ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES

THE EFFECT OF PROJECT MANAGEMENT KNOWLEDGE AREAS ON THE PERFORMANCE OF KALITI PREFABRICATED HOUSING PROJECT

BY

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This is to certify that the thesis prepared by Kidus Dawit Asrat entitled: **"THE EFFECT OF PROJECT MANAGEMENT KNOWLEDGE AREAS ON THE PERFORMANCE OF KALITI PREFABRICATED HOUSING PROJECT"** and submitted in partial fulfillment of the requirements for degree of masters of project management complies the regulations of the university and meets the standards with respect to originality and quality.

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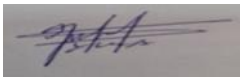
Dr. Yilkal Wassie		July 27 2024
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DECLARATION

I, the undersigned, declare that this research project, entitled "THE EFFECT OF PROJECT MANAGEMENT KNOWLEDGE AREAS ON THE PERFORMANCE OF KALITI PREFABRICATED HOUSING PROJECT", is my original work, prepared under the guidance of Dr.Maru Shete Bekele, (Associate Professor). All sources of material used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

Kidus Dawit Asrat _____ _____

Signature **Date**

St. Mary's University, Addis Ababa **June, 2024**

ENDORSMENT

This thesis has been submitted to St. Mary University, school of graduate studies for examination with my approval as a University advisor.

Dr. Maru Shete, Assoc. Professor

08 June 2024

Signature

St. Mary's University, Addis Ababa **June, 2024**

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List of Acronyms

ECWC	Ethiopian construction work corporation
HR	Human Resource
KPI	Key Performance Indicator
MOUDHD	Ministry of Urban Development Housing and Construction
PM	Project Management
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PPI	Project Performance Indicators
SPSS	Statistical Package for Social Science

Abstract

The goal of this study is to investigate how the Kaliti prefabricated house project is affected by project management knowledge domains, namely the iron triangle of cost, time, and scope. The study especially attempts to investigate and characterize the relationship between performance indicators of Kaliti Prefab housing and project cost management elements, project time management factors, and project scope management variables. The study used a quantitative research methodology and a causal research design. 37 structured, closed-ended survey questions were used in the survey, which was given to consultants and contractors working on Kaliti building construction projects. The causal link between variables influencing project performance and project performance indicators (construction cost, construction duration, and construction scope) was investigated using descriptive and multiple regression statistical techniques. The results of the regression analysis demonstrated that the building construction projects at Kaliti Prefabricated Housing are favorably and strongly impacted by project scope, project time, and project cost management aspects. Because of this, the study suggested that in order to improve the effectiveness, efficiency, and caliber of building construction projects at the Kaliti site, consultants and contractors should truly focus on resolving the correlates of project performances.

Keywords*:* project cost management factors, project time management factors, project scope management factors, project performance indicators, iron- triangle, and Kaliti prefab-housing project.

1. CHAPTER ONE: INTRODUCTION

1.1 Background of Study

In the words of Turner (1999), "a project is an endeavor in which human, financial and material resources are organized in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives."
The term project refers to to any temporary endeavor with the definite beginning and end depending on its complexity, it can be managed by a single person or hundreds. Also project is defined as a sequence of tasks that must be completed to attain a certain outcome (project management institute, 2022).

According to PMI (1994), project management involves applying knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations. It is the art of directing and coordinating human and material resources throughout the life of a project to achieve project objectives within specified constraints.
Kerzenr (2009) defines project management as the planning, organizing, directing, and controlling of company resources for a relatively short term objective that has been established to complete specific goals and objectives. Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements.

Project Management Institute, 2017 stated that Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes such as: initiating, planning, executing, controlling, and closing. The term project management is sometimes used to describe an organizational approach to the management of ongoing operations also referred to as management by projects.

Cheung et al (2004) identified project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication. It is obtained by Navon (2005) that a control system is an important element to identify factors affecting construction

project effort. For each of the project goals, one or more Project Performance Indicators (PPI) is needed.

Pheng and Chuan (2006) obtained that human factors played an important role in determining the performance of a project. Ugwu and Haupt (2007) remarked that both early contractor involvement (ECI) and early supplier involvement (ESI) would minimize constructability-related performance problems including costs associated with delays, claims, wastages and rework, etc.

The formal definition for KPIs according to Public Record Office Victoria (2010) is Key Performance Indicators (KPIs) are quantitative and qualitative measures used to review an organizations progress against its goals.

Construction supply chain companies will be able to benchmark their performance to enable them to identify strengths and weaknesses, and assess their ability to improve over time. The KPIs framework consists of seven main groups: time, cost, quality, client satisfaction, client changes, business Performance, health and safety (DETR, 2000).

According to Project Management Institute, 2017 the American standard, the key Project Management Knowledge Areas (PMKAs) needed to fully understand project management processes are Project Integration Management, Project Scope Management, Project Schedule Management, Project Cost Management, Project Quality Management, Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management, and Project Stakeholder Management.

The PMI framework of project management consists of 49 processes which are categorized in 10 knowledge areas as set out in the Project Management Body of Knowledge (PMBOK®, 6th edition). This is based on the philosophy that project management consists of one-off and recurring processes for which the PMBOK describes common good practices.

This article provides you with an overview of the 10 knowledge areas and 49 processes in a nutshell (PMBOK®, 6th ed.)

Project scope management: This knowledge area includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. Generally, managing the project scope is primarily concerned with defining and controlling what is and is not included in the project (PMI, 2013).

Project integration management: It includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups (PMI, 2013). This Knowledge Area addresses the glue that links all of the deliverables from the Process Groups into a unified whole (Wysocki, 2014).

Project time management: Project time management includes the processes required to manage the timely completion of the project (PMI, 2013). It provides time estimates for both the duration of a project task and the actual effort or labor time required completing the task. It also involves comparing estimated times to actual times as well as managing the schedule and cost variances (Wysocki, 2014).

(PMI, 2013) defines project management knowledge areas as the following separately, Project cost management: Project cost management includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget. Project quality management: Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities sothat the project will satisfy the needs for which it was undertaken.

Project procurement management: The processes necessary to purchase or acquire products, services, or results needed from outside the project team are included under project procurement management, Project communication management: Project communications management includes the processes that are required to ensure timely and appropriate planning, collection, creation, Evaluating project performance is an important factor in successful completion of a project, project performance is an ongoing review of the efficiency and importance of a given project, there are many ways to conduct these reviews but the overall measurement of whether a projecthas met objectives and requirement of cost, schedule and quality. distribution, storage, retrieval,management, control, monitoring, and the ultimate disposition of project information

Project human resource management: Project human resource management focuses on actions related to the human aspect of the project and, according to PMI (2013), it includes the processes that organize, manage, and lead the project team, Project risk management: Project risk management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project. Its objectives are to increase the likelihood and impact of positive events, and decreasethe likelihood and impact of negative events in the project (PMI, 2013).

Project stakeholder management: Project stakeholder management includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the

project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution (PMI, 2013).

We say the project is effective when it meets with the project objective in which it meets with the preferred quality, in a given budget and at a given time and to be sure that its effective we measure the performance of the project throughout the design period.

The linkage between project performance and project management knowledge area based on project management iron triangle, Furthermore, a term frequently mentioned in the project management literature is the Iron Triangle, which refers to the three major elements of or constraints to project management – time/schedule, cost, and quality (Duggal, 2011)

The Iron Triangle was originally conceived as a framework to enable project leaders to evaluate and balance the competing demands of cost, time, and quality within their projects (Atkinson, 1999). Over time, it became the favored method for defining and measuring project performance, with the general perception of project leaders being that only those three criteria are needed for a project to be successful (Pinto, 2010).

The Iron Triangle concept refers to the interdependence ofthree constraints: increasing quality may require an increase in time, which could lead to an increase in cost, while a fixed time schedule might result in a drop in quality and a subsequent increase in cost (Morris & Sember, 2008).

Although the strength of the Iron Triangle has often been examined with regard to other knowledge areas such as Scope or Performance (Badewi, 2016; Pinto, 2010; Pollack et al., 2018), it remains the dominant concept in project management.

On-time completion within budget, required quality standards and performance measured by customer satisfaction are all critical factors in the long-term success of a construction project. (Omran, 2012). This means that budgets and schedules are increasingly central to project management methodologies, while other aspects of performance are becoming more relevant.The major thing to not forget about iron triangle is all three of them(scope, cost, time) are elements of project management knowledge area.

Prefabricated houses, which are also called manufactured houses, prefab houses, or modular houses in the industry (Expressmodular.com) are units of houses manufactured in large factories, and then transported to the site where they can be put ready for transfer to another location or mounted on the ground through masonry groundwork. Mobile homes appeared on the scene in the early 1900s, when, in order to find jobs, people had to move frequently to wherever they could find employment.
The city government of Ethiopia’s capital, Addis Ababa, began building 5,000 affordable apartments. The flats located in a series of four and nine-storey buildings in the Akaki Kaliti district in the south of the city.

1.2 Statement of the Problem

According to research done by Akewushola, (2012), found that if these project management methods are well managed, there is a very high probability that there is a viable project that guarantees success. This includes scope of work, time, resources, costs, quality, communication, and risk and contract deliverable. Organizations rely heavily on an effective project management process.

There are three major problems that kaliti prefab housing project facing in the moment which are scope not meeting with standards, delay on the parts and finally cost overrun all the listed problem are related with the project management iron triangle as well as project management knowledge area.

In Ethiopia, 79.06 percent of projects had failed to meet their objectives (Getachews, 2015). Abadir (2011) found out that among the management knowledge areas of project in Ethiopia which determine the performance of the project, project time management is considered the critical one with only 24% projects managed well.

lack of understanding or definition of project task have been the problem throughout the project period and also inadequate planning by contractors and project managers is also the problem facing kaliti prefab project in addition incorrect estimation of project cost also the problem in kaliti prefab project the quality problem categorized under the listed problem of cost, scope and time.

The execution of most of the construction projects were not completed on time, within budget and desired quality Becker and Behailu (2006). Such problems lead to loss of profits, increasing cost and leading to technical and managerial problems between project parties. Abebe and Ayalew (2009) also revealed a gap in practice of basic project management body of knowledge areas.

Fetene (2008) examined factors that cause cost overrun during construction and their effects on public building construction projects in Ethiopia. Utilizing questionnaire survey of 70 completed public building construction projects in Ethiopia. The authors identified, and assessed the impact of cost overrun on the delivery of construction projects. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects.

According to a report by Federal Democratic Republic of Ethiopian, Ministry of Urban Development, Housing and Construction (2014) on project performance status evaluation stated

that among 14 public building projects under construction 8 projects, i.e. 57%, have failed to meet the planned percentage, (MOUDHD, 2014).

Change in defined scope, lack of proper planning, lack of proper evaluation of tender documents by contractors at tendering phase and contractor's financial problems were identified as major causes which affect the performance of the construction project. Abebe and Jemal (2015) stated that the most common effects of cost over run identified are delay, supplementary agreement, adverse relations among stake holders and budget shortfall of project owners.

Ethiopian construction Works Corporation was planning to complete the project in 12month period at a cost of around $80M or $16,000 for each, each but it have been taking 16month and not completed yet and also the cost also overrun and estimated that its cost about $21,000, we can put different reason for this including inflation of the economy but the major reason is in adequate estimation of cost, in appropriate time management of project and undefined scope of project, as a result this study is conducted to identify sources of problems and come up with recommendation.

Kaliti prefabricated housing have been passed through many difficulties which could be solved with proper utilization of project management knowledge area and also with understanding of the project management iron triangles we can secure project performance. Unfortunately, the research that had been done conducted to assess the effect of project management knowledge areas on the performance of kaliti prefabricated housing project wouldn't result the expected value.

As the researcher tried to mention in the above from 10 of project management knowledge area three of themare inclusive to iron triangle which is directly related to project performance and proper utilization of project cost, quality and also time management would definitely solve kaliti problem of cost overrun, given scope and delay in parts which results desired quality.

Various studies studied the causes and effects of cost overrun on public building construction project in Ethiopia; Siraw (2014) did studied the analysis of factors contributing to time overruns on building construction projects under Addis Ababa city Administration; Tekalign (2014) studied the role of project planning on project performance in Ethiopia. But, many studies which are conducted in this area of study ignore to study the project time, scope and cost (iron triangle) factors together on performance of a project. In addition, it is recommended to study and identify the most important factors affecting the performance of building construction projects.

In addition the contractor (the Ethiopian construction work corporation) has no or very little experience on prefab construction and no adequate research had been conducted to assess the effectiveness of project management knowledge areas on project performance in the organization. So effectiveness of project management knowledge areas are not fully understood and documented. With this backdrop, the current study has been taken up to study the effectiveness project management guidelines in kaliti prefab site

1.3 Objective of the Study

1.3.1 General Objective of the Study

The general objective of the study is investigating the level of effectiveness of project management knowledge areas on the performance of kaliti prefabricated housing project.

1.3.3 Specific objective of the study

- ✓ To identify time management practice in kaliti prefabricated housing project.
- ✓ To identify scope management practice in kaliti prefabricated housing project.
- ✓ To identify cost management practice in kaliti prefabricated housing project.
- ✓ To identify the relationship between project scope management with project cost management process on kaliti prefabricated housing project.

1.4 Research question

1. How to identify time management practice in kaliti prefabricated housing project?
2. How to identify scope management practice in kaliti prefabricated housing project?
3. How to identify cost management practice in kaliti prefabricated housing project?
4. How can we identify the relationship between project scope management with project cost management process on kaliti prefabricated housing project?

1.5 Scope and limitations of the Study

Conceptually this study focused on the three of the knowledge areas which are cost, time and scope project management knowledge area of project management at which I used the data from 2012 up to the end of 2022 and the geographical scope will be Akaki kaliti sub city in southern part Addis Ababa (kaliti prefab site).

In addition if we try to make it deep scope it limited to project managers on the site, consultants, engineers and every employee of the company on the site. The major obstacle that I faced could be non-availability of adequately published and documented data about effective project management knowledge areas on prefab houses by the contractor and also lack willingness to give information I need to analyze the data.

1.6 Significance of the study

It's expected that the finding of this study will help to take the corrective action to the existing problems and the gap in the project performance of kaliti prefabricated housing project. As a result I strongly believes that the findings of this study.

It will provide valuable information to the stakeholders (contractor, consultant, government) towards achieving the project within the specified time, budget, within therequired quality standards and scope. It provides a guide line for evaluating and monitoring the level of effectiveness of projectmanagement knowledge areas on kaliti prefabricated housing project.

Its serves as a spring board for those people who want to assess the impacts of properutilization of project management knowledge areas on performance of a project in thesimilar projects.

1.7 Organization of the thesis

The project work is organized into five chapters. Chapter one, which is the introductory part, presents background of the study, statement of the problem, objectives of the study, research questions, scope, limitation, and hypothesis and significance of the study. Chapter two comprises of literature review and quotes the various related works done in this area of study, take place about project process groups, project management success and all the important frame works and concepts. Chapter three which is the research methodology part covers research design, target population; sampling techniques, sample size and data collection tools. And chapter four which is data analysis and finding's part reveals findings and analysis from both qualitative and quantitative data collected from the instruments are analyzed and described exhaustively. The last chapter, chapter five that is the summery of findings, conclusions and recommendations.

CHAPTER TWO

2 LITERATURE REVIEW

Introduction

2.1 Conceptual Definition

2.1.1 Concepts and Definition of Project and Project Management

2.1.1.1 Project

Lock (1987), indicated that Projects have been part of the human scene since civilization started. Although some may argue the concept of a project the construction of the Tower of Babel or the Egyptian pyramids were some of the first "projects," or cave dwellers probably formed a project to gather the raw material for mammoth stew. However, it is certainly true that the construction of Boulder Dam and Edison's invention of the light bulb was projected by any sensible definition. Modern project management, however, is usually said to have begun with the Manhattan Project. Morris (1994) stated that managing a project has been one of the oldest and most repeated accomplishments.

A project as a problem is scheduled for a solution. Alternatively, he defined a project as a problem-solving instrument and that failure to define the problem properly is what sometimes gets us into trouble. The desired objective is not a problem by itself rather the solution is the objective. The key to a problem is that there is an obstacle that prevents you from closing the gap. A problem is a gap (achieving your objective) between where you are and where you want to be, with an obstacle that prevents easy movement to close the gap. Therefore, problem solving consists of ways of finding or overcoming, or getting around the obstacle. Projects have specific characteristics and rules in comparison to operational work Contemporary literature outline such findings and offer sample definitions, highlighting the uniqueness of every project.

Projects are temporary organizations, established to achieve desired goals and objectives resulting in project teams being also temporary, redundant, or reassigned after the completion project(J.M.juran1999). According to PMBOK (2000), a project has different characteristics. The first one is project is a one-time-activity whose main purpose is to solve a problem or to grasp an opportunity. Also, have start and endpoints. The project's success is highly affected by

stakeholder participation. So, the project has to be managed properly. The project manager is a responsible person to manage a project.

The PMBO Guide (2000) has added five new project management processes plan scope management, plan schedule management, plan stakeholder management, and control stakeholder management. United Nations Industrial Development Organization (UNIDO) has divided project cycles into phases and stages as follows. Pre-investment phase, Investment phase, and Operational phase.

The Baum Cycle (adapted by the World Bank in 1970): Have five stages. The breakdown of the phases in the project cycle is artificial. In reality, the process is continuous and iterative. The phases are: Identification, Preparation (feasibility study), Appraisal, Implementation, and Evaluation – added after a certain period. It involves an ex-post evaluation.

New Project Cycle (World Bank 1994): It has four phases Listening- Listen to the stakeholders, Piloting- trying it on a small scale, Demonstrating- demonstrating the pilot, and Mainstreaming duplicating the pilot.

According to Muszynska, (2016), a project can be considered to be any series of activities and tasks that: have a specific objective, with a focus on the creation of business value, to be completed within certain specifications, have defined start and end dates, have funding limits (if applicable), consume human and non-human resources (i.e., money, people, equipment), are multifunctional (i.e., cut across several functional lines) (Kerzner, 2006), defined PM as “Project management is the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives.

2.1.1.2 Project management

There are many definitions to project management, but the ,(PWG.Morris, 2006)defined PM as “the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder‟s needs and expectations from a project” Construction project management does not differ much from project management in general; Walker defined it as “The planning, Co-ordination and control of a project from conception to completion on behalf of a client requiring the identification of the client‟s objectives in terms of utility, function, quality, time and cost, and the establishment of relationships between resources, integrating, monitoring and controlling the contributors to the project and their output, and evaluating and selecting alternatives in pursuit of the client‟s satisfaction with the project outcome”.

Project management is accomplished through the use of processes as initiation, planning, executing, controlling, and closing which are also the project lifecycle. Construction project management was defined by walker in 200 and later re-emphasized by Farrell (2008) as the planning,Organizing and monitoring of a project from initiation to closing out (including commissioning) on behalf of a client requiring the identification of the client’s objective in terms

of utility, function, quality, time, and cost and the establishment of relationships between resources, integrating, monitoring and controlling the contributions to the project and evaluating and selecting a different alternative in pursuit of the client‘s satisfaction with the project outcome.

The application of project management practices has been identified as an effective approach that would help in improving competencies and efficiently complete projects (Arnabodi et al, 2004).

Construction project management is the planning, control, and coordination of a project from conception to completion (including commissioning) on behalf of a client. It is concerned with the identification of the client’s objectives in terms of utility, function, integration, monitoring, and control of the contributions to the project and their output, and the evaluation and selection of alternatives in pursuit of the client’s satisfaction with the project's outcome are fundamental aspects of project management. The success or failure of any construction project begins from the planning stage. While project management can be observed to be a growing discipline in Nigeria, periodic assessments of how projects are managed must be carried out from time to time. One way to assess how projects are managed is to assess the use of project management tools/ techniques in the execution of construction projects (Ayodele et al, 2015).

Windapo 2013 defines construction as a series of activities undertaken by construction companies (contractor and consultant) that produce or alter buildings, roads generally infrastructures. CDM (2015) defines a construction project as any other project, which includes all planning, designing, controlling, and management work involved in a project from the initiation until the project closing out and meet the client satisfaction.

Project management knowledge areas can be applied to construction projects to ensure successful project delivery by providing a framework for managing various aspects of a project. The Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) outlines 10 key knowledge areas that are essential for managing projects effectively.

According to the American standard, the key Project Management Knowledge Areas (PMKAs) needed to fully understand project management processes are Project Integration Management, Project Scope Management, Project Schedule Management, Project Cost Management, Project Quality Management, Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management, and Project Stakeholder Management (Project Management Institute, 2017). Every PMKA contains specific processes, practices, input, output, tools, and techniques, and together they complement each other to meet the project’s overall requirements and demands. The synergistic effect of these PMKAs is well known in project practice and science, despite some PMKAs often being singled out as “more important” than others. For example, it is often said that project management focuses on

delivering a product according to defined scope, time, cost, and quality (Project Management Institute, 2017; Wysocki, 2019; Zidane & Olsson, 2017).

In the project, there are core concept areas and knowledge areas. Moreover, managing the iron Triangle is important in project management success. In addition, this paper more focuses on the planning and controlling of the iron triangles (time, cost, quality). A project plan cannot be simply prepared without applying methodology or tools.

A methodology is an approach used to facilitate the preparation of the project plan. PIM (2013) revealed that organizations underestimate project management and put an inadequate focus on project management development. An effective approach that would help to improve management competencies is the application of project management in the project. (Arnaboldi et al, 2004). Olateju et al. (2011), noted that because of the unique nature of a project there may not be a preexisting blueprint for the project‘s implementation and a need to repeat the project once completed.

Furthermore, a term frequently mentioned in the project management literature is the Iron Triangle, which refers to the three major elements of or constraints to project management – time/schedule, cost, and quality (Duggal, 2011; Pollack et al., 2018; Shenhar & Dvir, 2007). The Iron Triangle was originally conceived as a framework to enable project leaders to evaluate and balance the competing demands of cost, time, and quality within their projects (Atkinson, 1999). Over time, it became the favoured method for defining and measuring project performance, with the general perception of project leaders being that only those three criteria are needed for a project to be successful (Pinto, 2010).

The Iron Triangle concept refers to the interdependence of three constraints: increasing quality may require an increase in time, which could lead to an increase in cost, while a fixed time schedule might result in a drop in quality and a subsequent increase in cost (Morris & Sember, 2008). Although the strength of the Iron Triangle has often been examined with regard to other knowledge areas such as Scope or Performance (Badewi, 2016; Pinto, 2010; Pollack et al., 2018), it remains the dominant concept in project management.

2.1.1.3 Project management knowledge areas

1. **Project Communication Management**

Communication is an essential precondition to work on a project. Project Communication Management involves planning communications, managing communications, and monitoring communications (Project Management Institute, 2017). This is not simply a process of information exchange, but rather a knowledge area that also encompasses processes needed to ensure the timely and proper planning of, search for, collection, creation, storage, management,

control, monitoring and, ultimately, use of project information. Effective communication can help to achieve considerable cost savings and reduce project duration (Yap & Skitmore, 2020).

Investigating project failures reveals that a lack of professional communication support at any stage of the project life cycle can lead to problems and project failure (eds. Trocki and Bukaha, 2016When it comes to starting a project, the most common issues are those related to a lack of identification of stakeholders, communication needs and their sources, and insufficient communication with key stakeholders.\

2. Project Risk Management

Every project has certain risks (Denicol et al., 2020; Rehman et al., 2020). A risk is an uncertain event or condition that, if it occurs, can have a positive or negative effect on project objectives. Hence, risk management is a component of project management.

Risks are common causes of Project Delays or cost overruns. Continuing on that theme, risk management should be viewed as a Management tool designed to improve planning, budgeting, performance management, and other core Business processes. Risk management also assists management in making more informed business Decisions about achieving strategic or operational Objectives, and may even highlight the need to change the strategy entirely due to an unacceptable level of risk.

According to the Project Management Institute (2017), risk management consists of the following steps: risk management planning, risk identification, qualitative and quantitative risk analysis, risk response planning, response implementation, and process monitoring and control. Although every risk has a certain probability of occurring and can have a certain impact on a project, high probability risks and high impact risks need to be especially monitored (Darwish & Zubari, 2020). As it is impossible to prevent some risks from happening, it is the task of project management to keep risk at a level that is acceptable to the project and its stakeholders.

3. Project Procurement Management

Project Procurement Management refers to the processes needed for procuring products, services, or deliveries from stakeholders outside the project team (Project Management Institute, 20In the delivery of infrastructure projects, procurement-related project management factors are also evident. Through survey questionnaires, Babatunde et al. (2012) identified three critical success factors in procurement management: a competitive procurement process, a thorough and realistic cost-benefit analysis, and transparency in the procurement process. Truong et al. (2008) found that large contractors used an effective procurement system that included well-prepared material procurement planning, clear documented solicitation, and transparent selection among potential suppliers, and well-managed relationships with suppliers in their study of

benchmarking approach. Truong et al. (2008) believe that more specific and detailed contract documents are essential for avoiding future disputes.

According to Manu et al. (2018), where procurement capacity deficiencies are prevalent in several SubSaharan African countries, challenges related to transparency, integrity, and accountability are among the topmost challenges affecting the effectiveness of public infrastructure procurement.

By carefully preparing and planning procurement, conducting procurement, and controlling procurement the most favourable supplier is selected (whose price does not necessarily have to be the lowest) (Lent, 2013; Owusu et al., 2020; Rane et al., 2019). This phase of project management should ensure that the project is managed in an efficient, sustainable and legally compliant manner.

4. Project Stakeholder Management

Project Stakeholder Management is the most recent PMKA (Project Management Institute, 2017). A project does not exist for itself but for specific stakeholders, such as a sponsor or owner who wishes to gain personal benefit from the project (profit, for example) or a customer who will consume (and pay for) project deliverables (Derakhshan et al., 2019). Often a project must meet certain legal regulations or gain public support. Hence, identifying key stakeholders and gaining their support is crucial to any project.

Top management support is one of the most important factors in project completion. Xaba(2011). Typically, the level of support provided by the functional manager is determined by the level of support provided by top management (Xaba, 2011). Pinto and Slevin (1987) identified top or divisional management support for the project, which has been communicated to all parties involved, as an important critical success factor.

To successfully deliver a project, managers need more than just technical knowledge; they need to be able to identify stakeholders and build and maintain a positive relationship with them. Various strategies can be used to engage stakeholders in a project. Stakeholders can be involved in developing the project charter and project scope statement, creating the project management plan, approving changes to the project and participating in the supervisory board for change, and establishing boundaries (Jayasuriya et al., 2020; Project Management Institute, 2017).

5. Project Integration Management

Project integration management can be simply defined as the framework that allows project managers to coordinate tasks, resources, stakeholders, changes and project variables. Project managers can use different tools to make sure there are solid project integration management

practices in place. For example, the project management plan is important for project integration because it works as a roadmap for the project to reach a successful end.

Project Integration Management is a project manager specific term. Whereas other Knowledge Areas can be managed by specialists (for example, cost analysis, scheduling specialists, risk management experts), Project Integration Management cannot be delegated or transferred (PMI, 2017). Hence A project manager should be identified and assigned as soon as possible, preferably while the project charter is being developed, and always before the project begins planning (PMI, 2017).

Once created, the project plan is approved by stakeholders and/or sponsors before it's monitored and tracked by the project management team.
Therefore, the standard identifies the processes that are considered good practices on most projects, most of the time. The standard also identifies the inputs and outputs that are usually associated with those processes.

Includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups. In the project management context, integration includes characteristics of unification, consolidation, communication, and integrative actions that are crucial to controlled project execution through completion, successfully managing stakeholder expectations, and meeting requirements. (Jayasuriya et al., 2020; Project Management Institute, 2017)

The project manager's skill, competency, and leadership are also important factors. According to XABA (2011), project managers are held accountable in most organizations for the successful completion of complete projects. This success is becoming increasingly dependent on project managers' ability to acquire and apply skills and competencies. Another significant challenge factor identified is a lack of clarity in goals and missions. The primary advantages of developing a Project Charter process are that it provides a direct link between the project and the organization's strategic objectives (PMI, 2017). The project management plan specifies how the project will be carried out, monitored, controlled, and completed (PMI, 2017). One of the challenges that prevent projects from being completed successfully is a lack of proper planning (Stephen, 2018).

Poor planning does not provide a coherent mechanism for project implementation. As a result, employers and team members are unsure what to do, when to do it, and how to do it at various stages of the project (Stephen, 2018). A detailed project plan should be documented, including how the Project Manager keeps track of information about each project, such as project time, cost, duration, client name, start and end date, requirements changes, and client comments and feedback. Monitoring and evaluation objectives that are not measurable cannot be used to evaluate project performance and achievements or to communicate project results (Tengan &Aigbavboa, 2016).Hence Limited monitoring and evaluation resources and budgetary

allocations, as well as poor data quality, gaps, and inconsistencies, are significant challenges identified for this study.

6. Project Scope Management

Project scope management entails the processes necessary to ensure that the project includes all of the work required, and only the work required, to successfully complete the project (PMI, 2017). The primary goal of project scope management is to define and control what is and is not included in the project. According to Mirza, Pourzolfagha, and Shahnazari (2013), a major contributor to failed projects is a lack of understanding or definition of project and product scope at the outset of the project.

A properly defined and managed scope results in the delivery of a quality product to stakeholders at an agreed-upon cost and within specified timelines. According to Mirza et al. (2013), a project scope addresses the work required to produce project deliverables. The project scope is limited to the work required to complete the project objectives.

A product scope, on the other hand, is the attributes and characteristics of the project's deliverables. The product scope is determined by the requirements; whereas the project scope is determined by the project plan. There is little chance of success without an agreed-upon and documented vision. Each project must clearly define and document its scope in order for the project to move forward in a coordinated manner and requirements to be written (Mirza, et al., 2013).

Project scope management is one of the most important project management knowledge areas. It consists of managing your project scope, which refers to the work that needs to be executed in a project. To manage your project scope, you'll need to build a project scope management plan, a document where you'll define what will be done in your project.

To start building your scope management plan, begin by writing a scope statement. This statement is anything from a sentence to a bulleted list that's comprehensive to reduce major project risks. Another part of this area is a work breakdown structure (WBS), which is a graphic breakdown of project work.

Validate scope during the project, which means making sure that the deliverables are being approved regularly by the sponsor or stakeholder. This occurs during the monitoring and controlling process groups and is about accepting the deliverables, not the specs laid out during planning. Includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. (Jayasuriya et al., 2020; Project Management Institute, 2017)

7. Project time management

Ikediashi et al (2014) stated that schedule delays, also known as time overruns, are the highest challenge factor and are considered critical to the failure of projects. Furthermore, inadequate planning by contractors and project managers, poor site management by contractors, insufficient experience managing projects, and delays in client payments to contractors are factors that contribute to schedule delays. Ikediashi et al (2014).

In their study (Hong and SUN, 2006), they identified control measures for effective mass infrastructure project time management. Examine the overall construction progress organization provided by the main contractor, as well as the critical path and milestones of the schedule network. Dynamically monitor project execution in accordance with annual, seasonal, and monthly schedule reporting. Furthermore, use a computer-aided system to manage the schedule, network control, and check construction progress records every day, every week, and every month. Arrange the lag relationship between the activities in a logical way.

Those project tasks are then put in an order that makes sense, and any dependencies between them are noted. These dependencies are then determined to be either finish-to-start (FS), finish-to-finish (FF), start-to-start (SS) or start-to-finish (SF). This is mostly for larger projects. Hat is and is not included in the project.

Includes the processes required to manage the timely completion of the project. The key benefit of this process is to break down work packages into activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling the project work.

8. Project Cost Management

This project management knowledge area involves estimating project costs to create a project budget. To do so, you'll need to use cost-estimating tools and techniques to make sure that the funds cover the project expenses and are being monitored regularly to keep stakeholders or sponsors informed.

According to (PMI, 2017), project cost management consists of three major functions: cost estimating, budgeting, and cost control. The cost management function's task is to generate information for internal users who require accurate, detailed, and frequent economic data to make decisions (Kujala et al., 2014).
Project management practice is heavily reliant on forecasting in project and organizational planning, and many project failures documented in the literature are primarily the result of incorrect estimates or costing issues (Abdulrahman, 2016). Kujala et al. (2014) identified major cost management challenges in their empirical study on the challenges of complex projects.

- Due to uniqueness of each project there is no accurate information for pricing and setting up appropriate Contingencies in the sales phase
- Prices of resources can vary during a long project, which causes problems for estimating costs.

- In complex projects, there are more project management and integration engineering costs which are more difficult to calculate that product costs.
- High uncertainty leads to large contingencies. Multiple contingencies are related to the different WBSs, so perceiving the total value of the contingencies is challenging

As with other project management knowledge areas, the cost management plan is the document where you'll explain the method to establish the budget, which includes how and if it will change and what procedures will be used to control it. Each project task will have to be estimated for cost, which means including all resources such as labor, materials, equipment and anything else needed to complete the task.
Includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget. (Jayasuriya et al., 2020; Project Management Institute, 2017)

9. Project Quality Management

A project can come in on time and within budget, but if the quality isn't up to standard, then the project is a failure. This means that quality management is one of the most critical project management knowledge areas. Your project management plan should include a quality management plan section that specifies the quality control and quality assurance guidelines for your project.

Therefore, to control quality, the deliverables must be inspected to ensure that the standards outlined in the quality management plan are being met.
Includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken. Project Quality Management uses policies and procedures to implement, within the project's context, the organization's quality management system and, as appropriate, it supports continuous process improvement activities as undertaken on behalf of the performing organization. Project Quality Management works to ensure that the project requirements, including product requirements, are met and validated. (Jayasuriya et al., 2020; Project Management Institute, 2017)

According to Amalraj et al. (2007), quality assurance and quality control should be managed by the parent company rather than a contractor or other third party. Prior to the start of the work, the parent company must review and approve job-specific construction contractor quality plans. In their survey, Montequin et al. (2016) identified poor or non-performance of quality checks as a constraining factor in project management.

10. Project Human Resource Management

The project team is your most important resource, so it's crucial to assemble the best team and make sure they're happy. But also you need to track their performance to ensure that the project is progressing as planned. A human resource management plan identifies the roles and requirements for those positions, as well as how they fit into the overall project structure.

After you've determined the project roles, it's time to fill those positions and acquire a project team. This can be done in-house by drawing from other departments in the organization, getting new hires or a combination of both. The team needs development, possibly training and other things that'll make them viable for the project.

Managing the project team is an ongoing responsibility of the project manager. The team is monitored to make sure they're working productively and that there are no internal conflicts, so everyone is satisfied.

The greatest challenge of project management practice in the twenty-first century is the need for human resources in project management (Mir & Pinnington, 2014). Human resources plan and execute the project, and it is critical to ensure that project teams are competent enough to successfully manage the project and exceed stakeholders' expectations.

Every project requires a unique set of human resources with specialized skills. Most of the time, it is difficult to find the right employees for the project, and this staffing issue may have several consequences for the project's success (Abdulrahman, 2016).

2.1.1.4 Challenges of projects in Ethiopia

- **Low Performance**

The failure of any construction project is mainly related to the problems and failure in performance. Moreover, there are many reasons and factors which attribute to such problem. Shaban (2008) stated that the construction industry performance problems in developing economies can be classified in three layers: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies.

The subject of performance measurement or assessment has become a matter of concern to several countries at different levels of socio-economic development which have realized the need to improve the performance of their construction industry (Kingsley, 2010). Navon (2005) identified in various forms as low productivity, delays, cost overrun, poor, and quality and so on. Poor project performance has been noted as the bane of construction industries of several countries, particularly, developing countries.

Ling et al (2007) remarked that architectural, engineering and construction (AEC) firms may face difficulties managing construction projects performance in China because they are

unfamiliar with this new operating environment. International construction projects performance is affected by more complex and dynamic factors than domestic projects; frequently being exposed to serious external uncertainties such as political, economical, social, and cultural risks, as well as internal risks from within the project.

- **Time and cost overrun**

Time and cost overruns in construction projects in Ethiopia is one of the most significant problems in the field construction management. Research and studies in this field in Ethiopia are few compared to the problem of time and cost overrun. Having this in to consideration this research is done on factors affecting performance in university building construction projects.

Despite the importance and the significant of the construction sector in Ethiopia, it is noted that the parties of project (owner, consultant, and contractor) didn't give sufficient evaluation for time and cost overruns at the end of the project.

Fetene (2008) examined factors that cause cost overrun during construction and their effects on public building construction projects in Ethiopia. Utilizing questionnaire survey of 70 completed public building construction projects in Ethiopia. The authors identified, and assessed the impact of cost overrun on the delivery of construction projects. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun.

The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects. The most important causes of cost overrun were found to be inflation or increase in the cost of construction materials, poor planning and coordination, change orders due to enhancement required by clients, excess quantity during construction.

2.2 Theoretical Frame work

According to Prakash Rao, (2016) Projects are needed to be completed within the time frame, budgeted cost and required Quality. A project is considered as a failure one if a project fails to meet the expectation in line with the stakeholders and the failure incident of project is associated with consideration of cost, quality and time.

Atkinson, (1999), reported that project management has cost, scope, and time as its critical factor. According to the study conducted by (Akewushola, 2012), finds out that if these project management practices are well managed, there is a very high possibility of having a viable project that will guarantee a sound business success. Which include work scope, time, resources, costs, scope, communication, risk, and contracts procurement k.wysocki, (2003), finds out that there are five constraints operate on every project; these are scope, quality, time, cost and resource.

According to the research and literature review conducted by (Tesfaye Hailu Zewdie, 2016), showed that significant numbers of projects in Ethiopia are under failed category. Hence, this research author recommends that effective project management processes like Planning, Time, scope, Cost and Communication processes have to be given great attention during execution of a project since they are the main driving force for success of a project.

2.2.1 Project Management vs Project Performance

Ugwu and Haupt (2007) stated that documenting and archiving performance data could be useful for future reference, such as for settling disputes on claims, and in maintenance and repair works. Kuprenas (2003) remarked that quantification of the impacts of the project management processes are identified through three steps of analysis: comparison of summary statistics of design performance, proof of statistical significance of any differences and calculation of least squares regression line of a plot of design performance measurement versus amount/application of project management as a means to quantify management influence to design phase cost performance.

Kuprenas (2003) stated that while project management is only one of the many criteria upon which project performance is contingent, it is also arguably the most significant as people formulating the processes and systems who deliver the projects.

Ugwu and Haupt (2007) remarked that an adequate understanding and knowledge of performance are desirable for achieving managerial goals such as improvement of institutional transformations, and efficient decision making in design, specification and construction, at various project-level interfaces, using appropriate decision-support tools. Ling et al (2007) investigated project management (PM) practices adopted by Singaporean construction firms.

It was determined that the performance level of their projects in China; identifies PM practices that led to better performance; and recommended key PM practices that could be adopted by foreign construction firms in China to improve project performance.

2.2.2 Factors Affecting Project Performance

Iyer and Jha (2005) remarked that project performance in term of cost is studied since 1960s. These studies range from theoretical work based on experience of researcher on one end to structured research work on the other end. Moreover, Pheng and Chuan (2006) stated that there have been many past studies on project performance according to cost and time factors.

Chan and Kumaraswamy (1996) stated that a number of unexpected problems and changes from original design arise during the construction phase, leading to problems in cost and time performance.

It is found that poor site management, unforeseen ground conditions and low speed of decision making involving all project teams are the three most significant factors causing delays and

problems of time performance in local building works. Okuwoga (1998) stated that cost and time performance has been identified as general problems in the construction industry worldwide.

Dissanayaka and Kumaraswamy (1999) remarked that project complexity, client type, experience of team and communication are highly correlated with the time performance; whilst project complexity, client characteristics and contractor characteristics are highly correlated with the cost performance.

Reichelt and Lyneis (1999) obtained that project schedule and budget performance are controlled by the dynamic feedback process. Those processes include the rework cycle, feedback loops creating changes in productivity and quality, and effects between work phases.

Chan (2001) identified that the best predictor of average construction time performance of public sector projects. This relationship can serve as a convenient tool for both project managers and clients to predict the average time required for delivery of a construction project. Kuprenas (2003) stated that process of a design team meeting frequency and the process of written reporting of design phase progress were found to be statistically significant in reducing design phase costs. Otherwise, the use of project manager training and a project management based organizational structure were found to be processes that do not create a statistically significant inreducing design phase costs.

Mohammed Bader (2004) found in his report the cause for the failure of performance of construction contractors. These are; Lack of experience in the line of work, replace key personnel, assigning project leader in the site, labor productivity and improvement, use of project management techniques, procurement practices, claims, internal company problems, owner's absence from the company, using computer applications, frauds, neglect, low margin profit due to competition, cash flow management, bill and collecting effectively, poor estimation practices, employee benefits and compensations, controlling equipment cost and usage, increased number of projects, increased size of projects, change in the type of work, lack of managerial maturity, national slump in the economy, construction industry regulation and bad weather.

Owusu Tawiah (1999) identified two main factors affecting contractor performance. The two factors were financial and managerial capacities of the firm. Under the financial factors contractor's financial stability in terms of access to credit was questionable and that has gone along way to affect their performance over the years. Again under the managerial capacities, heidentified site management practices, lack of technical expertise among others as factors influencing contractor performance in Ghana.

A number of studies have been conducted to examine factors impacting on project performance in developing countries. Mohammed Bader (2004) reported that shortage of skills of manpower, poor supervision and poor site management, unsuitable leadership; shortage and breakdown of

equipment among others contribute to construction delays. Mohammed Bader (2004) examined causes of client dissatisfaction in the South African building industry and found that conflict,poor workmanship and incompetence.

Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety (Cheung et al. 2004).

Generally, performance dimensions may have one or more indicators, and could be influenced by various project characteristics. For example, Dissanayaka and Kumaraswamy (1999) found that project time and cost performances get influenced by project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, and external conditions.

Similarly, Iyer and Jha (2005) identified many factors as having influence on project cost performance, these include: project manager's competence, top management support, project manager's coordinating and leadership skills, monitoring and feedback by the participants, decision-making, coordination among project participants, owners' competence, social condition, economic condition, and climatic condition. Coordination among project participants the most significant of all the factors, having maximum influence on cost performance.

2.3 Empirical Literature

Unegbu et al. (2021) investigated the relative importance of the project performance to construction projects and the relationship between the project management knowledge areas using the relative importance index and structural equation model.

Their research finding showed that the utilization of the project management knowledge area in the construction industry resulted in improved project performance. The structural equation model indicated that the management of communication has a positive impact on the rest of the project management knowledge areas with the strongest relationship existing between communication management and procurement management.

Shaban (2008) in his thesis on factors affecting the performance of construction projects in the Gaza Strip, found out that the most important factors agreed by the owners, consultants and contractors were: average delay because of closure and materials shortage, availability of resources as planned through project duration, leadership skills for project manager, escalation of material prices, availability of personals with high experience and qualification and quality of equipment and raw materials in project.

Alwaly and Alawi (2020) identified the factors affecting the effective implementation of the project management knowledge areas contained in the PMBOK Guide in the construction industry in the developing country Yemen. The result of their data analysis which was focused

on identifying the level of implementation of the PMBOK Guide showed that the construction companies sparsely applied the project performance in managing construction projects with quality management and closing processes emerging with highest ranks. It also attributed this outcome to lack of qualification and poor training of the project management professionals in contemporary trends in project management, hence, they recommended the need for regular training and project management certification to be emphasized by the project organizations.

Amusan, (2011) studied factors affecting construction cost performance in Nigerian construction sites. It was discovered from the analysis that factors such as contractor's inexperience, inadequate planning, inflation, incessant variation order, and change in project design were critical to causing cost overrun, while project complexity, shortening of project period and fraudulent practices are also responsible. Fetene (2008) did a study on causes and effects of cost overrun on public building construction projects in Ethiopia. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects.

Iyer and Jha (2006) did a research on factors affecting cost performance evidence from Indian construction projects and found out that the project manager's competence and top management support are found to contribute significantly in enhancing the quality performance of a construction project. Nyangilo (2012) did an assessment of the organization structure and leadership effects on construction projects' performance in Kenya, he found out that lack of appropriate project organization structures, poor management systems and leadership are the major causes of poor project performance.

Based on local studies that have been done in Kenya; Auma (2014) Factors Affecting the Performance of Construction Projects in Kenya; Fetene (2008) did a study on causes and effects of cost overrun on public building construction projects in Ethiopia. The performance of the building construction in Oromia, Ethiopia is poor as time, cost and quality performance of projects are to the extent that over 70% of the projects initiated are likely to escalate with time with a magnitude of over 50% and over 50% of the projects likely to escalate in cost with a magnitude of over 20% (OIUD, 2007).

Besides, many studies which are conducted in this area of study ignore to study the iron triangle and risk project management factors together on performance of a project. Therefore, this research will focus on key project management knowledge areas effect on performance of projects of kaliti prefabricated housing project.

Unegbu et al. (2020) studied the relationships existing between the critical success factors and the project performance measures for construction projects using structural equation model. Their research result revealed that factors connected with the consultant have the highest level of

impact on project performance. This was followed by the factors connected with the project manager, contractor and client in the order of decreasing path coefficient. (Kog & Loh, 2012)

Hwang and Lim (2013) studied the factors critical to the success of the key players in construction projects based on different objectives of construction projects (quality, schedule and budget performance) using analytic hierarchy process (AHP). The key players considered in the study were the contractor, consultant and client or owner. Their research findings revealed that the satisfaction of project owners was the most important Unegbu et al., The impact of the project management knowledge areas on the performance of the key players in construction projects

According to the study conducted by Akewushola, (2012), finds out that if these project management practices are well managed, there is a very high possibility of having a viable project that will guarantee a sound business success. Which include work scope, time, resources, costs, quality, communication, risk, and contracts procurement (k.wysocki, 2003), finds out that there are five constraints operate on every project; these are scope, quality, time, cost and resource.

According to previous studies, it could be said that the performance measurement is a process that include factors as Key Performance Indicators (KPIs) such as time, cost, quality and scope in order to enable measurement of current construction projects performance and to achieve significant performance improvements of future projects. It was obtained that there were many fields and topics which are related to performance such as, construction management, information technology, factors affecting performance of managers, measurement of project performance, key performance indicator and benchmarking. The key performance indicators are used to evaluate performance of construction projects. These indicators can then be used for benchmarking purposes, and will be as a key component of any organization to move towards achieving best practice and to overcome building construction performance problem in kaliti prefab housing project.

2.3 literatures on prefabricated housing

According to (Wei Guo and Kai Qian,2022) Prefabrication construction is a method that manufactures construction components in the factories, transports the components to the construction site and finally connects the components together to construct the whole building.

2.4 Hypothesis of the research

Hypothesis 1

H01: construction cost performance indicator has significant relationship with project cost management factors, project time management factors, and project scope management factors of kaliti prefabricated project.

Hypothesis 2

H02: construction time performance indicator will positively impact project cost management

factors, project time management factors, project quality management factors, project scope management factors and project risk management factors of kaliti prefabricated housing project.

Hypothesis 3

H03: construction scope performance indicator will positively impact project cost management factors, project time management factors, project quality management factors, project scope management factors and project risk management factors of kaliti prefabricated housing project.

2.5 Conceptual Frame Work

A conceptual framework is defined as a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Ramey & Reichel, 1987). The conceptual framework in this study was used to show various variables that affect the performance of construction projects. The model used in this assessment based on the recent PMBoK by using the ten knowledge areas (PMI, 2013) after assessing the data's of knowledge area based on the quantitative data result obtained will be used to measure the level of performance of project in kaliti prefab site.

We have already scope our study area from ten knowledge area to three of them which is scope management, time management and also cost management then finally the data collected will be analyzed and used as an input for performance evaluation in the project.

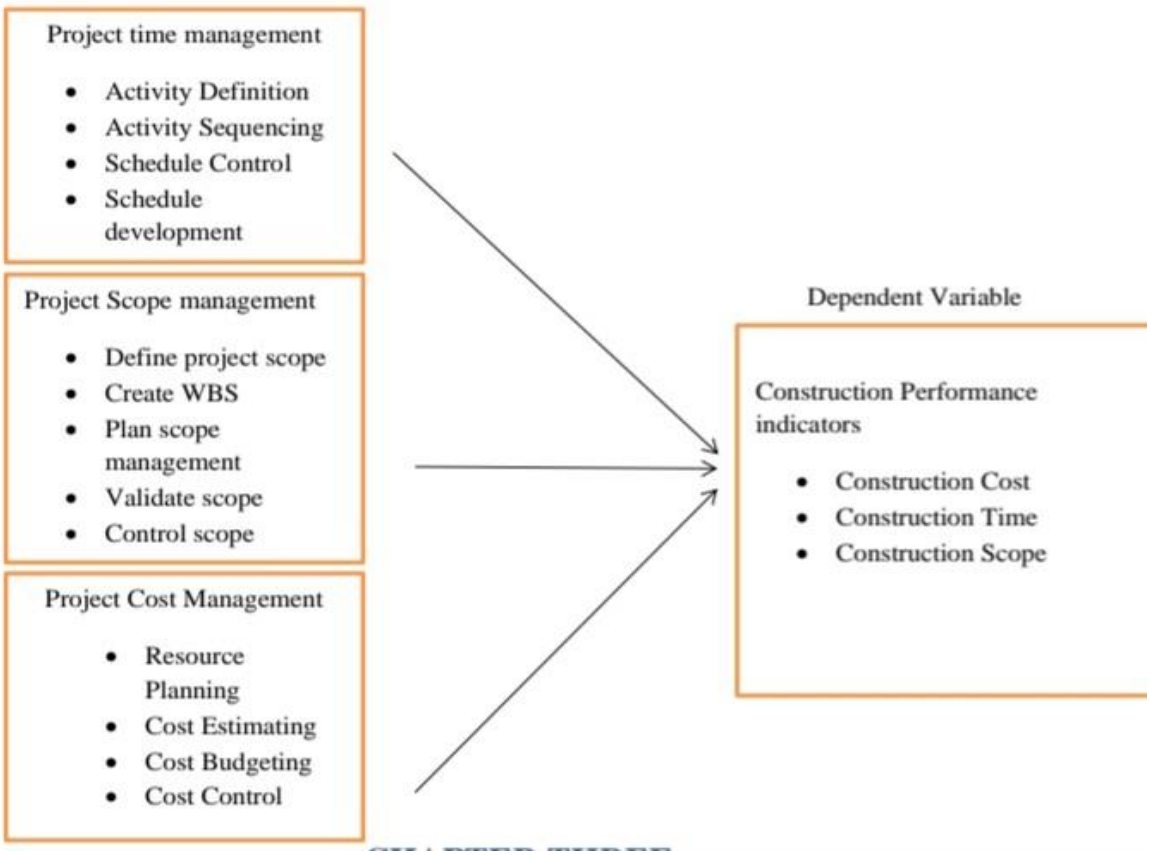


Figure 2.1 conceptual frame work

CHAPTER THREE
3 RESEARCH METHODOLOGY

Research approach and design

The researcher used causal type of research design because I tried to describe the actual rate of performance indicator and the variables or the effect project management knowledge area on project performance of kaliti prefabricated housing project. The research obtained quantitative data, thus a quantitative research approach adopted.

Research design: - since this study is causal research design used quantitative research approach Quantitative data is collected from the stakeholders (project managers on the site, consultants, engineers and selected employee of the company on the site).

3.1 Sampling Techniques

To select the respondents for the questionnaire, and interview a purposive sampling technique was employed. This sampling method is chosen for it allowed the researcher to focus on a limited number of informants that were selected from different project experts to get the required information to carry out the study in order to get optimal insight. In this study projects are taken as unit of analysis.

3.2 sample size and sampling procedure

The target populations of the study is employees of construction company which is Ethiopian Construction Works Corporation particularly involved in Planning, implementation and control of projects undertaken by the company. Sampling is used as a basis for statistical estimation from items, about the features of that population (M.Saunders, 2009).

The target groups in this study Ethiopian Construction Works Corporation (ECWC) management staff and professional engineers at head office and project. Since the stakeholders are employees, management group there are around 250 populations in the entire project and all member of the organization are responsible since they are involved directly or indirectly in the process. But due to limited time the sample is limited Thus, due to the above mentioned the optimum size of 47 samples of respondents was taken from large population in the organization in order to managing the study.

3.3 Data sources and data collection method

3.3.1 Data Collection Method

The data collection method is quantitative. Quantitative because the researcher prepared and distribute questionnaire for sample respondent (Questionnaires have been distributed to contractors, owners(ECWC) and consultants of the project). Questionnaires is used to gather data

because the information could be collected from a large sample (250).

3.3.2 Data Analysis Technique

The analysis part combined based on all groups of respondents (contractors and consultants) in order to obtain significant results. For the purpose of this study, regression analysis is used to analyze quantitative data generated through questionnaire based survey questionnaire. The analysis of quantitative data will be assisted by SPSS.

Data was manipulated in order to change the data to the form that can be used to conduct analyses (Pallant, 2011). Therefore, the researcher conducted various data manipulation activities in order to prepare the data for analysis depending on the data file, variables of interest and the type of research questions that desired to be addressed. Descriptive statistics is used to clean and scan data, preliminary analysis and final analysis.

3.4 Validity Test

This section presents test of validity of questionnaire according to the pilot study. Validity refers to the degree to which an instrument measures what is supposed to measure (Pilot and Hunger, 1985). Validity and reliability is an important aspect of the research instrument and they must be considered to ensure that accurate results are obtained (Kothari, 2009).

Validity has a number of different aspects and assessment approaches. Statistical validity is used to evaluate instrument validity, which include criterion-related validity and construct validity. To insure the validity of the questionnaire two statistical tests should be applied.

The first test is criterion- related validity test (spearman test) which measures the correlation coefficient between each paragraph in one field and the whole field. The second test is structure validity test (spearman test) that used to test the validity of the questionnaire structure by testing the validity of each filed and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all of the fields of the questionnaire that have the same level of similar scale.

3.5 Reliability Analysis

Williamson (2002) defines reliability as the extent to which a research may be repeated with the same findings. The survey's dependability may be defined as obtaining quality replies to the questions and being able to get the respondents to comprehend the questionnaire. To do this, sample questions were utilized in conjunction with a scaling mechanism.The survey was carefully designed to guarantee that respondents can react in the best possible way and that there is a high response rate. As a result, in order to assure the reliability of the measuring instrument, the researcher first standardized it before distributing it to all respondents.

Cronbach's alpha was also utilized to examine the internal consistency of each construct. As a result, the data gathering approach produced consistent results, and there was openness in how the raw data are interpreted.The result of the coefficient alpha for this study,,s instrument was

found to be overall 0.7, as an indication of the acceptability of the scale for further analysis. As a consequence, because the results are satisfactory, additional analysis is carried out.

Cronbach‟s alpha is a measure that used to assess the reliability, or internal consistency, of a set of scale or test items. According to (U Sekeran, 2003), reliability measures stability and consistency across time and the various items in the instrument. It indicates the extent to which the instrument is free from error or bias. The closer the Cronbach‟s alpha to 1 is the higher the reliability of the instrument. Thus a scale is said to have a good reliability.

In conducting the reliability test using SPSS version 20 for windows. Coefficients evaluated using the guidelines suggested by George and Mallery (2010), where values 0.9 or higher indicate excellent reliability, values ranging from 0.8 to 0.89 indicate good reliability, values ranging from 0.7 to 0.79 indicate acceptable reliability, values ranging from 0.6 to 0.69 indicate questionable reliability, values ranging from 0.5 to 0.59 indicate poor reliability and values less than 0.5 indicate unacceptable reliability.

Table 3.1 Reliability statistics of dependent and independent variables

Reliability Statistics of Dependent and Independent variables			
Variables	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Performance Indicators	.814 .	.853	3
Project Cost Management Factors	.743	.703	9
Project scope Management Factors	.873	.862	10
Project time Management Factors	.729	.726	10

Source: Researcher's own compilation of survey data and SPSS V26 output (2024)

As indicated in table 1, for performance indicators, project cost management factors, project time management factors, and project scope management the cronbach's alpha results become in 0.814, 0.743, 0.729 and 0.873 respectively. For all items which exceed 0.7, indicate acceptable reliability.

3.6 Ethical Considerations

This research was guided by strict adherence to research ethics which do not allow the researcher to engage in deception or invasion of privacy. The respondents' rights will not to respond to the questions not clear from the onset and consent sought from the word go. The secrecy of the respondents will be assured and confidentiality will guaranteed as an integral part of the research.

The researcher will maintain humility and conduct the research with utmost honesty avoiding distortions and misleading data manipulation. The researcher will strive to uphold intellectual honesty and seek collaborative support which is duly acknowledged. The researcher also endeavored to arrive at conclusions based on objective inferences that are merely guided by the data which will be collected.

CHAPTER FOUR

3 DATA ANALYSIS, PRESENTATION AND INTERPRETATIONS

4.1 Introduction

This chapter presents the data analysis including the response rate, descriptive statistics, the regression analysis, hypothesis testing and the discussion. The purpose of the study is to identify the effect of project management knowledge areas specially the iron triangle in the performance of kaliti prefab housing project. 37 questionnaires were distributed to contractors and consultants and majority of them returned successfully. The results and discussions of this study are based on the response rate presented in table 2.

Table 4.1 Distribution of questionnaires to contractor and consultant response rate

Category of the Respondents	Method	Distributed Numbers	Returned Numbers	Response Rates (%)
Contractor	Personal deliver	47	31	65.9
Consultant	Personal deliver	47	31	65.9
Total	Personal deliver	47	31	65.9

4.2 Results of Descriptive Statistics (demography)

The demographic details of the respondent's age, gender, professional background, and job experience are compiled in this section. The primary goal of this research's demographic analysis is to characterize the respondents' attributes so that readers can better understand the analysis.

As listed in table 4.2, 83.9% of respondents were male and 16.1% of respondents were female on the top of that 80.6% of respondents were contractor and 19.4% of respondents were consultants. And the conclusion of this data shows that majority of respondents are male.

Age interval of respondents are grouped under three categories which are from 25 to 30 in first category, 30 to 40 in second category and the final category is 40 years and above and the collected data gives us that the first category have 9.7% the second category would be 25.8% and the last and the majority of respondents have 64.5%. The researcher believes they are mature enough to provide reliable answers to the questions asked.

The researcher also tried to look what would it look like the variety of professional background in the site and as expected civil engineers plays a vital role both in the consultant and contractors side in which it holds 45.2%of the respondent's background. Next to the civil engineers architects have 12.9%.Respondent mainly participated in consultant side in managerial position have 9.7% of respondents professional background. Finally mechanical engineers, sanitary and

electrical engineers have five, three and two percent of the respondent background respectively. The work experience of the respondents were categorize in to four intervals, 9.7% of respondents had below 5 years work experience so as respondents with the experience of eleven up to fifteen also have 9.7%, 22.6% of respondents had 5-10 years' work experience, and 58.1% of respondents had more than 16 years' work experience. Most of the contractors and consultants had better experience as a result it is helpful for the performance of the construction project.

Table 4.2 summary of demographic variables

	Variable Classification	**Frequency**	**Percent**
Gender	Female	5	16.1
	Male	26	83.9
	Total	31	100.0
	25-30 years	3	9.7
	30-40 year	8	25.8

Age	30-40 year	8	25.8
	40 and above	20	64.5
	Total	31	100.0
Type of organization	Consultant	6	19.4
	Contractor	25	80.6
	Total	31	100.0
Year of experience	below 5 years	3	9.7
	5-10 years	7	22.6
	11-15 years	3	9.7
	16 and above	18	58.1
	Total	31	100.0
Professional background	Architect	4	12.9
	electrical engineer	2	6.5
	mechanical engineer	5	16.1
	civil engineer	14	45.2
	sanitary engineer	3	9.7
	Other	3	9.7
	Total	31	100.0

Source: Researcher's own compilation of survey data and SPSS V26 output (2024)

4.2.2 Descriptive Analysis Results of independent variable

Table 4.3 summary of project management factor (independent variable)

			Frequency					
Independent variable	Mean	Std. Deviation	very good	Good	accept	poor	very poor	Total
Activity Definition	2.61	1.145	6	9	8	7	1	31
Activity Sequencing	2.61	.989	3	14	6	8	0	31
Schedule Development	2.77	1.175	3	12	9	3	4	31
Schedule Control	3.10	.944	1	7	13	8	2	31
Define project Scope	2.84	1.157	3	11	8	6	3	31
Create WBS	2.68	1.013	2	15	6	7	1	31
Plan scope management	2.58	.886	3	11	14	2	1	31
Validate scope	3.10	.944	1	7	13	8	2	31
Control scope	3.42	1.205	1	7	9	6	8	31
Resource Planning	2.42	.923	5	12	10	4	0	31
Cost Estimating	2.65	1.050	4	11	9	6	1	31
Cost Budgeting	2.97	1.169	4	7	8	10	2	31
Cost control	3.23	1.087	1	8	9	9	4	31

Source: Researcher's own compilation of survey data and SPSS V26 output (2024)

Table 4.3 displays the findings of the analysis of the project scope management factors. Plan scope management has a mean score of 2.58, while a control scope management factor has a mean score of 3.42.

The overall project scope management factor items have a less significant impact on the performance of building construction projects at Kaliti Prefab Housing Project, as indicated by the overall mean and standard deviation of 2.92 and 1.041, respectively. The outcome shows the project has less scope regarding to WBS, monitoring and controlling well practiced. According to Mirza, Pourzolfagha, and Shahnazari (2013), a major contributor to failed projects is a lack of understanding or definition of project and product scope at the outset of the project.

A properly defined and managed scope results in the delivery of a quality product to stakeholders at an agreed-upon cost and within specified timelines. According to Mirza et al. (2013), a project scope addresses the work required to produce project deliverables.

The project time management factors analysis results show in table 4.3. The mean score for the items range from 3.1 (schedule control project time management factors) to 2.61(activity definition and sequencing project time management factors).

The overall mean 2.77 and SD 1.063 result shown that, the overall schedule performance of the company is not good at all. That is the monitoring and controlling tools and mechanisms, and managing those problems had been bring about in low performing status from management side of the company. Form this we can infer that the projects had been managers of the organization is been giving less attention to the schedule management process and is being stumpy in evaluating their work based on the stated goal.

It is very clear from the documents available in the literature that the most important factors affecting scheduling process for any project are the financial situation of the owners and contractors, resources availability, change orders, communication between involved parties, prices escalation, and the delays in contractors‘ payment and engineer‘s experience (Nouban, 2017).

In our projects case also change order, scope creep management and contractor financial capability had been week performance in kaliti prefab project. so we can see the effect clearly on the performance status of the projects. Contractor financial capabilities will as such affect the performance of project schedule.

The cost management factor's SD and mean values, as shown in table 4 fall between 0.923 and 1.169 for the SD and 2.42 and 3.23 for the mean. This range is interpreted as representing poor slightly near too neutral cost control, poor resource planning (2.42 and 2.65), and average cost budgeting. This indicates that the performance of building construction projects at Kaliti Prefab Housing Project is influenced by the overall project cost management component, which has an average SD, and mean of 1.05 and 2.817 items, respectively, and is relatively relevant

As Mansfield (1994) find that Cost overruns are attributed to payment arrangement, poor material shortage, inaccurate estimators and price fluctuation. In our cases all parameters are under worst performance status, as such the projects had been through in cost overrun. So such concerns are the critical factor in managing cost. It has also been recommended that project management could be improved in the planning stage of the project itself. So the managements must give a lot of time for project planning in order to avoid cost overrun. The central mean result shown that, the overall cost performance of the company is not good at all. That is all cost related functions are not done well according to projects specific need and they are not efficient based on the cost management specification.

As stated by Kombe (2016) the most effective solutions for better cost performance is to employ better estimation methods and budget for costs. In our specific cases, the respondents and actual project document findings show that the estimations was not being undertaking in an efficient manner. In addition the budgeted costs are not being evaluated based on scientific measurement standard.

Table 4.4 summary of dependent variable (performance indicator)

			Frequency					
Dependent variable	Mean	Std. Deviation	very good	good	Accept	poor	very poor	Total
Construction cost	2.26	.930	5	18	3	5	0	31
Construction scope	2.35	.985	5	15	7	3	1	31
Construction time	2.74	1.094	4	9	11	5	2	31

Source: Researcher's own compilation of survey data and SPSS V26 output (2024)

For building construction projects at Kaliti Prefab Housing, the construction cost performance indicator is reaching good standards, as indicated by the mean score and standard deviation of 2.26 and 0.93, respectively.

The construction scope performance indicator for building construction projects at Kaliti Site has a mean score of 2.35 and a standard deviation of 0.985, indicating that it is meeting average and approaching good status. For building construction projects at the Kaliti site, construction time serves as a performance metric. For building construction projects at the Kaliti site, the construction time performance indicator is meeting unsatisfactory standards, as indicated by the mean score and standard deviation of 2.74 and 1.094, respectively.

4.2.6 Summary of Descriptive Statistics of the Dependent and Independent Variables

The dependent and explanatory variables utilized in this study on the conceptual framework are presented in this section with their descriptive statistics. The performance indicators for construction projects the construction cost, time, and scope indicators were employed as the dependent variable in this study.

Table 4.5 descriptive statistics of variables

	N	Mean	Standard deviation
Construction Cost Performance Indicator	31	2.817	1.05
Construction Time Performance Indicator	31	2.77	1.063
Construction scope Performance Indicator	31	2.92	1.041

Source: Researcher's own compilation of survey data and SPSS V26 output (2024)

Thirteen one observations across three variables made up the data. For categorical variables, the researcher calculated frequencies, percentages, and descriptive statistics. The explanatory variables study showed that the project scope management factors, project cost management factors, and project time management factors had mean score values of 2.92 (SD=1.041), 2.77 (SD=1.063), and 2.817 (SD=1.05), respectively.

These values fall into the important and less important categories and have an impact on the building construction projects' performance at the Kaliti Prefab Housing Project. When it comes to performance indicators, the construction time performance indicator man score value was 2.77 (SD=1.063) a poor score and the construction scope performance indicator mean score value was 2.817 (SD=1.05), indicating that the construction cost performance indicator falls on poor.

4.3 Results of Regression Analysis assumption

4.3.1 Test of Assumption of the Regression Analysis

Three assumptions for regression analysis used in this study were discussed for the individual variables: multicollinearity, linearity, auto correlation and Normality. In the following paragraphs, each assumption is explained.

4.3.1.1 Test for Multicollinearity

According to Hill et al. (2003), multicollinearity is not a violation of the assumptions of regression but it may cause serious difficulties. Hill et al. (2003) propose that these serious difficulties include:

1. variances of parameter estimates may be unreasonably large;
2. parameter estimates may not be significant; and
3. A parameter estimate may have a sign different from what is expected.

The amount of variance in a single variable that cannot be accounted for by other predictor variables is known as tolerance. It has a range of 0 to 1, with a value near 1 signifying that the variance in that variable is not explained by the other predictors. A number around zero indicates that the other factors account for nearly all of the variance in the variable. This enables us to verify more formally that there isn't too much correlation between our independent variables. We require a tolerance score of at least 0.1 and VIF scores of at least 10 or a tolerance score of at least 0.2 and VIF scores of at least 5 in order to satisfy the multiple regression assumptions. Therefore, the variance inflation factors (VIF) and tolerance for the multicollinearity statistics below.

Table 4.6 multicollinearity problem test using VIF

Coefficients[a]								
Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	.086	2.602		.033	.974		
	Cost	.298	.090	.597	3.308	.003	.787	1.271
	Time	-.117	.095	-.275	-1.232	.229	.515	1.942
	Scope	.046	.082	.119	.556	.583	.560	1.787

The researcher concluded that after conducting multicollinearity test three of the performance indicators which are project cost, time and scope indicators met with the specification at which the VIF and significance value of each of them are under the requirement.

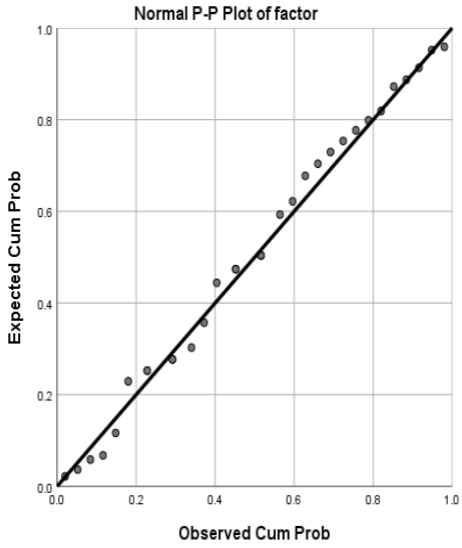
N.B in the table below dependent variable construction time, cost and scope are transformed in to a single dependent variable which is performance and regretted with the independent variable through SPSS and the researcher found that there is no multicollinearity problem exist in the model.

4.3.1.2 Test for Linearity

The linearity of the relationship between the dependent and independent variable represented the degree to which the change in the dependent variable is associated with the independent variable (Hair et al., 1998). In a simple sense, linear models predict values falling in a straight line by having a constant unit change (*slope) of the dependent variable for a constant unit change of the independent variable (Hair et al., 1998). Malhotra et al. (2007 as cited in Devika, 2012) discussed that conventional regression analysis underestimate the relationship when nonlinear relationships are present, i.e., R2 underestimates the variance explained overall and the betas underestimate the importance of the variables involved in the non- linear relationship.

We must check the bivariate correlation for each pair of variables to make sure that no non-linear correlation is found before we can verify this assertion. Plots of the regression residuals created with SPSS software were utilised to ascertain whether the relationship between the independent variables—project cost management factors, project time management factors, project scope management factors, and project risk management factors and the dependent variable performance indicators (construction cost, time and scope) is linear.

Figure 4.2 linearity of construction time vs independent variable



4.3.1.3 Normality Test

Malhotra et al. (2007) propose that normal probability plots are often conducted as an informal means of assessing the non-normality of a set of data. According to Hair et al. (1998), the plots are different from residuals plots in that the standardized residuals are compared with the normal distribution.

In general, the normal distribution makes a straight diagonal line, and the plotted residuals are compared with the diagonal (Hair et al., 1998). If a distribution is normal, the residual line will closely follow the diagonal (Hair et al., 1998).

Malhotra et al. (2007) explain that the "correlation coefficient" will be near unity if the data fall nearly on a straight line. The "correlation coefficient" will become smaller if the plot is curved. The normality probability plots were plotted to assess normality. The P-P plots were approximately a straight line instead of a curve. Accordingly, the residuals were deemed to have a reasonably normal distribution, as suggested by Hair et al. (1998).

The Skewness value provides an indication of the symmetry of the distribution while kurtosis provides information about the peakedness of the distribution. A positive Skewness value indicates right (positive) skew while a negative value indicates left (negative) skew. The higher the absolute value is the greater the skew (Tabachnick & Fidell, 2001).

Figure below illustrates the performance indicator's frequency distribution in relation to a normal distribution frequency. As you can see, many of the residuals are very close to the curve, even while certain residuals (such those that occur around 0) are relatively far away from it.Additionally, the bell-shaped histogram suggests that the residuals, or mistakes or disturbances, are normally distributed. Therefore, there are no deviations from the normally distributed assumption error term.

The measurements of kurtosis and skewness have to be as near to zero as feasible. But in practice, data are frequently kurtotic and distorted.Therefore, as long as the measurements do not deviate significantly from zero in relation to their standard errors, there should be no issues. Using a calculator, divide the statistic (measure) by its standard error to find the z value, which should be between -1.96 and +1.96.

The researcher comes to the conclusion that the performance indicators for project cost management factors, project time management factors, and project scope management factors are somewhat skewed and kurtotic in terms of skewness and kurtosis. However, it doesn't deviate much from the norm. Lastly, the researcher made the assumption that the skewness and kurtosis of the data are somewhat regularly distributed.

Figure 4.3normal Q-Q plot of performance

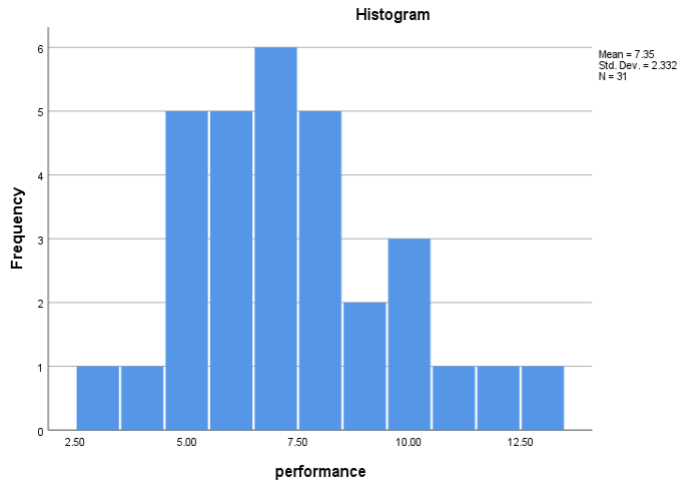


Table 4.7 test of normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Performance	.141	31	.119	.962	31	.335

Table 4.8 normality descriptive of performance indicator

Descriptive				
			Statistic	Std. Error
Performance	Mean		7.3548	.41878
	95% Confidence Interval for Mean	Lower Bound	6.4996	
		Upper Bound	8.2101	
	5% Trimmed Mean		7.2832	
	Median		7.0000	
	Variance		5.437	
	Std. Deviation		2.33164	
	Minimum		3.00	
	Maximum		13.00	
	Range		10.00	
	Interquartile Range		3.00	
	Skewness		.551	.421
	Kurtosis		.088	.821

4.3.1.4 Auto-correlation /Durbin-Watson Test/

It is the assumption of independent error acceptable or reasonable test. Durbin-Watson used to test for serial correlation between errors. The Durbin-Watson statistic test can vary between 0 and 4. A value of 2 meaning

residual statistics are uncorrelated field (2006). A value greater than 2 indicates negative correlation adjacent residuals, whereas a value below 2 indicates a positive correlation.
Similarly, Ott and Longnecker (2001) defines when there is no serial correlation, the expected value of Durbin-Watson test statistics d is approximately 2.00; a positive serial correlation makes d> 2.00. Although, values of d less than approximately 1.5 (or greater than approximately 2.5) lead one to suspect positive (or negative) serial correlation. If serial correlation is suspected, then the proposed multiple linear regression models are inappropriate.

Table 4.9 model summary for durbin-watson

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.554[a]	.307	.230	2.04542	2.022

a. Predictors: (Constant), scope, cost, time

b. Dependent Variable: performance

The Durbin-Watson value of this study is 2.022. Therefore, the auto-correlation test has almost certainty met, since it falls between 2 and 4, and we can conclude that our model is free of serial correlation.

4.3.3 Regression Analysis Results for Independent Variables and Construction cost Performance Indicator

The study assumed that project cost management factor and project scope management factor has a positive and significant effect on construction time performance indicator.

Table 4.10 model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.462[a]	.213	.157	4.28919

a. Predictors: (Constant), scope, time

Table 4.11 the coefficient statistics of independent variables and construction cost performance indicator

Coefficients[a]					
Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig.	Collinearity Statistics

		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	18.577	4.178		4.447	.000		
	Time	.315	.190	.370	1.660	.108	.566	1.768
	Scope	.096	.171	.125	.559	.580	.566	1.768

a. Dependent Variable: cost

As The dependent variable construction cost performance indicator's overall statistics are displayed in the model table above. R=.462 indicates a positive correlation between the dependent variable and the independent variables, project time management factors and project scope management factors, and the adjusted R square value of.157 indicates that the independent variables included in the model explained 15.7% of the variance in the dependent variable construction cost performance indicator; other factors not included in the model are responsible for the remaining 84.3% of the variance.Therefore, the overall model result (adjusted R square=0.157) provided evidence in favour of the hypothesis that the construction cost performance indicator is positively impacted by project cost management, project time management, and project scope management aspects.

An analysis of variance (F-test) was used to determine the model's significance. The ANOVA table below illustrates how the model as a whole is significant, with a F(2,28)=3.794, P value >0.05 (P=0.035). Therefore, it can be said that the hypothesis that was put forth which claims that the Kaliti Prefabricated Housing Project's construction cost performance indicator has a substantial link with the project scope management and project time management factors is correct.

As shown below, it can be observed from the ANOVA table that the model as a whole is significant F(2,28)=3.794,P value >0.05 (P=0.035). Thus, it is concluded that the proposed hypothesis which states that construction cost performance indicator has significant relationship with the project scope management factors, project time management factors, of kaliti prefabricated housing project.

Hence, hypothesis 1 is accepted.

Table 4.12 ANOVA F-test

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	139.588	2	69.794	3.794	.035[b]

	Residual	515.121	28	18.397		
	Total	654.710	30			

a. Dependent Variable: cost

b. Predictors: (Constant), scope, time

4.3.4 Regression Analysis Results for Independent Variables and Construction time Performance Indicator

The study made the assumption that the construction time performance indicator will be positively and significantly impacted by project cost management, project time management, and project scope management aspects. The dependent variable construction time performance indicator's overall model statistics are displayed below. R=.696 indicates that the dependent variable and the independent variables, project cost management factors, project time management factors, and project scope management factors, have a positive correlation.

The adjusted R square value of.448 indicates that the independent variables included in the model explained 44.8% of the variance (.448×100%) in the dependent variable construction time performance indicator, with the remaining 65.2% variance being attributed to factors that are not included in the model.Hence, the overall model result (adjusted R square=0.448), supported the idea that project cost management variables, project time management factors and project scope management factors had a positive influence on construction time performance indicator.

An analysis of variance (F-test) was used to determine the model's significance. The model as a whole is significant, with a P value <0.05 (P=.000, F (2,28)=13.82, and a P value less than 0.05, as can be seen in the ANOVA table below. The postulated hypothesis, according to which the Kaliti Prefabricated Housing Project's construction time performance indicator has a considerable impact on the project's cost, time, and scope management elements, is thus concluded.

Hence, hypothesis 2 is accepted.

Table 4.13 the coefficient statistics of independent variable and construction time performance indicator

Coefficients[a]							
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.016	5.188		-.003	.998		

Cost	.285	.171	.242	1.660	.108	.864	1.157
Scope	.514	.132	.570	3.905	.001	.864	1.157

a. Dependent Variable: time

Table 4.14 model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.696[a]	.485	.448	4.07755

a. Predictors: (Constant), scope, cost

Table 4.15 ANOVA F-test

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	438.331	2	219.165	13.182	.000[b]
	Residual	465.540	28	16.626		
	Total	903.871	30			

a. Dependent Variable: time b. Predictors: (Constant), scope, cost

4.3.4 Regression Analysis Results for Independent Variables and Construction scope Performance Indicator

The research postulated that the construction scope performance indicator is positively and significantly impacted by project cost management, project time management, and project scope management aspects. The dependent variable construction scope performance indicator's overall model statistics are displayed below.

R=.440 indicates a positive correlation between the dependent variable and the independent variables, project cost, project time, and project scope management factors. The adjusted R square value of.401 indicates that the independent variables included in the model explained 40.1% of the variance (.401×100%) in the dependent variable construction scope performance indicator, with the remaining 59.9% variance being due to other factors that are not included in the model.Therefore, the overall model result (adjusted R square=0.448) provided evidence in favour of the hypothesis that the construction scope performance indicator is positively impacted by project cost management, project time management, and project scope management aspects.An analysis of variance (F-test) was used to determine the model's significance.

The model as a whole is significant, as can be seen from the ANOVA table below, where P value is less than 0.05 and P=.000, F (2,28)=11.002. It is therefore concluded that the provided hypothesis, which claims that the Kaliti Prefabricated Housing Project's construction scope performance indicator has a considerable impact on the project's time, cost, and scope management elements, is correct.

Hence, hypothesis 3 is accepted

Table 4.16 model summary2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.664[a]	.440	.401	4.70617

a. Predictors: (Constant), time, cost

Table 4.17 ANOVA F-test 3

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	488.242	2	244.121	11.022	.000[b]
	Residual	620.145	28	22.148		
	Total	1108.387	30			

a. Dependent Variable: scope

b. Predictors: (Constant), time, cost

Table 4.19 the coefficient statistics of independent variables and construction scope indicator

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	10.862	5.625		1.931	.064		
	Cost	.115	.206	.089	.559	.580	.796	1.257
	Time	.685	.175	.619	3.905	.001	.796	1.257

a. Dependent Variable: scope

Based on the above multiple regression analysis the following are the most significant factors affecting the performance of kaliti prefabricated housing project based on the value of adjusted R square for each independent variable (explaining the variance in dependent variable).

Table 4.20 summary of factor affecting performance of kaliti prefabricated housing project

Independent variable	Percent of factor affecting(R square) in%	Rank
Project Cost Management Factors	84.3%	1
Project time Management Factors	65.2%	2
Project scope Management Factors	59.9%	3

From the above table 4.22 the most significant factors affecting the performance of kaliti prefabricated housing project commercial are ranked based on their adjusted R square value. Project cost management factors explained for 84.3% of variance in performance indicators, project time management factors explained for 65.2% of variance in performance indicators, project scope management factors explained 59.9 % of variance in performance indicators.

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CHAPTER FIVE

4 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

Evaluating the effect of project management knowledge areas mainly the iron triangle on the performance of kaliti prefabricated housing project This paper wants to light which knowledge are affect the project performance highly.. Therefore the most relevant factors of effective project performance where collected from literature in addition with data collected systematically and analyzed accordingly.

Hence, this chapter has four parts; summary, conclusion, recommendation and indication for future research. The summary indicates with the basic questions raised in the first chapter and the major finding obtained from the analysis and interpretation of the data. At last some recommendation was suggested which gives as possible solution to the problem.

4.3 Summary of Findings

This study was conducted with an objective of identifying the effect of project management knowledge area on the performance of kaliti prefabricated housing project. in Addis Ababa by using time, cost and scope parameters as performance indicators. This general objective was broken down in three specific objectives; to describe the status of effective project management knowledge areas on kaliti prefabricated housing project, to identify the relationship between project time management with project cost management process on kaliti prefabricated housing project, to identify the relationship between project scope management with project cost management process on kaliti prefabricated housing project.

The target populations of the study is employees of construction company which is Ethiopian Construction Works Corporation particularly involved in Planning, implementation and control of projects undertaken by the company. The target groups in this study Ethiopian Construction Works Corporation (ECWC) management staff and professional engineers at head office and project. Since the stakeholders are employees, management group there are around 250 populations in the entire project and all member of the organization are responsible since they are involved directly or indirectly in the process. But due to limited time the sample is limited Thus, due to the above mentioned the optimum size of 47 samples of respondents was taken from large population in the organization in order to managing the study.

The descriptive analysis and the regression showed that

- The number of male employees in the organization is 83.9% which is far higher than female.
- In terms of age majority of the employees were 40 years and above which is 64.5% of the total population.

- From the data collected from the population 80.6% of the employees are contractor and the rest are consultants.
- With regard to experience with in the company 58.1% of respondents have 16 and above year of experience which is the highest of the other categories whereas respondents with 5 years and below experience is only 9.7% of the total respondent.
- When we look at professional background civil engineers have highest percent with professional background with 45.2%.
- The construction cost performance indicator falls on poor, the construction time performance indicator mane score value was 2.77 (SD=1.063) falls on poor, and the construction scope performance indicator mean score value was 2.92 (SD=1.041 falls on poor too.
- The Durbin-Watson value of this study is 2.022. Therefore, the auto-correlation test has almost certainty met, since it falls between 2 and 4, and we can conclude that our model is free of serial correlation.
- Regarding Skewness and kurtosis the performance Indicators are a little skewed and kurtotic for project cost management factors, project time management factors, and project scope management factors. But, it does not differ significantly from normality. Finally, the researcher assumed that the data are approximately normally distributed in terms of Skewness and kurtosis.
- With regards to multicollinearity statistics shown below, the tolerance and variance inflation factors (VIF) showed that there was no multicollinearity because VIF of all variables were not greater than 10 and tolerance scores not less than 0.1. Also VIF of all variables were not greater than 5 and not less than 0.2.
- The proposed hypothesis (hypothesis 1) which states that construction cost performance indicator has significant relationship with the project scope management factors, projecttime management factors, of kaliti prefabricated housing project.
- R=.696 indicates that there is a positive correlation between the dependent variable construction time performance indicator and the independent variables project cost management factors, project time management factors and project scope management factors proposed hypothesis which states that construction time performance indicator has significant impact with the project cost management factors, project time management factors and project scope management factors of kaliti prefabricated housing project. ***Hence, hypothesis 2 is accepted.***
- The proposed hypothesis which states that construction scope performance indicator has significant impact with the project cost management factors, project time management

factors and project scope management factors of kaliti prefabricated housing project.
Hence, hypothesis 3 is accepted

Regression findings

- The researcher concluded that after conducting multicollinearity test three of the performance indicators which are project cost, time and scope indicators met with the specification at which the VIF and significance value of each of them are under the requirement. multicollinearity statistics shows, the tolerance and variance inflation factors (VIF) showed that there was no multicollinearity because VIF of all variables were not greater than 10 and tolerance scores not less than 0.1. Also VIF of all variables were not greater than 5 and not less than 0.2.
- The researcher comes to the conclusion that the construction cost indicator for project cost management factors, project time management factors, and project scope management factors are somewhat skewed and kurtotic in terms of skewness and kurtosis.
- Construction cost The Durbin-Watson value of construction cost indicator vs independent variable is 2.066 therefore, the auto-correlation test has almost certainty met, since it falls between 2 and 4, and we can conclude that our model is free of serial correlation. As of the construction cost indicator construction time indicator also met with the requirement with the value of 2.146.and The construction scope indicator Durbin Watson value become 2.482 which indicate the auto correlation test has met with the requirement as a result we can conclude that our model is free of serial correlation.
- The linearity diagram of the performance indicators which are construction time construction scope and construction cost are shown linear.
- The researcher observed from the ANOVA table that the model as a whole is significant F(2,28)=3.794,P value >0.05 (P=0.035). Thus, it is concluded that the proposed hypothesis which states that construction cost performance indicator has significant relationship with the project scope management factors, project time management factors, of kaliti prefabricated housing project.
  Hence, hypothesis 1 is accepted.
- R=.696 indicates that there is a positive correlation between the dependent variable construction time performance indicator and the independent variables project cost management factors, project time management factors and project scope management factors proposed hypothesis which states that construction time performance indicator has significant impact with the project cost management factors, project time management factors and project scope management factors of kaliti prefabricated housing project.
  Hence, hypothesis 2 is accepted.
- The proposed hypothesis which states that construction scope performance indicator has significant impact with the project cost management factors, project time management

factors and project scope management factors of kaliti prefabricated housing project.
Hence, hypothesis 3 is accepted

4.4 Conclusion

The following key conclusions can be drawn by the researcher from the study's significant findings. When compared to male employees, the number of female employees is negligible. Additionally, the majority of the workforce is made up of adults in terms of age. The bulk of employees in the company are those who have been there for 16 years or longer.

Thirteen one observations across three variables made up the data. For categorical variables, the researcher calculated frequencies, percentages, and descriptive statistics. The explanatory variables study showed that the project scope management factors, project cost management factors, and project time management factors had mean score values of 2.92 (SD=1.041), 2.77 (SD=1.063), and 2.817 (SD=1.05), respectively. These values fall into the important and less important categories and have an impact on the building construction projects' performance at the Kaliti Prefab Housing Project.

Regarding performance indicators, the construction scope performance indicator mean score value was 2.92 (SD=1.041) and the construction time performance indicator man score value was 2.77 (SD=1.063), both indicating that the construction scope performance indicator falls on poor. The construction cost performance indicator mean score value was 2.817 (SD=1.05).

According to the descriptive study, the building construction projects at the Kaliti Prefabricated Housing Project are not meeting the construction cost performance indicator, construction time performance indicator, or construction scope performance indicator.The results of linear multiple regression analysis regarding the effects of project cost management factors, project time management factors, project scope management factors on performance indicators (construction cost performance indicator, construction time performance indicator, and construction scope performance indicator), it is concluded that there is a positive and significant relationship.

This implies that building construction projects at the Kaliti site perform better when cost, schedule, and scope are successfully managed. This suggests that the Kaliti site's building construction projects performed better due to optimal cost, schedule, and scope management.

5.3. Recommendations

Problems can be solved through projects. The lack of available housing in Addis Ababa led to the development of housing projects as well. However, the fact that time and money

overruns were the primary causes of project delays meant that these initiatives did not completely solve the issue. For projects to be implemented successfully, construction organisations need to have the right environment.

Construction companies must recognise their performance gaps in order to address and overcome them. Recommendations based on the results collected are listed below.

- Contractors should not increase the number of projects that cannot be performed successfully.
- Contractors should consider political and business environment risk in their cost estimation in order to overcome delay because of closures and materials shortage.
- It is advisable that contractors should really give emphasis on addressing project cost management factors, project time management factor and project scope management factors, other project management knowledge areas so as to increase performance of construction projects.
- In order to improve the performance of construction projects, consultants should highly emphasise addressing project cost management factors, project time management factors, project quality management factors, project scope management factors, project risk management factors, and other project management knowledge areas.
- Consultants are recommended to facilitate and quicken orders delivered to contractors to obtain better time performance and to minimize disputes and claims
- It is advised that human resources in the construction sector be developed through appropriate and ongoing training programmes for the execution of construction projects. These courses can help them stay current with new developments in the field and increase their familiarity with project management methods and procedures. Additionally, in order to raise the performance of construction projects, it is advised that engineers enhance and expand their managing abilities. By providing effective and efficient training programmes in managing schedule, time, cost, scope, etc., all of that may be put into practice.

5.4. Indication for future research

Students working in this area for the future can follow the following untapped area.

- Due to time and money constraint this research paper focus only on project cost management factors, project time management factors and project scope management factors . So any voluntary researcher can dig out the rest factors.
- In this study, only contractors and consultants are the study population so any other researcher can make their population of study other than contractors and consultants i.e. owners, labors, suppliers, government regulators etc.…

References

Abdullah, M. R., Aftab, H. M., Azis, A. A. & Rahman, I.A. (2010). *Factors affecting construction cost performance in project management projects: case of Mara large projects,* University of Hussein, Malaysia. Abebe, & Ayalew, (2009). *Causes and effects of variations in Ethiopian federal road Projects*. Master's thesis, Addis Ababa University. Retrieved April 14, 2017, from Retrieved from Addis Ababa University Institute of Technology http://hdl.handle.net/123456789/9977 Ahmad, W. B. W., Ismail, M. T. Nasid, A. Rosli, A. R., Wan, N. A. &Zainab, M. Z. 2009).
Effects of procurement systems on the performance of construction projects. University Technology, Malaysia. Abebe, & jemal, (2015). *Factors affecting time and cost overrun in road construction Projects in*

Addis Ababa. Master's thesis, Addis Ababa University. Retrieved April 15, 2017, from website Addis Ababa University Institute of Technology http://hdl.handle.net/123456789 Aftab Hameed Memon, Ismail Abdul Rahman and Ade Asmi Abdul Azis. (2014). *Time and Cost Performance in Construction Projects in Southern and Cenrtal Regions of PeninsularMalaysia.*

Curt. (September, 2005). *Construction Measures: Key Performance Indicators.* Department of the Environment, Transport and the Regions (DETR), *KPI Report for the Minister for Construction by the KPI Working Group,* January 2000.

DETR. Department of the Environment Transport and the Regions. Devika, R. (2012). *Job satisfaction among pharmaceutical sales representatives in the context of Herzberg"s Motivation-Hygiene Theory* (Master's thesis). University of KwaZulu-Natal. Retrieved from scholar Google website on August 4, 2017

Ethiopian Construction Industry Development Policy (ECIDP) (2014). Approved by Ministry mikirbet, published by December 2014. Federal Democratic Republic of Ethiopia, Ministry of Urban Development, Housing and Construction. (2014).

Fetene, N. (2008). *Causes and effects of cost overrun on public building construction projects in Ethiopia.* MSc Thesis Construction Technology and Management, Addis Ababa University.

Housing Development and Public Building Construction office 2014 Fiscal Year Report Fetene, N. (2008). *Causes and effects of cost overrun on public building construction projects in Ethiopia.* MSc Thesis Construction Technology and Management, Addis Ababa University. Gbadura, I. H.,& Oke, A. E. (2010). *An examination of project management leadership styles*
of Nigerian quantity surveyors, Federal University of Technology, Akure Nigeria. George D. and

Mallery P., (2003), *SPSS for window Step by Step, fourth edition*. Getachew, Y. (2015). *Causes of failure of projects financed by development bank of Ethiopia:*
The case of corporate credit process. Master's thesis, Addis Ababa University, Ethiopia.

Hill, G. M. (2008). *The Complete Project Management Office Handbook. (Second Edition) USA: Taylor and Francis Group.* Hobbs, B. and Aubry, M. (2007). *A multi-phase research program investigating project*
management offices (PMOs): the results of phase 1. Project Management Journal, 38 (1), Jugdev & Thomas, 2002; Mittermaier & Steyn, 2009 cited in Backlund et al, 2014). Backlund, et al (2014) Kaliba, C., Muya, M., & Mumba, K. (2008). *Cost escalation and schedule delays in road*
construction projects in Zambia. International Journal of Project Management. Kerzner (2014) Kerzner, H. (2009). *Project management: A systems approach to planning, scheduling and controlling.* (Tenth Edition). New Jersey: John Wiley & Sons. Kleim, R.L. and Ludin, I.S. (1998). *Project Management Practitioner's Hand Book. AMACOM*
Books. Kothari, C.R (2004), *Research Methodology, Methods and Techniques (2nd ed.). New Age International, Ltd., Publishers*

Kerzner, H. (2006). Project management best practices: Achieving global excellence. Hoboken, NJ: John Wiley & Sons. Kerzner, H. (2009). Project Management (10th ed.).:108-112

Kingsley Afre N., (2010). *Construction Professionals Perspective on the Criteria for Rating Contractor Performance in the Ghanaian Construction Industry.* Kwame Nkrumah, University Of Science and Technology, College Of Architecture And Planning Department Of Building Technology, Kumasi.

Mhando, K. S. & Mrema, L. K. (2005). *Causes of failure of housing projects: Case of Unfinished Buildings in Dares Salaam,* World Congress on Housing Transforming Housing Environments through Design September 27-30, 2005, Pretoria, South Africa.

Mohammed B. (2004). *Causes of Contractors' Failure in Saudi Arabia.* Construction Contracting.

Mullins, L. J. (1993). *Management and Organizational Behavior.* Pitman Publishing, London. Myrtveit, I. & Stensrud, E. (2005).*Identifying high performance construction projects*. In Khosrowshahi, F (Ed.).

Pitt, M. & Sapri, M. (2005). *Performance measurement in facilities management; state of knowledge. In Khosrowshahi, F (Ed.),* Proceedings 21st Annual ARCOM Conference, September 2005, London, UK. Association of Researchers in Construction Management, Vol. 1,

Project Management Institute. (2008). *Organizational Project Management Maturity Model (OPM3®). (Second Edition). Pennsylvania: PMI.*

Project Management Institute. (2008). *Organizational Project Management Maturity Model*

(OPM3®). (Second Edition). Pennsylvania: PMI.

Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge. (Fifth Edition). Pennsylvania: PMI.*

Reichelt Kimberly and Lyneis James. (1999).*The dynamic of project performance: Benchmarking the drivers of cost and schedule overrun.* European management journal. Samson, M. and Lema, N. M, (2002), *Development of construction contractors performance measurement framework,* 1st International Conference of Creating a Sustainable contractors performance.

Samson, M.; Lema, N. M. (2005). *Development of construction contractors performance measurement framework.* Department of Construction Technology and Management, University of Dares Salaam, Tanzania.

Swan, W. and Kyng, E. (2005). *An introduction to key performance indicators Centre for Construction Innovation, 2004*.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Boston: Allyn and Bacon.

Thoor, S.R. and Ogunlana, S.O. (2010). *Beyond the iron triangle: Stakeholders perception of key performance indicators (KPIs) for large-scale public sector development projects*. International Journal of Project Management, 28(3), 228-236.

Tuman, G.J. (1983). *Development and implementation of effective project management information and control systems, in Cleland, D.I. & King, W.R. (eds.) Project management handbook.* New York: Van Nostrand Reinhold Co., 495-532.

Turner (1999), *Beyond the iron triangle: Stakeholders perception of key performance indicators (KPIs) for large-scale public sector development projects*. International Journal of Project Management, 28(3), 228-236.

Ugwu, O. O.; Haupt, T. C. (2007). *Key performance indicators and assessment methods for infrastructure sustainability a South African construction industry perspective*, Building and Environment 42: 665–680. doi:10.1016/j.buildenv.2005.10.018.

APPENDICES

APPENDIX A

Questionnaire

St. Mary's University

Post Graduate Program

Department of project management

M.A Thesis on project management

Dear respondent,

This questionnaire is designed to collect data for the study of "The effect of project management knowledge areas on the performance of kaliti prefabricated housing. " the study is conducted to achieve a master's degree in St. Mary's university. Your response to each question is vital for the effectiveness of this study. So please respond to the questions honestly by ticking the most appropriate response.

As a researcher would like to assure you that your response to the questionnaire would be kept confidential and it has no intention except for academic purposes. Please don't write your name or any personal identifier on the questionnaire. For any clarification needed, please contact me on the below telephone number and email.

I would like to thank you in advance, for completing this questionnaire and assisting me in my project work.

Yours Sincerely

Kidus Dawit.

Mobile: - 0921798060

Email:-kidaff07@gmail.com

General Instruction: Please, tick "✓" in the appropriate columns for your response for closed - ended questions among the provided alternatives but write your response in the space provided for open-ended questions.

SECTION 1: PERSONAL DETAILS OF THE RESPONDENT

Instruction: Please tick [✓] appropriately

1. Gender: Female [ ] Male [ ]

2. Age..... year

3. Type of Organization

Consultant [ ] Contractor [ ]

4. Years of Experience..... years

5. Professional Background

Quantity Surveyor [ ] Architect [ ] Electrical Engineer [ ]

Mechanical Engineer [ ] Civil Engineer [ ] Sanitary Engineer [ ]

Other [ ]

SECTION 2: Project Management iron triangle and performance Questions

Please answer the following questions based on your experience in the kaliti prefab housing project.

Instruction: Please, tick "✓" in the appropriate boxes and columns.

2.1 Indicators of performance

Please, tick "✓" in the appropriate columns to indicate the extent that the following listed

Indicators of performance on the kaliti prefabricated housing project.

Performance indicators in kaliti prefab housing project	Scale				
	Very good	Good	Acceptable	Poor	Very poor
Construction cost					
Construction scope					
Construction time					

2.2 Project Cost Management Factors

Please, tick "✓" in the appropriate columns to indicate how much you agree that the following listed project cost management effect on kaliti prefab housing project.

Project Cost Management Factors	Scale				
	Very good	Good	Acceptable	Poor	Very poor
Resource Planning					
Cost Estimating					
Cost Budgeting					
Cost control					

2.3 project time management factor

Please, tick "✓" in the appropriate columns to indicate how much you agree that the following listed project time management effect on kaliti prefab housing project.

Project time Management Factors	Scale				
	Very good	Good	Acceptable	Poor	Very poor
Activity Definition					
Activity Sequencing					
Schedule Development					
Schedule Control					

2.4 project scope management factor

Please, tick "✓" in the appropriate columns to indicate how much you agree that the following listed project scope management effect on kaliti prefab housing project.

Project time Management Factors	Scale				
	Very good	Good	Acceptable	Poor	Very poor
Define project scope					
Create WBS					
Plan scope management					
Validate scope					
Control scope					

2.5 questions regarding on the effect project management iron triangle on the performance of kaliti prefabricated housing project

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

SECTION 3: Measuring the performance of a project and linkage with ten knowledge areas.

Please indicate the significance of each indicator and their variables by ticking "✓" the appropriate boxes.

Part One: Cost Performance of a Construction Projects

Cost performance measurement	Scale				
	Very good	Good	Acceptable	Poor	Very poor
1. Project design cost					
2. Cost Estimation accuracy					
3. Cost of variation orders Controlling Mechanism					
4. Actual Waste rate of materials Management					
5. Regular project budget update					
6. Escalation and Fluctuation in prices of materials					

Part Two: Schedule Performance of a Construction Projects

Schedule performance measurement	Scale				
	Very good	Good	Acceptable	Poor	Very poor
1. Site preparation period					
2. Time usage of orders delivered					
3. Time usage to implementing variation orders					
4. Time usage to rectify defects					
5. claim approval response					
6. Materials and Equipment Availability					

Part Three: scope Performance of a Construction Projects

Scope performance measurement	Scale				
	Very good	Good	Acceptable	Poor	Very poor
1. Definition of project scope					
2. Quality of Work break down structure prepared in defining scope in your project					
3. Effort of Monitoring and controlling scope in your project					
4. The importance (awareness) of project scope management in your organization or project team.					

APPENDIX B

Descriptive Analysis of Variables, Reliability Analysis, Multicollinearity, Linearity Test, Normality Test, Auto-Correlation Test/Durbin-Watson Test/ and Regression Analysis Results (SPSS V.20 Detail Statistical Output for each data analysis)

Reliability Analysis

Reliability Statistics for cost management factor		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.743	.703	9

Reliability Statistics for scope management factor

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.873	.862	10

Reliability Statistics for project time management factor		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.729	.726	10

Reliability Statistics of Scale: performance indicator

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.853	3

Multicollinearity

Coefficients[a] performance vs construction cost, time, scope factor							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	

		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.086	2.602		.033	.974		
	Cost	.298	.090	.597	3.308	.003	.787	1.271
	Time	-.117	.095	-.275	-1.232	.229	.515	1.942
	Scope	.046	.082	.119	.556	.583	.560	1.787

Source: Researcher's own compilation of survey data and SPSS V20 output (2019

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	cost	time	scope
1	1	3.945	1.000	.00	.00	.00	.00
	2	.029	11.752	.21	.13	.34	.09
	3	.015	15.960	.09	.28	.37	.62
	4	.011	19.051	.70	.60	.29	.29

a. Dependent Variable: performance

Measures of Association

	R	R Squared	Eta	Eta Squared
performance * scope	.158	.025	.653	.426

Measures of Association

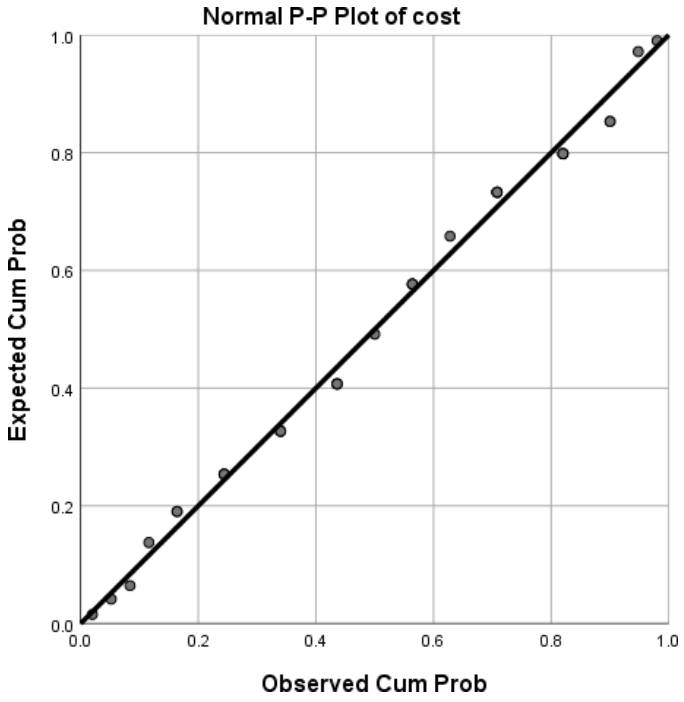
	R	R Squared	Eta	Eta Squared
performance * time	.074	.005	.835	.696

Measures of Association

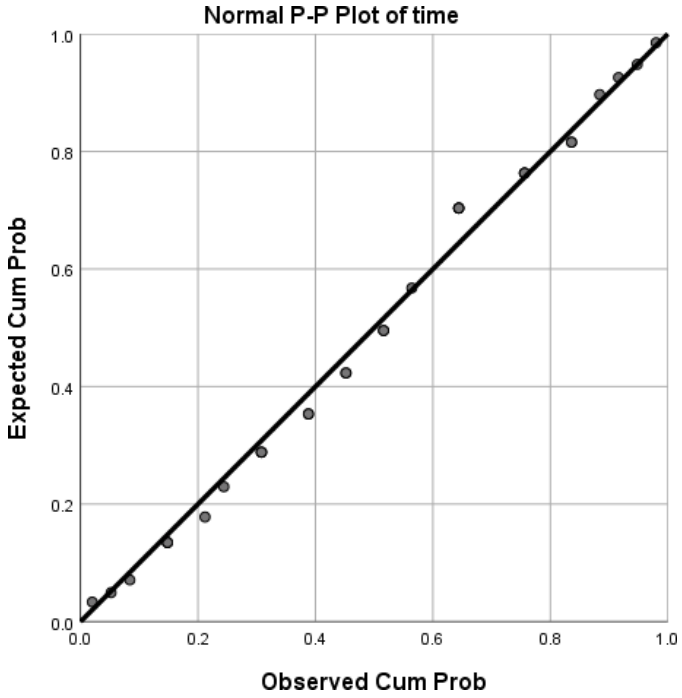
	R	R Squared	Eta	Eta Squared
performance * cost	.517	.267	.753	.567

Linearity Test

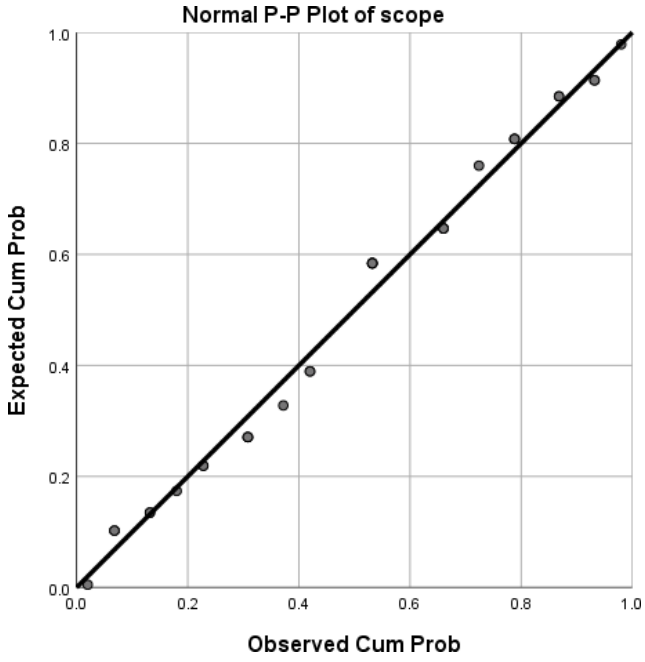
Performance vs construction cost performance graph



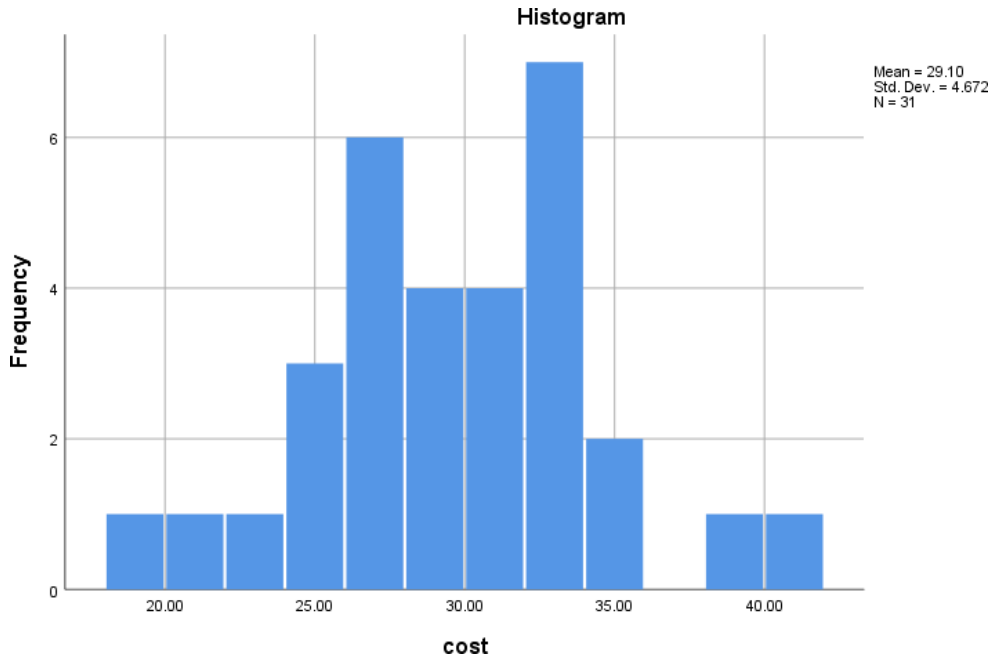
Performance vs construction time performance graph



Performance vs construction scope performance graph



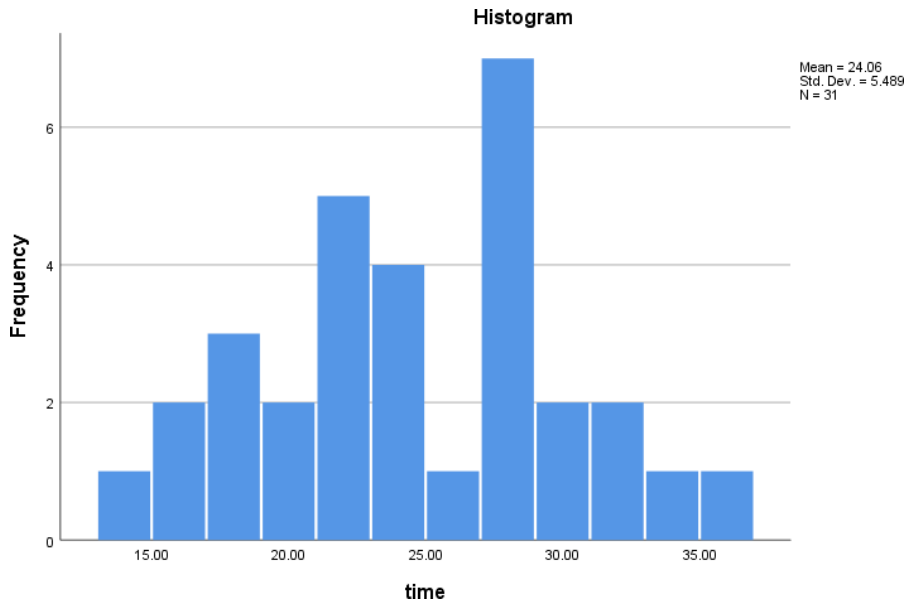
Normality



Descriptive cost management indicator for normality test

			Statistic	Std. Error
Cost	Mean		29.0968	.83904
	95% Confidence Interval for Mean	Lower Bound	27.3832	
		Upper Bound	30.8103	
	5% Trimmed Mean		29.0520	
	Median		29.0000	
	Variance		21.824	
	Std. Deviation		4.67158	
	Minimum		19.00	
	Maximum		40.00	

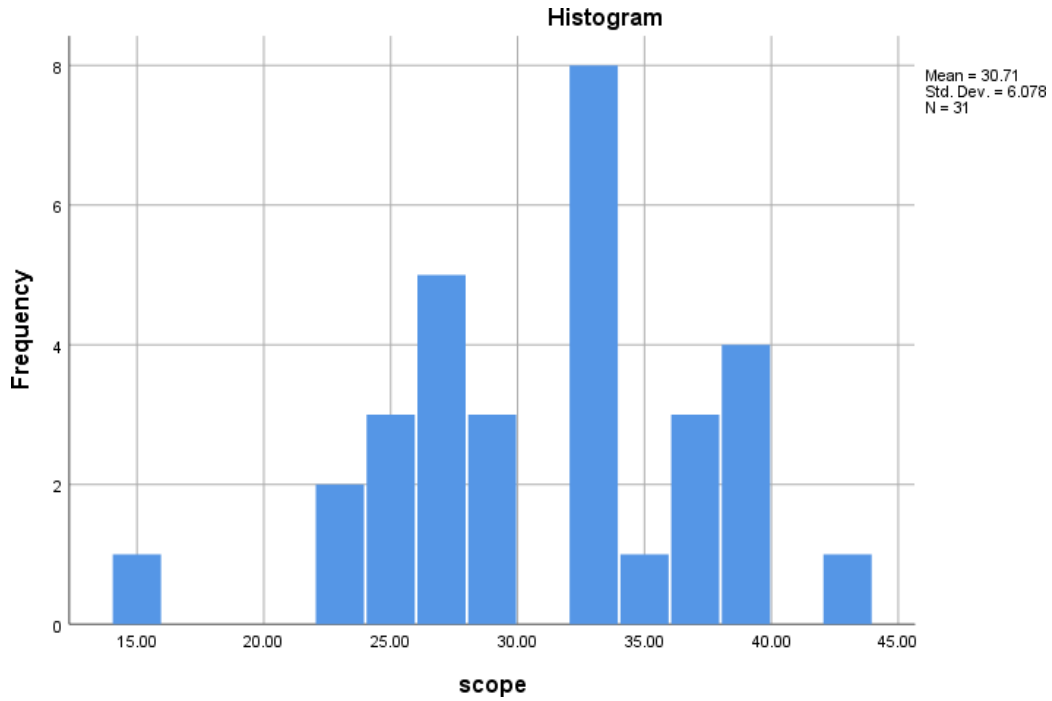
	Range	21.00	
	Interquartile Range	6.00	
	Skewness	.075	.421
	Kurtosis	.212	.821



Descriptive time management indicator for normality test

			Statistic	Std. Error
time	Mean		24.0645	.98585
	95% Confidence Interval for Mean	Lower Bound	22.0511	
		Upper Bound	26.0779	
	5% Trimmed Mean		24.0000	
	Median		24.0000	
	Variance		30.129	
	Std. Deviation		5.48899	

	Minimum	14.00	
	Maximum	36.00	
	Range	22.00	
	Interquartile Range	8.00	
	Skewness	.110	.421
	Kurtosis	-.558	.821



Descriptive scope management indicator for normality test

Descriptives

		Statistic	Std. Error
scope	Mean	30.7097	1.09170

	95% Confidence Interval for Mean	Lower Bound	28.4801	
		Upper Bound	32.9392	
	5% Trimmed Mean		30.8208	
	Median		32.0000	
	Variance		36.946	
	Std. Deviation		6.07834	
	Minimum		15.00	
	Maximum		43.00	
	Range		28.00	
	Interquartile Range		10.00	
	Skewness		-.259	.421
	Kurtosis		.118	.821

Auto-Correlation Test/Durbin-Watson Test/

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	50.136	3	16.712	3.995	.018[b]
	Residual	112.961	27	4.184		
	Total	163.097	30			

a. Dependent Variable: performance

b. Predictors: (Constant), scope, cost, time

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.086	2.602		.033	.974
	cost	.298	.090	.597	3.308	.003
	time	-.117	.095	-.275	-1.232	.229
	scope	.046	.082	.119	.556	.583

a. Dependent Variable: performance

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4.7003	9.8398	7.3548	1.29275	31
Residual	-2.44973	5.44640	.00000	1.94045	31
Std. Predicted Value	-2.053	1.922	.000	1.000	31
Std. Residual	-1.198	2.663	.000	.949	31

a. Dependent Variable: performance

Source: Researcher's own compilation of survey data and SPSS V20 output (2019)