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Project Management Maturity Assessment in Addis Ababa Water and Sewerage Authority; In the Case of Nifas-Silk Branch

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BY

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ADDIS ABABA

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DECLARATION

I **LEYLA ABDULKADIR ABDELLA** hereby declare that this thesis is original and has never been presented in any other institution. I also declare that, any secondary information, and materials used has been accordingly quoted and acknowledged in this thesis.

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ABBREVIATIONS/ACRONYMS

AAWSA	**Addis Ababa Water and Sewerage Authority**
NSB	**Nifas Silk Branch**
CMM	**Capability Maturity Model**
CMMI	**Capability Maturity Model Integration**
OPM	**Organizational Project Management Maturity**
PM	**Project Management**
KPMMM	**Kerzner Project Management Maturity Model**
P3M3	**Portfolio, Program and Project Management Maturity Model**
PMO	**project management Office**
PMI	**Project Management Institute**
PMBOK	**Project Management Body of Knowledge**

Abstract

The study focuses on assessment of the project management maturity of Addis Ababa water and Sewerage Authority (AAWSA); a case study in Nifas-silk branch (NSB) water and sewerage line installation and replacement project, which is the main objective of the research. The study used the project management solution maturity model to assess the organization current maturity level in terms of the ten-project management body of knowledge area practice and the five-process group as perceived by employees of the organization. The importance of this model has taken on a greater significance in assessing the current capability of the organization in project handling to achieve its objective. The study used modified PM solution questionnaire to assess the current maturity level. A total of 82 respondents were selected based on a purposive sampling of the researcher's subjective judgment which considers that the respondent gives the required level of information and 60 respondents have returned the questionnaire and used for maturity assessment analysis. Descriptive analysis was applied to answer the research question and objective. The study revealed the overall practice maturity of each knowledge area is found to be level 2.77 and process group 2.6 thus, the organization maturity rate as level two. Among the knowledge area scope and time management are at better maturity of 2.9 and 3 respectively whereas risk management is the lowest matured with level 2.3. Generally, the maturity level two in the practice of the knowledge area means that there is existence of the project management process within the organization but lack organizational standards.

Key Word: ***Project Management, Maturity, Project Management Body of Knowledge, Addis Ababa Water and Sewerage Authority***

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

In recent years, projects have played a major and important role for organizations because projects provide a competitive edge to an organization. Projects make organizations leaders in their respective fields (Pennypacker & Grant, 2009) Organizations are striving to deliver projects effectively and successfully because project management has become the dominant way of accomplishing work (Pennypacker, 2008) The delivering project successfully is a critical success of the organization that manages the project to achieve corporate goals (Institute, 2013). The success rate in implementing projects is very closely related to project management maturity and the use of appropriate project management methods and tools (Pennypacker & Grant, 2009). Measurement of project management maturity enables organizations to identify how to improve project performance (Brookes, 2014). As proposed by Spalek (2014), to deliver a project with increased performance and effectiveness organization should continuously evaluate their project result for finding area of improvement to increase project management maturity. As mentioned by Brookes (2014), improved project performance is linked with proper project management and attaining the desired project management maturity.

The success of a water related construction project is mainly seen in performance measurement. That is needed to track, forecast, and ultimately controls variables that are important for the success of a project and organizational effectiveness. In water and sewerage line installation and replacement sector, several performance problems and target deviations of the projects are observed repeatedly. To mention among the Various Performance problems observed for several decades in the sector: Delay time and cost overrun, poor quality, safety problems, community dissatisfaction, lack of coordination, and communication can be mentioned.

All these mentioned indicate a gap in implementing project management knowledge and the role of project management practice in a project has become a crucial factor for the success of the construction organizations. The positive influence of using these methods and tools of project management on the success and efficiency of projects has been confirmed by several

studies (Peerasit Patanakul, 2010). And also increasing the organization competencies in project management is a key factor for improving the project management processes (Meredith, 2021).

Maturity in an organizational context is a state that creates the perfect condition for an organization to achieve its desired objectives (Mateen, 2015). According to Mateen (2015), who stated that maturity, said when applied to projects of the organization, provides perfect conditions to handle projects. According to (Ferreira, 2015) maturity models used in the diagnosis of Project Management culture in organizations are helping to define a set of actions and measures to better its performance as an organization. A maturity model offers a framework with several defined levels of capability against which the current position can be assessed objectively (Hillson, 2010). It also defines the next level of capability to which the organization can aspire, creating an improvement target for development programs.

Addis Ababa Water and Sewerage Authority (AAWSA) were established as an autonomous body by order No. 68/1971 issued in 1971. It has since been re-organized in 1995 and 2003. It is entrusted to: supply safe and adequate water within the limits of Addis Ababa City, provide waste water sludge collection and disposal, ensure that water resources are protected and conserved, determine the quantity of water to be supplied and waste water to be disposed and ensure that water quality conforms to standards. (Project Appraisal document of World Bank Report No: 391 19-ET). Providing safe water and waste management programs and projects is being implemented at national level where all of the regional governments are responsible to implement the program at the towns of the respective region.

Addis Ababa Water and Sewerage Authority have executed different projects for the purpose of expanding the urban water supply and sewage infrastructure. During those projects a team will be assigned for the projects so as to follow and to perform the intended results. So, this research aimed to assess the project management maturity of AAWSA; a specific case study in NSB water and sewerage line installation and replacement project.

To develop competencies or improve processes in project management, organizations need to evaluate project management maturity and identify the baseline and weaknesses and gaps which are appropriate to focus on increasing the competencies and improving the processes (Moutawe et.al., 2017). With this regard, project management models are needed for an

organization to evaluate their project management practices, compare themselves with other organizations in their field to achieve excellence, and ensure survival. Maturity Models are models designed to provide a way for organizations to understand their project management practices and to evaluate their maturity against an extensive set of project management best practices.

Numerous models exist for the project management maturity which will be reviewed in the literature review. Those are Capability Maturity model CMM, PM solution's Maturity model, Kerzner's PM maturity model PMMM, Organizational Project Management Maturity Model-OPM^3.

Generally, the above background about project success, importance of project management and evaluating organization using different maturity model leads the study to use the project management solution maturity model new edition for assessing the organization current maturity level in terms of project management body of knowledge area and the process group. So overall study tries to assesses maturity level of Addis Ababa water and sewerage authority (AAWSA). a case study in Nifas-silk branch (NSB) water and sewerage line installation and replacement project.

1.2 Statement of the Problem

The urban water supply and sewage infrastructure plays a major role in the growth and development of a city and improve standard of living of the people. This sector comprises various stakeholders to execute projects successfully. However, the sector is criticized by its poor performance of delivering projects with poor quality, time delay, cost overrun, safety, community (user) dissatisfaction, and other performance deviations like some known projects, and or did not meet the initial objectives (Fetene, 2008; Tekalign, 2014). These entire gap in implementing project management knowledge and the role of project management practice in a project has become a crucial factor for the success of the organizations to meet its objectives and undertake its mission.

Most of project managers may perform only those processes that they are most familiar with or easier to perform. So, they may give lower priority to knowledge areas that have higher impact on project performance. These Performance problems result in a huge impact on the

project's success and the proper functioning of organizations to meet its mission and goal that mainly established for.

Effective project management practices ensure that the project would meet not only key technical objectives (budget, time and quality) but also the needs of stakeholders. It also ensures that the project fulfills the requirements for which it was initiated. On the other hand, ineffective project management practice would lead to project failure (Firehiwot, 2019). Yimam (2011), stated one of the main reasons of project failure in developing countries is lack of effective or poor project management process

Such problems are causing loss of profits, increasing cost, and leading to technical and managerial problems between project parties. Abebe & A. (2009), also revealed a gap in the practice of basic project management body of knowledge areas. This knowledge area is used to equip project managers with the skill and management proficiencies that help them to accomplish the project effectively and efficiently because the project management knowledge area constitutes the input which collective knowledge required for the successful completion of a project. So, the Successful delivery of projects is dependent on organizational capability in project management. For an organization to be able to determine whether its project management processes are adequate, agreed measures are required to enable it to compare its management of projects with the best practice or against its competitors. To develop and improve project management capability organizations need to know the status of current capability and have a plan for where to be in the future.

Project management Maturity assessment in the water and sewerage line sector is not a new concept of study but in Ethiopia, it is not well-researched area due to different limitation and most of the published research was conducted on AAWSA and water and sewerage related areas in which they concern on the organization's scope of work and nature of the project they undertake and more of technical and engineering aspects research findings. AAWSA's project is within the boundary of Addis Ababa which make this research unique is because it assesses the maturity of AAWSA project undertaken under Nifas-silk branch water and sewerage line installation and replacement project maturity assessment based on project management knowledge areas and project life cycle components.

The research mainly needs to fill the gap of project management handling capability of the organization by assessing the project management body of knowledge areas practice maturity and process groups' maturity will help to know the level of maturity of AAWSA, Nifas silk branch project. Project management maturity assessment enables organizations to further improve its project management structure and show directions on how to maximize the level of maturity to improve the practice of the Project Management Body of Knowledge Areas which will enhance better implementation of projects. Hence this study tries to assess *the project management maturity* of Addis Ababa water and Sewerage Authority (AAWSA) specifically Nifas-silk branch water and sewerage line installation and replacement project based on the PMI maturity model assessment.

1.2.1 Research Questions

1. What is the level of project management knowledge areas practice maturity of the NSB project?
2. What is the level of project management process group maturity of the NSB project?
3. What weaknesses should be identified to improve the current maturity?

1.3 Objective

1.3.1 General objective

- The general objective of this study is to assess the project management maturity of AAWSA project undertaken under NSB water and sewerage line installation and replacement project.

1.3.2 Specific objective

- To assess the Project management body of knowledge's areas practice Maturity level of the Nifas-silk branch project
- To assess Project management process groups' maturity levels of the branch project
- To identify weaknesses to improve the current maturity

1.4 Scope of the study

The study is delimited conceptually and geographically and in terms of sector. Conceptually it is focused mainly on project management body of knowledge and process maturity. Geographically it only covers one project undertaken under AAWSA Nifas-silk branch. Other researchers are done on the other aspects of the water supply and sewerage line installation and replacement Project and could be studied further in the future but this one was focusing on the project maturity.

1.5 Limitation of the study

Limitation of the study is the study use PM solution maturity model for the assessment even though there are many models for assessing maturity of any organization PM solution maturity assessment model is the simplest and easily understandable model for assessment and the model is based on project management body of knowledge.

This research was done on the project which is already completed and the respondents were trying to respond for this study in a retrospective way and the research might consider recall bias as a limitation. And the study is only focusing on the Addis Ababa water and Sewerage Authority (AAWSA) NSB only which will not include sample from the other eight branches and the project office and the head quarter which perform similar project in the city.

1.6 Significance of the study

Conducting project management maturity assessment gives an organization a benchmark on their current environment, how project management is being used, and most importantly, where to focus improvement efforts to advance to higher levels of maturity concerning this the assessment result of project management knowledge and process area gives insight for AAWSA where the organization project management maturity level place and in which knowledge and process area the organization lags which needs potential recommendation and improvement. This gives the organization to set framework and standardize its set of actions and process which helps to meet its objective and continuous fulfillment of its projects successful.

Further, this study helps to strategy and policy makers, government and non-government organizations that are related with AAWSA; like Addis Ababa Road Authority and electric power and utility offices which are mostly work in relation to one another which is better to know the status of the organization to walk laterally and to draw integrated strategies. In addition, it used for other researchers to assess the maturity of other organization using different maturity model and compare the sectorial level of maturity.

1.7 Organization of the study

The paper consists of five chapters. The first is the introductory chapter. The second chapter contains a review of related literature. Chapter three is concerned with the research methodology. The fourth chapter consists of Results and discussion. The fifth chapter which is the closing chapter focuses on conclusions and recommendation

CHAPTER TWO: REVIEW OF LITERATURE

2.1 Theoretical Review of Literature

2.1.1 What is a Project

A project is a series of multi-functional activities and tasks that have a specific objective to be completed within certain specifications, defined start and end dates, funding limits, and consume human and non-human resources (Kerzner, 2009). According to PMI project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates that a project has a definite beginning and end (PMI, 2013). Project can be defined as a group of tasks performed in definable time period and cost and resource in order to meet specific objectives. So generally, we can say that project is not a routine and repetitive work; it has specific time and cost which undertake to create a unique product or service (Gray, 2018).

Project management is the planning, organizing, staffing, directing and controlling of organizational resources to achieve its goal and objectives. And it involves process from conception to completion stage (PMI, 2013)

2.1.2 Project management maturity

Project management maturity refers to the gradual development of a company-wide project management approach, methodology, strategy, and decision-making process (Crawford, 2007). According to Kerzner (2017), maturity in project management is the implementation of a standard methodology and accompanying processes such that there existed a high likelihood of repeated success. Jessen (2003), refer to maturity as “a state where an organization is in perfect condition to achieve its objectives. Project maturity would then mean that the organization is perfectly conditioned to deal with its projects. The organization will also have to advance on its capability to prove on-time delivery of projects, a decrease of costs, efficiency and an increase of profit-making (Brookes, 2009)

Recently, project management maturity has been defined as the integration of project management models in an organization. With respect to the definitions presented, project management maturity can be understood as the advancement and improvement of the systems and capabilities in organizations for achieving project objectives (Gomes, 2015)

2.1.3 Maturity

The term maturity is defined as a method of the assessment of completeness, perfection, growth, and development of organizations with respect to their capabilities to handle their operations (Gottschalk, 2009) Likewise, (Kerzner, 2017) described maturity as the improvement of processes and structures which are repetitive by nature. So, maturity can be understood as the development in each domain of a specific profession or area of an organization.

Maturity is a comparative level of improvement an organization has achieved any given process or set of activities. Organizations with more fully defined policies, standards, and practices are considered more mature (PMI, 2013) Organizations with higher maturity level in improved performance in all observed areas (Pennypacke & Grant, 2009)

According to (Chrissis, 2011) a mature process is well-realized throughout a mature organization; usually through documentation and training, and the process is continually being monitored and improved by its users.

2.1.4 Review of Maturity models.

Maturity model allows an organization to assess and compare its practices against best practices or those employed by competitors, with the intention to map out a structured path to improvement (Pennypacker & Grant, 2009) A maturity model is a framework describing the ideal development toward the desired improvement using several successive stages or levels. Framework provided by the maturity model enables organizations to access and improve their processes (Pennypacker & Grant, 2009).

Maturity models for PM are used to measure the degree to which an organization is executing PM by comparing its PM practices against practices in general or 'best practices'. These models describe how 'mature' or professionalized organizations are in conducting PM and what they could do to improve their way of working (Man, 2007)

Maturity models vary from one another in the concepts they exemplify and the suggestions they make as to how the path to maturity looks like (Watt, 2015). A different maturity model for PM may define maturity differently and measure different things to determine maturity. For this reason, organizations should consider the selection of a maturity model.

2.1.5 Organizational Project Management Maturity Model

OPM3 is an acronym for Organizational Project Management Maturity Model. It is a standard developed and introduced by the Project Management Institute (PMI, 2013). The development of this standard was inspired by the increasing interest in a maturity model that shows a step-by-step method of improving and maintaining an organization's ability to translate organizational strategy into the successful and consistent delivery of projects. In other words, OPM3 is meant to enable organizations to bridge the gap between organizational strategy and successful projects (Schlichter, 2015)

The purpose of OPM3 is not to prescribe what kind of improvements users should make or how they should make them. Rather, by providing a broad-based set of organizational project management (OPM) best practices (Pennypacker & Grant, 2009) and helps organizations understand and measure project management maturity of the processes used to conduct projects based on the best practice standards defined in the PMBOK.

"OPM3 combines three elements: knowledge (the contents of the standard, including maturity and best practices), assessment (a method for comparing a real organization to the standard), and improvement (how to change the organization, build capabilities and implement best practices" (Wagenstein, 2008) In the knowledge element, members of the organization become proficient in PMBOK and the body of best practices outlined in the OPM3. The assessment element gives the organization a clear idea of where it is in terms of organizational project management maturity and its current position to go forward. The improvement elements include the plan for improvement and the improvement actions according to the plan. This element helps organizations plan improvements based on the results of the assessment and take action to execute them to improve their maturity

Organizational project management provides a framework that integrates project, program, and portfolio management of the organization for all the best practices. The integration defined by organizational project management includes:

I. Knowledge (of the portfolio, program, and project processes)

II. Organizational strategy (mission, vision, objectives, and goals)

III. People (having competent resources), and

IV. Processes (the application of the stages of process improvement)

OPM3 is the only truly multi-dimensional project management maturity, model. The foundation of OPM3 is that when an organization executes multiple projects, an assessment of its maturity must also take a general view looking at program, portfolio, and project management. There are usually synergies that are derived from executing multiple projects.

Organizations may have a high maturity level for project management practices but do not necessarily have to excel in portfolio or program management as well. The maturity of portfolio and program is measured against portfolio and program management practices. OPM3 provides flexibility in terms of the organization's size and type, size, and complexity of projects and geographical locations of projects (Institute, 2013)

2.1.6 Capability Maturity Model Integration

CMMI stands for Capability Maturity Model Integration. Its first version was presented by the Software Engineering Institute (SEI) in 2002 as the successor of the Capability Maturity Model (CMM), which was developed from 1987 until 1997. The SEI (2007), defines CMMI as a process improvement approach that helps organizations integrate separate functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for evaluating current processes. CMMI applies to organizations that commence on software development, systems engineering, and product development using a single tool to assess maturity or capability and provides direction while developing more complex processes (Staples, 2007) CMM does not explain steps on how to improve rather it helps in determining and analyzing the current level of process maturity which identifies the issue to overcome for achieving maturity

2.1.7 CMM Approach

CMM framework provides two different approaches for improving project management processes. These approaches are termed as "model representation"

Continuous Representation – the emphasis is on the organization's processes. It provides a framework to evaluate and improve processes. It enables the space for improvement related to the individual process. The improvement progress is measured alongside capability levels (Muhammad, 2015).

Table 1. Continuous representation capability level

Capability Level	Description
0	Incomplete
1	Performed
2	Managed
3	Defined
4	Quantitatively Managed
5	Optimizing

Staged Representation – provides a comprehensive picture of the organization. It measures maturity at the organization level compared to continuous representation which measures maturity at the process level. It is easy to understand and less detailed compared to continuous representation. The framework of staged representation provides a standardized value of an organization's maturity Like process capability levels, staged representation is measured as the organization's maturity levels. The detail of these maturity levels is shown in the below table:

Table 2. Staged representation maturity level

Maturity Level	Description
1	Initial
2	Managed
3	Defined
4	Quantitatively Managed
5	Optimizing

There are five maturity levels used in the 'staged' representation of CMMI:

1. *Initial*: Processes are unpredictable, poorly controlled, and reactive

2. *Managed*: Processes are characterized for projects and are often reactive

3. *Defined*: Processes are characterized by the organization and are proactive

4. *Quantitatively managed*: Processes are measured and controlled

5. *Optimizing*: There is a focus on process improvement

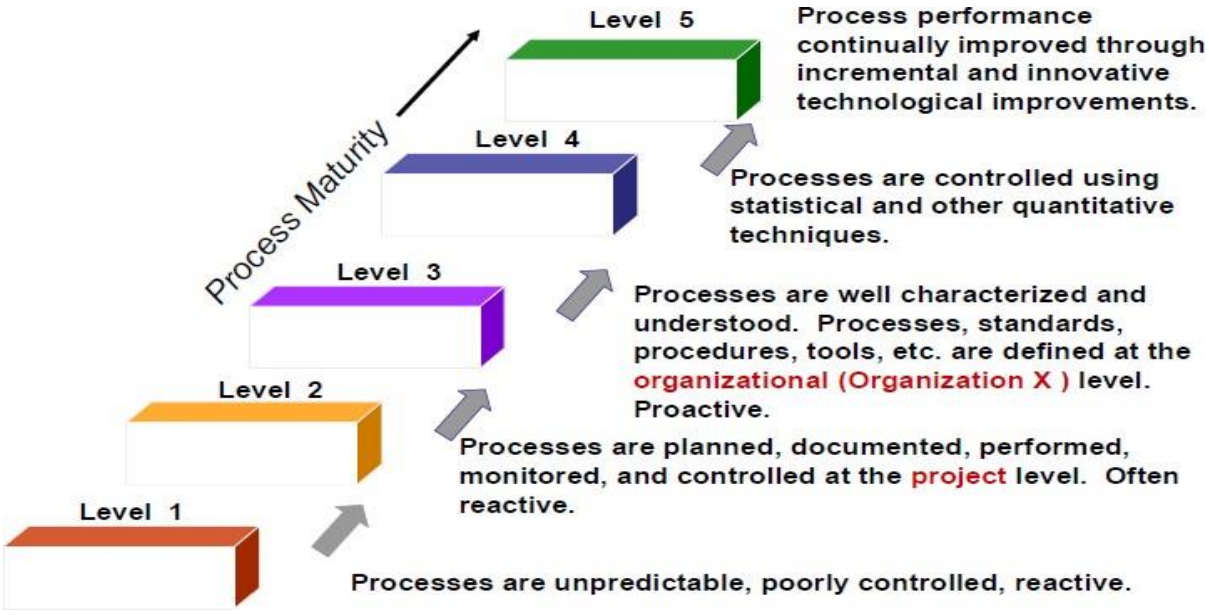

Figure 1. Maturity Levels for CMMI Staged Representation

Constantinescu (2007), argued that in addition to the aspect that CMMI was initially focused on product and service engineering by collaborating between system engineering and software engineering, the framework of CMMI is also applicable to other disciplines and the organization's type.

Project Management Maturity Model (K-PMMM)

The Project Management Maturity Model (PMMM) was introduced by H. Kerzner in 1998. The first edition of his book describing this model was published in 2001. In 2005, he published the second edition.

PMMM is a practical PMBOK-aligned standard (Kerzner, 2019). The model sets forth various levels or stages of development towards project management maturity; together with assessment instruments to validate how far along the maturity curve the organization has improved. The original purpose of the PMMM is to provide organizations with a framework that allows organizations to create an organization-specific maturity model. Each organization can have a unique approach to maturity and that is why organizations can adapt the questions and answers of the PMMM questionnaire (Kerzner, 2019)

KPMMM is made up of five levels of maturity combined with the area structure of PMBOK Each of the five levels represents a different degree of maturity in project management.

Level 1—*Common language*: "In this level, the organization recognizes the importance of project management and the need for a good understanding of the basic knowledge on project management and the accompanying language/terminology (Kerzner, 2019).

Level 2—*Common processes*: "In this level, the organization recognizes that common processes need to be defined and developed such that successes on one project can be repeated on other projects. Also included in this level is the recognition of the application and support of the project management principles to other methodologies employed by the company (Kerzner, 2019).

Level 3—*Singular methodology*: "In this level, the organization recognizes the synergistic effect of combining all corporate methodologies into a singular methodology, the center of which is project management. The synergistic effects also make process control easier with a single methodology than with multiple methodologies (Kerzner, 2019).

Level 4—*Benchmarking*: "This level contains the recognition that process improvement is necessary to maintain a competitive advantage. Benchmarking must be performed continuously. The company must decide whom to benchmark and what to benchmark (Kerzner, 2019).

Level 5—Continuous improvement: "In this level, the organizations evaluate the information obtained through benchmarking and must then decide whether this information will enhance the singular methodology (Kerzner, 2019).

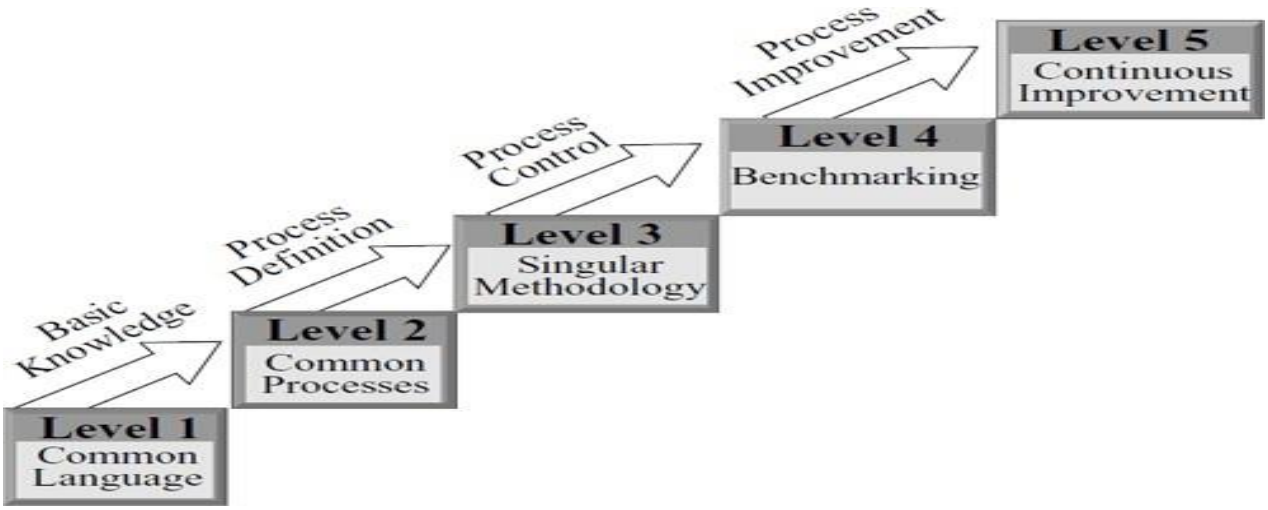

Figure 2. Five Levels of K-PMMM

Project, Program and Portfolio Management Maturity Model (P3M3)

P3M3 stands for Portfolio, Program, and Project Management Maturity Model. It was formally published in February 2006 by the Office of Government Commerce (OGC) after some refinements were made. (Murray, 2006) Like the SEI-CMM, the Portfolio, Program, and Project Management Maturity Model (P3M3) is described by a five-level maturity framework. These levels constitute the structural components that comprise the P3M3

The P3M3 describes the portfolio, program, and project-related activities within key process areas that contribute to achieving a successful project outcome. The P3M3 recognizes not only the program and project management activities being carried out at the individual program and project level but also those activities within an organization that provide focus and help sustain efforts to build a program and project infrastructure of effective program and project approaches and management practices.

In the absence of an organization-wide program and project infrastructure, repeatable results depend entirely on the availability of specific individuals with a proven track record; this does not necessarily provide the basis for long-term success and continuous improvement throughout the organization

The levels described within the P3M3 indicate how key process areas can be structured hierarchically to provide transition states for an organization wishing to set realistic and sensible goals for improvement. The levels facilitate organizational transitions from an immature state to become a mature and capable organization with an objective basis for judging quality and solving program and project issues. A mature organization has an organization-wide ability for managing programs and projects based on standard, defined program, and project management processes. These processes can be tailored to meet specific organizational needs. The program and project approaches are communicated to program and project team members and stakeholders, and activities are carried out in compliance with the plans and defined processes.

The Portfolio, Program & Project Management Maturity Model (P3M3) can be used as the basis for improving portfolio, program, and project management processes. It is structured with five levels of maturity, which are.

- Level 1 - initial process
- Level 2 - repeatable process
- Level 3 - defined process
- Level 4 - managed process
- Level 5 - optimized process

Table 3. Portfolio, Program & Project Management Maturity Model

Maturity:	**Project**	**Program**	**Portfolio**
Level 1 - initial process	Does the organization recognize projects and run them differently from its ongoing business? (Projects may be run informally with no standard process or tracking	Does the organization recognize programs and run them differently to projects? (Programs may be run informally with no standard process or tracking system.)	Does the organization's Board recognize programs and projects and run an informal list of its investments in programs and projects? (There may be no formal tracking and

	system.)		reporting process.)
Level 2 - repeatable process	Does the organization ensure that each project is run with its processes and procedures to a minimum specified standard? (There may be limited consistency or coordination between projects	Does the organization ensure that each program is run with its processes and procedures to a minimum specified standard? (There may be limited consistency or coordination between programs)	Does the organization ensure that each program and/or project in its portfolio is run with its processes and procedures to a minimum specified standard? (There may be limited consistency or coordination)
Level 3 - defined process	Does the organization have its own centrally controlled project processes, and can individually projects flex within these processes to suit the project?	Does the organization have its own centrally controlled program processes and can individual programs flex within these processes to suit the program?	Does the organization have its own centrally controlled program and project processes and can individually programs and projects flex within these processes to suit programs and/or projects? And does the organization have its portfolio management process?

Level 4 - managed process	Does the organization obtain and retain specific measurements on its project Management performance and run a quality management organization to better predict future performance?	Does the organization obtain and retain specific measurements on its program management performance and run a quality management organization to better predict future program outcomes?	Does the organization obtain and retain specific management metrics on its whole portfolio of programs and projects as a means of predicting future performance? Does the organization assess its capacity to manage programs and projects and prioritizes them accordingly?

Level 5 - optimized process	Does the organization run continuous process improvement with proactive problem and technology management for projects to improve its ability to depict performance over time and optimize processes?	Does the organization run continuous process improvement with proactive problem and Technology management for programs to improve its ability to depict performance over time and optimize processes?	Does the organization run continuous process improvement with proactive problem and technology management for the portfolio to improve its ability to depict performance over time and optimize processes?

PM Solutions' Maturity Model

The Project Management Maturity Model (PMMM) is a formal tool developed by PM Solutions that aims to measure the maturity in project management of an organization. The model utilizes a PMBOK ten knowledge area and has five distinct levels of maturity and examines an organization's implementation across the ten project management knowledge areas (Crawford, 2021)

The objective of the PMMM methodology is to allow any organization to systematically and efficiently develop its project management capabilities (Crawford, 2021)

The PM Solutions Project Management Maturity Model is based upon a two-dimensional framework. Both dimensions are based on recognized industry standards. The first dimension signifies the level of maturity. It is based on the structure of the Software Engineering Institute Capability Maturity Model. This model has received extensive acceptance as a standard for process modeling and assessment of organizational maturity in various process areas. The second dimension clarifies the key areas of project management addressed where this dimension adopts the structure of PMI's ten knowledge areas. the ten knowledge areas were further decomposed into key components that provide for a more rigorous and specific determination of project management maturity (Pennypacker, 2008)

Levels of PM Solutions' Maturity

There are five levels of maturity level included in the PM Solutions Project Management Maturity Model.

Level 1: Initial Process

"Although there is an acknowledgment that there are project management processes, there are no established practices or standards, and individual project managers are not held to specific accountability by any process standards. Documentation is loose and ad hoc. Management understands the definition of a project, that there are accepted processes, and is aware of the need for project management. Metrics are informally collected on an ad hoc basis" (Crawford, 2021).

Level 2: Structured Process and Standards

"Many project management processes exist in the organization, but they are not considered an organizational standard. Documentation exists on these basic processes. Management supports the implementation of project management, but there is neither consistent understanding, involvement, nor an organizational mandate to comply with all projects. Functional management is involved in the project management of larger, more visible projects, and these are typically executed systematically. There are basic metrics to track project cost, schedule, and technical performance, although data may be collected/correlated manually. The information available for managing the project is often a mix between summary level data, and detailed level data" (Crawford, 2021)

Level 3: Organizational Standards and Institutionalized Process

"All project management processes are in place and established as organizational standards. These processes involve the clients as active and important members of the project team. Almost all projects use these processes with the minimal exception—management has institutionalized the processes and standards with formal documentation existing on all processes and standards. Management is regularly involved in input and approval of key decisions and documents and key project issues. The project management processes are typically automated. Each project is evaluated and managed considering other projects" (Crawford, 2021)

Level 4: Managed Process

"Projects are managed with consideration of how the project performed in the past and what is expected for the future. Management uses efficiency and effectiveness metrics to make decisions regarding the project and understands the impacts on other projects. All projects, changes, and issues are evaluated based upon metrics from cost estimates, baseline estimates, and earned value. Project information is integrated with other corporate systems to optimized business decisions. Processes and standards are documented and in place to support the practice of using such metrics to make project decisions. Management clearly understands its role in the project management process and executes it well, managing at the right level, and differentiating management styles and project management requirements for different sizes/complexities of projects. Project management processes and standards are integrated with other corporate processes and systems" (Crawford, 2021)

Level 5: Optimizing Process

"Processes are in place and actively used to improve project management activities. Experiences and lessons are frequently examined and used to improve project management processes, standards, and documentation. Management and the organization are not only focused on effectively managing projects but also on continuous improvement. The metrics collected during execution are used to understand the performance of not only a project but also for making organizational management decisions for the future" (Crawford, 2021)

2.2 Review of Empirical Literature

The most widely recognized reasons for change requests experienced during the development of most projects in Ethiopia are classified reasons for change orders: Design Errors and Oversights, Change of Scope, Unforeseen Conditions, Value Engineering, Force Majeure, and Others (Mekonnen, 2015) Among the nine PMBOK knowledge area lack of proper scope management are the principal reasons as indicated by this investigation (Mekonnen, 2015)

The most well-known reasons for time overrun in most projects are Delay to handover the site, budgetary issues of contractual workers, Improper planning, and Site management are among the other Furthermore, the most widely recognized reasons for cost overrun are Design change, variance in the expense of materials and insufficient inspection for drawings

details and contract management (Abebe & J., 2015) With this regard lack of PMBOK knowledge areas such as cost management, scope management, and Integration management are obstacles of meeting project goals.

A major problem in Ethiopian any construction project is planning and scheduling of project besides this absence of past project performance data is also a cause for the project problems. Furthermore, proper project duration estimation and scheduling of activity, proper stakeholder engagement is a source of conflict between client and contractor which in turn create a delay in the project (Abebe & J., 2015) improving the managerial capability of contractors need be one of the priority considerations for improvement of the capability of contractors in developing countries (Yimam, 2011), Also other research on developing country construction project explain that the main reason for project failure (in developed countries) is not the absence of general resources or financial resources, but the lack of Project management capability (Ebenezer, 2019)

Research conducted on Ethiopian Construction Works Corporation indicted that among the studied project management knowledge area cost and time management are at better maturity whereas maturity level of risk management and quality management are least matured knowledge area (Tewodros, 2017) Other research which is focused on Addis Ababa road authority on factors affecting success project indicate that project delay, cost overrun, poor coordination between stakeholder and lack of skilled manpower is a major factor affecting the success. All these factors are related to the inappropriate implementation of the knowledge of project management.

In addition, stakeholders have also their own vital role in project performance and management. By assessing how the project stakeholders were being managed from the client side by assessing the practice of stakeholder management in water and sanitation infrastructure development projects, and evaluating the challenges encountered in managing project stakeholders which investigate the practices of project stakeholder identification, project stakeholder management planning, and the practice of engagement and communication with project stakeholders, and the associated challenges in project stakeholders management (Amanuel, 2020)) which results that the main challenges in project stakeholder management were conflicting requirements of stakeholders, late identification of stakeholders' interest,

procedural issues, and communication gaps, respectively and inadequate allocation of financial resources and technical tools, inadequate project management capacity building trainings, reluctance due to compensation issues, right of way issues, difficulties in dealing with change of interest with time by stakeholders, integration and commitment issues, and lack of timely decisions.

Most Project management practices in Addis Ababa water and sewerage authority are at low level of mean value except project quality management, Lack of suitable project management methodology and lack of project management practices are the major challenges that the organization faced off during the assessment (Firehiwot, 2019) Therefore, to alleviate these prevailing implementation challenges the organization should adopt a standard Project Management (PM) methodology for its projects, diversify funding partners, and conduct need assessment of beneficiaries and needs Change to project scope, deliverables, timescales or resource.

As shown in the above empirical review most of the research conducted on construction projects related failure in a developing country, in general, are lacks project management capability and specifically to a water and sewerage line construction project. Regarding this studying project management maturity of a water and sewerage line installation and replacement project of AAWSA is not well researched but this research address some of the project management maturity assessment and project related documents in general and specifically on similar sector as follows.

Table 4. Summary of empirical review

Study	Key finding
ABRAHAM EJIGU (2017) Assessment of Project Management Maturity Level of Commercial Bank of Ethiopia	Focus on assessing the project management maturity level of PMO of the commercial bank of Ethiopia based on the PM solution maturity model. The key finding indicates that most practices of knowledge areas are practiced informally, and the overall maturity level of the bank is at a lower level. To attain higher maturity the researcher, recommend that creating project management standard creating awareness for all stakeholder toward the project and strengthening the PMO are recommended.
KIBROM HAILE (2018) Analysis of Project Management Maturity Level for Sugar Plant Projects Execution the Case of Metals and Engineering Corporation	Finding focus on assessing the nine-project management knowledge area of METEC in executing a sugar plant project in which the result indicates that the organization is at level three maturities. Also, project time, cost and risk management are at the lowest level of maturity
MARU ENDALE (2017) Assessment of Project Management Maturity Level of Ethiopian Road Authority	Carried out to identify weaknesses and strengths of project management in Ethiopia road authority also the research tries to find the level of maturity of the organization. According to the finding, the organization is at level 3 maturity level. The paper recommends the organization should integrate all the knowledge areas in all projects undertaken by ERA.
TEWODROS ABERE (2017) Project Management Maturity in Ethiopian Construction Works Corporation: The Case of Road Construction Projects	The study used the project management institute maturity model to assess the level of maturity regarding the project management knowledge area of the organization. According to finding the overall project management maturity level of the organization is at level two. The study recommends that improvement should be made for the lowest level of project quality and project risk management, respectively.

AMANUEL NEGASH (2020) Assessment of Project Stakeholder Management practices: The case of Addis Ababa Water and Sewerage Authority (AAWSA)	Focus on assessing how the project stakeholders were being managed from the client side by assessing the practice of stakeholder management in water and sanitation infrastructure development projects. As the finding said the main challenges in project stakeholder management were conflicting requirements of stakeholders, late identification of stakeholders' interest, procedural issues, and communication gaps and others.

2.3 Conceptual Framework

Mature organizations as mentioned by (Cooke-Davies, 2007) can manage all projects effectively and demonstrate consistent improvement. Project management maturity and project management capability can be considered as similar because both are concerned with the development of systems and processes that can be repeated in nature and offer a high probability that each project will be successful. The importance of project management maturity is to assess an organization's current capabilities and assist in improving the organization to achieve better performance. As clearly stated in the literature about the PM solution maturity model developed by (Crawford, 2021) assess maturity based on project management institute project management body of knowledge. This research also uses (Crawford, 2021) maturity assessment model and project management process group to assess the maturity of the AAWSA. Based on the assessment model and project management process group the following conceptual model was prepared.

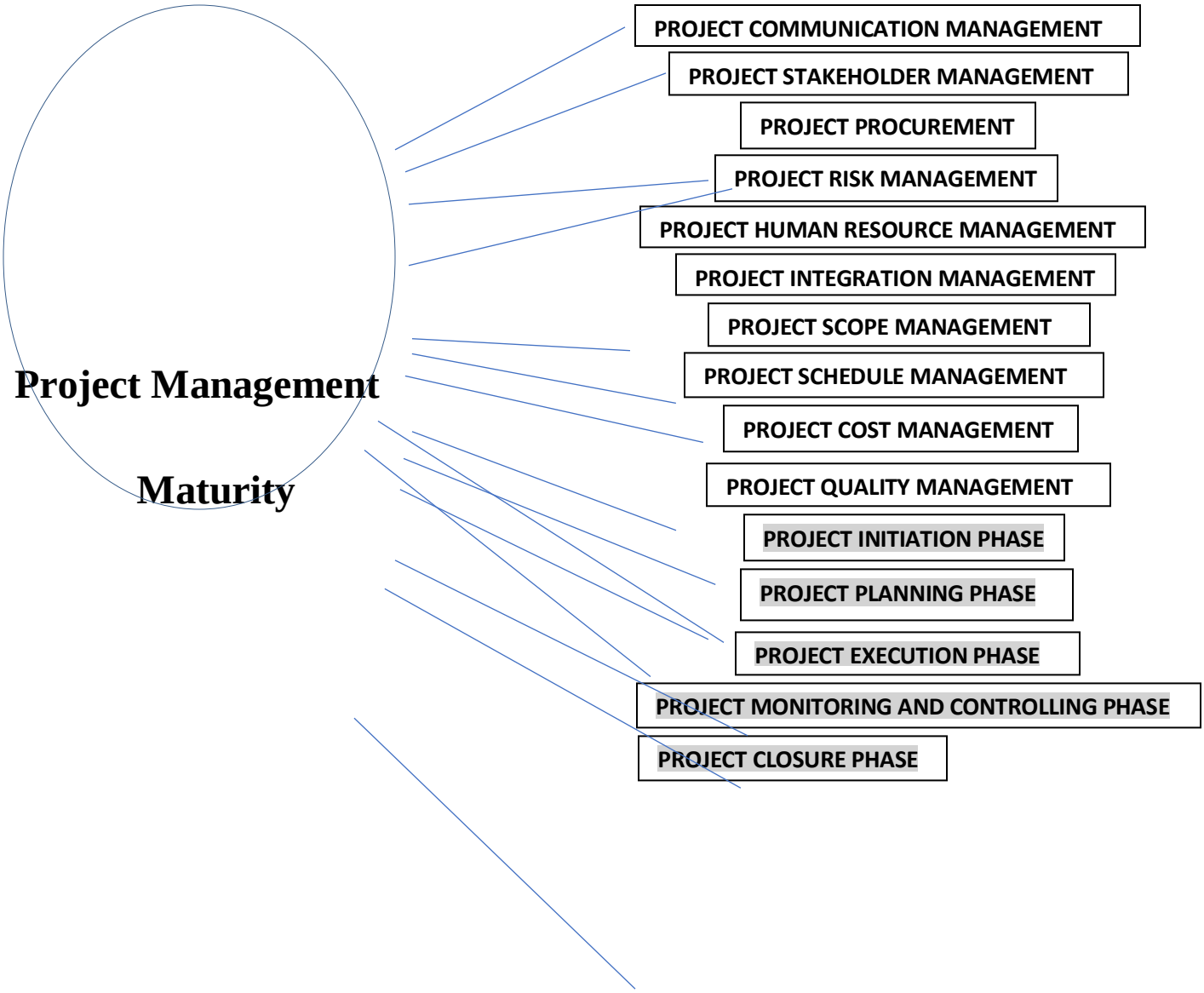

Figure 3. Conceptual framework

CHAPTER THREE: METHODOLOGY

This chapter presents the methodology used in the study. The tools and processes that are found relevant to gather data for the research work and the method of data analysis are explained. The chapter is composed of the research design; research approach; tools and source of data; sampling techniques used, method of data analysis, and validity & reliability test.

3.1 Research Design

Cooper and Schindler (1998), stated that the determination of the research design is one of the most important challenges which confront a researcher. Research design is about turning research questions into the research project (Robson, 2016) It means that to answer research questions, the appropriate strategies, methods, and techniques should be chosen. The research questions in this study focus mainly on "what" questions. So, the study used Descriptive research design. Descriptive research aims at identifying and recording a phenomenon, process, or system and may be conducted using surveys (Robson, 2016)

3.2 Research Approach

To accomplish the objectives of the research, the study employed both quantitative and qualitative research method. The quantitative approach provides the overall picture of the phenomenon and the qualitative aspect provides support for interpretation of the results and answers to some of the research questions (Creswell, 2009).

3.3 Tools and Sources of Data

The type of data collection tool used for the study was a structured questionnaire. For the proper achievement of the objectives of the study, the researcher used both primary and secondary data sources. The primary data was obtained from employees of AAWSA Nifas-silk branch project. Questions were prepared based on the project management institute maturity model using Project Management Body of Knowledge considerations in each knowledge area. Whereas the secondary data was collected from all relevant documents such as books, journal articles, published and unpublished research papers, and company project reports.

3.4 Sample size and Sampling Technique

The Target populations of the study included all the staff members of AAWSA Nifas-silk Branch who participated on water and sewerage line installation and replacement project. The respondent consisted of the site and office senior and junior water and civil Engineers, junior and senior technicians, senior administration, finance and procurement officers, and project team leaders in the authority.

The sampling method the researcher chosen for the study is a purposive or judgmental sampling. The respondents of the questionnaires were selected based on a purposive sampling of the researcher's subjective judgment which considers that the respondent gives the required level of information. Purposive sampling was chosen as it is possible to deliberately determine who to include in the study based on their ability and experience to provide necessary and reliable data. Based on the purposive sampling method the data found from AAWSA human resource directorate the respondent from nine directorates were chosen according to the scope of the work and majorly division working on the project as follows.

Table 5. List of the branch project team division for the study

NO	Division	No of respondent
1	Customer service team	7
2	Human resource administration and finance team	8
3	Purchasing team	8
4	Procurement team	8
5	Non-revenue water team	8
6	Water distribution line installation and replacement team	11
7	Water customer line installation and replacement team	12
8	Sewerage main line installation and replacement team	10
9	Sewerage customer line installation and replacement team	10
	TOTAL	**82**

As shown in the table 5 a total of 82 respondents selected based on a purposive sampling of the researcher's subjective judgment so 82 questionnaires were sent to the mentioned division employee but only 60 respondents have returned the questionnaire. Hence 60 responses were used for maturity assessment analysis.

3.5 Method of Data Analysis

The data gathered were analyzed through descriptive statics using SPSS version 26 data analysis software. Mean, and percentage was used to calculate the project management maturity level of the organization. Calculating the response rank of each knowledge areas and process groups were undertaken for each respondent by calculating the mean. Taking the mean of all respondents finally indicates the maturity level of the organization. The project management practice and process maturity level of the organization were assessed as per the standardized PMI maturity model assessment question in which for this specific study the questioner was modified so that the respondent can easily understand and replay to each project management knowledge area and each project management process group.

3.6 Validity and Reliability test

Quality is always one of the most important issues in research. If an instrument has consistent results it is believed to be reliable (Schindler, 2013)In other words, the reliability of a questionnaire is an indication of the stability and consistency with which the instrument measures the concept. The most popular test of internal consistency reliability is Cronbach's coefficient alpha (Schindler, 2013) which is used for multipoint scaled items.

The coefficient demonstrates whether the different items converge. The higher the coefficients, the better the measuring instrument. Scales with a coefficient alpha between 0.80 and 0.95 are considered to have very good reliability. Scales with a Cronbach's coefficient alpha between

0.7 and 0.8 are considered to have good reliability, and an alpha value between 0.6 and 0.7 indicates fair reliability. When the Cronbach's coefficient alpha is below 0.6, the scale has poor reliability (Schindler, 2013)

The Cronbach's alpha value of the reliability test indicates the internal consistency of the measurement. Table 6 shows that the alpha coefficient for the knowledge area item was 0.97 and for process group item alpha value is 0.945 which indicated that those items had relatively high internal consistency.

Table 6. Reliability statistics result.

Reliability Statistics	
Cronbach's Alpha For knowledge area	No of Items
0.970	45
Cronbach's Alpha For process group	No of item
0.945	16

CHAPTER FOUR: RESULTS AND DISCUSSION

In this section of the research, the data set defined in section three was illustrated and analyzed. A brief interpretation is made to the results achieved which include the general profile of the respondents. A discussion and interpretation were also made based on the analysis. A total of 82 questionnaires were distributed personally to the employee of AAWSA Nifas-silk Branch. Out of 82 respondents 60 have returned the questionnaire properly. As a result, the response rate was found 73.17% which is very good for analysis.

4.1 Demographic characteristics of the respondent Response rate

This section contains four items about demographic characteristics of the respondents, which includes Gender of respondents, Age of respondents, Position of respondents, work experience of respondents and job title of respondents.

4.1.1 Age Distribution of Respondents

Figure 4 presents distribution of sample by age. The results show that, among the respondents, the majority which is equivalent to 57.3% falls between the ranges of 20-29 years which. This is followed by age categories of between 30-39 and 40-49 years with 31.4% and 9% respectively. This shows that most of the employees of the AAWSA Nifas-silk Branch are young and productive work force.

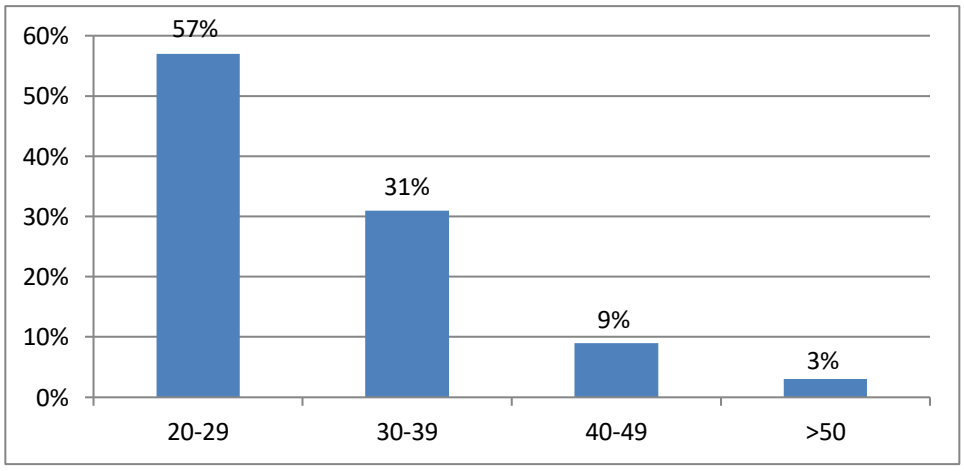

Figure 4: distribution of sample by age

4.1.2 Distribution of Respondents by gender

The table below shows the distribution of respondents by gender. The result shows that there are more male respondents (71.7%) than female (28.3%).

Gender	Frequency	%
Male	43	71.7
Female	17	28.3
Total	**60**	**100.0**

Table 7: Distribution of Respondents by gender

4.1.3 Distribution of Respondents by work experience

Figure 5 presents results of respondents' year of service as a measure of experience on the job. Originally the respondents were asked to indicate their belongingness into four groups of 5year intervals. The results showed that majority of respondents (47.1%) have from 6-10 years of work experience. respondents who have work experience from 5 and below shows that (23.2%) followed by 11-15 years (18.5%), 16-20 years are (6.2%), 21-25 years are (2.9%). And the remaining (2.1%) employees have above 25 years of experience.

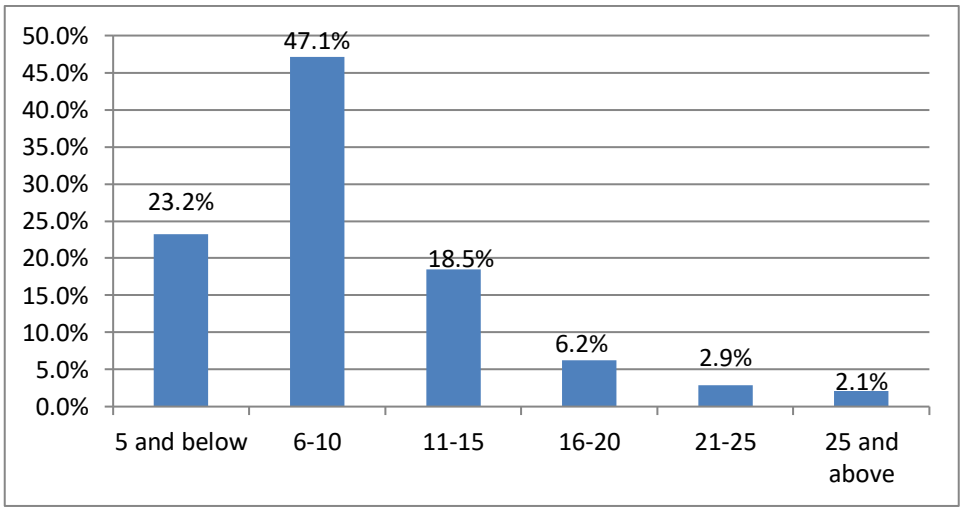

Figure 5: Work experience of the respondent

4.1.4 Positions of Respondents

As shown in the following figure 6 46.7% of respondent are office engineer, 21% are project manager, 6.7% are project team leader while 3.3 are project coordinator and the rest 5% are site engineer 16% respondent are other staff but directly involved in a project such as a senior administration, finance and procurement officers. This implies that the respondent has a better understanding of project management practice.

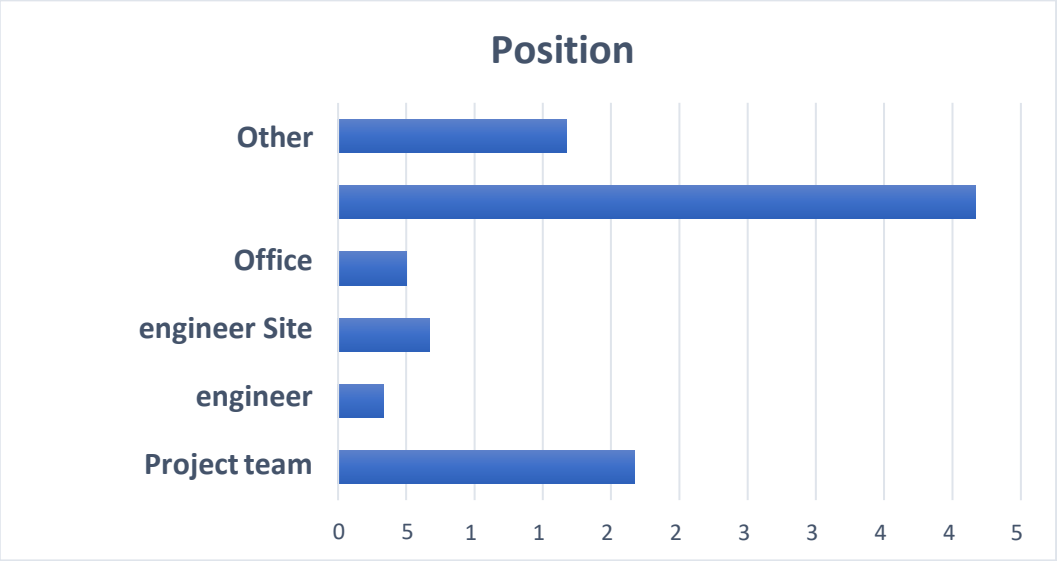

Figure 6. Position of respondents

4.2 Result of Maturity assessment

The first objective of the research was to assess the Project management body of knowledge areas practice Maturity level of AAWSA; NSB project. The research question for this objective was at what level of project management knowledge areas practice maturity of the organization? To answer the research, question the respondent was asked to state their level of agreement of each project management body of knowledge area from level one maturity to level five maturity levels. The research was also assessed the Project management process group mostly known as project life cycle which are Project Initiating group, Project Planning group, Project executing group, Project monitoring, and controlling group, and Project closing group respondent from AAWSA; NSB state their agreement at what level is the organization in terms of project management process group.

To determine the overall organizational maturity level in terms of the ten-knowledge area the research uses the PM solution maturity assessment. According to (Crawford, 2015) the lowest level of maturity level should be fulfilled to achieve the higher-level maturity. So, the accomplishment of each maturity level by an organization is cumulative that is, for each succeeding maturity level, the assumption is that all criteria for the preceding levels for that component are being (or have been) fulfilled. In other words, the overall maturity level for the component of each knowledge area cannot be higher than the lowest individual component score.

Based on the assessment criteria the research result for the ten-knowledge area and the five-process group presented below and the analysis calculation on how the maturity of each knowledge area and process group was determined is shown in (Appendix B)

4.2.1 Maturity level of project management knowledge area

i. Maturity of project integration management (PIM)

Project integration management is the process that ensures various elements of the project are properly coordinated. Project and organizational success rely on integrating effective Project management strategies with proper utilization of PM techniques. As for project integration management, the mean value of the component of integration management such as for project charter development, project management plan, and directing and managing project work are

2.7333, 2.8833 and 2.5333 respectively which indicate the organization has to pay attention for that component. The overall integration management maturity of AAWSA; NSB is found to be 2.8466 which indicate developing project plans, integrating, analyzing, and developing project work result are structured and documented but there is organizational standard and the involvement of management is for only highly visible projects.

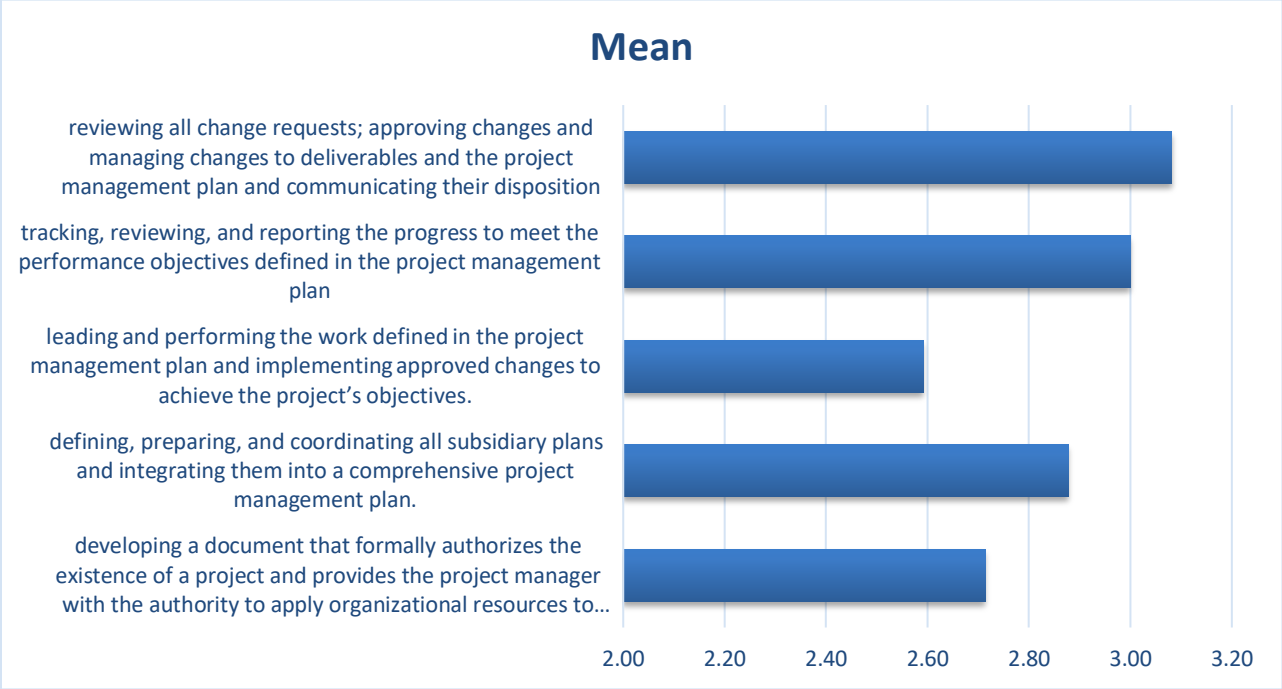

Figure 7: Descriptive Statistics PIM

ii. Maturity of project scope management (PSM)

Project scope management is the process that ensures all the factors and variables for defining and controlling the project are included. This includes project planning and cost control, tradeoff analysis, project charter preparation, the kickoff meeting, a scope-of-work statement, validation of the project scope, and initiation of a change control process. The mean score of scope management maturity of the organization ranged from 2.5 to 3.06 as for component of scope management collecting requirements which includes defining and documenting stakeholder's needs and expectations to meet project objectives have the lowest mean of 2.5 the overall scope management maturity of AAWSA; NSB is found 2.92 even though the organization has scored 2.72 mean for project scope management it is at the lowest level in terms of requirement collection which implies the overall scope maturity of the organization

is at level two. The indication of level two (Structured Process and Standards) for scope management is that the organization applied scope management techniques for large and visible projects.

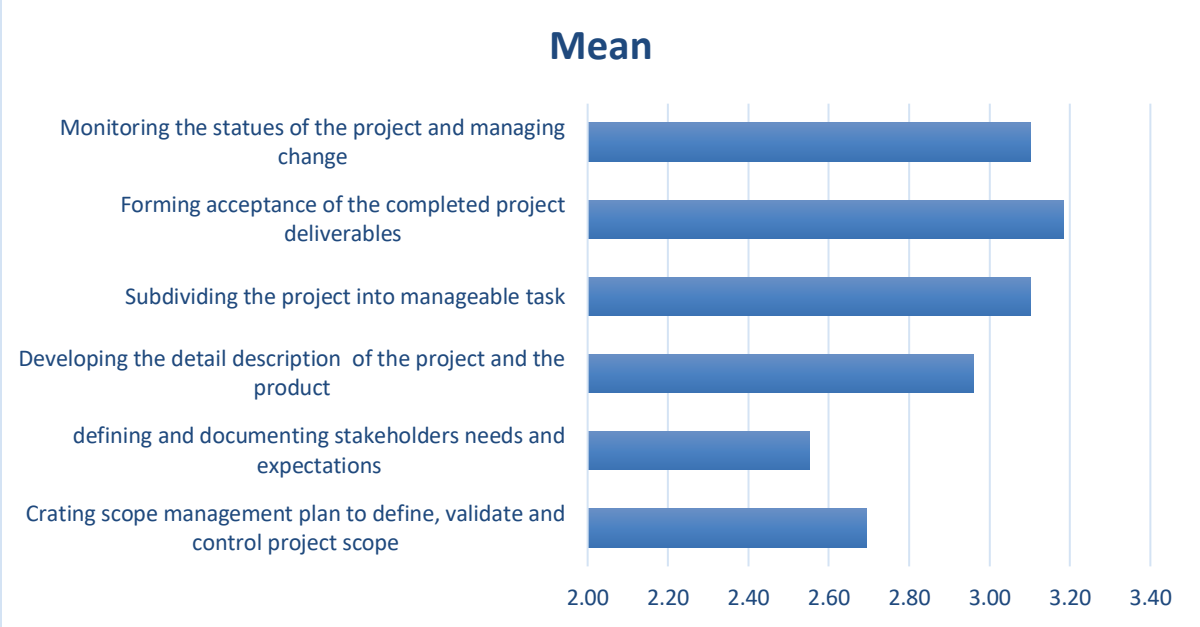

Figure 8: Descriptive Statistics PSM

iii. Maturity of project time or schedule management (PTM)

Project time management ensures completing a project on time, which is one of the major challenges for any project manager. It includes activity definition and sequencing, duration estimation, schedule development, and schedule control. The response for time management subcomponent such as estimating activity duration, estimating activity resources and developing a schedule for a project are at level three maturity. However, mean result for Defining the specific activities action to be performed to produce the project deliverables is

2.8 the overall project time management becomes at level two maturity. Even though the average time management for AAWSA; NSB was at level three (Organizational Standards and Institutionalized Process) the lowest maturity should be fulfilled first according to (Crawford, 2015). The overall indication of Level Two maturity of time management maturity for AAWSA; NSB is referred to as the existence of a basic process for projects but not required for project planning and scheduling. Standard scheduling approaches are utilized for large, visible projects.

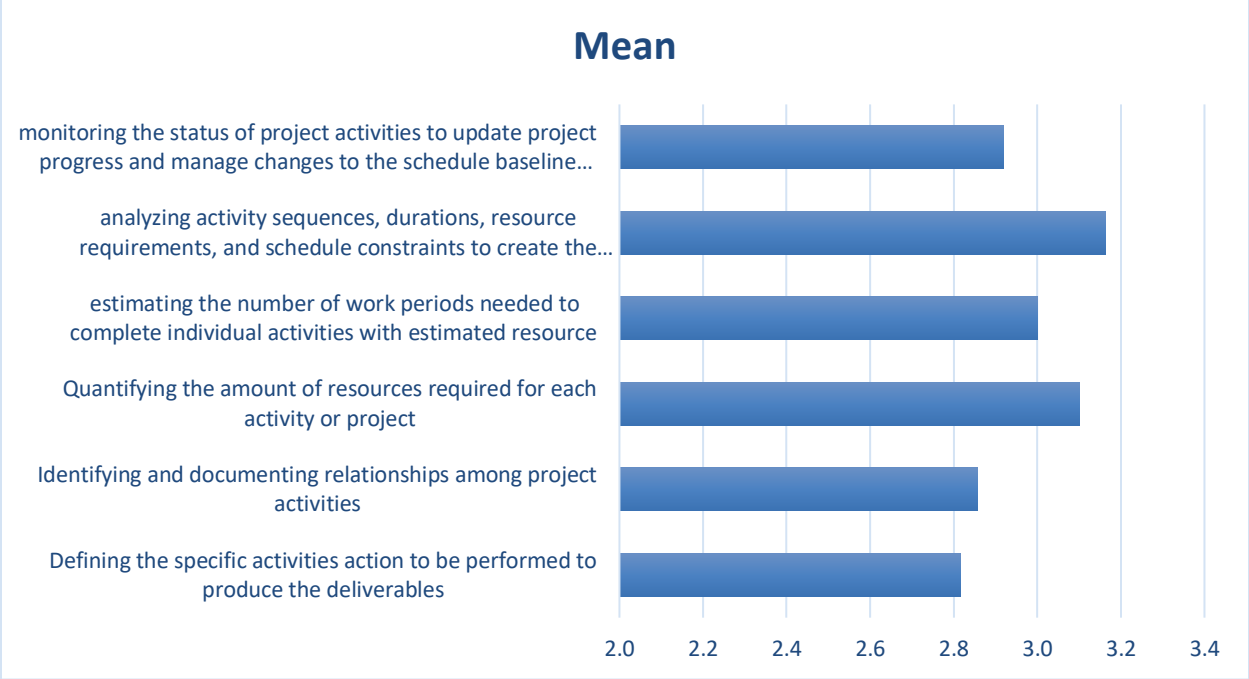

Figure 9: Descriptive Statistics PTM

iv. Maturity of Project Cost Management (PCM)

Project cost management ensures that the project is completed within the approved budget by planning, estimating, budgeting, financing, funding, managing, and controlling the project costs.

The finding of the research indicates that planning for cost management, estimating the approximate cost for the project have a mean of 2.75 and 2.75 respectively which implies that the organization should focus on estimating and planning project costs. Meanwhile the organization cost monitoring and controlling of its project cost is at level three maturity. The average mean 2.875 of cost maturity indicates overall project cost management of AAWSA; NSB is at level two maturity. The implication of level two maturity for cost management indicates that Cost estimating, reporting and performance measurement process have existed within the organization and identification of resource such as categorizing labor, equipment and material are documented, and monitoring of cost metrics process existed. However, these processes are not considered organizational standards.

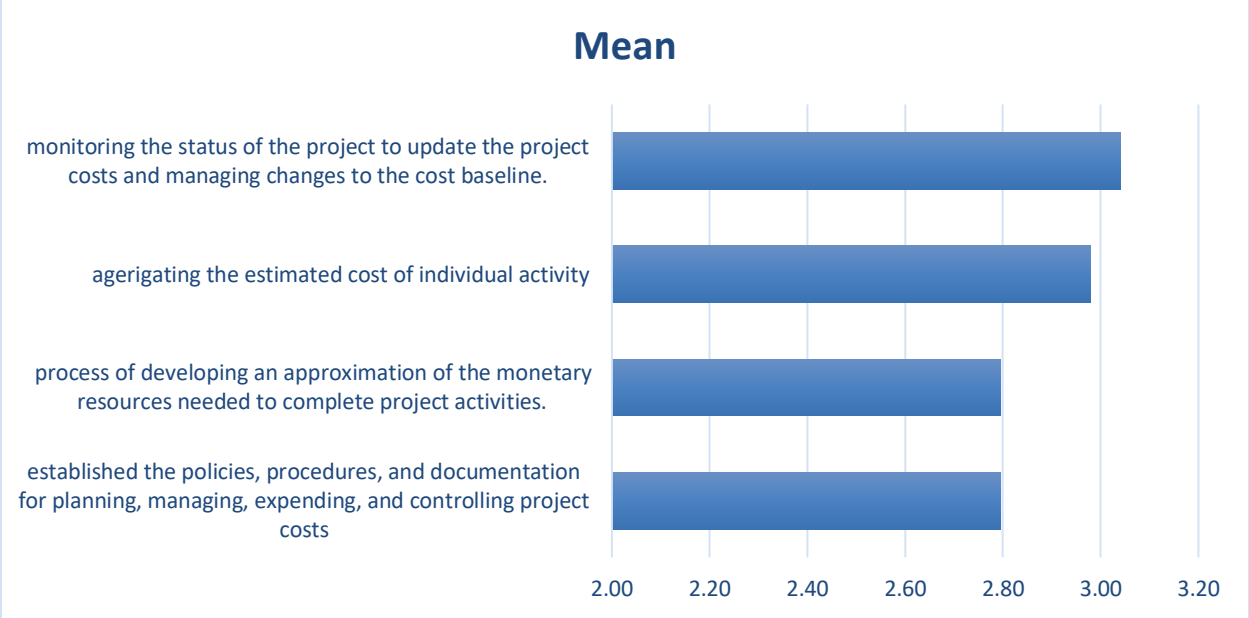

Figure 10 Descriptive Statistics PCM

v. Maturity of Project Quality Management (PQM)

Project quality management ensures that the project will meet or exceed all activities of the overall management function. It includes an overview of quality concepts and the cost of quality within the component of a quality management plan and statistical process control within the quality assurance component and finally variation and measurement, and quality improvement within the quality control component. The finding of the research indicates that the mean value of quality management plan, quality assurance, and quality control component of project quality management maturity was found 2.75, 2.55 and 2.95 respectively. The overall maturity of AAWSA; NSB was found 2.75 which indicates the organization is also at level two concerning the maturity of quality management. The implication of level two maturity for quality management indicates that adoption of quality policy for projects and implementation of quality control metrics to enhance project quality.

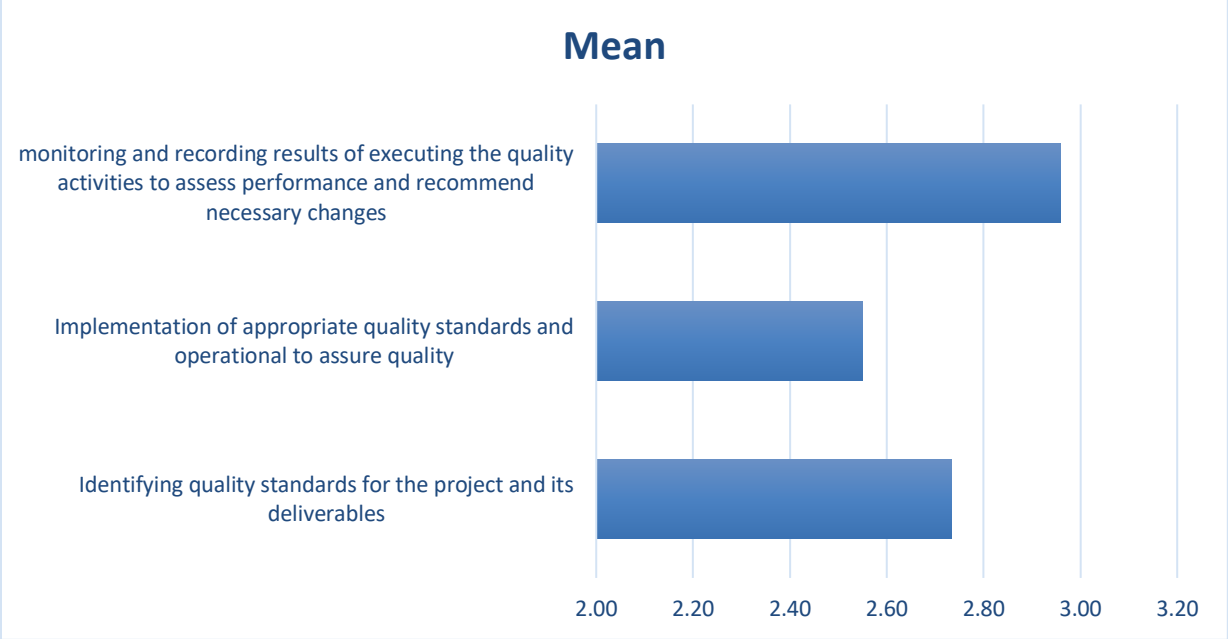

Figure 11: Descriptive Statistics PQM

vi. Maturity of Project Human Resource Management (PHRM)

Project human resource management ensures the most effective use of the people involved with the project. It is to manage, motivate, and organize people effectively. It includes assigning project roles and responsibilities, reporting organizational relationships, staffing, motivation, leadership, team development, and conflict resolution. Project human resource management maturity result revealed that all the requirements to project human resource management at AAWSA; NSB have maturity values which were averaged to 2.74 hence the organization is at level two maturity in terms of human resource management. It indicates that

existence of a repeatable process for managing and planning human resource.

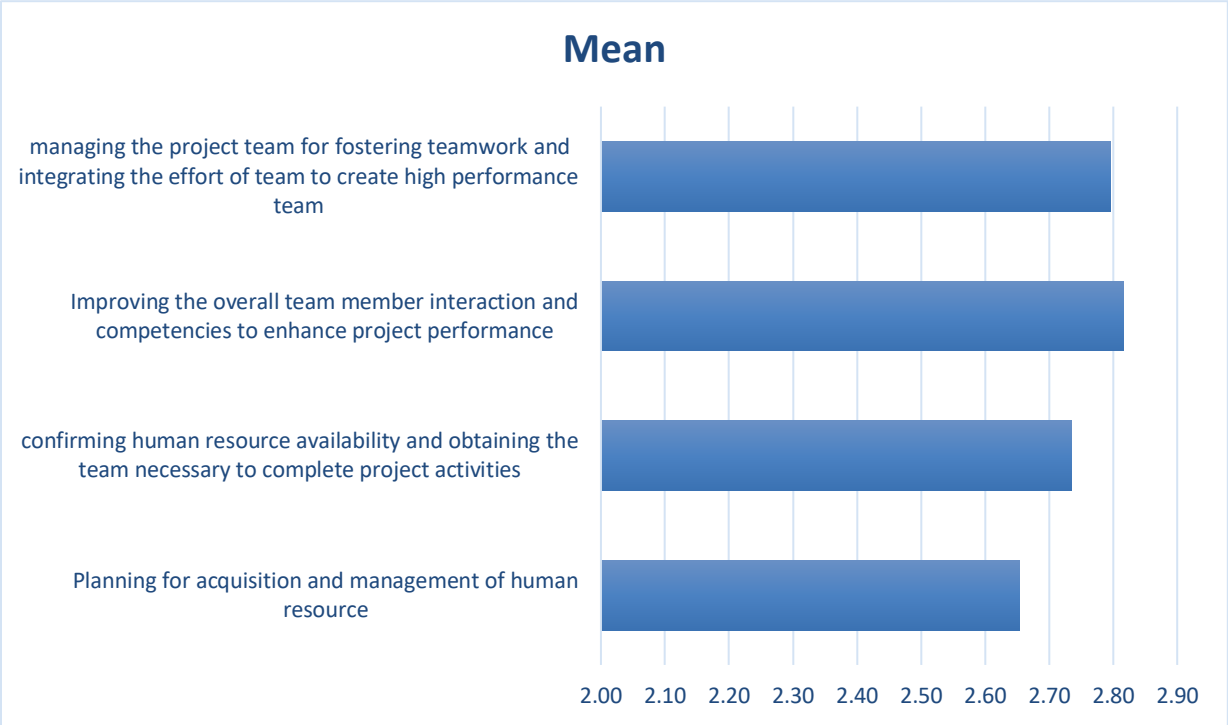

Figure 12: Descriptive Statistics PHRM

vii. Maturity of Project Risk Management (PRM)

Project risk management identifies, analyzes, and responds to project risk. It includes defining, identifying, and quantifying risk; formulating risk mitigation strategies; and developing appropriate risk response and control processes. The assessment indicates that the average maturity result for risk management is 2.36 which is the lowest result of the project management knowledge area also the sub-component risk management plan, risk identification qualitative, and quantitative risk analysis have the lowest mean of 2.35, 2.21,2.23 and 2.21 respectively. As for the AAWSA; NSB the overall risk management maturity, result and subcomponent of risk management maturity are found lowest relative to other knowledge areas. From the finding, it could be generalized that lack of risk management in the organization. Even though risk management maturity of the organization was lowest the overall organization risk management is at level two which implies risk management process is developed for the large and visible project and for a large project the project team member

understands some detail level risk and quantify the impact of risk.

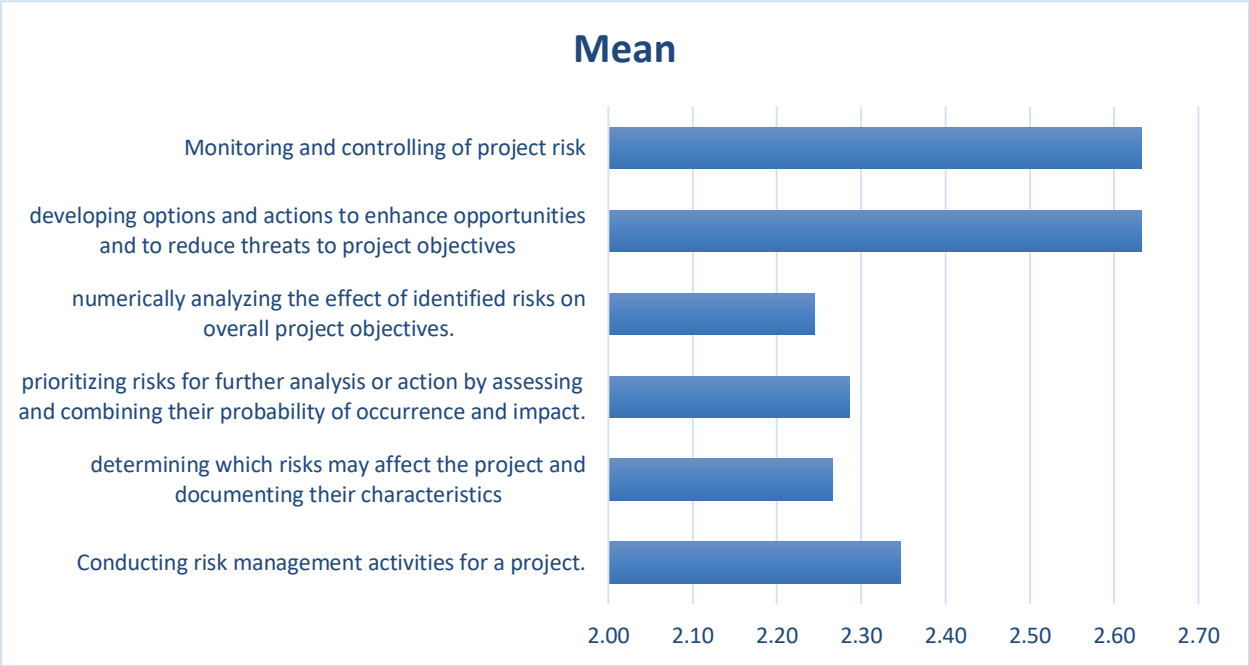

Figure 13: Descriptive Statistics PRM

viii. Maturity of Project Procurement Management (PPM)

Project procurement management ensures that goods and services from outside the performing organizations are acquired. It includes contract administration, contract risk, contract negotiations, configuration management, and contract termination. Procurement management involves planning for all purchases, acquisitions, and contracts. All the processes and actions of procurement planning must conform to the constraints of the overall organizational structure and policies.

The overall procurement management practice maturity of the organization is found to be at 2.82 which means the organization performs procurement management in a structured process but not in standard practice and contract are managed to appropriate detail level and there is a periodic report of the status of each contract.

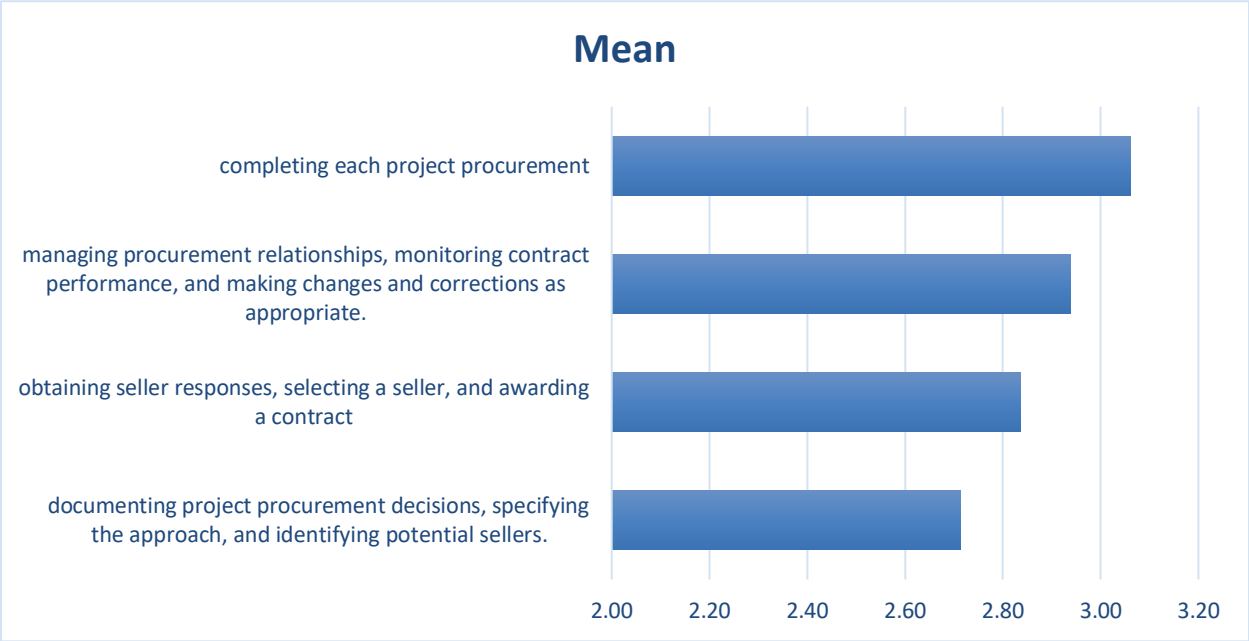

Figure 14: Descriptive Statistics PPM

ix. Maturity of Project Stakeholder Management (PSM)

Stakeholder management ensures that individual or group who may impact or impacted by a project are identified and engaged also address issues as they arise and manage engagement and control the expectation of stakeholders the process include identifying stakeholder, stakeholder management plan, managing stakeholder engagement and control stakeholder engagement.

The overall procurement management practice maturity of the organization is found to be at 2.76. which means the organization performs stakeholder management in a structured approach and project stakeholder are identified and analyzed but it varies from project to project also for high and visible project stakeholder management plan are developed.

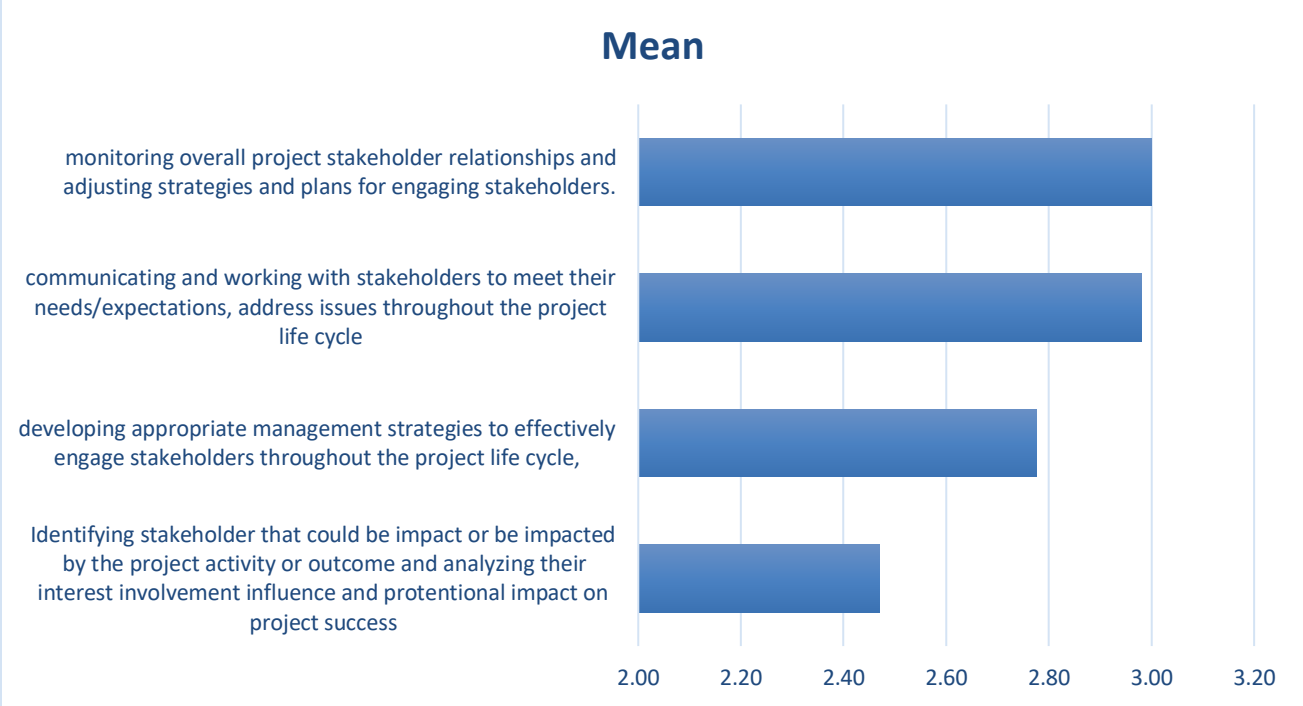

Figure 15: Descriptive Statistics PSM

x. Maturity of Project communication Management (PCOM)

Project communication management ensures timely and appropriate generation, collection, dissemination, storage, and disposition of project information. Open and clear communications are required among planners, implementers, and all levels of the organization for project success. It includes having a communication plan, information distribution path, progress reporting, and information sharing system for management and customers.

According to the research finding next to risk management maturity, the second-lowest maturity level was found for communication management maturity with an overall mean of from the subcomponent of communication management monitoring and controlling of communication through the entire project life cycle have average maturity at level three. The implication of maturity level two for communication management indicates that the organization established basic communication management and stakeholder are notified of the progress and status of the project regularly. Also, at this level for a high and visible project the organization management shares detailed information regularly for decision making.

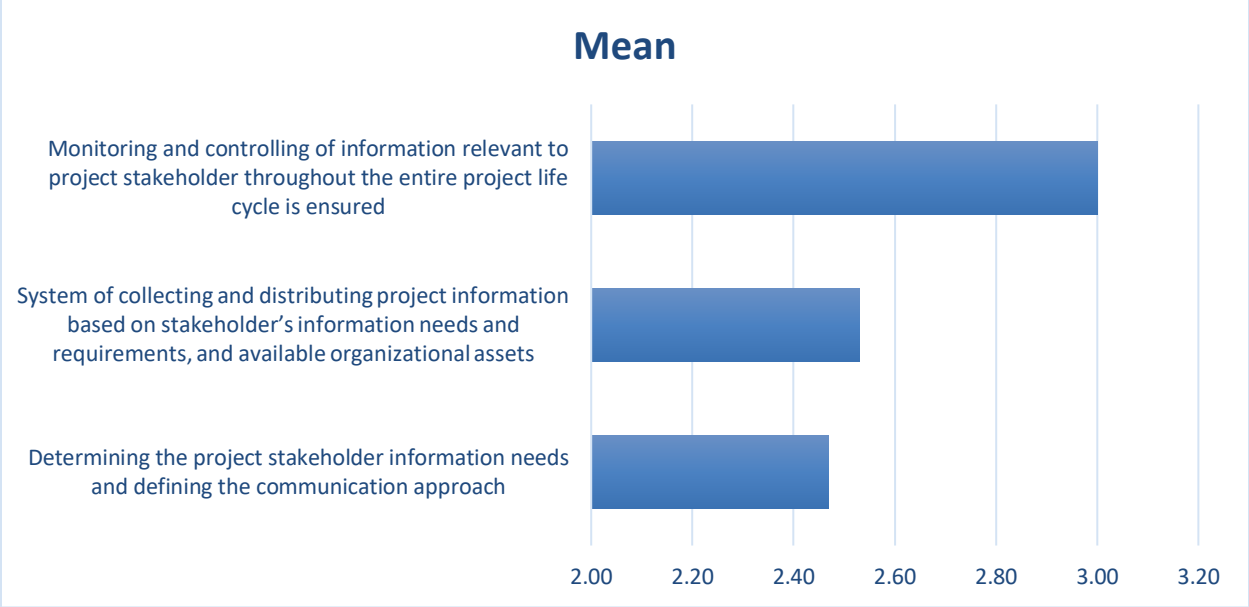

Figure 16: Descriptive Statistics PCOM

4.2.2 Maturity of Project management process groups

i. Maturity of Project Initiating Process (PIP)

Project initiation includes all the processes of defining the problem and opportunity, collecting and screening of project ideas, conducting cost and benefits analysis, making comparison and choosing the best project among others then if the project is approved the necessary arrangement will be made, the project team will be formed and the project management office will also be established.

The overall AAWSA; NSB process maturity level of project initiation reveals at a mean of 2.99. Project/organization defined, standard or basic Project management Process, Policy or direction or guideline that requires or recommends planning and performing projects and

Identification of all stakeholders are being done within the organization.

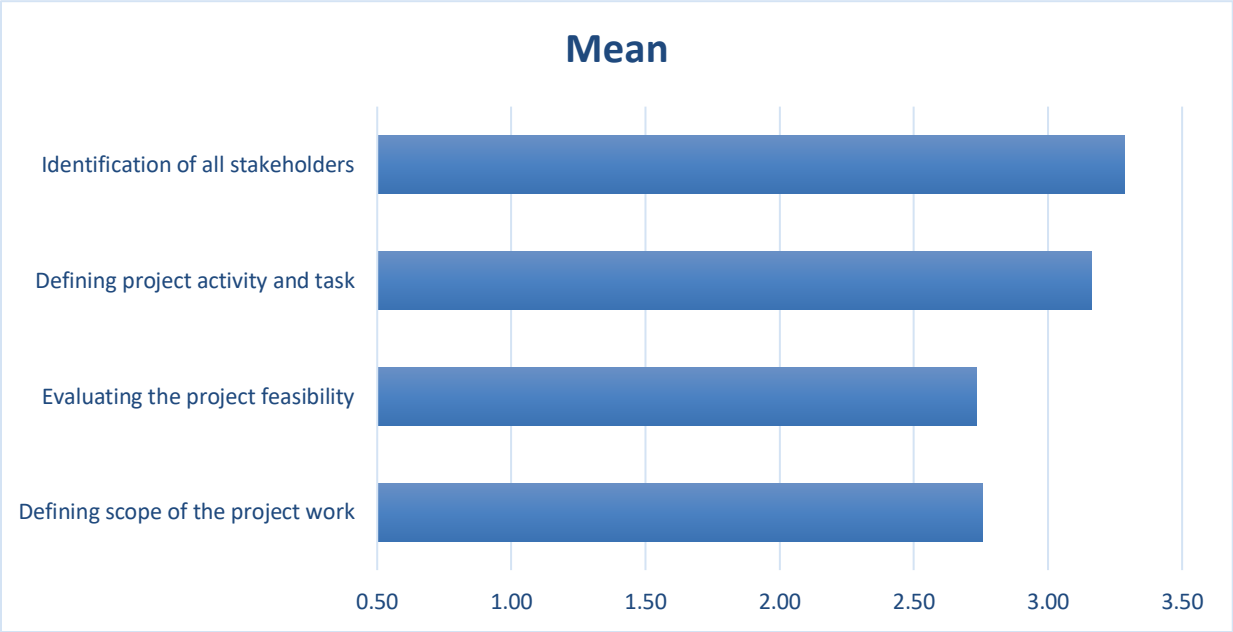

Figure 17: Descriptive Statistics PIP

ii. Maturity of Project Planning Process (PPP)

The project planning process leads to the development and maintenance of a workable scheme to accomplish the business needs for the project. It includes defining overall scope, identifying planning strategy, developing the work breakdown structure for cost and schedule, refining estimates and analyzing commitments, optimizing the project plan, developing risk management plans, and organizing the project team to establish a project-driven organization environment. The finding of the research indicates that planning phase components such as resource planning, planning for stakeholder involvement, and establishing project management plans have a mean result of 2.91, 2.6, and 3.1, respectively. The overall average mean is 2.87. It shows that AAWSA; NSB project planning phase at level two maturity.

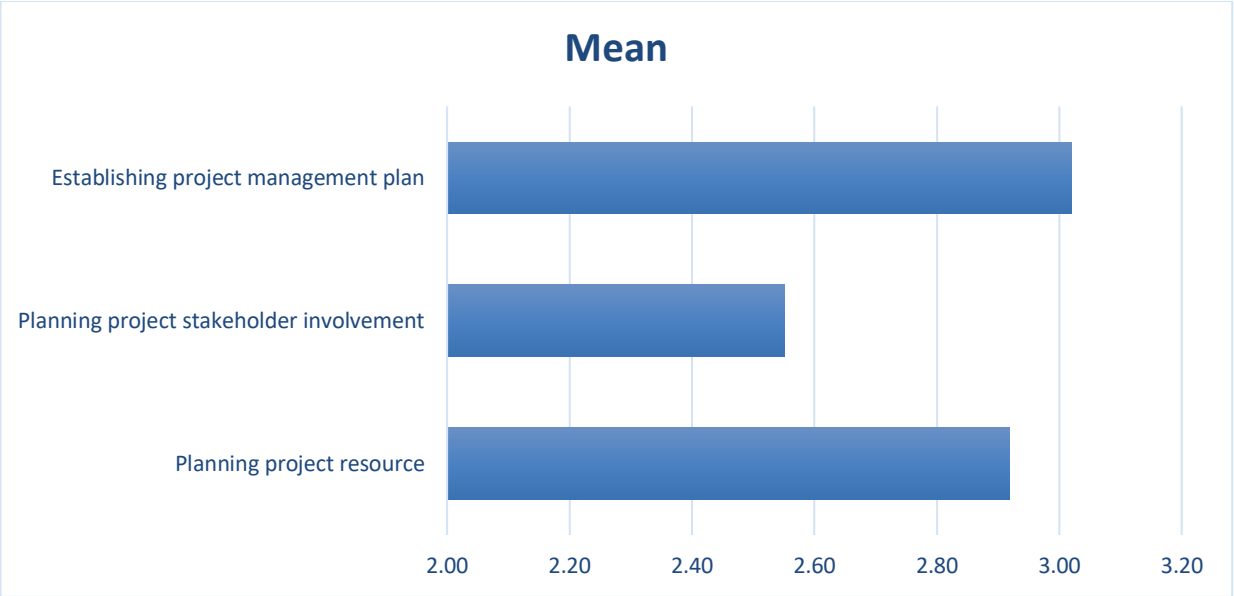

Figure 18: Descriptive Statistics PPP

iii. Maturity of Project Execution Process (PEP)

The project executing process coordinates an organization and other resources to carry out the project effectively. This process group involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan. Generally, the overall process maturity level of project execution shows at 2.85. The organization/project coordinates resources needed to perform project activities; Knowledge or experience of Peoples involved in performing projects is at level two. But the executing process group is the highest matured group among the five processes.

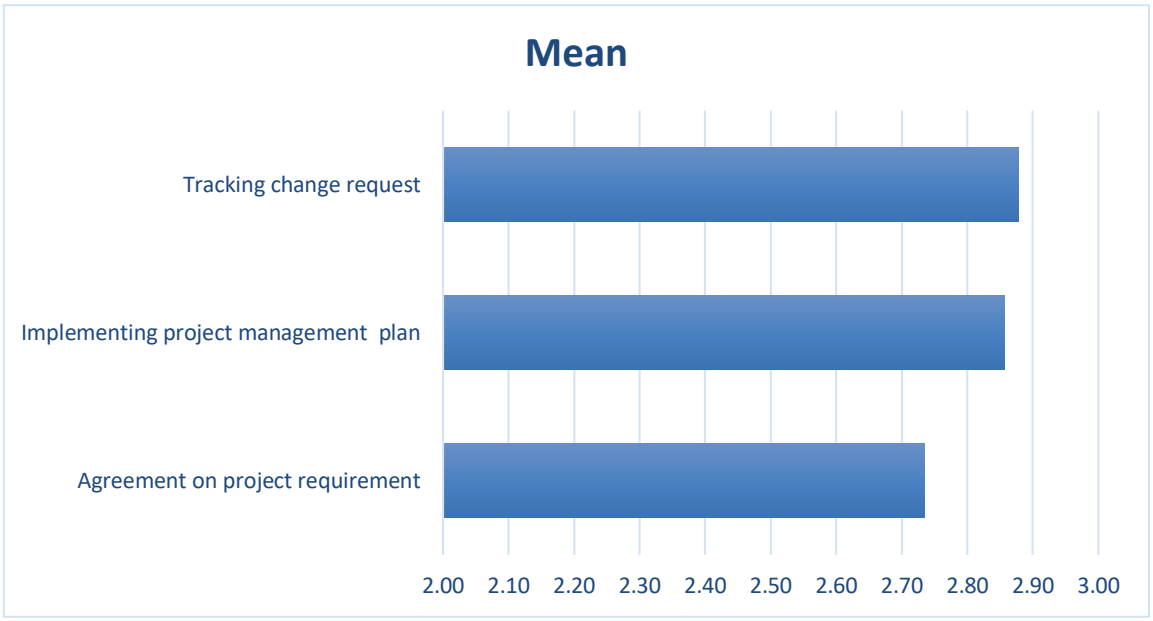

Figure 19: Descriptive Statistics PEP

iv. Maturity of project monitoring and controlling(evaluating) process (PMEP)

The project controlling process ensures that project objectives are met by measuring progress and taking corrective actions when necessary. It includes collecting project progress status, analyzing variances, and communicating project status. The overall process maturity level of project monitoring and controlling shows at 2.65 which implies that monitoring controlling of the project exists within the organization but lack standard process.

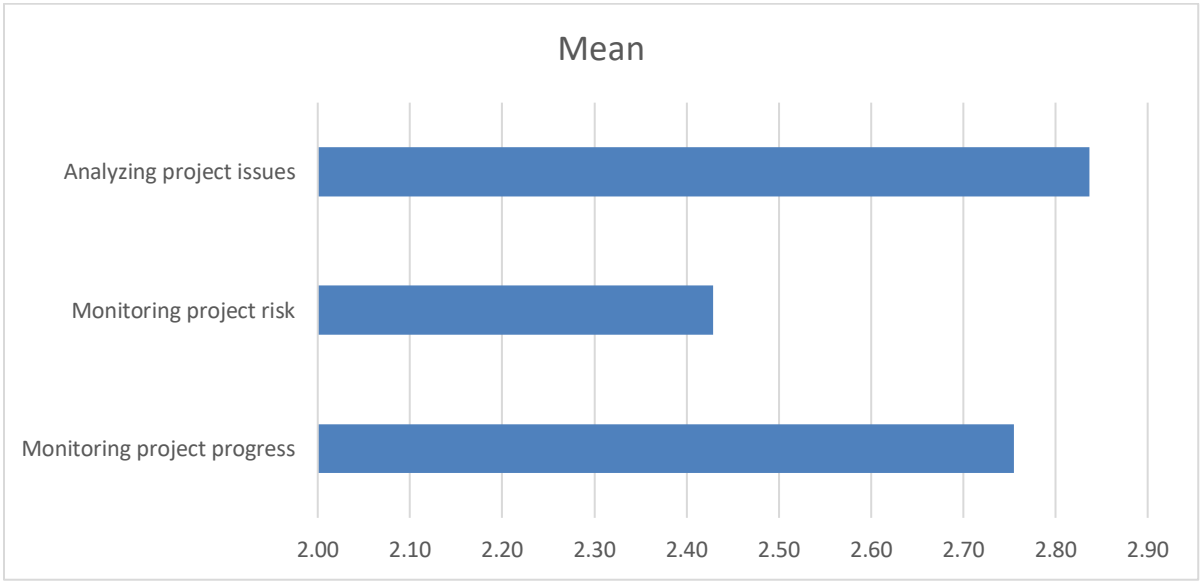

Figure 20: Descriptive Statistics PMEP

v. Maturity of Project completion Process (PCP)

The project closing process ensures formalizing acceptance of the project or phase and brings it to an orderly end. It includes contract closeout, the lessons learned documentation, and administrative closure. According to research result, maturity of project completion process has the lowest maturity with an average result of 2.47 maturity level two for project completion indicate informal closing of the project, lower level of information dissemination and documentation of project file also a lower level of lesson learned for a future project.

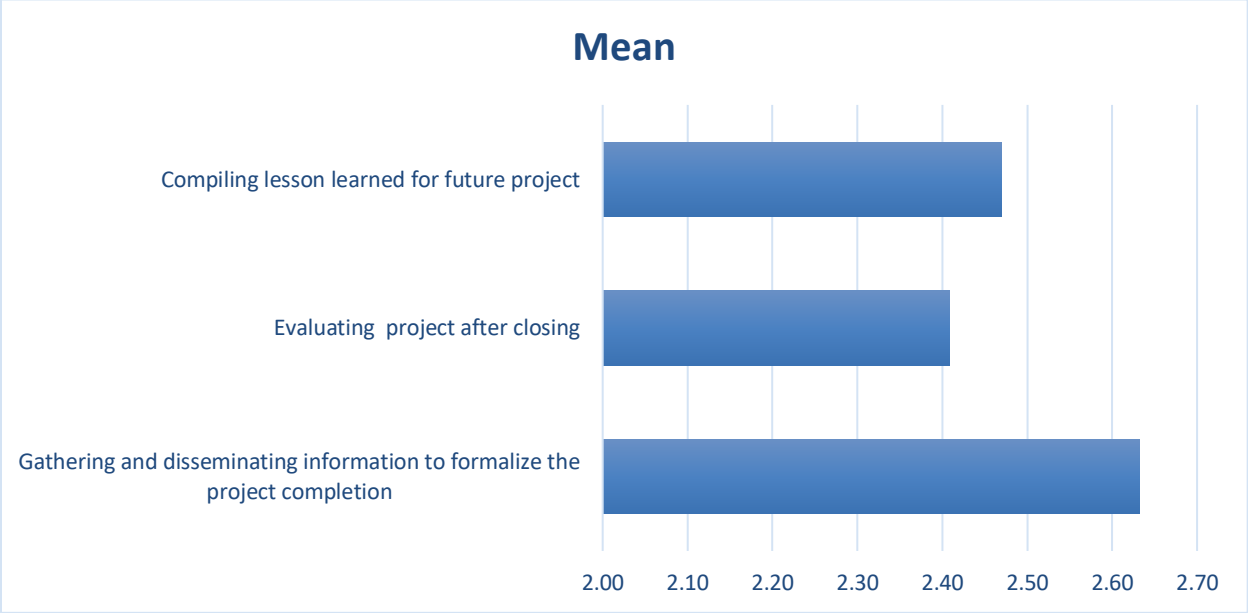

Figure 21: Descriptive Statistics PCP

4.3 Discussion

The overall mean values of all the ten knowledge areas are shown in Table7. The result shows that project time management was ranked the highest in terms of the project management body of knowledge practice maturity, followed by project scope management. Meanwhile, the two lowest areas of PMBOK practice maturity went to project communication management and project risk management.

The research result as shown in Table 8 for the project management process group the initiation process group was ranked highest maturity. Meanwhile project closing phase for organization ranked as the lowest maturity.

Table 7. Maturity level of project knowledge areas

Knowledge Area	**Mean**
Project integration management	2.84
Project scope management	2.9
Project time management	3
Project cost management	2.87
Project quality management	2.75
Project human resource management	2.73
Project risk management	2.3
Project procurement management	2.8
Project stakeholder management	2.76
Project communication management	2.66
Average	**2.77**

Table 8. Maturity level of process group

project management process	**Mean**
project Initiating Phase	2.99
project planning phase	2.87
project execution phase	2.85
project monitoring and control phase	2.65
project completion phase	2.47
Average	**2.76**

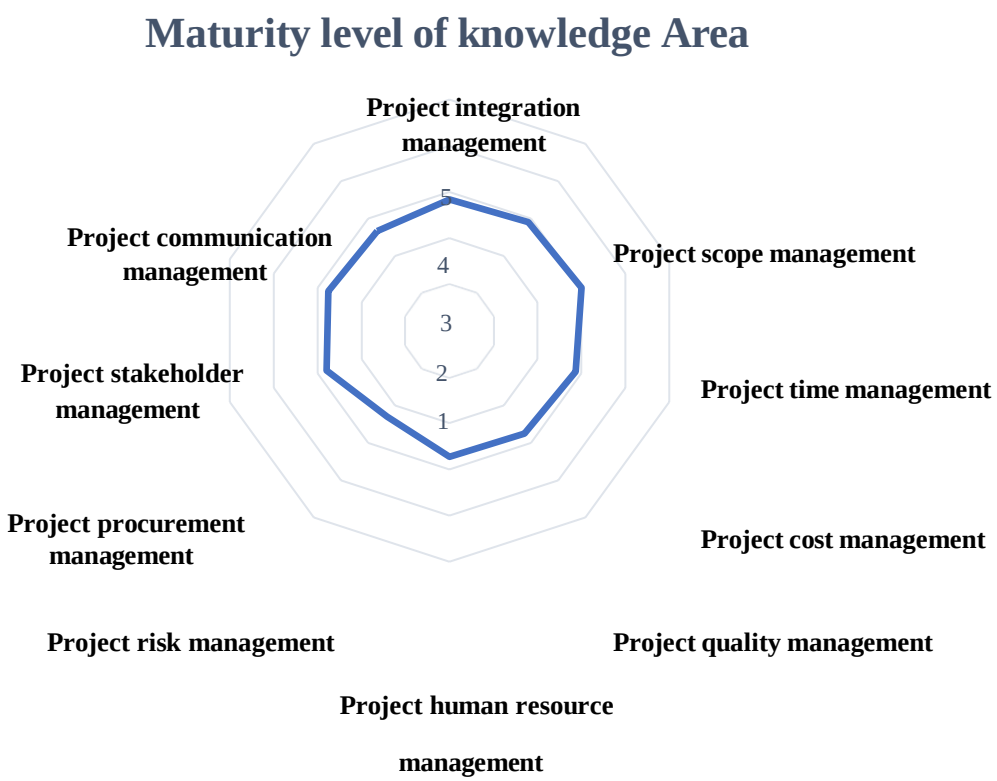

Figure 20 Maturity level of knowledge areas

Generally, the assessment of project management maturity for AAWSA; NSB concerning the project management body of knowledge maturity was found 2.77 and for project management process group maturity was found 2.76 hence, the overall maturity of AAWSA; NSB is at level two.

Accomplishing maturity level two in the practice of the knowledge area suggests that the existence of the project management process within the organization but lack organizational standards and application of project management is supported by the organization management. Also, large, and visible projects are executed systematically.

Table 9. Maturity level of knowledge areas of the organization.

Knowledge area	Level of maturity	Description
Project integration management	2	Structured process and standards
Project scope management	2	Structured process and standards
Project time management	3	Organizational standards and institutionalized
Project cost management	2	Structured process and standards
Project quality management	2	Structured process and standards
Project human resource management	2	Structured process and standards
Project risk management	2	Structured process and standards
Project procurement management	2	Structured process and standards
Project stakeholder management	2	Structured process and standards
Project communication management	2	Structured process and standards

The overall organizational maturity level is determined by picking the lowest level of the knowledge area (Crawford J. K., 2015) By observing the result in Table 9 except for time management most of the knowledge areas are at level two. The finding of this study agrees with the study of (Mullaly, 2006) which stated that 60% of the international organizations that practice project management fall under structured and standard maturity levels.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This thesis has tried to assess the level of maturity of project management practice and process in AAWSA; NSB water and sewerage line installation project. Based on the analysis result on the project management knowledge area and project management process group of the organization the study concludes the following points.

As shown in z above chapters the assessment of project management maturity for AAWSA; NSB concerning the project management body of knowledge maturity was found 2.77 and for project management process group maturity was found 2.76. Hence the overall project management maturity of the organization at level two maturity which indicate the organizational standard and process was achieved in all project management knowledge area however in some knowledge area such as lower result was observed for project risk management.

Project time management maturity and scope management maturity are relatively at a higher average than the rest knowledge area although the organization's average cost management maturity is relatively higher thus AAWSA; NSB is good in managing project scope, cost, and schedule or the three project constraints. This research also concludes that the project initiation process group of the organization is relatively at a higher level.

5.2 Recommendation

This study identifies the current maturity level of the organization project management practice maturity and project process group maturity and during a review of literature and analysis the study found better project management maturity is vital for project success also the study found a potential area of improvement of a component of each knowledge area. In this regard this research provides the following potential recommendations.

- To maintain its sustainability, the organization must shift from level two maturity to level three maturity because increasing the level of maturity can ultimately lead to greater project delivery success

- As the finding of the research indicate that for all knowledge area there exist basic process and lack organizational standard, therefore, to move towards higher maturity and better project success the organization should establish sub project directorate in each branch office which works integrated with the main project office of AAWSA. This use to set up guideline and standard for each project team to follow every project.

- It is recommended that the organization should pay more attention to improve risk management practice and should prepare risk management plans for each project and carry out risk identification and risk qualitative and quantitative analysis together with a risk response plan for each project. Further, it is recommended that the organization should carry out risk monitoring and control at the beginning of the project and should have risk management policies and procedures.

- To perform better in project success the organization should document previous project file and prepare lesson learned from each project so that the organization improve the current lower level in project closing phase.

- The research also recommends that the organization should review the current project management system by itself to identify the strength and weakness of the system

- Project management Maturity has evolved in the last decade or so as more and more maturity model has been introduced in recent years. Based on the findings and research work of this thesis assessment of more than two or more organization project management maturity using different models would be recommended. Also, it would be interesting to extend the research for evaluating the relationship between project performance and project management knowledge area.

Bibliography

Abebe, &. A. (2009). *Causes and effects of variations in Ethiopian federal road Projects.* Master's thesis, Addis Ababa University, Addis Ababa University.

Abebe, &. J. (2015). *Factors affecting time and cost overrun in road construction Project s in Addis Abaa. Addis. .* Addis Ababa University ., School of Civil and Environmental Engineering, , Addis Ababa.

Amanuel.N. (2020). Assesmnet of project stakeholder managmnet practice,the case of ADDIS ABABA water and sewarage authourity.

Brookes, N. B. (2014). The use of maturity models in improving project management performance. *The us International Journal of Managing Projects in Business, ,* 7(2), p.231–246.

Chrissis, M. B. (2011). *CMMI: Guidelines for process integration and product improvement. third edition.* Addison Wesley.

Colin Robson, K. M. (2016). *Real world research: a resource for social scientists and practitioner. 4th Edition.* Oxford: Blackwell Publishing.

Constantinescu, R. (2007). Capability maturity model integration. *Journal of Applied Quantitative Methods,,* 2(1), 187.

Cooke-Davies, T. J. (2007). *Project management maturity models the handbook of managing projects. .* New York : Wiley .

Crawford, J. K. (2007). *Project Management Maturity Model.* USA, New York: Auerbach Publications.

Crawford, J. K. (2021). *Project Management Maturity Model (4th ed.).* New York: Auerbach Publications. doi:https://doi.org/10.1201/9781003129523

Ebenezer, E.-B. &. (2019). Challenges of Project Management in Developing Countries. . *project Management Scientific Journal, , 3*(6), 84-88.

Ferreira, H. A. (2015). Maturity Evaluation in Project Management and Implementation of a PMO. *The International Journal of Business & Management, ,* 3(11), pp. 338-347.

Firehiwot, A. (2019). *PROJECTMANAGEMENT PRACTICES: A CASE STUDY OF ADDIS ABABA WATER AND SEWEARAGE.* Masters thesis, ST.MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES, FACULTY OF BUSINESS.

Gomes, T. F. (2015). Assessment of maturity in project management: . *A bibliometric study of main models. Procedia Compute science, ,* 5, 92-101.

Gottschalk, P. (2009). Maturity levels for interoperability in digital government. . *Government Inf.*, 26, 75-81.

Gray, C. F. (2018). *Project management : the managerial process. Seventh edition.* New York, NY :: McGraw-Hill Education.

Hillson, D. (2010). Assessing organizational project management capability. . *Journal of Facilities Management,* , 2(3), pp.298–311.

Institute, P. M. (2013). *Organizational Project Management Maturity Model (OPM3®) Knowledge Foundation Third Edition,.* Project Management Institute.

Jessen, A. E. (2003). Project maturity in organizations. *International Journal of Project Management,*, 21, 457-461.

Kerzner, H. (2009). *Project Management, A Systems Approach to Planning, Scheduling, and Controlling.* New York: John Wiley & Sons Inc. New York.

Kerzner, H. (2019). *Using the Project Management Maturity Model: Strategic Planning for Project Management, 3rd Edition.* USA, New Jersey:: John Wiley & Sons.

Kerzner.H. (2017). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 12th Edition.* John Wiley & Sons.

Man, T.-J. (2007). *A framework for the comparison of maturity models for project-based management.* Netherlands: Utrecht University.

Mateen, M. (2015). *Measuring Project Management Maturity A framework for better and efficient Projects delivery.* . MSc Dissertation,, Göteborg: Chalmers University of Technology., Sweden.

Mekonnen, B. (2015). *Assessment of cause and cost impact of change orders on road projects in Ethiopia.* thesis for partial fulfillment of M.Sc. degree , Addis Ababa University , School of Civil and Environmental Engineering, Addis Ababa.

Meredith J, S. M. (2021). *Project Management: A Managerial Approach, 11th Edition.* USA: John Wiley Son.

Moutawe.et.al, M. H. (2017). A SURVEY OF PROJECT MANAGEMENT MATURITY FOR CONSTRUCTION CONTRACTORS IN EGYPT: THE CURRENT STATUS. *Journal of engineering sectror, 12*(42), 1-13.

Muhammad, M. (2015). *Measuring Project Management Maturity - A framework for better and efficient Projects delivery. Master's Thesis* . Master's Thesis.

Naomi Brookes, R. C. (2009). Using Maturity Models to Improve Project Management Practice. *The Centre for Project Management Practice.* Orlando, Florida U.S.A: Aston University.

Peerasit Patanakul, B. I. (2010). An empirical study on the use of project management tools and techniques across project life-cycle and their impact on project success. *Journal of General Management, 36*(1), 41-65.

Pennypacker J.S. & Grant, K. (2009). Project management maturity: an industry benchmark. . *Project Management Journal,*, 34(1), 4-11 .

Pennypacker, K. P. (2008). Project management maturity: an assessment of project management capabilities among and between selected industries,. *IEEE Transactions on Engineering Management,*, 53, 59-68.

PMI. (2013). *A Guide to the Project Management Body of Knowledge PMBOK (Vol. Fifth Edition).*

Schindler, D. R. (2013). *Business Research Methods, 12th Edition.* McGraw-Hill Education.

Schlichter, J. (2015). *Organizational project management maturity model program plan.*

Seweryn Spalek. (2014). Assessing Project Management Maturity in the Area of Knowledge Management in Select Companies. *International Journal of Economics, Finance and Management Sciences, 2*(2), , pp. 164-170. doi:10.11648/j.ijefm.20140202.18

Staples, M. N. (2007). An exploratory study of why organizations do not adopt CMMI. . *Journal of systems and software,*, 80, 883-895.

Tewodros.A. (2017). *project management maturity in Ethiopian construction works corporation: the case of road construction projects.* Masters thesis, St. Mary's University. Addis Ababa:, project management .

Wagenstein, H. N. (2008). A capability maturity model for training & education. . *Paper presented at PMI® Global Congress 2008—EMEA, Newtown Square, PA: Project Management Institute.* Madrid, Spain.

Watt, A. (2015). *Project management: the criteria for success. 2nd edition.* The Saylor Foundatio.

Yimam, A. H. (2011). *project management maturity in the construction industry of developing countries (the case of Ethiopian contractors).* University of Maryland (College Park, Md.) , Civil Engineering. Digital Repository at the University of Maryland.

Yin., R. K. (2014). *Case Study Research Design and Methods (5th ed.)* . . Thousand Oaks: SAGE Publications.

Appendices

Appendix A

The study Questionnaires

Dear Respondent:

I am master's program student at ADDIS COLLAGE Project management department conducting research on Addis Ababa water and Sewerage Authority (AAWSA); Nifas-silk branch (NSB) water and sewerage line installation and replacement project. The research will investigate the following issues:

1.To what level each of the Project Management knowledge areas and processes are being applied in managing in the projects.

2. The areas that need focus for development and improvement of Project Management practice.

The research output will provide information about Project Management Maturity and Capability in all areas of project management body of knowledge: integration, scope, time, cost, quality, risk, communication, procurement stakeholder management.

In addition, the result provides a framework for prioritization and development of project management improvement.

Your precious time and effort in participating in this research will also contribute to the development and improvement of Project Management in your organization. Thus, you are kindly invited to fill out the questionnaire and return to the researcher.

Sincerely thank you

Leyla Abdulkadir

Part one- General Information

Direction: Please provide the required information on the space provided

GENDER	Male		**AGE**	< 25		
				25-30		
				30-35		
				35-40		
	Female			40-45		
				45-50		
				50-55		
				>55		
QUALIFICATION	DIPLOMA					
	DEGREE					
	MASTERS					
POSITION HELD	Project Engineer/Manager					
	Project Director					
	Project coordinator					
	Project team leader					
	Site engineer					
	Office engineer					
	Other					
PROJECT RELATED EXPERIENCE	1 to 5 years					
	6 to 10 years					
	11 to 15 years					
	16 to 20 years					
	20 and above					

Part two – project management practice maturity questions General direction Answer all the Questions that follow based on your knowledge of practice of Project Management in the project you are participating or in the organization you are working. Please choose the ascending maturity level one up to five based on the key characteristics which were taken from project management maturity model (Crawford, J.K., 2015).

N.B this part has four pages

Level 1: Initial process

- Ad hoc process (formed, arranged, or done for particular purpose only) without consistent and standardized procedures.

Level 2: structured process and standards

- Basic processes, not standard on all projects, used on large, highly visible projects
- Management supports and encourages use of processes, Estimates and schedules are based on expert knowledge and generic tools.

Level 3: organizational standards and institutionalized management

- All processes, standards for all projects and are repeatable
- Summary and detailed information, Estimates and schedules based on Industry standard.

Level 4: Managed process

- Process integrated with corporate process
- Management uses data to make decisions, estimates and schedules are normally based on organization.

Level 5: Optimizing process

- Process to measure project effectiveness and efficiency
- Process in place to improve project performance
- Management focuses on continuous improvement

N.B: Please put one ☑ for each question.

	PMMM Assessment Survey Checklist						
	Please put one ☑ for each question	**Project Management Maturity Levels**					
NO		**1**	**2**	**3**	**4**	**5**	
	Ten project management knowledge areas of PMBOK to assess Maturity level						
1	**Project Integration Management**						
1.1	Developing a document that formally authorizes the existence of a project and provides the project manager with the authority to apply Organizational resources to project activities.						
1.2	Defining, preparing, and coordinating all subsidiary plans and integrating them into a comprehensive project management plan.						
1.3	Leading and performing the work defined in the project management plan and implementing approved changes to achieve the project's objectives.						
1.4	Tracking, reviewing, and reporting the progress to meet the performance objectives defined in the project management plan						
1.5	Reviewing all change requests; approving changes and managing changes to deliverables and the project management plan and communicating their disposition						
2	**project scope management**						
2.1	Crating scope management plan to define, validate and control project scope						
2.2	defining and documenting stakeholders needs and expectations						

2.3	Developing the detail description of the project and the product					
2.4	Subdividing the project into manageable task					
2.5	Forming acceptance of the completed project deliverables					
2.6	Monitoring the statues of the project and managing change					
3	**project time/ schedule management**					
3.1	Defining the specific activities action to be performed to produce the deliverables					
3.2	Identifying and documenting relationships among project activities					
3.3	Quantifying the amount of resources required for each activity or project					
3.4	estimating the number of work periods needed to complete individual activities with estimated resource					
3.5	analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model					
3.6	Monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.					
4	**project cost management**					
4.1	established the policies, procedures, and documentation for planning, managing, expending, and controlling project costs					
4.2	Process of developing an approximation of the monetary resources needed to complete project activities.					

4.3	aggregating the estimated cost of individual activity					
4.4	Monitoring the status of the project to update the project costs and managing changes to the cost baseline.					
5	**project Quality management**					
5.1	Identifying quality standards for the project and its deliverables					
5.2	Implementation of appropriate quality standards and operational to assure quality					
5.3	monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes					
6	**project human resource management**					
6.1	Planning for acquisition and management of human resource					
6.2	confirming human resource availability and obtaining the team necessary to complete project activities.					
6.3	Improving the overall team member interaction and competencies to enhance project performance					
6.4	managing the project team for fostering teamwork and integrating the effort of team to create high performance team					
7	**Project Risk Management**					
7.1	Conducting risk management activities for a project.					
7.2	determining which risks may affect the project and documenting their characteristics					
7.3	Prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.					

7.4	numerically analyzing the effect of identified risks on overall project objectives.					
7.5	developing options and actions to enhance opportunities and to reduce threats to project objectives					
7.6	Monitoring and controlling of project risk					
8	**Project Procurement Management**					
8.1	documenting project procurement decisions, specifying the approach, and identifying potential sellers.					
8.2	obtaining seller responses, selecting a seller, and awarding a contract.					
8.3	managing procurement relationships, monitoring contract performance, and making changes and corrections as appropriate.					
8.4	completing each project procurement					
9	**Project Stakeholder Management**					
9.1	Identifying stakeholder that could be impact or be impacted by the project activity or outcome and analyzing their interest involvement influence and protentional impact on project success					
9.2	developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle,					
9.3	communicating and working with stakeholders to meet their needs/expectations, address issues throughout the project life cycle					
9.4	monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders.					

10	**Project Communications Management**					
10.1	Determining the project stakeholder information needs and defining the communication approach					
10.2	System of collecting and distributing project information based on stakeholder's information needs and requirements, and available organizational assets					
10.3	Monitoring and controlling of information relevant to project stakeholder throughout					
	Project management process maturity level	**Maturity Levels**				
	Five PMBOK Process groups Key Process Characteristics					
1	**PROJECT INITIATION PHASE**	**1**	**2**	**3**	**4**	**5**
1.1	Defining scope of the project work					
1.2	Evaluating the project feasibility					
1.3	Defining project activity and task					
1.4	Identification of all stakeholders					
2	**PROJECT PLANNING PHASE**					
2.1	Planning project resource					
2.2	Planning project stakeholder involvement					
2.3	Establishing project management plan					
3	**PROJECT EXECUTION PHASE**					
3.1	Agreement on project requirement					
3.2	Implementing project management plan					

3.3	Tracking change request					
4	**PROJECT MONITORING AND CONTROL PHASE**					
4.1	Monitoring project progress					
4.2	Monitoring project risk					
4.3	Analyzing project issues					
5	**PROJECT COMPLETION PHASE**					
5.1	Gathering and disseminating information to formalize the project completion					
5.2	Evaluating project after closing					
5.3	Compiling lesson learned for future project					

Appendix B

Analysis result

1. Descriptive Statistics PIM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
developing a document that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.	60	4.00	1.00	5.00	2.7333	1.10264
defining, preparing, and coordinating all subsidiary plans and integrating them into a comprehensive project management plan.	60	4.00	1.00	5.00	2.8833	.99305
leading and performing the work defined in the project management plan and implementing approved changes to achieve the project's objectives.	60	3.00	1.00	4.00	2.5333	.94719
tracking, reviewing, and reporting the progress to meet the performance objectives defined in the project management plan	60	4.00	1.00	5.00	3.0000	.99149

reviewing all change requests; approving changes and managing changes to deliverables and the project management plan and communicating their disposition	60	4.00	1.00	5.00	3.0833	1.06232
Valid N (listwise)	60					

2. Descriptive Statistics PSM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Crating scope management plan to define, validate and control project scope	60	4.00	1.00	5.00	2.7167	1.12131
defining and documenting stakeholders needs and expectations	60	4.00	1.00	5.00	2.5000	1.01681
Developing the detail description of the project and the product	60	4.00	1.00	5.00	2.9667	.97366
Subdividing the project into manageable task	60	4.00	1.00	5.00	3.0667	1.23325
Forming acceptance of the completed project deliverables	60	4.00	1.00	5.00	3.2000	.97076
Monitoring the statues of the project and managing	60	4.00	1.00	5.00	3.0667	1.10264
	60					

3. Descriptive Statistics PTM

	N	Range	Minimum	Maximum	Mean	Std. Deviation

Defining the specific activities action to be performed to produce the deliverables	60	4.00	1.00	5.00	2.8000	1.13197
Identifying and documenting relationships among project activities	60	4.00	1.00	5.00	2.8333	1.09183
Quantifying the amount of resources required for each activity or project	60	4.00	1.00	5.00	3.1667	1.09183
estimating the number of work periods needed to complete individual activities with estimated resource	60	4.00	1.00	5.00	3.0833	1.16868
analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model	60	4.00	1.00	5.00	3.1667	1.02786
monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.	60	4.00	1.00	5.00	2.9500	.96419
Valid N (listwise)	60					

4. Descriptive Statistics PCM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
established the policies, procedures, and documentation for planning, managing, expending, and controlling project costs	60	4.00	1.00	5.00	2.7500	1.00212
process of developing an approximation of the monetary resources needed to complete project activities.	60	4.00	1.00	5.00	2.7500	1.08339
aggregating the estimated cost of individual activity	60	4.00	1.00	5.00	2.9333	1.11791
monitoring the status of the project to update the project costs and managing changes to the cost baseline.	60	4.00	1.00	5.00	3.0667	1.19131
	60					

5. Descriptive Statistics PQM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Identifying quality standards for the project and its deliverables	60	4.00	1.00	5.00	2.7500	1.37317
Implementation of appropriate quality standards and operational to assure quality	60	4.00	1.00	5.00	2.5500	1.25448
monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes	60	4.00	1.00	5.00	2.9500	1.38301
Valid N (listwise)	60					

6. Descriptive Statistics PHRM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Planning for acquisition and management of human resource	60	4.00	1.00	5.00	2.6500	1.19071
confirming human resource availability and obtaining the team necessary to complete project activities	60	4.00	1.00	5.00	2.7500	1.17351

Improving the overall team member interaction and competencies to enhance project performance	60	4.00	1.00	5.00	2.7833	1.13633
managing the project team for fostering teamwork and integrating the effort of team to create high performance team	60	4.00	1.00	5.00	2.7667	1.19840
Valid N (listwise)	60					

7. Descriptive Statistics PRM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Conducting risk management activities for a project.	60	4.00	1.00	5.00	2.3500	1.20486
determining which risks may affect the project and documenting their characteristics	60	3.00	1.00	4.00	2.2167	.95831
prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.	60	4.00	1.00	5.00	2.2333	1.07934
numerically analyzing the effect of identified risks on overall project objectives.	60	4.00	1.00	5.00	2.2167	1.09066
developing options and actions to enhance opportunities and to reduce threats to project objectives	60	4.00	1.00	5.00	2.5833	1.02992
Monitoring and controlling of project risk	60	4.00	1.00	5.00	2.5667	1.35755

8. Descriptive Statistics PPM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
documenting project procurement decisions, specifying the approach, and identifying potential sellers.	60	4.00	1.00	5.00	2.6833	.96536
obtaining seller responses, selecting a seller, and awarding a contract	60	4.00	1.00	5.00	2.7667	.98060

managing procurement relationships, monitoring contract performance, and making changes and corrections as appropriate.	60	4.00	1.00	5.00	2.8500	.98849
completing each project procurement	60	4.00	1.00	5.00	2.9833	1.12734
Valid N (listwise)	60					

9. Descriptive Statistics PSM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Identifying stakeholder that could be impact or be impacted by the project activity or outcome and analyzing their interest involvement influence and protentional impact on project success	60	4.00	1.00	5.00	2.3833	1.04300
developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle,	60	4.00	1.00	5.00	2.7000	1.04638
communicating and working with stakeholders to meet their needs/expectations, address issues throughout the project life cycle	60	4.00	1.00	5.00	3.0167	.96536
monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging	60	4.00	1.00	5.00	2.9667	1.05713

stakeholders.						
Valid N (listwise)	60					

10. Descriptive Statistics PCOM

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Determining the project stakeholder information needs and defining the communication approach	60	4.00	1.00	5.00	2.4333	1.07934
System of collecting and distributing project information based on stakeholder's information needs and requirements, and available organizational assets	60	3.00	1.00	4.00	2.5500	.92837
Monitoring and controlling of information relevant to project stakeholder throughout the entire project life cycle is ensured	60	4.00	1.00	5.00	3.0000	1.34038
Valid N (listwise)	60					

1. Descriptive Statistics PIP

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Defining scope of the project work	60	4.00	1.00	5.00	2.6667	1.00282
Evaluating the project feasibility	60	4.00	1.00	5.00	2.8000	1.23233

Defining project activity and task	60	4.00	1.00	5.00	3.2000	.81926
Identification of all stakeholders	60	4.00	1.00	5.00	3.3000	.86944
Valid N (listwise)	60					

2. Descriptive Statistics PPP

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Planning project resource	60	4.00	1.00	5.00	2.9167	1.18310
Planning project stakeholder involvement	60	4.00	1.00	5.00	2.6000	.96023
Establishing project management plan	60	4.00	1.00	5.00	3.1000	1.20310
Valid N (listwise)	60					

3. Descriptive Statistics PEP

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Agreement on project requirement	60	4.00	1.00	5.00	2.7833	1.18023
Implementing project management plan	60	4.00	1.00	5.00	2.8500	1.13234
Tracking change request	60	4.00	1.00	5.00	2.9167	1.23908
Valid N (listwise)	60					

4. Descriptive Statistics PMEP

	N	Range	Minimum	Maximum	Mean	Std. Deviation

Monitoring project progress	60	4.00	1.00	5.00	2.6833	.96536
Monitoring project risk	60	4.00	1.00	5.00	2.3667	1.00788
Analyzing project issues	60	4.00	1.00	5.00	2.9000	1.29798
Valid N (listwise)	60					

5. Descriptive Statistics PCP

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Gathering and disseminating information to formalize the project completion	60	3.00	1.00	4.00	2.6167	.99305
Evaluating project after closing	60	4.00	1.00	5.00	2.3333	1.09956
Compiling lesson learned for future project	60	4.00	1.00	5.00	2.4667	1.30795
Valid N (listwise)	60					