiopia as possible.

Insofar as experiences in the software projects is concerned, 57.14% of the respondents were 3 up to 5 years. When compared with respondents of below 3 years project experience, the ratio of below 3 years experienced respondents was lower at 28.57%.

As depicted in Table 4.3, the majority of the 42 valid respondents had Bachelor's degree (BA/BSc), 35.71% had Master's degree and the remaining respondents (2.38%) were Diploma. From open ended question analysis of field of specialization, respondents studied accounting, Banking Practice, Business Administration, Computer Science, Developmental Economics, Economics, Electrical & Computer Engineering, Industrial Control Engineering, Information System/Technology, Management, Marketing Management, Project Management, Software Engineering, Telematics-Communication & Networking.

4.3.2. Commonly used Software Project Management framework and guidelines/tools

This first section of the analysis sought to identify the framework and guidelines/tools used while software projects were held. The responses to the questions are summarized in the tables below. The project management framework consists of 32 valid responses and guidelines/tools consists of 35 responses. The remaining number of responses within both subjects have been given as "other" which contained "no idea" about the subject.

Table 4.4 Nature of Software Project Management Life Cycle

Nature of the software project management life cycle		
	Frequency	Percent
No Methodology	7	16.7
Waterfall	11	26.2
Dynamic Systems Development Model (DSDM)	4	9.5
Adaptive Software Development (ASD) Model	6	14.3
Scrum	1	2.4
Adaptive Project Framework	3	7.1
Other	10	23.8
Total	42	100

The table above shows that fifty-nine percent of respondents report the use of one or more project management framework for software projects in the Commercial Bank of Ethiopia. 11 (26.2%) of the respondents indicated that the framework used by their project was Waterfall and the second highest percent response with its figure 10 (23.8%) was given by respondents who did not pursue the idea of project management framework. 7(16.7%) responses put

emphasis on 'No Methodology' for Software Projects in Commercial Bank of Ethiopia. The rests (i.e. 6 or 14.3%, 4 or 9.5%, 3 or 7.1% and 1 or 2.4%) of the population had the remaining response ranks to manage software projects although there was a distribution of stretched values in the range of number of counts each frameworks were chosen and their unique characteristics were seen by the respondents.

Table 4.5 Response to Nature of Software Project Management Life Cycle as per Project Positions

		Nature of the software project management life cycle							
		No Methodology	Waterfall	RUP	DSDM	ASD	Scrum	APF	Other
		Count	Count	Count	Count	Count	Count	Count	Count
Position	Team Member	5	8	0	1	5	1	2	10
	Team Leader	1	1	0	2	0	0	0	0
	Project Manager	1	2	0	1	0	0	1	0
	Director PMO	0	0	0	0	0	0	0	0
	Other	0	0	0	0	1	0	0	0

NB: RUP – Rational Unified Process Model; DSDM - Dynamic Systems Development Model; ASD - Adaptive Software Development Model; APF - Adaptive Project Framework

Furthermore, as depicted in the above table, all "other" responses were from project team members. This might be due to they did not have a clear understanding or participation in project management matters. Therefore, the results are based on the subjects' experiences and not on speculation or what they believe or think, and should therefore be reliable. It is also interesting to note that various types of project management frameworks were selected by project managers and team leaders more than once.

Table 4.6 Project Management Guideline/tool used

Project Management Guidelines/ tool used		
	Frequency	Percent
No guideline/tool	14	33.3
PMBOK	2	4.8
PRINCE1 or 2	1	2.4
Combination of Various guidelines/tools	18	42.9
Other	7	16.7
Total	42	100

This table shows that of the total survey, 18 responses specified combination of various guidelines/tools. This number amounts to 42.9%. The rest indicated that there was no guideline

(14 or 33.3%) or no clear idea (7 or 16.7%) about the subject and the remaining 7.2% showed two guidelines (PMBOK and PRINCE 1 or 2).

4.3.3. Challenges and issues facing the teams at the bank from adopting common Software Project Management frameworks

With identified projects management frameworks and guidelines stated in the previous section of the analysis, a comprehensive status review of software projects was given here by focusing on project success criteria such as time, quality and cost. A cross-check with the overall project status was applied. The overall status of projects and status as per time, cost and quality were determined by respondent's percentage and they are shown below.

Status of Projects based on Schedule

Table 4.7 Status of Software Projects based on Schedule

		Status of the project based on schedule					
		Behind the Schedule	On the Schedule	Ahead of the Schedule	Other		
		Count	Count	Count	Count	Total	%
Overall status of the project	Failed and Closed	3	0	0	0	3	7.1%
	On progress	17	1	5	1	24	57.1%
	Completed and closed	8	1	2	0	11	26.2%
	Other	4	0	0	0	4	9.5%
Total		32	2	7	1		
%		76.2%	4.8%	16.7%	2.4%		

Unfortunately, most respondents (32 or 76.2%) indicated that software projects in Commercial Bank of Ethiopia were behind schedule and three of them experienced runaway projects. From 11 or 26.2% completed and closed status responses, under half (only 3) responses said software projects completed and closed on the schedule or ahead of the schedule whereas 8 responses indicated the software projects were behind the schedule. Remarkably, 7 (16.7 %) responses indicate ahead of the schedule response with five responses attributed as 'on progress' overall projects status. Overall, the majority responses show that the software projects in Commercial Bank of Ethiopia have 'on progress' overall project status and this represents 57.1% of responses.

Table 4.8 Status of Projects based on Project Cost

		Status of the project based on cost					
		Beyond the Cost Plan	As Plan	Under the Cost Plan	Other		
		Count	Count	Count	Count	Total	%
Overall status of the project	Failed and Closed	2	0	1	0	3	7.1%
	On progress	12	2	8	2	24	57.1%
	Completed and closed	3	4	3	1	11	26.2%
	Other	1	0	2	1	4	9.5%
Total		18	6	14	4		
%		42.9%	14.3%	33.3%	9.5%		

From this table one realizes that the majority of responses indicated they had an experience of the software projects were run mostly beyond the cost plan. The figure amounts to 18 (42.9%). In addition to this number, 14 (33.3%) responses represent project cost status were under the cost plan. Only 6 (14.3%) responses indicated that software projects run as initially stated cost plan, whereas 4 (9.5%) said that they did not have accurate information about this status.

Status of Projects based on software product quality

Table 4.9 Status of Projects based on Software Product Quality

		Status of the project based on quality					
		Rejected	On test	Accepted	Other		
		Count	Count	Count	Count	Total	%
Overall status of the project	Failed and Closed	2	0	0	1	3	7.1%
	On progress	5	10	8	1	24	57.1%
	Completed and closed	0	0	11	0	11	26.2%
	Other	1	1	0	2	4	9.5%
Total		8	11	19	4		
%		19.0%	26.2%	45.2%	9.5%		

The figures and percentages in the above table show the quality management status that was on software projects in Commercial Bank of Ethiopia. As it can be seen, 19 (45.2%) of the responses indicated that projects were with accepted quality while 26.2% of them showed that quality of software products were on test. Only 4 (9.5%) of the respondents showed that they were not sure of the software product quality. For projects that were not closed, five

respondents perceive some software projects were continued with rejected product quality and entirely 8(19.0%) respondents replied as software projects were with rejected quality.

4.3.4. The Practices of Project Management Knowledge Areas in Software development and/or customization projects

Here, the practice of software project management in Commercial Bank of Ethiopia was assessed by focusing on examining only five project management knowledge areas from PMBOK guideline, that are, the generally accepted practice areas which shows the difference with other types of projects.

Table 4.10 The Practice of Project Scope Management

Factors	S.D.		D		N		A		S.A.		Mean	SD
	n	%	n	%	n	%	n	%	n	%		
Plan scope management - Defined	1	2.4	6	14.3	16	38.1	17	40.5	2	4.8	3.31	0.87
Requirements - defined from the beginning	2	4.8	10	23.8	12	28.6	12	28.6	6	14.3	3.24	1.12
WBS - created	1	2.4	4	9.5	21	50.0	13	31.0	3	7.1	3.31	0.84
Scope - verified	4	9.5	5	11.9	11	26.2	20	47.6	2	4.8	3.26	1.06
Changes to project scope - controlled	4	9.5	10	23.8	20	47.6	7	16.7	1	2.4	2.79	0.93
										Average	3.18	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent
a – Multiple modes exist. The smallest value is shown

From the above table, a higher number/percentage 17 (40.5%) out of a total of 42 research participants answered that plan scope management was well defined. 16 respondents (38.1%) were in a state of confusion whether plan scope management was defined or not while the remaining 16.7% (7) respondents disagreed/strongly disagreed that the plan scope management was clearly defined. By using the mean value (3.31), it can be assured that the plan scope management was defined.

The above table again shows that 14.3% of respondents strongly agreed that software requirements definition were done at the beginning while 28.6% agreed on the statement. In contrast, 28.6% responses mentioned that respondents did not provide insight into the understanding of the software requirements definition. Out of the 42 respondents, 2(4.8%) strongly disagreed and 10(23.8%) disagreed that the requirements were defined. The central

tendency of data was 3.24 and the overall analysis shows that the software project requirements were well defined at the beginning.

Asked whether the Work Breakdown Structure (WBS) was created, the majority of respondents, i.e. 21 or 50.0% showed that they did not show their reflection, put themselves on neutral while only 13 (31.0%) respondents agreed that it was created. Half of the respondents, which was 21(50.0%), put themselves on neutral. 4(9.5%) respondents disagreed that WBS was created and the remaining 4(9.8%) strongly disagreed that it was created. Based on this result, a conclusion could be reached on WBS was created.

Next, the researcher asked the respondents if scope was verified for software projects in Commercial Bank of Ethiopia. As can be seen form the above table, of 42 responses, only 4(9.5%) strongly disagreed and 5(11.9%) disagreed that it was verified, 11(26.2%) were uncertain. Interestingly, the majority respondents, 20(47.6%), agreed that software project scope was verified and 2(4.8%) were strongly agreed. Furthermore, the mean and the standard deviation were 3.26 and 1.06, respectively. For the question on project scope verification, the figures show that scope was verified.

Although 47.6% of respondents indicated their uncertainty on changes to project scope were controlled, the majority of the response were shown on the left side of neutral position or disagreement (i.e. 10 (23.8%) disagreed and 4 (9.5%) strongly disagreed). This was shown on the mean value of 2.79. Only 7 (16.7%) of respondents agreed and 1 (2.4%) strongly agreed. This, therefore, implies that control attempts to scope change were done but not as a satisfactory level. As a result, based on the majority, changes to the project scope were not controlled.

Hence, from this table, one could say that the overall results seem carefully done on the project, i.e. during initial stages of scope planning, requirement definition and then verifying. However, in the practice of Project Scope Management of Software projects, the Commercial Bank of Ethiopia lags on the activities or measures taken on monitoring and controlling while something is changed on project scope.

Table 4.11 The Practice of Project Time Management

Factors	S.D.		D		N		A		S.A.		Mean	SD
	n	%	n	%	n	%	n	%	n	%		
Time management plan - developed	3	7.1	11	26.2	12	28.6	12	28.6	4	9.5	3.07	1.11
Activities - defined	2	4.8	8	19.0	15	35.7	14	33.3	3	7.1	3.19	0.99
Activities - sequenced	3	7.1	10	23.8	18	42.9	9	21.4	2	4.8	2.93	0.97
Duration of activities - estimated	5	11.9	14	33.3	9	21.4	13	31.0	1	2.4	2.79	1.09
Changes to project schedule - controlled	3	7.1	15	35.7	22	52.4	2	4.8	0	0.0	2.55	0.71
										Average	2.90	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent
a – Multiple modes exist. The smallest value is shown

As can be seen on the above table on the response on the time management plan development, the highest percentage 28.6% are shown on two scales, neutral and agree whereas only 4(9.5%) respondents strongly agreed that the plan was developed. 26.2% and 7.1% of respondents were disagreed and strongly disagreed, respectively. As a result, mean 3.07 and standard deviation 1.11 indicated that respondents were not sure whether the time management plan was developed.

Likewise, the highest percentage, 35.7%, of respondents were not certain whether activities required for completion of project deliverables were defined or not. However, the next higher number of respondents, i.e. 14, were agreed for completion of activities definition whereas 3 were strongly agreed. By excluding neutral responses, 17 respondents positively and 10 respondents negatively witnessed that activities were defined. As a result, activities were well defined.

However, 18 (42.9%) respondents out of 42 were not sure whether activities sequenced. The remaining respondents were 3 (strongly disagreed), 10 (disagreed), 9 (agreed) and 2 (strongly agreed). Hence, the defined activities were not sequenced.

By the value of mean, 2.79, the duration of the activities was not estimated. Like change control on project scope, changes to the project schedule were not as controlled as they should have

been. It was indicated by the mean value of 2.55. In all the five questions surveyed, majority of the respondents disagree that project time management was done cautiously.

Table 4.12 The Practice of Project Quality Management

Factors	S.D.		D		N		A		S.A.		Mean	SD
	n	%	N	%	n	%	n	%	n	%		
Quality standards – identified	0	0.0	14	33.3	14	33.3	13	31.0	1	2.4	3.02	0.87
Quality standards – reviewed	3	7.1	9	21.4	18	42.9	12	28.6	0	0.0	2.93	0.89
Project performance - evaluated on regular basis	5	11.9	8	19.0	17	40.5	10	23.8	2	4.8	2.90	1.05
Results - monitored whether comply with quality standards	1	2.4	16	38.1	19	45.2	6	14.3	0	0.0	2.71	0.74
										Average	2.89	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent
a – Multiple modes exist. The smallest value is shown

The data in the table shows the results gathered based on the observations and experiences of respondents in regard to the questions asked for assessing the practice of project quality management on Software Projects in Commercial Bank of Ethiopia. The highest percentage (33.3%) of respondents for identification of quality standards were in the scales of disagree and neutral; and the second highest percentage (31.0%) was on agree scale. Therefore, this could not be assure a conclusion of the quality standards were identified.

Similarly, for other questions regarding quality management, the majority of respondents, i.e. greater than 40%, were uncertain about review of quality standards, regular project performance evaluation and monitoring to verify their compliance with the identified standards.

Meanwhile, the above four questions investigated the project quality management on software projects and showed that it was not as it was supposed to be. As a result, software project quality management was not well practiced in Commercial Bank of Ethiopia.

Table 4.13 The Practice of Project Cost Management

Factors	S.D.		D.		N.		A		S.A.		Mean	SD
	n	%	n	%	n	%	n	%	n	%		
Quantity of resources - determined	0	0.0	9	21.4	17	40.5	14	33.3	2	4.8	3.21	0.84
Cost plan - well-defined	0	0.0	13	31.0	17	40.5	12	28.6	0	0.0	2.98	0.78
Project cost - estimated	0	0.0	6	14.3	20	47.6	15	35.7	1	2.4	3.26	0.73
Required budget - determined	1	2.4	4	9.5	19	45.2	16	38.1	2	4.8	3.33	0.82
Changes to budget - controlled	1	2.4	12	28.6	22	52.4	7	16.7	0	0.0	2.83	0.73
										Average	3.12	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent

The figures and percentage in table above show the majority of the respondents were not sure about software project cost management practices inquired. The figures amount to 40.5%, 40.5%, 47.6%, 45.2% and 52.4%, respectively. 2 and 14 respondents strongly agreed and agreed that the quantity of project resource determination was done for software projects in the bank. 13 respondents disagreed that the cost plan were well defined. When changes happened to project budget, 28.6% respondents disagreed that software projects had cos control. To sum up, on software projects in the bank, the project cost management was practiced appropriately on resources determination, cost and budget estimation. However, budget changes were not controlled at the proper level.

Table 4.14 The Practice of Project Risk Management

Factors	S.D		D		N		A		S.A		Mean	SD
	n	%	n	%	n	%	n	%	n	%		
Risk management plan - developed	5	11.9	14	33.3	16	38.1	5	11.9	2	4.8	2.64	1.01
Risks - identified and registered	5	11.9	17	40.5	15	35.7	5	11.9	0	0.0	2.48	0.86
Risks - prioritized & implications - estimated	6	14.3	17	40.5	16	38.1	3	7.1	0	0.0	2.38	0.82
Risk response plan - developed	7	16.7	17	40.5	15	35.7	3	7.1	0	0.0	2.33	0.85
Identified risks - monitored and controlled	6	14.3	15	35.7	19	45.2	2	4.8	0	0.0	2.40	0.80
										Average	2.45	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent

Respondent were asked about the practice of project risk management on software project in Commercial Bank of Ethiopia, it can clearly be seen that the median and mode of each factors, except risk management plan development, were below average value (3.0). This implies that the software projects in the bank have not practiced project risk management in a way that it was expected to put into practice for software projects.

4.3.5. Common Challenges of Software Project Management

In this study, the researcher presented 27(twenty-seven) challenges that are unique or at least can significantly make worse in the context of software projects. They were collected and classified using a systematic collaborative process and categorized according to a need for expertise or skill as follows: 11(eleven) factors are Project Management specific, 9(nine) – Software Engineering specific and the remaining 7(seven) are both Project Management and Software Engineering related challenges.

Table 4.15 Project Management Specific Challenges

Factors	S.D.		D		N		A		S.A.		Mean	SD
	n	%	n	%	n	%	n.	%	n	%		
Clear and certain expectations with roles in project	5	11.9	6	14.3	14	33.3	16	38.1	1	2.4	3.05	1.06
Success criteria - defined & measuring project success - done appropriately.	4	9.5	8	19.0	16	38.1	13	31.0	1	2.4	2.98	1.00
Senior management understood of their role in driving project success	8	19.0	12	28.6	16	38.1	6	14.3	0	0.0	2.48	0.97
Project teams - well informed about project tasks and works	5	11.9	14	33.3	13	31.0	9	21.4	1	2.4	2.69	1.02
Adequate commitment to software project works	4	9.5	9	21.4	18	42.9	6	14.3	5	11.9	2.98	1.12
Understood about impacts of regulation changes	4	9.5	13	31.0	21	50.0	4	9.5	0	0.0	2.60	0.80
The effects of environmental changes - considered	1	2.4	9	21.4	21	50.0	10	23.8	1	2.4	3.02	0.81
Stakeholders' conflicts - managed properly	2	4.8	8	19.0	24	57.1	6	14.3	2	4.8	2.95	0.85
Early warnings about a projects' likely	6	14.3	7	16.7	24	57.1	5	11.9	0	0.0	2.67	0.87

success - identified and analyzed												
Project human resources - well managed with important expertise	3	7.1	5	11.9	14	33.3	10	23.8	10	23.8	3.45	1.19
Unrealistic expectations - managed	8	19.0	9	21.4	15	35.7	9	21.4	1	2.4	2.67	1.10
										Average	2.87	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent

From the above table, only three factors which are Project human resources management, consideration of the effect of environmental changes and clarity of roles in software projects have above the average value. As a result, based on the analysis, software projects in Commercial Bank of Ethiopia have the following challenges regarding project management specific which are: Wrong success criteria, Lack of management supports, Miscommunication about tasks and works, Lack of commitment, Regulation changes, Stakeholders conflict, Late warning about project success and Unrealistic expectation. According to the mean values of the responses of each challenges, lack of management support, regulation changes, late warning and unrealistic expectations were the major four challenges with mean values of 2.48, 2.60, 2.67 and 2.67, respectively.

Table 4.16 Software Engineering Specific Challenges

	S.D.		D.		N		A.		S.A.			
Factors	n	%	n	%	n	%	n	%	n	%	Mean	SD
Had abilities project knowledge areas	9	21.4	5	11.9	15	35.7	9	21.4	4	9.5	2.86	1.26
Had understandings about software development standards	5	11.9	10	23.8	14	33.3	13	31.0	0	0.0	2.83	1.01
Appropriate technical skills - identified	2	4.8	11	26.2	14	33.3	13	31.0	2	4.8	3.05	0.99
Appropriate trainings - provided.	21	50.0	9	21.4	7	16.7	5	11.9	0	0.0	1.90	1.08
Proper software architecture - used	4	9.5	6	14.3	20	47.6	10	23.8	2	4.8	3.00	0.99
Documentations - prepared	13	31.0	10	23.8	10	23.8	5	11.9	4	9.5	2.45	1.31
Proper software development methodology - used	6	14.3	8	19.0	21	50.0	6	14.3	1	2.4	2.71	0.97
Technology gaps – minimized	3	7.1	14	33.3	15	35.7	9	21.4	1	2.4	2.79	0.95
Appropriate testing - done timely	3	7.1	15	35.7	10	23.8	8	19.0	6	14.3	2.98	1.20

	Average	2.73	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent

Regarding Software Engineering specific factors, only technical skills and proper software architecture-used have above average value. Non-fulfilment of the others are considered as factors for software projects in Commercial Bank of Ethiopia. These are: Lack of ability about knowledge areas, Lack of understanding about software development standard, Less training (which has considerably 1.90 mean value), Lack of documentation, Improper software development methodology, Technology gap and Less testing.

Table 4.17 Both Software Engineering and Project Management Related Challenges

	S.D.		D		N		A		S.A			
Factors	n	%	n	%	n	%	n	%	n	%	Mean	SD
Appropriate communication for project owner needs	2	4.8	12	28.6	18	42.9	9	21.4	1	2.4	2.88	0.89
Method to guarantee user requirements	3	7.1	16	38.1	13	31.0	8	19.0	2	4.8	2.76	1.01
Approved and clear specifications	1	2.4	16	38.1	8	19.0	14	33.3	3	7.1	3.05	1.06
Effective communication b/n technicians and users	2	4.8	14	33.3	18	42.9	6	14.3	2	4.8	2.81	0.92
Controlling and monitoring works	7	16.7	7	16.7	16	38.1	12	28.6	0	0.0	2.79	1.05
Appropriate inputs - received from users	3	7.1	11	26.2	15	35.7	9	21.4	4	9.5	3.00	1.08
Understood about procurement procedures	5	11.9	11	26.2	16	38.1	7	16.7	3	7.1	2.81	1.09
										Average	2.87	

NB: S.D. – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; S.A. – Strongly Agree; n – Frequency; % - Percent

In the above table, both project management and software engineering related challenges were analyzed. Of them, clear specifications and appropriate inputs from users got approximately average value (3.05 and 3.00 respectively). The others are below the average which are highlighted as challenges: Miscommunication about project owner needs, No method to guarantee user requirements statement to be consistent, accurate, and complete, Miscommunication between technicians and users, Lack of controlling and monitoring and less understanding about procurement procedures.

4.3.6. The areas of improvements in Software development and/or customization projects.

In relation to the areas of improvements, the respondents did not forward their comments in practicing Software Project Management in Commercial Bank of Ethiopia. However, through analysis of the questionnaires, the bank has good practices of activities of the project management knowledge areas, especially while projects are at the stages of initiation and execution. However, while they go forward, software projects have become withdrawn starting from the stage of monitoring and controlling till closure. Activities and challenges at these stages should be considered as areas of improvements.

Chapter 5: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary of Major Findings

Based on the analysis, the below outlined findings were recognized:

- According to the responses of the respondents on nature of software project management frameworks, all types of frameworks (except Rational Unified Process (RUP) Model) were chosen with different percentages of responses, but the highest percentage attainable was WATERFALL framework and it can be considered as the commonly used framework for software projects in the bank.
- Project Management guidelines/tools are designed to help all the people (like project managers, team leaders, etc.) involved in planning and controlling various project activities to successfully step through all the stages and phases of the project life-cycle; and most respondents in all three project positions (project manager, team leader and team member) agreed that software projects used combination of various guidelines/tools.
- With currently used frameworks and guidelines, 76.2% of respondents indicated that software projects in the bank were behind the schedule, 42.9% of respondents beyond the cost plan, 19.0% rejected quality and 7.1% totally failed & closed.
- The practice of project scope management of software projects in Commercial Bank of Ethiopia can be categorized as acceptable unless there is only inviable scope changes.
- The findings of the analysis for the project time management shows that currently running software projects at different stages of project management have trends mainly focused on activities at project initiation phase such as time management plan development and activities definition. In contrary, it has been clearly seen that the projects has failed according to time parameter and came across with an extended delay.
- From the data analysis result, it has been shown that project quality management practice was inadequate that end up with a lot of rework, which in turn leads them to miss their deadlines and exceed their budget.
- In Commercial Bank of Ethiopia, Software project management has relatively better practice on project cost management.

- Regarding the practice of project risk management, a great challenge has been seen and majority of the respondents oppose that the project risk management practice performed on software projects.
- Changes related with Scope, Schedule and Budget were the main causes of degraded software project performance when they were not properly controlled. These were some parts of execution phase, monitoring & controlling and closure.
- The Software project management framework used were not able to reduce the disputes due to scope creeping and schedule changes.
- Based on the mapping of the challenges for success of software projects, the overall project management specific and software engineering specific failure factors are very critical.
- For instance, in response to training availability, all the respondents replied that the training provided is inappropriate or trainees was unhappy with the trainings provided.
- Documentation was not well prepared and that often places a project in despair.
- Respondents has identified poor top management support as one of the factors that lead to failure of software projects in Commercial Bank of Ethiopia.
- As a result, based on the analysis, software projects in Commercial Bank of Ethiopia have problems regarding project management specific which are: Wrong success criteria, Lack of management supports, Miscommunication about tasks and works, Lack of commitment, Regulation changes, Stakeholders conflict, Late warning about project success and Unrealistic expectation.
- Non-fulfilment of the others are considered as failure factors for software projects in Commercial Bank of Ethiopia. These are: Lack of ability about knowledge areas, Lack of understanding about software development standard, Less training (which has considerably 1.90 mean value), Lack of documentation, Improper software development methodology, Technology gap and Less testing.
- The others are below the average which are highlighted as challenges: Miscommunication about project owner needs, No method to guarantee user requirements statement to be consistent, accurate, and complete, Miscommunication between technicians and users, Lack of controlling and monitoring and less understanding about procurement procedures.

In the final analysis, from the empirical and theoretical findings of the study, it was found that the project management framework and guidelines/tools currently used by Commercial Bank of Ethiopia for managing software projects were ineffective. There is a need for a software project management tool/framework which would lead to less claims and disputes.

5.2. Conclusion

The reason for software project management is to incorporate user requirements along with time and budget constraints in helping business achievements. Although software projects in the bank were remarkable players in winning business competition and improved customer satisfaction, some projects encountered scope creeping and time delays. There were issues related with the way in which the software projects have been managed that was the result of not using appropriate frameworks and guidelines/tools. Current software project management frameworks/tools could not effectively manage the software projects with the magnitude of scope, time, quality, cost and risk. As a result, poor software project management practices lead the Commercial Bank of Ethiopia to be unsuccessful in managing software projects. Moreover, improperly managed challenges of software projects were killing project teams' productivity.

In the final analysis, from the empirical and theoretical findings of the study, it was found that the framework/guidelines currently used by the Commercial Bank of Ethiopia for managing software projects was ineffective. There is a need for new project management framework/tool which would lead to fewer claims and disputes. Project managers have to be flexible and to deal with various methodologies, and have to quickly recognize the pros and cons.

5.3. Recommendations

This section looks at the recommendations that can be made to stakeholders such as; CBE – Information System and its departments; CBE – Program Management Office and all software project owners. This will enable the management of software projects to be enhanced and the running of projects to be a much smoother operation. The recommendations are guided by the objectives of the study.

5.3.1. Root causes of Software Project Failure

The findings indicate that the five most important knowledge areas and processes in PMBOK for software projects were not adequately applied. These knowledge areas are very influential on software projects and can help to achieve project objectives, fix software bugs early &

appropriately, to correct errors, and to leverage misunderstandings between users and technicians. From the results of data analysis, it was found that there were often clashes between the business needs and technical specifications on the software product. This was shown on the response of miscommunication of needs. The unsatisfied project owner needs were mostly due to mismatch between initial business requirements and final software product. It needs continuous feedback to iteratively re-check and put features on a software product.

This illustrates the need for compatible software project management frameworks/tools that will effectively manage software projects, especially to iteratively recheck the fulfilment of project needs. Balancing the elements of a complex project – time, money, scope and people is highly recommended.

5.3.2. Software Project Management frameworks/tools

Throughout this study, it has been found that managing software projects is a very technical and complex issue. With numerous frameworks and each with its own qualities and shortcomings, choosing the right project management framework is critical to software projects success. It is crucial in bringing a reliable guideline for project teams to easily establish and follow up the critical factors involved in software projects including scope, timeline, resources, budget, quality and risks.

Selection of the right software project management framework suggests practices, processes, tasks and tools to perform project planning and execution adequately. It can be troublesome to choose one appropriate methodology when there are so various choices out there. The following are a couple of frameworks, guidelines and tools for managing software projects:

- Waterfall
- Rational Unified Process (RUP) Model
- Dynamic Systems Development Model (DSDM)
- Adaptive Software Development (ASD) Model
- Scrum
- Adaptive Project Framework
- PMBOK
- PRINCE1 or 2

With several project management frameworks available, determining the selection approach based on explicit measures is critical. A cautious strategy has got to be taken to select the proper framework, and therefore the project is going to be completed very likely with extraordinary achievements. By assessing the key components involved in software projects, a well-matched

framework can be selected which will bring the requirements of the project. Furthermore, in view of the quality and shortcomings of various frameworks, numerous kind of project management frameworks can be used or a new combination of generic frameworks can be designed to meet the prerequisites of various project types.

In addition, with current trends in Commercial Bank of Ethiopia, project management frameworks, guidelines/tools or techniques utilized in previous projects were not recorded and documented. Documenting previous software projects' life cycle procedures, processes and techniques as a lesson learned can help future projects to start out the added values from previously used frameworks.

5.3.3. Recommendation for further research

Although the study has attempted to address the issues of software project management using Commercial Bank of Ethiopia as a case study, some issues could not be looked into. It is therefore recommended that future research take the following into consideration;

- Correlation between project management practices, software engineering practices and corporate procedures/policies.
- Selection of appropriate framework for software project management in any specific business sectors
- Case study on influencing factors for project management framework and guidelines/tools selection in any organization by previous trends of projects

REFERENCES

A. A., 2018. An Empirical Assessment of Agile Project Management Approach For Fintech Project: The Case Of M-Birr.. *Addis Ababa University.*

Abel, S. B., 2019. An Assessment of Critical Success Factors on Software Development Projects: A Case Information Network Security Agency, Ethiopia. *Addis Ababa University.*

Almgren, K., 2014. Information Technology Project Management Processes and Practices: A Comprhensive Study for Successful Implementation of IT Projects. *International Journal of Business and Social Science,* 5(11), pp. 84-91.

Anwar, A., 2014. A Review of RUP (Rational Unified Process). *International Journal of Software Engineering (IJSE),* 5(2), pp. 8-24.

Asegid, D. F., 2019. Adoption Level and Challenges of Implementing Agile Project Management Methodology at the Private Banking Industry in Ethiopia. *Addis Ababa University.*

Barghoth, M. E., Salah, A. & Ismail, M. A., 2020. A Comprehensive Software Project Management Framework. *Journal of Computer and Communications,* 8(3), pp. 86-102.

Bassil, Y., 2012. A Simulation Model for the Waterfall Software Development Life Cycle. *International Journal of Engineering & Technology (iJET),* 2(5).

Borg, W. R. & Gall, M. D., 1989. *Educational research : an introduction.* 5th ed. New York: Longman.

Bridges, J., 2014. *Software Project Management: Why It's Different.* [Online]
Available at: https://www.projectmanager.com/training/software-project-management-why-its-different
[Accessed 17 April 2020].

Chemuturi, M. & Cagley Jr., T. M., 2010. *Mastering Software Project Management: Best Practices, Tools and Techniques.* USA: J. Ross Publishing Inc..

Cleland, D. I., 2004. *Field Guide to Project Management.* 2nd ed. New Jersey and Canada: John Wiley & Sons, Inc., Hoboken.

combanketh, 2020. *Commercial Bank of Ethiopia Company Official Website.* [Online]
Available at: https://combanketh.et/
[Accessed 21 April 2020].

Commercial Bank of Ethiopia, 2017. *Commercial Bank of Ethiopia 75th Anniversary Profile,* Addis Ababa: Commercial Bank of Ethiopia.

Cornelia, P. G. & Georgiana, C., 2011. The Role of Information Technology on the Banking Industry. *Annals of the "Ovidius" University, Economic Sciences Series,* XI(1).

Coronado, S. & Jaén, J. A., 2002. *A software project management method: A3.* Paper presented at PMI® Research Conference 2002: Frontiers of Project Management Research and Applications, Seattle, Washington., Newtown Square, PA: Project Management Institute..

Corporate Finance Institute, 2020. *Nominal Data - Definition, Characteristics, and How to Analyze.* [Online]
Available at: https://corporatefinanceinstitute.com/resources/knowledge/other/nominal-data/
[Accessed 14 May 2020].

Cunha, J. A. O., Moura, H. P. & Vasconcellos, F. J., 2016. *Decision-making in Software Project Management: A Systematic Literature Review.* Brazil, Elsevier B.V..

Damasiotis, V. & Fitsilis, P., 2015. *Assessing Software Project Management Complexity: PMCAT Tool.* s.l., Springer, Cham.

Ebert, L., 2002. *Successful project management for software product and information system development.* Paper presented at Project Management Institute Annual Seminars & Symposium, San Antonio, TX., Newtown Square, PA: Project Management Institute..

E. T., 2017. Challenges of Implementing a Program Management Office: The case of Commercial Bank of Ethiopia. *Addis Ababa University.*

Freezer, F. M., 2018. Assessing the Life Cycle of Projects in Commercial Bank of Ethiopia Program Management Office. *Addis Ababa University.*

Gay, L. R., Mills, G. E. & Airasian, P. W., 2009. *Educational Research Competencies for Analysis and Applications.* 9th ed. Columbus: Pearson.

GEAMBAªU, C. V., Jianu, I., Jianu, I. & Gavrila, A., 2011. Influence Factors for the Choice of a Software Development Methodology. *Journal of Accounting and Management Information Systems,* 10(4), pp. 479-494.

Ghauri, P. & Grønhaug, K., 2005. *Research Methods in Business Studies: A Practical Guide.* 3rd ed. New York: Financial Times Prentice Hall: Pearson Education Limited.

Girum, B. T., 2018. Agile Software Project Management Practices and Success Rates of Monitoring and Evaluation Software Projects in the NGO Sector – the case of PRIME: a scrum software project. *Addis Ababa University.*

Greener, S. & Martelli, J. T., 2015. *Introduction to Business Research Methods.* 2nd ed. s.l.:Ventus Publishing.

Hazra, A., 2012. *Software Project Management.* New Delhi-110028 for Lovely Professional University, Phagwara: EXCEL BOOKS PRIVATE LIMITED A-45.

Hedeman, B., Heemst, G. V. v. & Fredriksz, H., 2009 . *Project Management Based on PRINCE2®.* 2009 ed. s.l.:Van Haren Publishing.

Hodgson, D., 2002. Disciplining the Professional: The Case of Project Management. *Journal of Management Studies,* 39(6), pp. 803-821.

IBM, 2020. *What Is Software Development?.* [Online]
Available at: https://www.ibm.com/topics/software-development
[Accessed 21 April 2020].

Jalote, P., 2002. *Software Project Management in Practice.* 1st ed. s.l.:Addison-Wesley Professional.

Jamieson, S., 2004. Likert scales: how to (ab) use them. *Medical Education,* 38(12).

Jamil, N. I. B. et al., 2019. Exploring Students' Intentions towards Game-Based Learning in Statistics. *International Journal of Academic Research in Business and Social Sciences,* 9(13), pp. 389-399.

Kerzner, H., 2009. *Project Management: A Systems Approach To Planning, Scheduling, and Controlling.* 10th ed. Hoboken, New Jersey and Canada: John Wiley & Sons, Inc..

Kotari, C. R., 2004. *Research Methodology: Methods and Techniques.* 2nd ed. New Delhi, Banglore: New Age International Publishers (P) Ltd.

Kruchten, P., 2000. *The Rational Unified Process--An Introduction.* 2nd ed. USA: Addison Wesley.

Kundu, J., 2014. Software Project Management – A Successive Process That Bring a New System. *International Journal of Computer Science and Information Technology Research,* Volume 2, pp. 297-306.

Lutaaya, S., 2019. Project Management Theory and Software Development Project.

Marczyk, G., DeMatteo, D. & Festinger, D., 2005. *Essentials of Research Design and Methodology.* Hoboken, New Jersey: John Wiley & Sons, Inc..

Menon, S., 2015. Best Practices and Implementation Challenges in Effective Project Management.. Volume 10.13140/RG.2.1.1439.8886..

Meredith, J. R. & Mantel, Jr., S. J., 2009. *Project Management: A Managerial Approach.* 7th ed. Hoboken, New Jersey: John Wiley & Sons, Inc..

Milosevic, D. Z. & Iewwongcharoen, B., 2004. *Project Management Tools and Techniques: the contingency use and their impacts on project success.* Paper presented at PMI® Research Conference: Innovations, London, England, Newtown Square, PA: Project Management Institute.

Mohammed, B., 2019. Assessment of Software Project Management Practices: The Case of Information Network Security Agency. *Addis Ababa University.*

Munns, A. K. & Bjeirmi, B. F., 1996. The role of project management in achieving Project Success. *International Journal of Project Management,* 14(2), pp. 81-87.

Pandey, D., 2011. *Project Management Essentials.* Mustang, Oklahoma 73064 USA: Tata Publishing and Enterprises.

Phillips, J., 2010. *IT Project Management: on Track from Start to Finish.* 3rd ed. s.l.:McGraw-Hill Education.

Pikkarainen, M. & Passoja, U., 2005. *An Approach for Assessing Suitability of Agile Solutions: A Case Study.* Sheffield University, UK., 6th International conference of eXtreme Programming and agile process in software engineering.

PMI, 2000. *A Guide to the Project Management Body of Knowledge (PMBOK).* 2000 ed. Newtown Square, Pennsylvania USA: Project Management Institute.

PMI, 2017. *A Guide To The Project Management Body Of Knowledge (PMBOK Guide).* 6th ed. Newtown Square, Pennsylvania 19073-3299 USA: Project Management Institute, Inc.

Pollock, N. & Cornford, J., 2004. Customising Industry Standard Computer Systems for Universities: ERP systems and the University as a "Unique" organisation' Information Technology and People. 17(1), pp. 31-52.

Putnam, L. H. & Myers, W., 1997. *Industrial Strength Software: Effective Management Using Measurement.* 1st ed. s.l.:IEEE Computer Society Press.

Ralph, P. & Kelly, P., 2014. *The dimensions of software engineering success.* Hyderabad, India, Proceedings of the 36th International Conference on Software Engineering.

Sajad, M., Sadiq, M., Naveed, K. & Shahid Iqbal, M., 2016. Software Project Management: Tools assessment, Comparison and suggestions for future development. *IJCSNS International Journal of Computer Science and Network Security,* 16(1), pp. 31-42.

Saldivar, M. G., 2012. *A Primer on Survey Response Rate,* Tallahassee: Learning Systems Institute, Florida State University.

Saputra, M. A. & Arman, A. A., 2015. *An Analysis of Software Project Management (Case Study: Government Agencies).* Bandung – Bali, International Conference on Information Technology Systems and Innovation (ICITSI).

Scavetta , A., 2020. *Project Management Framework Types, Key Elements & Best Practices.* [Online] Available at: https://www.projectmanager.com/blog/project-management-framework [Accessed 17 April 2020].

Sommerville, I., 2016. *Software Engineering.* 10th ed. Edinburgh Gate Harlow Essex CM20 2JE England: Pearson Education Limited.

Standish Group, 2018. *CHAOS Report,* s.l.: Standish Group.

Stepanek, G., 2005. *Software Project Secrets: Why Software Projects Fail.* 1st ed. s.l.:Apress.

Think Thyme, 2020. *Adaptive Project Framework Methodology In Project Management.* [Online] Available at: https://thinkthyme.com/project-management/adaptive-project-framework-methodology [Accessed 17 May 2020].

T. S., 2017. Assessment on Project Management Practices: a case study on Japanese Social Development Trust Fund Grant Project. *Addis Ababa University.*

Tsai, H. L., 2003. *Information Technology and Business Process Reengineering: New Perspectives and Strategies.* s.l.:Praeger.

Verzuh, E., 2005. *The Fast Forward MBA in Project Management.* 2nd ed. Hoboken, New Jersey and Canada: John Wiley & Sons, Inc..

Virine , L., 2020. *Adaptive Project Management.* [Online] Available at: https://www.projecttimes.com/articles/adaptive-project-management.html [Accessed 17 April 2020].

Vrečko, I., Barilović, Z. & Božicev, M., 2015. The role of IT departments in the enhancement of banks' project management. Volume 48, pp. 123-134.

Watt, A., 2014. *Project Management.* 2nd ed. Victoria: B.C.: BCcampus.

Williams, M., 2008. *The Principles of Project Management.* 1st ed. 48 Cambridge Street Collingwood: SitePoint Pty. Ltd.

Wu, H. & Leung, S.-O., 2017. Can Likert Scales be Treated as Interval Scales?—A Simulation Study. *Journal of Social Service Research,* 43(4), pp. 527-532.

Wysocki, R. K., 2014. *Effective Project Management: Traditional, Agile, Extreme.* 7th ed. Indianapolis, Indiana: John Wiley & Sons, Inc..

Yabuuchi, Y., Kocaoglu, D. & Wata, J., 2006. *Analysis of Project Management in Software Development.* Istanbul, Turkey, IEEE, 2006 Technology Management for the Global Future - PICMET 2006 Conference,.

Yin, R. K., 2014. *Case Study Research Design and Methods.* 5th ed. Thousand Oaks, California: s.n.

Zewdie, T. H., 2016. The Effectivness of Project Management Processes on Performance of Construction Projects: Case Study Analysis in Selected Companies in Addis Ababa. *Alpha University College,* 6(6), pp. 203-212.

APPENDIX A: Questionnaire

Dear respondents:

My name is Berhanu Temesgen and I am working on my thesis as a partial fulfillment for Masters on Project Management at Addis Ababa University, School of Commerce. Because you were a project manager, a team leader or a team member in one of software projects in the bank, I am inviting you to participate in assessing Software Project Management Practices: The case of Commercial Bank of Ethiopia by completing the attached surveys.

It requires approximately 15 minutes to complete the questionnaire.

Thank you for taking the time to assist me in my educational endeavors. If you require additional information or have questions, please contact me at the number listed below.

Sincerely,

Berhanu Temesgen
(+251) 911514169
mail2berhanu@gmail.com
Advisor Name: Dr. Solomon Markos

General Direction

- *Please DO NOT write you name since the identity of the respondent is not necessary.*
- *Put "✓ " or "X" mark on your choice;*
- *All your responses will be analyzed anonymously, thus will NOT be traceable to you.*
- *If you cannot get any satisfying choice among the given alternatives, you can write your answer in the space provided at the end of the questionnaire;*

Part I: Demographic characteristics and general background of the respondents

1. **Sex**:

   Male ☐ Female ☐

2. **Age**:

   21-30 ☐ 31-40 ☐ 41-50 ☐ Above 50 ☐

3. **Educational Level**

   PHD ☐ MA/MSc ☐ BA/BSc ☐ Diploma ☐ High School completed ☐
   If other, please specify_____

4. **Field of Specialization** (The field you have studied) _____

5. **Position:**

   Director ☐ Project Manager ☐ Team Leader ☐

   Technical Team Member ☐ Business Team Member ☐ Other ☐

6. **Project Title _____**
7. **Service period in the project work**

   Below 3 years ☐ 3-5 years ☐ 5-8 years ☐ Above 8 years ☐

Part II: Current Project Status and Software project management framework, guidelines/tools used at Commercial Bank of Ethiopia

1. Overall status of the project

Completed and closed ☐ On progress ☐ Failed and Closed ☐
Other, Specify _____

2. Status of the project based on schedule manner

On Schedule ☐ Behind Schedule ☐ Ahead of Schedule ☐
Other, specify _____

3. Status of the project based on project cost parameter

As Plan ☐ Beyond the Cost Plan ☐ Under the Cost Plan ☐
Other, specify _____

4. Status of the project based on product quality parameter

Accepted ☐ Rejected ☐ On test ☐
Other, specify _____

5. Nature of the software project management life cycle

Waterfall ☐

Rational Unified Process (RUP) Model ☐

Dynamic Systems Development Model (DSDM) ☐

Adaptive Software Development (ASD) Model ☐

Scrum ☐

Adaptive Project Framework ☐

A Combination of Various Methodologies ☐

No Methodology ☐
Other, Specify _____

6. Project Management Guidelines/ tool you use

PMBOK ☐

PRINCE1 or 2 ☐

Combination of Various guidelines/tools ☐

No guideline/tool ☐
Other, Specify _____

Part III: Practices of five Project Management Knowledge Areas according to PMBOK on Software development and/or customization projects in Commercial Bank of Ethiopia

Based on your experience in the CBE software projects, please feedback to what extent do you think the following factors listed under each project management knowledge areas are important to the effectiveness of the project.

(5=Strongly Agree, 4= Agree, 3= Neutral, 2= Disagree, 1= Strongly Disagree)

No.	Survey Questions	5	4	3	2	1
	I. Project Scope Management					
1	Plan scope management was defined (As a basis for future project decisions.)					
2	Requirements were clearly defined from the beginning					

3	WBS was created (WBS (Work Breakdown Structure is a key project deliverable that organizes the team's work into manageable sections)					
4	Scope was verified (formalizing acceptance of the project scope)					
5	Changes to the project scope was controlled					
	II. Project Time Management					
6	Time/schedule management plan was developed					
7	Activities were defined					
8	Activities were sequenced					
9	Duration of activities were estimated					
10	Changes to the project schedule was controlled					
	III. Project Quality Management					
11	Quality standards of the project were identified					
12	Quality standards of the project were reviewed					
13	Project performance were evaluated on regular basis					
14	Results were monitored to check if they comply with the quality standards identified					
	IV. Project Cost Management					
15	The quantity of the necessary resources were determined					
16	Cost plan was well-defined					
17	The project cost was estimated					
18	The required budget was determined					
19	Changes to the project budget was controlled					
	V. Project Risk Management					
20	Risk management plan was developed					
21	Risks were identified and registered					
22	Risks were prioritized and their implication on the project was estimated					
23	Risk response plan was developed					
24	The identified risks were monitored and controlled					

Part IV: Identification of Common Challenges of Software Project Management in Commercial Bank of Ethiopia

In this stage, you are expected to give your feedback on what extent a list of challenges have been found in the implementation of software projects in Commercial Bank of Ethiopia, beginning from the preparation phase until the completion phase.

(5=Strongly Agree, 4= Agree, 3= Neutral, 2= Disagree, 1= Strongly Disagree)

	Challenges	**5**	**4**	**3**	**2**	**1**
	I. Project Management Specific Challenges					

1	Project stakeholders were clear and certain about their expectations within a certain role, typically their role in the projects.					
2	Success criteria were defined and measuring project success was done appropriately.					
3	Senior management understood of their role in driving the software project success					
4	Project teams were well informed about project tasks and works					
5	All stakeholders had adequate commitment to software project works					
6	Project manager and teams understood about impacts of changes regarding the laws, regulations, policies, and precedents applicable to the software project					
7	The effects of environmental changes - Availability and distribution of facilities, resources, infrastructure and materials - were considered by a project					
8	Software project stakeholders' conflicts were managed properly					
9	Early warnings about a projects' likely success on cost, schedule and quality parameters were identified and analyzed					
10	Project human resources were managed with important expertise, skills, competencies, and specialized knowledge for the software projects.					
11	Unrealistic expectations about a situation, especially with the difficulties involved in defining software project cost, schedule and quality to achieve success were managed					
	II. Software Engineering Specific Challenges					
12	Project manager and project team members had abilities project knowledge areas regarding software projects					
13	Project manager and project teams had understandings about software development standards					
14	Appropriate technical skills - the knowledge and expertise needed to accomplish complex tasks relating software development - were identified					
15	Appropriate trainings have been provided in a technical skill (e.g., current software product, software systems, configuration management); and in other related skills (e.g., information technology, project management).					
16	Proper software architecture was used so that the software evolved quickly enough to keep up with the business needs					
17	Documentations (functional specification for the user-facing explanation of the software and technical specification for the developers to define how it is going to work) were prepared and considered as part of the procurement documents when closing a project					
18	Proper software development methodology was used					

19	Technology gaps – (between the people who were involved in the projects as a team member and users or between products used by the project and current-day technology) were minimized					
20	Appropriate testing have been done timely					
	III. Both Software Engineering and Project Management Related Challenges					
21	Effective and efficient project management communication was delivered by considering project owner needs					
22	There was a method to guarantee user requirements statement to be consistent, accurate, and complete					
23	Project deliverables include approved and clear specifications					
24	Effective communication channel have evolved between technicians and users					
25	The project involves controlling and monitoring works					
26	Appropriate inputs were received from users on what the customer wants, then how well the product is designed, or how well the code works					
27	Understanding about procurement procedures created a relationship with outside vendors and suppliers for goods and services needed to complete a project.					

Part V: Areas of improvements

Comment on Areas of improvements on software development and/or customization projects in Commercial Bank of Ethiopia

_____

_____

APPENDIX B: Reliability Test Tables

1. Practices of five Project Management Knowledge Areas

1.1. Project Scope Management Practice

Reliability Statistics

Cronbach's Alpha	N of Items
.786	5

1.2. Project Time Management Practice

Reliability Statistics

Cronbach's Alpha	N of Items
.881	5

1.3. Project Quality Management Practice

Reliability Statistics

Cronbach's Alpha	N of Items
.848	4

1.4. Project Cost Management Practice

Reliability Statistics

Cronbach's Alpha	N of Items
.817	5

1.5. Project Risk Management Practice

Reliability Statistics

Cronbach's Alpha	N of Items
.941	5

2. Common Challenges of Software Project Management in Commercial Bank of Ethiopia

Reliability Statistics

Cronbach's Alpha	N of Items
.876	27