Assessment on Monitoring and Control of Public Housing Construction : In The case of The Addis Ababa City Administration Housing Construction

Dagmawi Asnake Ayalew

A Thesis Submitted to the Department of Civil Engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirements of Masters Science in Civil Engineering (Specialization in Construction Engineering and Management)

Office of Graduate Studies

Adama Science and Technology University

January, 2024

Adama, Ethiopia

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Meseret Getenet (Ph.D.)

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DECLARATION

I hereby declare that this master's thesis entitled "**Assessment on Monitoring and Control of Public Housing Construction: In The case of The Addis Ababa City Administration Housing Construction"** is an independent work of mine that has not been submitted for the award of any academic degree, diploma, or certificate in any other university. All sources of material used in this thesis were duly acknowledged through citation. I undersigned below checked that this thesis project is my sole work.

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RECOMMENDATION

I, the major advisor of this research, hereby certify that I have closely advised/supervised the student while developing this thesis and read the draft thesis entitled **"Assessment on Monitoring and Control of Public Housing Construction: In The case of The Addis Ababa City Administration Housing Construction"** prepared under my guidance by Dagmawi Asnake Ayalew. Therefore, I recommend the submission of the thesis to the department for further review and evaluation.

Meseret Getenet (Ph.D.) _____ _____

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APPROVAL OF BOARD OF REVIEWERS

We, the undersigned, members of the Board of Reviewers of the thesis by Dagmawi Asnake Ayalew have read and evaluated the thesis entitled **"Assessment on monitoring and control of Public housing construction: In case of Addis Ababa City Administration housing construction"** and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Civil Engineering (Specialization in Construction Engineering and Management).

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ACKNOWLEDGEMENT

First and foremost I would like to thank the Almighty God for his invaluable care and support throughout the course of my life. Next, I would like to express my appreciation to Dr.Meseret Getenet for his patience, encouragement and wise advice. I would like to thank him for offering his time, knowledge, and advice throughout the development of my thesis. I would also like to thank all individuals and companies who support me during facilitating the data collection processes and my gratefulness goes to all members of my best friends, family, colleagues and all my supporters for their cooperation, inspiration and encouragement.

ABSTRACT

The initiating, planning, execution, monitoring, control, and closing of all forms of civil works are all covered by the construction sector. The purpose of the study is to identify, from the viewpoints of various respondents, including clients, consultants, contractors, regulators, and others with experience in the construction of public buildings, factors that influence monitoring and control practices in Addis Ababa public housing construction, and to offer recommendations regarding the management of construction sites. Through a review of the literature, 66 factors were discovered and divided into six categories. Respondents were asked to rank the significance of 66 project monitoring and control practices aspects.

The 6 groups of factors which have significant impact on the project monitoring and controlling practices are ranked depending on their RII as: Communication Factor, Cost Factor, Stakeholder engagement Factor, Schedule factors, Quality Factor and Scope factor. According to the result of the study the top factors of project monitoring and controlling practices includes: Payment delay, Scope change within time, cost and quality change, Price fluctuation, Cost variations, Written communication and Delays in decisions making.

The major impact lack of monitoring and controlling practices are time delay, cost increase and quality factors from initial contract on this project are originated by the employer, contractor, regulatory and consultant.

It's recommended that building construction organization assign project manager and construction supervisors with sufficient management skills in project, minimize Accident and any safety problems, develop human resources through proper and continuous training programs frame a strong assignment, vision and a planned approach to overcome poor project monitoring and controlling. It's recommended that the government should consider as major concern, to enforce hard and fast laws and regulation that help to obtain practices work force in the building construction.

Keywords: Construction, monitoring and control, project, project management

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LIST OF ACYRONYMS

AAIHDP - Addis Ababa Integrated Housing Development Program

AAHDPO- Addis Ababa Housing Development Project Office

CBPP - Construction Best Practice Program

EDM - Earned Duration Management

EVA - earned value analysis

GDP- gross domestic product

IS - project monitoring and evaluation information systems

KPIs - key performance indicators KPOs - key performance outcomes M&E – Monitoring and Evaluation

PM - project management

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The construction industry is a sector of the economy that transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development. It embraces the process by which the said physical infrastructure were planned, designed, procured, constructed or produced, altered, repaired, maintained, and demolished. One of the distinguishing features is that projects are normally required to complete within specified timeframe and an allocated cost budget. On the other hand, many uncertain factors have potential impact on time and cost during project delivery. In the construction industry, which mainly deals with one-off projects, the influence of uncertainties is more dominant, necessitating the need for effective management control.(Olawale & Sun, 2015)

PMI, (2011)The project monitoring and control process is complete make sure everything is going according to plan. In others words, it recognizes contradictions and deals with change manage, provides feedback on updates, plans gradually (Jack et al., 2016). Formally, the project monitoring and control system also work minimize deviations from the project plan is to check the status of the Project, compare and analyze it with the plan deviations and implementations of the corresponding modifications action. Therefore, it contains a set of guidelines, methods and tools to achieve Project goals.

An effective system should clearly define the following policies:

(a) Monitoring policy: what, how, where, when and by whom to monitor,

(b) Intervention and control policy: what, how, where, when and by whom to prevent, intervene and correct.

The construction industry in Ethiopia is growing rapidly and playing a major role in the country's development. The industry incorporates different construction projects such as buildings, roads, railways, waterworks, dams, hydropower construction, and others. In Addis Ababa, several high-rise and complex building projects are being undertaken, along with railways, roads, and other forms of construction. The city is engaged in various

government and private-owned construction projects, some of which are remarkably carried out by foreign construction companies. The construction industry in Ethiopia where public and private sectors are investing hugely is also in a boom. According to the Ethiopian National Planning commission (2016) the construction sector has been a major driver both in terms of growth and structural change within the industry sector. Ethiopia's GDP grew by 6.1% in 2020, down from 8.4% in 2019, largely because of the COVID–19 pandemic. Growth was led by the services and industry sectors, whereas the hospitability, transport, and communications sectors were adversely affected by the pandemic and the associated containment measures to prevent the spread of the virus. (African Development Bank, 2019). Currently Ethiopia is undertaking major construction projects in transport infrastructures (railways, airports, roads, and expressways), industrial parks, irrigation and hydroelectric dams.

There have not been many studies specifically focused on enhancing the project control process in practice, despite the abundance of studies in this general area. Studies like Olawale & Sun (2015) and Acebes et al.(2014) only focused on specific aspects of the process, like techniques and estimating, rather than the project control practice as a whole. For instance, the 'Managing the Risk of Delayed Completion in the 21st Century' report (Olawale & Sun, 2015) explicitly stated, "While it is apparent that some projects are managed very well in the UK, it has to be recognized that the quality of time management on construction projects is generally poor" with room for improvement. The absence of recent research on the general practice of project cost and time control in the UK construction industry, along with these kinds of clamors, have made a study from this particular angle necessary. Otieno(2000)noted that Third World developing nations were unable to complete projects as early as 2000, but suggested that implementing monitoring and control would be the answer to this problem.

The construction industry world over and more especially in developing nations are greatly manual and as such requires more human resource to undertake the many activities aimed at achieving set targets. These activities, however, require close supervision to ensure that they are executed right at first hand to eliminate re-work, increased project cost and prolong project duration and as such the need to monitor and evaluate projects to achieve the desired outcome.

According to this report(Ayalew et al., 2016), Ethiopia is the second from the last followed by Mozambique which indicates that the management practice in Ethiopia is even far behind from those poor performing developing countries in Africa. With this driving fact, this research assessed the performance of Ethiopian construction industry with respect to project management practices and its challenges in order to identify the major issues for intervention. The results revealed that the level of project management practice in terms of adapting general project management procedures, project management functions, tools & techniques to be unsatisfactory. Particularly, the level of practice in terms of safety, risk and time management was found to be very low. The amount of schedule slippage ranges between 61-80% and that of planed costs and other variables such as risk, quality, resources utilization and safety deviates in the range 21-40% from predetermined requirements or anticipated at the beginning of the project.

Ethiopian construction firms need effectively monitor their projects for success if they are to be competitive in and benefit from a sector that continues to be a major budget recipient. Constructions in Ethiopia, roads that received 12.06% of the latest federal budget (CEPHEUS, 2019) included, suffer from quality defects, schedule and cost overruns. A study Belachew et al. (2017) by on federal road projects in southern district revealed the average cost overrun to be 21.52% while average time delays was 427 calendar days. Out of the 40 factors identified as causes for the overruns the lack of monitoring during pre and post contract stages ranks third.

One of the major challenges of Addis Ababa city is lack of shelter and unemployment as identified by city administration of Addis Ababa, which needs an urgent remedy. In order to solve these challenges, the city administration has established an integrated housing development program which has to be planned to change the image of the city, to modernize the life style of the society, and to promote the construction industry (MWUD, 2010).

In 2004 E.C, the City government launched the Addis Ababa Integrated Housing Development Program (AAIHDP) to alleviate housing shortage (UN Habitat, 2011). The major purpose of housing program is primary to satisfy the housing need of the public in connection to creating cities that are free from slums in the near future. The 40/60 housing program is one among the projects that are mainly aimed at building condos that are up to

24 upstairs in length and build the city to be one among the major cities in the world (Ethiopian Herald, 2016)

The program comprises of four different schemes based on percent of advance payment modalities such as 10/90, 20/80, 40/60 and housing association. According to AASHDE Report(2011), the 40/60 housing construction has 14 sites with nine topologies, i.e., B+G+7,B+G+8, B+G+9, B+G+10,2B+G+12, 3B +G+12, 2B+G+13, 2B+G+15 and 2B+G+18. Total number of Blocks 355.

According to AASHDE report (2011), 136 contractors having first to third level ranks and eleven consulting organizations are participated in14 different sites on the 40/60 housing development program. Recent AASHDE report (2015), 257 contractors having first to third level ranks and 8 consulting organizations are participated in 10 different sites on the housing development program with total of 2,301 housing buildings.

Factors that affect monitoring and control of comes was the method of following, reviewing, and control the accomplish meet the performance objectives outlined within the project management plan. Monitoring contains standing coverage, progress measuring, and prediction whereas analysis is systematic and freelance. In regard to factors that affect monitoring & controlling practices, performance offers information on the projects performance regarding scope factors, schedule factors, cost factors, resources factors, quality factors, and risk factors, which might be used as inputs to other processes (Otieno, 2000).

Unfortunately, project monitoring and control have been faced with several barriers to their implementation in the sub-region due to reasons as the complex nature of construction and divergent views on project delivery with less technological incorporation in the industry in developing nations. The aim of this study is therefore to assess the practice of monitoring and control in the public housing construction projects in Addis Ababa. It is hoped that this study will provide an approach for a more streamlined process for the reliable delivery of quality and economical projects within the stipulated period.

1.2. Statement of the problem

Worldwide projects have experienced numerous barriers in their implementation. As a solution, project monitoring and controlling are key elements in improving project performance. These barriers are primarily influenced by the kinds of measures being used and the minimum amount of attention given to the practice. The effectiveness and success

of every monitoring plan depend largely on the capacity of the institution or individual mandated to undertake the activity. Implementation of project monitoring and evaluation is therefore challenged with weak institutional capacity.

Globally, the implementation of monitoring and control (M&C) has not been entirely successful to bring about the desired outcome of projects. This may have been influenced by lack of appreciation of the role of M&C and its influencing factors within specific project environment like the construction industry (Otieno, 2000). Studies on project management suggest that the underlying indicators of project success are unlimited in the project environment and M&C is topical (Otieno, 2000). The impact therefore, of monitoring and evaluation in project implementation towards achieving success has never been in doubt (Tengan & Aigbavboa, 2021). This notwithstanding, M&E practice has not been accorded the needed attention as its implementation has been challenged.

In Ethiopia, construction industry plays an essential role in socio-economic development of the country. Since construction project comprises from many processes starting from initiation to completion, it passes several activities in each significant stage to accomplish the project goals. Construction projects are subjected to large stakeholders and environmental issues making it susceptible to deviations from planned progress and budget. Undoubtedly, numerous infrastructure projects initiated by most developing countries have failed due to several reasons. Remarkable among these reasons for the failure of projects include poor planning of the project implementation process and the ineffective monitoring and control of projects.

The Urban Development and Housing Program identified limited capacity in project monitoring and control as one of the challenges to the (Ethiopian National Planning commission, 2016). Furthermore, According the result of the research by (Ayalew et al., 2016) indicated particularly the level of practice in terms of safety, risk and time management was found to be very low. The amount of schedule slippage ranges between 61-80% and that of planed costs and other variables such as risk, quality, resources utilization and safety deviates in the range 21-40% from predetermined requirements or anticipated at the beginning of the project.

In Ethiopia, it is observed that there have been time overruns in housing construction projects. In general in the four years plan of 2006/07 to 2009/10, it was planned to construct

400 thousand housing units out of which the construction of more than 150 thousand housing units was completed (MWUD, 2010).

As per commercial bank of Ethiopia report, 156,932 people are registered for saving housing units in August 2013(Capital News Paper, 2015). As evidence shows in the above-specified year based on the rate of construction, it might take decades to deliver the houses fully to the registered public housing scheme. The housing projects scheme in Addis are lagging behind their contracted schedules and budget.

The housing construction projects have not been completed at the set time. In view of these observations, there is a need to carry out a study on factors influencing the timely completion of the project.

Hence, most of the researches focused on identifying major factors of delay or focus on determinants of construction projects delay. Most recent studies conducted on condominium housing both 20/80 and 40/60 schemes can be an evidence for this. As an example, the study conducted by Desse (2016) focus on identifying the major causes to the delay in the construction of 40/60 saving houses project in Addis Ababa. In addition, the study conducted by Bekele (2018)focus on determinants of construction projects delay on case of 20/80 condominium. Despite many research conducted on finding out the factors for delay of construction in Ethiopia the problem of delay of projects continue. The construction of projects continues to be described as delaying for instance (UN Habitat, 2011) and (Capital News Paper, 2015).

The issues of delayed housing delivery of the Addis Ababa condominium projects were apparent since over the past years. The motivating factor to undertake this research that in 2013 around a million residents of Addis Ababa registered for the 10/90, 20/80 and 40/60 condominium housing schemes and began to deposit in the state-owned Commercial Bank of Ethiopia (CBE) the minimum saving required under each scheme. The promise from the city administration was to handover the houses to the beneficiaries within 3 years delivery time to 40/60 category and 5 years delivery time to 10/90 and 20/80 categories.

The vast majority of those who enrolled in the program in 2013 are bitterly awaiting the keys to the houses as the matter of fact they had been given a promise to receive the houses within 3 years. Even these citizens have no idea as to when the construction of the condominiums would be completed or when they would be handed over to them. Due to

many reasons such as the absence of the required housing project management knowledge, the poor execution capacity of the management and staff of the executing government agencies as well as ethics-related problems and inadequacy of funds program is way behind schedule (Reporter Newspaper, 2017).

Generally, on the budget year Package 2 occupied 17,737 Housing construction Executions on average 23.55% planned to be accomplished but possibly done 10.53 percent. The package 2 Construction Execution was planned to be accomplished 100% up to the end of the Budget year but possibly done 86.98 percent (AASHDE, 2011).

On the other hand, on the budget year, package 3 comprises 20,503 houses construction execution that was planned to be accomplished on average 39.93% but possibly done 9.77 percent (AASHDE, 2011).

Based on the housing construction execution, both the package 2 Housing construction, which includes 17,737 Houses, and package 3 Housing construction that includes 20,503 did not accomplished in their scheduled time and budget . It was planned that package 2, 17,737 housing construction to be done on average 13.02(55.29%)and package 3, 20,503 Housing Construction to be done on average 36.16(75.53%) but they are accumulated works that were not done. For this fact this shows there is a delay in the construction process (AASHDE, 2011).

Some construction projects contracted to local companies are noted for poor quality, schedule delays, and cost overruns. According to (Gidiss, 2017; Lemma, 2018) the research finding from the first top ten contributing factors affecting cost and time performance that are related to monitoring and control on public housing project in Addis Ababa have been found Lack of cost planning/monitoring during pre-and post-contract, Ineffective And planning and scheduling of project by contractor.

The implication of local contractors not delivering construction projects within the planned budget and schedule is not limited to a policy failure to develop a competitive Ethiopian construction industry. In their research on Sub-Saharan Africa projects, (Belachew et al., 2017)listed Pareto-inefficient allocation of resources, further delays and cost escalation, negative public perception, loss of job and income, and at the worst total project abandonment as the effects of cost and schedule overruns. Furthermore construction projects entail large penalties or damages for project delays (PMI, 2011)

Most these challenges are related what we call it that effective monitoring and control plays a critical role in construction project implementation given the needed attention by the project implementers/team by providing adequate resources, technical capacity building and providing a conductive project environment and the involvement and participation of stakeholder in monitoring and control will see project performance improved.

1.3. Objectives of the study

1.3.1. General Objectives

The general objectives of this study are to study on monitoring and control of public housing construction project: In case of Addis Ababa administration housing project.

1.3.2. Specific Objectives

The specific objectives of the designed proposal are to:

- Assess the monitoring and control practices at public housing construction projects in Addis Ababa
- Identify the factors that affect the monitoring and control practices at public housing construction projects in Addis Ababa.
- Determine impact of monitoring and controlling practices on public housing construction projects in Addis Ababa

1.4. Research Questions

- What is the practice of construction-work monitoring and control in public housing construction projects in Addis Ababa?
- How effective is the project monitoring and control practice of housing cooperation?
- What are the major factors to the affects monitoring and control?
- What could be recommended to improve project planning, monitoring and control at housing cooperation?

1.5. Significance of the study

Buildings are being constructed to provide different services for the public to address social demands and improve their situation. Therefore, refining the performance of contractors concerning the timely completion of building projects will contribute mainly to the economic development of the nation. It also enhances the local construction companies'

ability to manage building projects, and create awareness to those who are engaged in the construction sector as a whole. Therefore, this study will give an insight into the current nationwide practice regarding building construction work monitoring and controlling as a limited number of research works are found relating to the topic.

Various stakeholders may benefit from this study, as it is an assessment of the practices, major problems and factors behind these problems about building construction project monitoring and control. Finally, the result of the study will be important to Addis Ababa housing project cooperation in particular and other contractors in general to create awareness on the issue and its importance to achieve the project objective. Even though the research will focus on construction projects, the findings and the outcome could be relevant to professional, other industries with particular emphasis on the various stages involved in project monitoring and control.

It is hoped that this study will increase awareness of the program in delayed project. Then if corrective measures are taken, it will ensure sustainability of the program in completing projects within the specified time limit of the housing project in Addis Ababa.

1.6. The scope of the study

The study was focused on the assessment of construction project planning, monitoring and control of public housing project in Addis Ababa Housing project cooperation. The sample respondents were comprised only managerial and professional engineers of the housing project cooperation, consultant and contractor. There are some limitations to the study. Firstly, the research population is too large to cover in the limited time given thus sampling is required which might have an impact on the general output of the study. Secondly, the data collection is limited in the sense that the respondents are the main participants of the project such as Client, Contractors and Consultants. The result of this study was be mainly based on the opinion and ideas of the respondents who were selected purposively. Though, project planning, monitoring and control is contesting issues, which deserve time series data collection, the data collection for this study delimited to the opinion of respondents which is collected once.

1.7. Organization of the Thesis

This thesis is organized in to five chapters. The first chapter is the introduction. The second chapter presents the review of related literature. In the third chapter, the research methodology is presented. In the fourth chapter presents data presentation, analysis, and discussion of the study. The last chapter describes summary, conclusion and recommendation the conclusions and recommendations of the study.

CHAPTTER TWO

LITERATURE REVIEWS

The Literature review studies various areas of interests in order to answer the research questions and contribute to the growing knowledge base of projects controls in construction projects. Initially, the study focused on the importance of construction project management and tries to identify 'Project controls and management' as an important factor for improving project performance.

2.1. Construction Project Management

The understanding of what construction project management involves will help to appreciate the environment in which monitoring and evaluation succeed. Maksimović (2014)defines construction as the sequence of preparing and forming buildings and building systems. He further mentions that the construction sequence begins with planning, design, and financing, which continues until the project, is ready for occupancy. Similarly, he states that construction project management is the overall planning, coordination, and control of a construction process from beginning to completion (Maksimović, 2014). The aim of the planning, coordination and controlling of the process of construction is to achieve design and client requirements of a functional and economic viable project. PMI (2011) also defines project management (PM) as the "application of knowledge, skills, tools, and techniques to project activities to meet the project requirements".

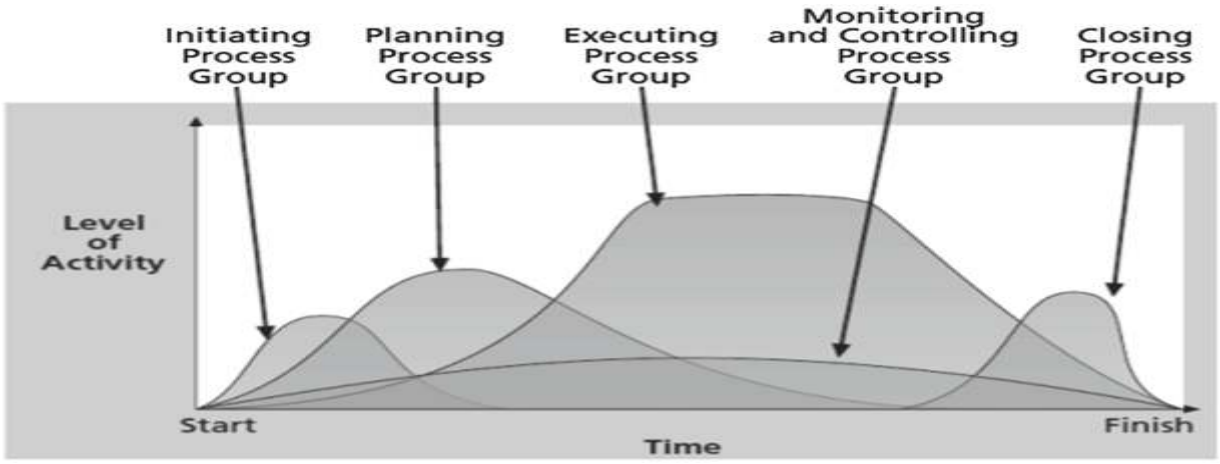

Figure 2.1 Project management processes in the project life cycle: Source (Attakora-Amaniampong, 2016; Project Management Institute, 2013)

From Figure 2.1, stages the initiating and planning processes for a project begins the project life cycle, they are concluded before the closure of the entire project. The closing process of the project also begins at a later stage of project implementation. On the other hand, both the monitoring and controlling and the project implementation processes of PM begin the project and closes with the project. This suggests that the monitoring and controlling process is fundamental in the entire life of the project to ensure the successful implementation of the project. Similarly, monitoring and evaluation are central to the management of projects if performance is to be achieved (IUCN, 2000)

Figure 2.2 illustrates the significant role of monitoring and evaluation during project

Hence the need to understand the role of Monitoring & Evaluation in the construction project management.

Initiating and planning project requires Monitoring & Evaluation to ensure the right needs of clients (project objects) are outlined and incorporated in the project while the needed resources for the project are planned. Execution and implementation of the project imply the translation of design into physical structures through several construction phases. As a project management tool to ensure value for money and achieve quality, cost and schedule and performance and satisfaction, Monitoring & Evaluation contrast actual progress with established project objectives. Project resources (material, human and financial) are closely monitored and evaluated to ensure effective resource utilization and project accountability.

2.2. Project control models and techniques

On time and within budget are common necessities for all building projects. Unfortunately, in actuality, many projects suffer from delays and price range overspends. Overcoming this hassle requires advantageous project cost and time control. Project control is frequently a complex task undertaken via project managers in practice. During the last few decades, several planning and control techniques, such as Gantt bar chart, program evaluation and review technique (PERT), earned value analysis, and critical path method (CPM) have been developed. A variety of software program packages is additionally on hand to aid software of these project control methods for example, Microsoft Project, Asta Power Project, Primavera, and so on. The problem is that these techniques, although beneficial, would continually be used, as phase of a project control procedure and do now not constitute a control procedure on their own. In practice, project control is a complicated and iterative procedure that is generally executed in three phases: setting overall performance standards, comparing proper overall performance with these standards, and then taking vital corrective actions. It is viewed the final logical step in management and in the course of the control stage; the degree of overall performance is compared with the deliberate objectives to discover any deviation and, consequently, act on it (Olawale & Sun, 2015).

The majority of the studies devoted to the development of project control models and techniques have mostly developed computer-based project control systems incorporating quantitative project management concepts such as earned value analysis (EVA). A common motivation for these studies is the desire to make project control models more easy to use in practice, as stated by(Olawale & Sun, 2015). Another common motivation that has informed the development of project control models is the need for integration. For example, (Fleming & Koppelman, 2005) developed different models that integrated the schedule and cost information with resource information in order to achieve efficient planning of construction processes. These studies focused on the project planning process instead of on the control process during project execution. The need for monitoring and control actions arises because projects are dynamic in nature and are often carried out in changing environments. Such dynamic characteristics of projects were not sufficiently considered by the existing project control studies, as criticized by (Olawale & Sun, 2015)

Finally, some studies have attempted to improve the much acclaimed earned value method for example; Khamooshi & Golafshani (2014) noted that the EVA uses cost as a proxy to

measure schedule performance in order to control the duration of a project and that this may not be effective. The study developed a new method called the Earned Duration Management (EDM), which generates a number of indexes that are better measure of schedule performance during project control. Naeni et al.(Acebes et al., 2014)on the other hand suggested incorporating the fuzzy principles into earned value calculations as a means of assisting project managers to estimate the future status of the project in a more robust and a more reliable way. Similarly, Aliverdi et al. (2013)proposed the use of statistical quality control charts in EVA in order to improve its capability of reporting deviation, hence contributing to a more reliable. Acebes et al.(2014) integrated the earned value methodology with project risk analysis in the argument that this approach will help project managers better understand the origin of project deviations and, therefore be able to take early corrective actions during project control.

Other researchers went beyond simple implementation of project control techniques by proposing new project control methods. Cho et al. (2010) argued for the need for an integration model that facilitates efficient planning of repetitive construction processes. Hence, a model was developed by integrating the schedule and cost information with resource information inputted to the project. However, it was recommended that because the developed model is only applicable to repetitive construction processes, an integration model that can carter for an entire project should be developed. A similar repetitive projects centric study was conducted by (Acebes et al., 2014), who developed a multi- objective optimization model to support planning and scheduling of repetitive construction projects.(Plaza & Turetken, 2009) adopted a quantitative approach based on the statistical process control (SPC) chart technique to refine and improve the performance of the traditional earned value management technique. Attakora-Amaniampong (2016) also developed a model based on the SPC method in a bid to evaluate cost overruns of asphalt paving projects. The problem is that although the SPC could identify the special causes of deviations, how it could be used to control the identified deviations was not specified, and the data was only used from asphalt paving projects. Shihemi (2016)developed a project control system that quantifies deviations from the planning to execution phase with respect to global project control specifications (GPCS), which would present project performance in all dimensions of operations, thereby drawing attention to poor performance. Olawale & Sun (2013), in contrast, argued that monitoring and control actions arises because projects are dynamic in nature and

recommended different allocations of control points through the application of the effort function (a non-linear function of the total number of active operations) and total slack time. The dynamic nature of projects also informed the study of Olawale & Sun (2013)who developed the dynamic planning and control methodology, which integrates application axiomatic design concepts, concurrent engineering, graphical evaluation and review technique (GERT), and system dynamic modelling. However, it is a complex system, and may not be readily adopted for ordinary projects; for example, GERT, just one of the components of the developed model, is rarely used in practice.

Finally, another area of research, which is most relevant to this paper, is process-based project control models. The basis for many of these studies is the well-known Deming's plan-do-check-action (PDCA) wheel (Deming 2000). Deming's PDCA wheel describes a management process, originally used for quality control purposes. Some researchers attempted to adopt it for construction project control while acknowledging the need for modifications. For example Platje and Wadman (1998) criticized the PDCA model as having the drawback of no time-dependent element and neither fully de- scribing the whole planning and control situation nor its development in time. The PDCA cycle was subsequently modified to plan, implement, do, check, act and management (PIDCAM), but just adding two additional stages to the classical PDCA model is not enough to improve the control process if other measures are not put in place during implementation of the model. Watson and Davis (2002) echoed Platje and Wadman's (1998) criticism, noting the lack of progression of each cycle as a limitation of Deming's PDCA.

There have been very few studies on practices for improving the specific activity of project control in practice. One of such studies is (Olawale & Sun, 2015), who identified that cost control planning using the cost breakdown structure and a budget baseline yields better results than controlling using work packages alone and that the use of detailed bar charts and CPM analysis techniques correlated with good schedule performance. More recently, Haponava and Al-jibouri (2010) argued that project control practice has traditionally focused on product- based goals and argued for the need to shift the emphasis towards process-oriented goals.

2.3. Factors influencing effective monitoring and controlling

Monitoring and controlling is conceived as two distinct but complimentary project management functions which is aimed at sequentially collecting information on projects to inform stakeholders on the progress (cost, quality, time, etc.), promote organizational learning and to inform management decision (Tengan & Aigbavboa, 2021). To achieve the task of effective M&C, factors that influence effective M&C implementation cannot be overstated. In addition, a qualitative research approach identifies four main factors that need to be considered when developing an M&C system. These factors are training, budgetary allocation, stakeholder participation and the influence of politics when he studied the effectiveness of M&C of constituency development fund projects in Changamwe, Kenya.

To improve project control, it is essential to understand the key factors that influence this process. Gardiner (2005)identified specific contributors to project budget and/or schedule performance success as team-building activities, core management group for small projects, maintenance contracts concurrent with small projects, standard processes and front-end planning use of checklists. (Shihemi, 2016), through a questionnaire survey, found coordination among project participants as the most important success or failure factor. Tengan & Aigbavboa (2021) established 69 performance indicators that can be used as a set of measurement to monitor projects, and classified these performance indicators as general indicators, time indicators, cost indicator, quality indicators, inter-organizational co-operation and socio-economic indicators. Similarly, Fellows & Liu (2008)established 24 project management practices that are significantly correlated with project performance and recommended that emphasis must be given to scope management to achieve superior project performance. Fellows & Liu (2008) identified project team commitment, client's competencies and contractor's competencies as critical in explaining overall performance of design and build projects. Ling (2004) found that contractor's record of accomplishment for completion on time affect up to six performance metrics, including time performance of a project. Lee et al. (2005) revealed that pre-project planning, project change management, and design/information technology are critical practices with important impacts on both cost and schedule performance of projects. White and Fortune (2002), through a questionnaire survey, found that clear goals and objectives support from senior management, and adequate funds/resources are the three leading critical project success factors. Finally, Tengan & Aigbavboa (2021) investigated the impact of standardized project management practices on

project performance, and identified standardized project management tools, leadership skills, and processes as factors that may exert a higher impact on project success.

Tengan & Aigbavboa(2021) also found that the availability of resources such as time, sufficient finances, adequate skilled personnel, technical competence regarding application and utilization of M&C system and favorable administrative culture significantly influence the success of monitoring and controlling system. A study conducted in Ghana on the barriers in the implementation of monitoring and controlling suggest factors including institutional capacity, approach to M&C, and resource & budgetary allocation as attributes to effective monitoring and controlling of the project in the Ghanaian construction industry.

Now a days building construction industries are boosting globally and consuming huge amounts of resources. Responsibly factors that affect monitoring and controlling practices on public building construction project is a vital component of optimum use of the limited resources we have that sustain the ongoing development. In this context, Preliminary focus is on scope factors, time factors, and cost factors, quality factors, stakeholder and communication factors of that affect monitoring and controlling practices (Karan Singh et al., 2015).Appropriate visibility permits timely corrective action to be taken once performance deviates considerably from the set up. A deviation is important if, once left unresolved, it precludes the project from meeting its objectives. These actions may require preplanning, which may include revising the original plan, establishing new agreements, or including additional mitigation activities within the current plan (Kumar & Bansal, 2015).

2.3.1. Project monitoring factors

Project Monitoring is the set of procedures and management practices used to collect information about the performance achieved or forecasted in a project and the developing organization based on a set of performance metrics. Project monitoring factors tracks and reports on progress in implementing the project during its life. According to Kumar & Bansal (2015) as indicated earlier, monitoring project performance involves making measurements as the project proceeds and comparing those measurements with the desired or expected values. The measurements made are limited in number because of the cost factor of data collection and by company policy and precedent factor. Performance in a project is complex and a limited number of measurements will provide a less than complete picture of the performance. This partial representation may be adequate

for the purposes of controlling the work or it may not. According to Mahmoud Khraiwesh, (2013) are describe the following.

A. **Monitor factor planning parameters**

Monitoring involves the measure practices of the actual parameter values of project planning, comparing these values to that estimated in the plan and then identify the deviation include size, complexity, and availability. The monitoring the project planning parameters to the monitoring the project progress against the schedule. Project plan are attributes of work products, Attributes of costs, Parameters of estimated and Attributes of schedule. Monitoring periodically the actual completion of activities and milestones are Actual activities and Actual milestones measures. The monitor resources provided and used Resources of the projects.

B. **Monitor Stakeholder Involvement factors**

Monitor stakeholder involvement practices the project plan factors. The project monitoring stakeholder involvement to ensure that appropriate interactions occur are measures stakeholders involved.

2.3.2. Manage corrective action to closure factors

Determining and documenting the appropriate actions to address identified issues are modifying requirement, revising estimates and plans, renegotiating commitments, adding resources and revising project risks. Monitoring corrective actions for completion are analyze Issues: Collect and analyze problems and confirm corrective actions to deal with them, take corrective action on known problems and manage corrective actions to closure.

These consist of factors that affect monitoring and controlling method cluster additionally includes:

- ✓ Controlling changes and recommending preventive action in anticipation of possible problems of factors
- ✓ Monitoring the ongoing project activities against the project management plan and the project performance baseline factors
- ✓ Influencing the factor that could circumvent integrated change control so only approved changes are implemented factors

This Continuous monitoring gives the project management team insight into the health of the project and identify any areas require additional attention. The monitoring and controlling method cluster not solely monitors and controls the work being done at intervals a method cluster however conjointly monitors and controls the complete project effort. In multiphase projects, the monitoring and controlling process group coordinates project phase in order to implement corrective or preventive actions to bring the project into compliance with the project management plan. The review can result in recommended and approved updates to the project management plan. Monitoring and Controlling processes occur at the same time as processes contained within other process groups. Thus, the Monitoring and Controlling Process is pictured as a "background" Process Group for the other four Process Groups shown in Figure 2.2 & 2.3

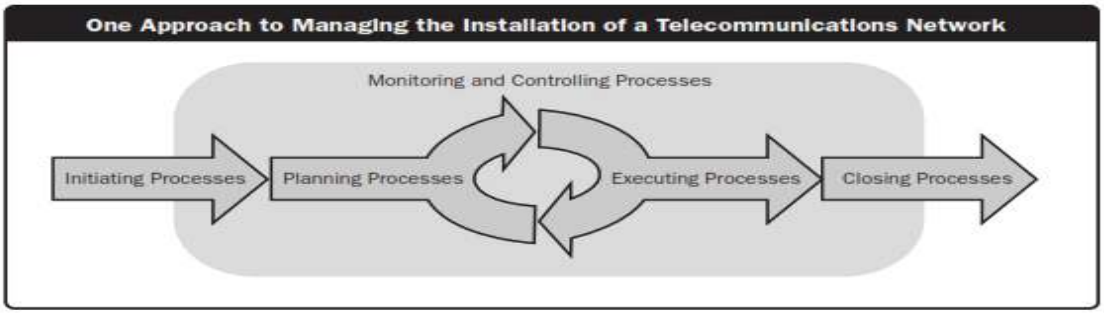

Figure 2.3 Single phase of project (Source: Project Management Institute, 2013)

2.3.3. Project Information

Throughout the life cycle of the project, a significant amount of information and data is collected, analyzed, reworked, and distributed in numerous formats to project team members and alternative stakeholders. Project information area unit collected as results of numerous corporal punishment processes and area unit shared inside the project team. The information could then be communicated verbally or hold on and distributed as reports in numerous formats.

According to Project Management Institute (2013), the project information area unit continuously collected and analyzed throughout the dynamic context of the project execution. The indiscriminate use of those terms will result in confusion and misunderstandings by the varied project stakeholders. The following pointers facilitate minimize miscommunication and facilitate the project team use acceptable terminology:

Work Performance data. The raw observations and measurements known throughout activities performed to hold out the project work. Examples include reported percent work physically completed, quality and technical performance measures, begin and end dates of schedule activities, variety of amendment requests, variety of defects, actual prices, actual duration, etc.

Work Performance information. The performance information collected from numerous controlling processes, Analyzed in context and integrated supported relationships across areas.

Work Performance reports. The physical or electronic illustration of work performance data compiled in project documents, supposed to come up with choices or raise problems, actions, or awareness. Examples include status reports, memos, justifications, information notes, electronic dashboards, recommendations, and updates.

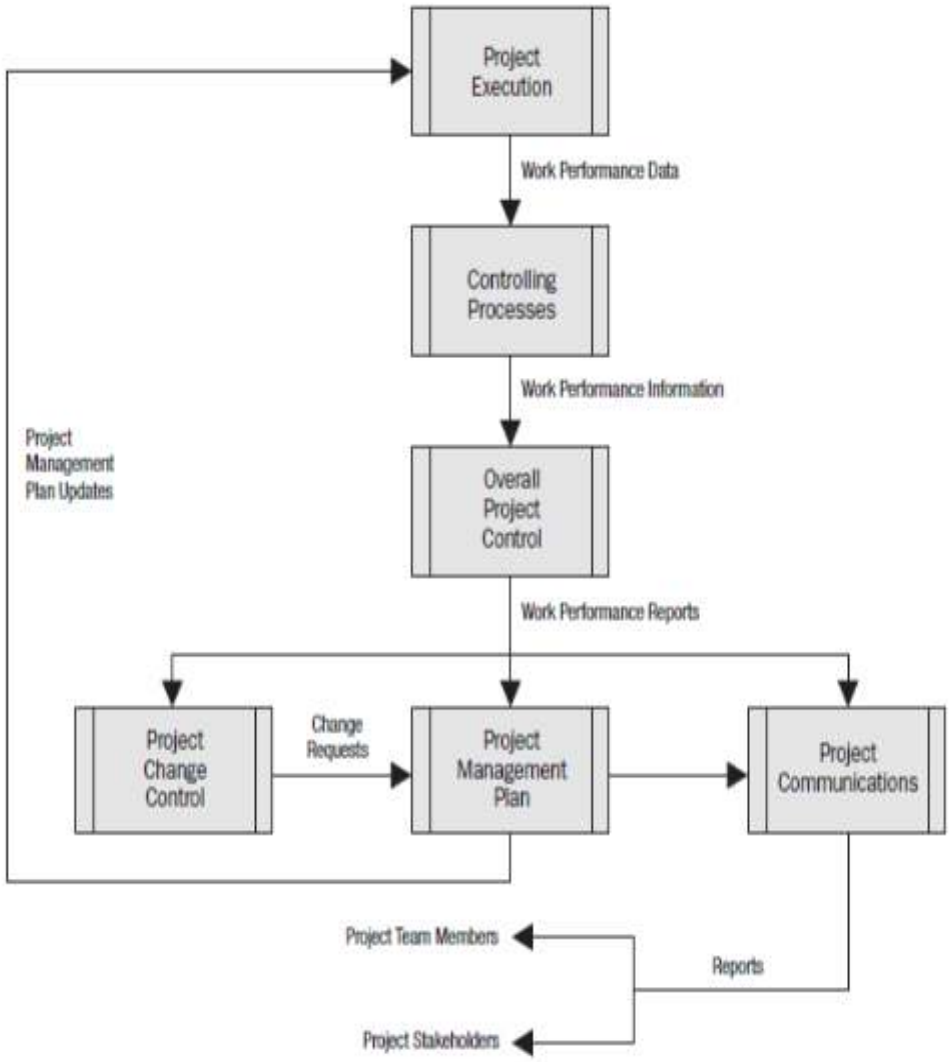

Figure 2.4 Project data, information and report flow (Source: Project Management Institute, 2013)

2.3.4. Design the project Monitoring System

The design project monitoring system is for commence, one has to reestablish the needs of a project monitoring system. It should be emphasized that, whereas a project monitoring system could be a method of comparison actual use of inputs and completed outputs with planned use of inputs and planned completed outputs, the aim of a project monitoring system is to produce info to stakeholders that may be accustomed create choices throughout the implementation of the project (Gardiner, 2005). Then, through group action, teams will establish the attainable stakeholders during a project. Among these may well be the beneficiaries, the project management workers, regional and national ministry officers, and also the donors /financiers.

Once this is often done, it's necessary that clear plan of the way to accomplish monitoring whereas guaranteeing maximum benefits is place in situ. It is thus instructed that before beginning of a project, a discussion ought to guarantee to undertake and establish these. Among them might be: straightforward, quickly provides information for corrective action, price effective, flexible, accurate, comprehensive, relevant, accessible, results in learning, transparent, and shares information up and down (Project Management Institute, 2013). Generally, the design project monitoring system is to provide a conceptual framework that may been used in designing a project monitoring system as following;

- ✓ Identify special characteristics of performance, Cost, and time that need to be
- ✓ Controlled in performance characteristics should be set for each level of detail in the project.
- ✓ Real time data should be collected and compared practices the plans this mechanisms to collect of data must be designed.
- ✓ Avoid tendency to focus on easily collected data
- ✓ One way of linking planning and control is to monitor project progress on MSP Gantt chart.

2.3.5. Project control factors

Control is defined as a task, as a method, associate degreed as an outcome (Olawale & Sun, 2015). Controls mentioned additionally as a practice, a system and a problem (Isaac and, 2014). The difficulty of agreeing on a normally accepted definition is also owing to the difficult variety of ability sets required to live, monitor, analyze, report and re schedule comes. Ma et al (2014) knew five high project manager skills; however, management is not on their list. DelPico (2013), on the opposite hand, writes that management could be elementary social control factors ability necessary for all project management roles. Thus, all construction managers would like expertise and information of the aim, perform and processes of management among comes. This knowledge is embedded in project management tools and methodologies (Rezones et al, 2006).

Therefore, during this report the term construction project factors practitioners United Nations agency all have expertise with a variety of styles of construction comes and project control mechanisms (LeyBoume and Sadler-Smith, 2006).

In addition, the dynamic nature of a construction project (Bakry et al, 2014) is best understood from a systems perspective as a result of improvement in productivity needs measures of more than one form of activity. The advanced interaction between activities of construction comes involves factors like work readiness, work flow dependability, materials provision, etc. (Vanhoucke, 2012). To determine the project factors is distinguished from project designing in two important ways (Jon Dahlgren, 2010).

1) Project control factors yields a set of designs, decision and actions, whereas project planning yields a design, and

2) Project control factors areal time process during the implementation, not before the implementation begins.

General Clause (Meredith & Mantel, 2011)

a) Performance

- ✓ Unexpected technical problems arise
- ✓ Sufficient resources are not available when needed
- ✓ Quality or reliability problems occur
- ✓ Owner/Client requires changes in technical specifications

b) Cost

- ✓ Reporting of the monitoring results are poor/late.
- ✓ Project budgeting for contractor cash flows not done right.
- ✓ Changes in market prices of the inputs.

c) Time

- ✓ Technical difficulties require more time to solve
- ✓ Scope of work increases
- ✓ Unexpected utilities needing relocation

Specific Clause (Meredith & Mantel, 2011)

a) Primitive Indicator

- May be biased.
- Do not consider that progress may be overestimated or underestimated due to:
  - execution of unscheduled work done, or

- execution of more work of low value and less work of high value
- More resources or less resources have been used than planned
- Activities are taking longer than planned
- Cost of activity (or of project to date) is higher than expected

2.3.5.1. Resources for Project Control

a) Money: - Factors a direct resource that use rather to influence the amounts or quality of other resources

b) Equipment: - Often used to augment labor in order to speed up project can be expensive and may involve renting or purchasing factors

c) Material and Supplies: - An increasing in quality or quantity may be necessary to enhance project control to improve for materials factors.

d) Manpower: - Project problem (time delays, excess costs, poor performance, etc.) are partly due to the human element (action or inaction). In Using Manpower as a tool for project control factors, PM encounters human emotions (anger, fear, frustration, etc.)

2.3.6. Mechanisms of Project Control

The Control in most Project Monitoring fall into this category (Meredith & Mantel, 2011) to testing see if some specific precondition has been achieved. Actively time completed and cost completed within budget.

2.3.7. Measures of control factors

In practice, a control system consists of making measures of performance; According to Al-Jibouri (2003) judging these against standards and taking any necessary control action. The effectiveness of control is a combination of the effectiveness of each of these features. In this work control action is assumed standard and the efficiency of the control system is directly related to the content and clarity of the information provided by the monitoring system. A project control system can indicate efficiency or inefficiency by many different

means. To be effective, a project control system must draw the project management's attention to problem factors areas.

2.4. Factors that affect monitoring and Control practices

The factors that affect project monitoring and control factors are scope factors, quality factors, cost factors; schedule factors, communication factors and Stakeholder engagement factors are the basic project monitoring and control areas that have direct factors that effect on project results.

2.4.1. Integrated change factors

An integrated change control factor involves identifying, evaluation and managing changes throughout the project life cycle. View project management as a process of constant communications and negotiations for plan change and establish a Forman change control system, including a change control Board (CCB) use good configuration management. Define procedures for making timely decisions on smaller change, use written and oral performance reports factors. Identify and manage change, use project management and other software to help manage and communication change factors.

According to Project Management Institute (2013)The process factors that affect all change requests; approving changes and managing changes to deliverables, organizational process assets, project documents, and the project management plan; and communicating their disposition.

Three main objectives of change control:

- **Influence-**the factor that creates changes to ensures they are beneficial.
- **Determine-**that a change has occurred to factors
- **Manage-**actual changes when and as they occur to factors

2.4.2. Scope factors

A project scope factors that is too broad and grandiose will cause severe issues. Scope control factors are involves dominant changes to the project scope. It is very difficult to make an honest scope factors statement and WBS for project even tougher to verify project scope factors and minimize scope changes factors. Scope factors verification involve formal acceptance of the finished project scope by the stakeholders factors. A client review then log off on key deliverables commonly achieves acceptance. According to Fred, et al., 2016

Project scope factors is that the overall definition of what the project is supposed to accomplish, and a particular description of what the tip result ought to A major part of scope factors are that the quality of the ultimate product. The amount of your time place into individual tasks determines the quality of the project. Some tasks might need a given quantity of your time to complete adequately, however given longer might be completed exceptionally. Over the course of an outsized project, quality will have a big impact on time and value (or vice versa). Scope management is that the ability project managers use to outline the work that has to be done on any given project (Project Management Institute, 2013). According to PMBOK fifth edition 2013 management Scope is that the method of observance the standing of the project and products scope and managing changes to the scope baseline. The key advantage of this method is that it permits the scope baseline to maintain throughout the project. Goal of scope control are to-

- **Influence** the factor that causes scope changes.
- **Assure change** processed according to procedures developed as part integrated change.
- **Manage change** when they occur
- Tools for performing scope control include a change control system and configuration management. **Variance** is the difference between planned and actual performance

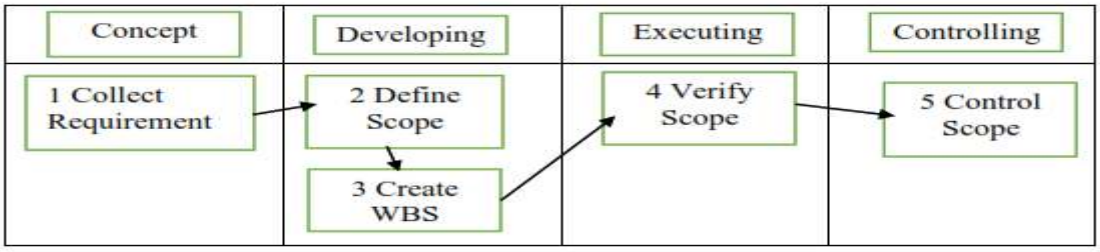

Figure 2.5 Scope Management process

2.4.3. Schedule factors

Control Schedule factors are that the method of monitoring the standing of project activities to update project progress and manage changes to the schedule baseline to realize arranges. The key advantage of this method is that it provides the means that to recognize deviation from arrange and take corrective and preventive actions and therefore minimize risk (Project Management Institute, 2013).

The Control of project schedule factors may be a very important half within the method of project construction, particularly for those comes that take into account project time and budget as targets. Delivering project on time or not has much to try to do with earning or losing a profit and/or a comeback on investment for parties (Liu Jun-yan, 2012).

During project execution, however, project schedules area unit littered with uncertainties in weather, design, labor efficiency, equipment efficiency, site conditions, etc. Those unsure factors might directly or indirectly cause schedule risks. It is well-known that bar charts and CPM area unit strictly settled in nature while not considering uncertainty. In the CPM and bar charts, those length values can't be modified by numerous risk factors that cause lead appropriate crucial path identification and a defective completion time (Liu Jun-yan, 2012).

The Schedule factors needed to supply a deliverable is estimated usmg several techniques (Fred & Henry, 2016). One technique is to spot tasks required to supply the deliverables documented during a work breakdown structure. The work effort for every task is calculable and people estimates area unit rolled up into the ultimate deliverable estimate, the project time. Tasks area unit prioritized, dependencies between tasks area unit known, and this information is documented during a project schedule. The dependencies between the tasks will have an effect on the length of the general project, as will the supply of resources. Restricting the schedule affects either the price or scope. The a lot of resources performing on a task equates to a better value for task completion (Project Management Institute, 2013).

Schedule Control is concerned with:-

a) **Influenced** the factors that affect create schedule changes to ensure that changes are agree upon,
b) **Determined** that affect the schedule has changes, and
c) **Managing the actual changes** when and as they occur. Schedule control must be thorough integrated with the other control processes, as described.

The purpose of scheduling is to organize and allocate the resources of, equipment and labor with the construction project's tasks over a set period. Benefits of good scheduling include, avoiding project bottlenecks, allowing for suitable procurement or necessary materials, and overall ensuring that the project is completed as quickly as possible. Poor scheduling can

result in unnecessary waste of time caused by delays as laborers wait for materials of equipment to become available or proceeding tasks to be completed (Fred & Henry, 2016).In order to successfully schedule a project, there must be some methodology to the process. For the basis of this study it will be assumed that computer based scheduling is applied. Proper applications of scheduling factors that affect will help avoid unnecessary delays and in tum reduce cost overruns. **Employee Training/Skills: -** Employee training benefits are much under or over estimated. Overall, investing in employee training programs will increase productivity and reduce costs caused by rework and lost time.

Employee Age: Many studies suggest that the "working class" is aging, which is leading to a shortage of young skilled workers. The shortage is caused by the retirement of the baby boom generation and popularity within the younger working class to opt for office-oriented jobs. Current solutions to this growing problem include a strengthening and modernization of the nation's vocational school system. **Temperature/Humidity:** -When not scheduled adequately, weather can cause delays due to forced changes in the schedule as well as damages causing rework. Productivity decreases in poor weather conditions for many reasons. Some construction processes affected poorly by suboptimal weather conditions. Hot weather, in particular, has both a physiological and psychological effect on workers. Psychologically workers tend to become restless and irritable. Physiologically they can acquire heat cramps, heat stroke, heat exhaustion, etc. The four factors in a hot environment that cause the increased stress include Humidity, Air Movement, Air Temperature and Heat Radiation (Schwarzkopf 1995). The most effective solution to curb the effect of inclement weather is planning with a consideration for seasonal conditions. Forecast bad weather and plan weather sensitive activities accordingly. In otherwise, build some amount of flexibility into the work schedule to allow for weather delays conditions.

1) Control Schedule Process Group

Control schedule is that the last method of your time management information space as explicit within the (PMI, 2011) coaching course. During the opposite method teams that precede management Schedule, we've determined the project activities, outlined the link of activities, calculable the length of activities and at last reached This schedule should be controlled throughout the project whether or not actual results square measure aligned with the planned values. In addition, PMP Project Management course tells

America that this is often drained management Schedule method cluster. In this article, we tend to square measure reaching to outline what management schedule method is and list what square measure the most activities that should be done drained management schedule.

Control schedule is that the method of monitoring the standing of the project activities to update project progress and manage changes to the schedule baseline to attain the plan. After develop schedule method is complete, you will have the project schedule and it will embrace begin and finish dates of every project activity. During project execution, actual results of the project can disagree from the planned values. While some activities may been completed prior to planned, some activities can take longer to finish. During management schedule method, actual results of the activities are going to be compared with the schedule baseline to work out any variances.

During monitoring and controlling schedule method, project managers should live against the plan and management the project. If there is, a variance supported the schedule performance management, and if the project cannot completed on time, corrective actions should planned and brought. For instance, schedule compression was planned to finish the remaining project activities prior to plan to finish the project on time.

During project execution, if factors inflicting several changes square measure found, these factors should been eliminated to stop or prevent the basis reason behind changes. If they cannot eliminated, the impact of these factors should decreased by taking preventive actions.

2.4.4. Cost factors

The cost control factors are also a vital ingredient for a successful project. The first step of cost control is to identify the factors that affect project costs. The existing factors can divided into two major categories: quantitative factors and qualitative factors. Currently, the AEC industry researchers have given many efforts to develop techniques that only consider quantitative factors and ignore qualitative factors such as "client priority on construction time, contractor's planning capability, procurement methods and market conditions including level of construction activity" (Elchaig, et al., 2005). Due to a great number of factors that need to considered, it is difficult to predict the exact cost to complete construction projects (Gould, 2004). It is common to see that the final project cost is higher than the budgeted cost. It had been reported that a cost overrun is one of the main problems in the AEC industry (Reina, at el., 2002).

Peters, et al., (2008) stated the biggest cause of cost overruns is inaccurate estimation at the beginning of a project.

An estimate is a general evaluation of the future project cost, and the budget represents the amount of money that the stakeholders would like to invest. The more accurate the estimate is, the closer the budget is to the actual cost, which means the profit is closer to what the project participants expect. According to Cleland, et al. (2002) cost control factors is the process of monitoring; evaluating and comparing planned result with actual results to determine the status of the project cost, schedule reducing the project cost will most likely affect the project negatively as it could mean a reduction in scope. The more resources assigned to a project to shorten the schedule or meet increased scope, the more the cost will increase (Project Management Institute, 2013). A project cost control is an attempt to restrict the actual costs within the budgeted costs. Variances between the actual and budget costs a proper corrective action will be carried out when any cost overrun is found. Project costs are all expenditures that occur on construction site including both direct and indirect costs. The level of the control depends on the breakdown structure of project costs into the number of individual cost centers. A cost center is the finest unit of control. The actual cost of each cost center is cumulated over time. A cost overrun that is lately discovered may not be able to correct.

Lee et al. (2014)stated that the main cost of a project includes staff cost, material cost and delay cost. To control these costs, managers should first set up a cost control system to:

a) Allocate responsibilities administration and analysis of financial data.
b) Ensure all costs are properly allocated against project codes.
c) Ensure all costs are genuinely in pursuit of project activities.
d) Ensure contractors. Payments are authorized.
e) Check that other projects are not using the budget.

According to Gyadu-Asiedu (2009) cost control is the process of monitoring; evaluating and comparing planned result with actual results to determine the status of the project cost and schedule. The table 2.1 below shows the summary of cost control identified from different countries

Table 2.1 Cost control literature reviews Source: - Literature review ((IUCN, 2000)

S/NO	Source	Country	Cost of Control
1	(Kirun and Varghese,2015)	India	Improper planning and scheduling, ineffective planning, reworks due to errors, due to defective work, wastage of materials, design changes, additional works, currency value, fluctuation in material cost and increase in interest rate.
2	(Sanni& Hashim, 2013)	Nigeria	Improper contract document, engagement of inexperience staff, unstable market condition, complexity of the project, unstable government regulations, choice of procurement method, lack of research and innovation, price and design risk, quality factors of cost information, non-provision of training of young professionals, inadequate access to software packages, non-clarity of exclusions, and ineffectiveness of professional bodies.
3	(Ademola, 2012)	South Africa	Lack of knowledge on the use of available tools and technology, abandonment of complicated strategies
4	(Song, 2014)	China	Using obsolete methods and concepts Over emphasizing results, and ignoring the process of PCC Lacking PCC processes and systems suitable to the Enterprise Lack of consistency in cost management by managers' Serious decision failure, excessive marketing expenses.

5	(Charoenngan&Sriprasert, 2001)	Thailan	• Difficulty in monitoring different sources of day-to-day • cost data
6	Authors construct, 2017		• Poor attitude towards ICT usage • Lack of financial commitment in projects

Control Costs is the process of monitoring the status of the project to update the project costs and managing changes to the cost baseline. The key benefit of this process is that it provides the means to recognize variance from the plan in order to take corrective action and minimize risk (Project Management Institute, 2013). Cost Control factors are concern with:•

a) **Influenced** the factors which create changes to cost baseline to ensure that changes are beneficial
b) **Determined** that the cost baseline has changed, and
c) **Managing** the actual changes when and as they occur

2.4.5. Quality factors

Quality control is taken into account to be the method of testing and inspecting material and craft or workmanship for compliance with the specifications and therefore the applicable codes. This method was additionally firmed by the kind of organization, contract format and therefore the project life cycle. Quality control could also been studied in a lump sum contract atmosphere and inside the execution and end stages of the project life cycle. In addition, quality control is extremely associated with each price and schedule functions. Furthermore, quality could also be thought of as a product of price and schedule management (Eniowo & Ogunjobi, 2018)

Quality Control is that the method of monitoring and recording results of execution the standard activities to assess performance and suggest necessary changes. The key benefit of this process includes

- Identifying the causes of poor process or product quality and recommending and/or taking action to eliminate them.
- Validating that project deliverables and work meet the requirements specified by key stakeholders necessary for final acceptance.

According to Eniowo & Ogunjobi (2018) Quality control is considered to be the process of testing and inspecting material and workmanship for compliance with the specifications and the applicable codes. This process is also impacted by the type of organization, contract format and the project life cycle.

According to Karan Singh et al. (2015)Engineers who pass judgment based on their experimental data, must know statistical methods by heart. Control Quality the process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes (Project Management Institute, 2013)

(Tengan & Aigbavboa, 2021) states that there are two measures for construction quality, they are accuracy and workmanship. Some benefits associated with quality control are avoided rework, generation of new work methods, and circumventing long term problems. Following is a list of key quality control factors that affect and quality problem areas that should be addressed within a jobsite quality inspection checklist. The list includes:

- Design requirements, Completed preceding work segments, Work done by qualified employees, Accepted materials used, appropriate amount of materials. Scope of work requirements achieved, Installation specifications met, Entire work phase complete and all quality problems have been fixed

2.4.6. Communication factors

Communication is therefore necessary to project success that it's been stated because the lifeblood of a project by over one professional. Project team members have to be compelled to collaborate, share, collate and integrate information and information to appreciate project objectives. Therefore, it's necessary to grasp the method of communication. At its most elementary level, communication consists of three components: a transmitter/sender, a transmission channel/medium and a receiver (BG Zulch, 2014). The communicated message flows from the sender, encodes the message through the transmission channel/medium by a verbal or non-verbal technique, to the receiver that decodes the message. To ensure effective communication, all parts should operate to forestall misunderstanding. The sender is that the start line of the communication cycle and contains a purpose to speak. The reason for communication in project management could also be letter of invitation for information, causation information, asking queries, giving associate

instruction, building groups or networking. The success of communication primarily depends on the sender's ability to talk, write, reason and listen competently.

Communication management is that the method of monitoring and controlling communications throughout the whole project life cycle to make sure the knowledge desires of the project stakeholders are met. The key advantage of this method is that it ensures associate best info flow among all communication participants, at any moment in time (Project Management Institute, 2013). The management Communications method involves the activities that are needed for information and communications to be monitored, acted upon, and discharged to stakeholders. Project communications return from multiple sources and will vary considerably in their format, level of detail, degree of ritual and confidentiality. Managing a project needs constant merchandising and reselling of concepts, explaining the scope and methodologies of the project to various teams of individuals (the public, management, purposeful departments and alternative stakeholders), threatening or talks with service suppliers and suppliers, or negotiating to settle disputes or social conflict between project team members or alternative stakeholders. Good communication is critical to with efficiency complete a project. Lack of comfortable communication will result in lack of employee motivation. Lack of communication will cause delays thanks to mistakes inflicting work, lack of knowledge inflicting time period, and mistaking. Although endless choices for communication are on the market, technical issues do exist. Other common issues related to communication on construction comes embody understanding the chain of command and unendingly act regarding the project and foreseeing potential issues within the future. This can be avoided by holding regular project management team conferences (Jack et al., 2016). The main reason behind this downside is poor communication due to inaccurate directions and inaccurate drawings. The most common sort of communication is verbal and, moreover, face-to-face. The other reason is that almost all of the acquiring used ancient or traditional approach.

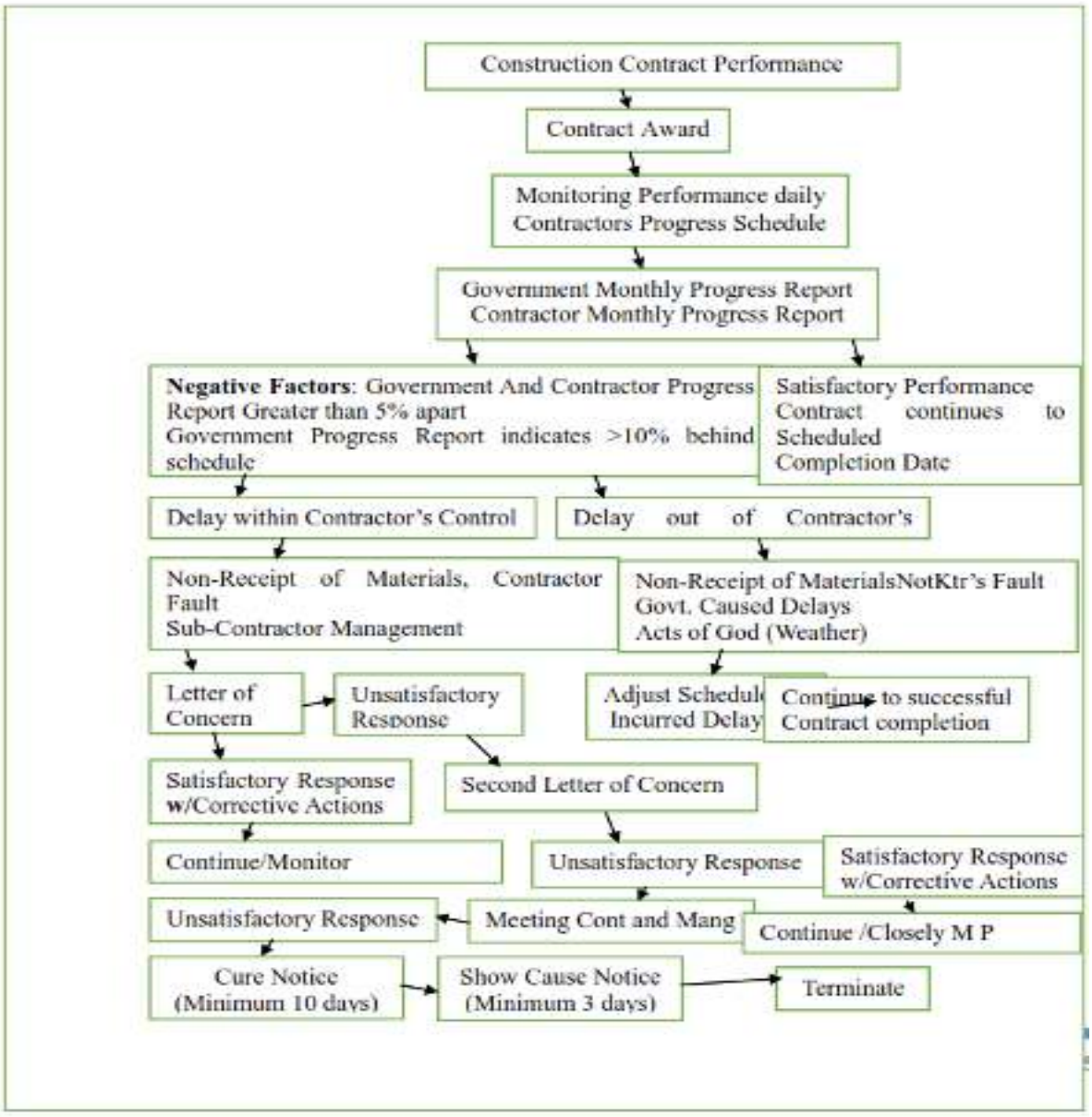

Figure 2.6 Communication control within contract performance (Source: Literature review (ECPMI, 2008)

2.4.7. Stakeholders Engagements Control

Stakeholder's engagements factors of control are the process of monitoring overall project stakeholder relationship and adjusting strategies and plans for engaging stakeholders. Control stakeholders Engagement are project Management Plan, Issue logs, work performance data and project document Tools and Techniques of information management systems, Expert judgment, meetings. Stakeholders Control Work performance

information, change requests, project management plan updates, project document updates and organizational process assets updates (Project Management Institute, 2013). Stakeholders is defined by Cooper (2004) as "the process that directs your people's work energy.

People's behavior is affected by motivation that successively ends up in a committed energy throughout the work. Some guidelines for increasing motivation inside the work include: give a secure work setting, acknowledge sensible behavior, Show appreciation, and Set attainable goals, Develop a good pay system and supply adequate training programs (Cooper 2004).

2.4.8. Project monitoring & control impact

The Project monitoring and controlling of careful designing, determination, and application of metrics and development of corrective or preventative actions is to maximize the alignment between planned work and actual work to deliver the meant product or service. Effective monitoring and controlling affects the project monetary, schedule, and quality results. Financially, there is also no larger waste than process. According to (Project Management Institute (2013)context is Project Monitoring and Control should be planned beforehand of project work commencing. The Project Manager, project team, and alternative stakeholders should determine what is going to be measured, however progress are measured, and once the Monitoring cycle can occur of factors that affect. The Project Manager should actually implement the plan, though, and follow through to spot or identify new risks and continue the reiterative method of project set up refinement through amendment requests. To maximize impact for flourishing completion, project Monitoring and Control should be planned for and enforced systematically. There is no guarantee for fulfillment in each project. But higher designing, preparation, Monitoring and application of plans may result in drum sander sailing on the approach.

2.4.9. Change Monitor and Control factors

Eniowo & Ogunjobi (2018) states that dynamic changes of project surroundings or environment can influence the method of project implementation, the project itself and will cause heightened risk. When winding or carrying up some activities, the ways totally different from that within the original arrange should be wont to keep the method moving forward (as knowledgeable beneath practice). Therefore, changes area unit inevitable

and want to be managed throughout project life-cycle. An effective amendment system should be established to confirm amendment procedure is evident and unambiguous and straightforward for worker to request amendment or change. And the following things ought to be concerned:

a) Monitoring and statement key factors that generate amendment or changes to confirm.
b) Ensuring that change is beneficial factors
c) Request for amendment should be checked by suitable person before being approved
d) Changes ought to ensue once it's approved and be monitored to see whether or not it worked for sure expected.

2.5. Summary of literature and research gap

Literature review revealed some weaknesses of these existing project control studies and developed models:

- Many existing systems are more geared towards planning than control. Although the importance of planning cannot be over- emphasized, during the project control process, planning is only the starting point.
- The process-based control models, such as PDCA and its variations, only describe what, not how. Hence, although a number of studies describe what an ideal project control process should look like diagrammatically, mathematically or with isolation of a project management control success factor, there is not much research on how they can be utilized in practice.
- Many studies are not well grounded in project control practice.
- Most of the developed models have not involved practitioners in their development. Therefore, it is questionable how accurately they reflect the real problems faced by project management practitioners during project control practice.

Notwithstanding that M&C is currently topical and are being implemented within government agencies and departments, and international development agencies globally due to underperformance and lack of accountability, it is imperative to deploy strategies to overcome the numerous implementation challenges in monitoring and evaluating projects (Tengan & Aigbavboa, 2021)). The implication of the study findings is to inform the

development of quality (utility, feasibility, propriety and accuracy), robust and efficient M&C systems to track progress, measure and evaluate outcomes of project. The establishment of an M&C system should be developed and integrated in the entire project implementation process and not as a stand-alone project activity. This will afford the effective monitoring and evaluation of all facet of the project life cycle; initiation, planning, execution and closure. Planning and budgeting for funding for M&C activities will be paramount considering that M&E touches the entire life cycle of project implementation (Tengan & Aigbavboa, 2021). Capacities of local M&C departments will be enhanced through training, hence limiting the continuous support from the international community in M&E. stakeholders with different interest interacts at all levels of the M&C process to ensure effective project implementation. Systems and procedures used by the company's Quantity Surveyors differed from site to site and that the cost information they produced was not presented in formats that other company disciplines could readily use formats that other company disciplines could readily use.

(Tengan & Aigbavboa, 2021) acknowledged that for monitoring and evaluation to be effective to mitigate poor project performance, demonstrate accountability and promote organizational learning, project monitoring and evaluation information systems (IS) is imperative. Also, studied the realities of monitoring and evaluation in municipal planning and uncovered six factors that determine the effectiveness of monitoring and evaluation practice. Limited resources allocation for monitoring and evaluation was mentioned. He refers to the need for enough time to undertake the effective evaluation, adequate funds for the monitoring and control and the required competence and expertise.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1.Introduction

In this study, the construction monitoring and control procedures for Addis Ababa's public housing projects were assessed. An analysis of the literature and a survey were carried out to achieve the research's objectives. Descriptive research methods were used to analyze the data obtained using the data collection tools after these. The study approach involves both literature search and the use of structured questionnaire, which was considered the most appropriate tool to reach the population of the study with limited time and from a distance at a time. The literature review was conducted to extract the variables for the assessment and to have a conceptual bases on the subject matter. Accordingly, the survey was designed based on variables extracted from literatures and organized in three parts, which include questions related to respondent profiles, performance related issues and management challenges.

3.2. Study Area

The study was conducted in Addis Ababa city housing public buildings

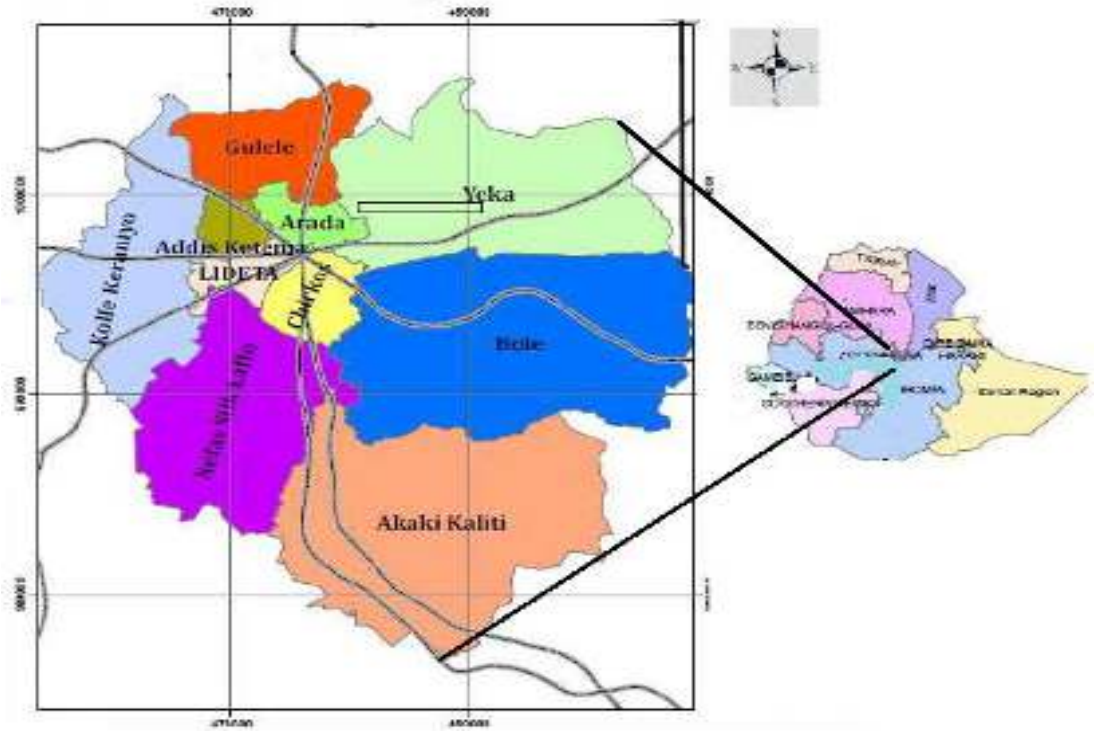

Figure 3.1 Location of sub-cities in Addis Ababa municipality, Ethiopia (Office of the revision of Addis Ababa master plan, 2002)

3.3. Research design

Research design is specific research methodology philosophies and techniques used to achieve the objective of the study. Research design is an action plan for getting from here to there where here may be defined as the initial set of questions to be answered, and there is some set of conclusion (answers) about these questions. Between here and there were a number of major steps, including the collection and analysis of relevant data. The research was studied monitoring and control practices on 10/90, 20/80 and 40/60 of public housing projects and uses of techniques, tools and documentation that constructed and on the way of construction stage undertaking by Addis Ababa city administration. Basically, the research questions was concerned with to assess the monitoring and control practices, major factor that affects the monitoring and control to external to particular project team on these particular projects. So, the research design would helped to integrate different components of the research in coherent and logical way. For this research, Kothari (2004) the research design was descriptive defines descriptive research study as – "research studies are those studies which are concerned with describing the characteristics of a particular individual, or of a group.". It is descriptive, because the research would basically focused on practical projects to assess the monitoring and control practices, major factor that affects the monitoring and control to external to particular project team and also would showed the how monitoring and control can affect the achievement of the project goal.

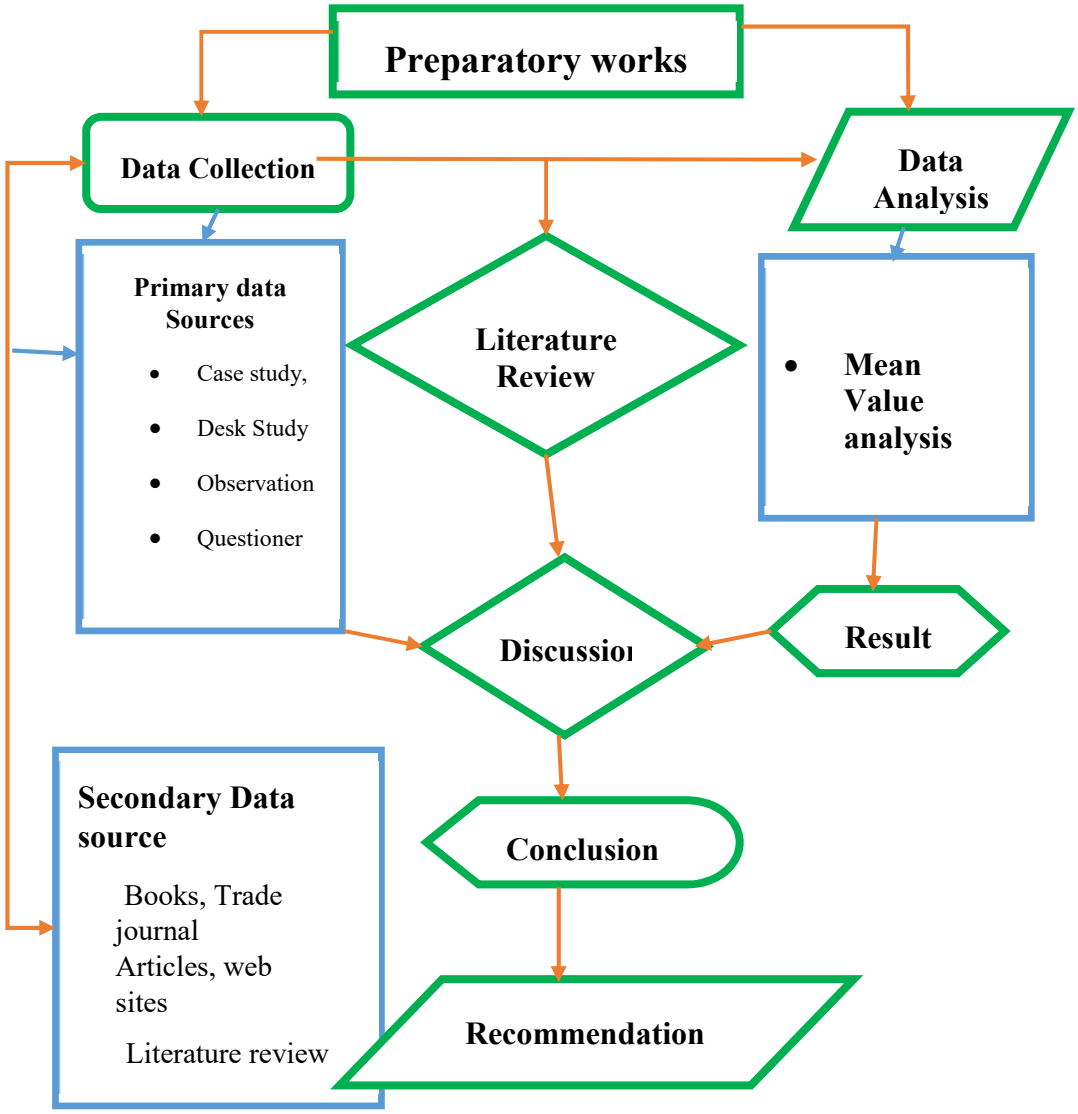

Figure 3.2 Research design process

In this research, the researcher used survey research. Survey research is a popular and common strategy in management research and is most frequently used to answer who, what, where, how much and how many questions. Surveys research allows the collection of a large amount of data from a sizeable population in a highly economical way. Often obtained by using a questionnaire administered to a sample, these data are standardized, allowing easy comparison. In addition, the survey strategy is perceived as authoritative by people in general and is both comparatively easy to explain and to understand. In addition, used for descriptive research. Surveys research allows the collection of a large amount of

data from a sizeable population in a highly economical way. Often obtained by using a questionnaire administered to a sample, these data are standardized, allowing easy comparison. In addition, the survey strategy is perceived as authoritative by people in general and is both comparatively easy to explain and to understand (Saunders et al., 2009).

In descriptive study, the steps involved in conducting an investigation were standard (Saunders et al., 2009). In this study, interviews, structured questionnaire, desk study and site visits were used in the gathering of data. The interviews were adapted to collect detailed information about respondent experiences and impressions about project monitoring and controlling practices on public building Construction. The structured questionnaire was probably the most widely used data collection technique for conducting surveys to find out facts, opinions and views. Interviews can be classified according to the degree to which they were structured. In an unstructured or non-directive type of interview the interviewer asks questions as they come to mind. On the other hand, in the structured or directive interview the questions were specified in advance (Saunders et al., 2009). It was also used to collect preliminary information to help in structuring the questionnaires. The questionnaire survey was also adapted to get feedback on opinions of respondents about project monitoring and controlling practices on Addis Ababa city housing public buildings.

3.4.Target Population

The target population refers to the specific group relevant to a particular study. Mugenda and Mugenda (2003) explain that a population is a group of individuals or objects that have the same form of characteristics.

The term population refers to the mixture or totality of all the objects, subjects, or members that adjust to a collection of specifications. In quantitative studies, the investigator identifies the population to be studied throughout the look section. A smaller population may be studied additional extensively at a set value than a bigger population; therefore it had been vital or important to make a decision what population has very of essential importance.

The research population for the study was, those building projects constructed under the supervision of Addis Ababa city housing construction bureau and those project under the supervision of Addis Ababa Sub-city. In current a total of 2,301 construction project are under construction in Addis Ababa public building projects.

3.5. Study variables

Dependent variables of the study was Project monitoring and controlling practices which depend on the scope factors, cost factors, schedule factors, quality factors, stakeholder engagement factors and communication factors.

3.6. Source of data

Data for the research is collected from both the primary and secondary source. Secondary data refers to data that is collected by someone other than the primary users. A common source of secondary data for research includes census information from government departments, organizational records, and data that was originally collected for other research purpose. Therefore data from previous literatures, like journal articles, books magazine's and research studies done on the subject matter is served as the secondary data source for this paper. A primary data source is an original data source, that is, one in which the data is collected by the researcher for specific research purpose. There are many different ways of collecting primary data but one of the most common one is through questioners, desk study, site visit, direct interview of personnel's who has knowledge of the subject matter and direct observation of what is to be studied.

3.6.1. Questionnaire Design

The questionnaire design was undertaken to determine the opinion of contractors, consultants, client and regulatory regarding the factors of project monitoring and controlling practices on public housing building construction projects in Addis Ababa City. The questionnaire was consists of three major sets of closed ended and one open questions on the factors of monitoring and controlling practices, the questionnaire further sought to obtain information on the level of knowledge of construction professionals on the concept of project monitoring and controlling practices on public housing construction projects in Addis Ababa City. Interviews, desk study and site visit were used to obtain specific information about construction on building projects.

3.6.2. Structure of questionnaire

The questions were constructed using the ordinary scale. The respondents were asked to rank on a scale of factors project monitoring and controlling practices on public housing construction sites where 5 = extremely factor, 4 = very factor, 3 = moderately factors, 2 = slightly factor and 1 = not factor .

3.7. Sample Size Determination

To conduct the sampling firstly determination of the population is done for the study. That means from the public housing construction, the specific study site will be selected to place the study context with the old project sites and new project sites. Then after determine the construction site in progress for the study and then the population of the sites of participants will be determined.

To start Case study, the existing construction sites currently under construction Addis Ababa Administration housing construction project. According to the data obtained from Addis Ababa City Administration housing construction project office there are 2301 housing construction projects. The site populations are considered to be inclusive to do this the projects was classified into two groups which are old sites and new sites their data concerning this study are available in the Addis Ababa at contractors' side, consulting parties and client sides. In sampling the data, the formula of sample size depending up on types of available data in sampling process will be used and the sampling method for this research will be random sampling because there is different participant that works for the same project objectives. Defined target population of this study particularly includes city Administration housing project office administrator employees, project administrator employees and 10/90; 20/80 and 40/60 housing scheme contractors and consultants, since they are qualified to explain and response the required inquire as per researcher interest.

Usually, such sampling occurs without replacement of the selected members of the population; the members of the population selected are excluded from further re-selection so that each member of the population can be selected only once. The selection of members to be sampled. Therefore, the following equation was used to determine the sample size (Fellows & Liu, 2008):

$$n = \frac{z^2 \times s^2}{(\mu - \bar{x})^2}$$

Equation 3.1 Sample Size Determination

Where S is Standard Deviation, μ-x is half of the width of the confidence interval required Normally, for 95 or 99% confidence levels, z = 1.96 or 2.58.

Where SS = Sample size

Z = Z worth (e.g. 1.96 for ninety fifth confidence level)

P = percentage selecting an alternative, expressed as a decimal (0.50 used for sample size needed).

C = margin of error (9%)

$$Ss = \frac{(1.96)^2 * 0.5 * (1-0.5)}{(0.09)^2} = 118.568 \approx 119$$

$$Ss\ new = \frac{Ss}{1 + \frac{Ss-1}{Pop}}$$

Equation 3.2

Where: Total sampled of construction parties = 267 match the proposed contracting companies

So, Pop = 267

$$Ss\ new = 119/(1 + 119 - 1/267) = 82.5 \approx 83$$

To ensure good representation of each stratum, the following was done:

Client = 7

Contractor = 250

Ss new Contractors $= \frac{250 * 83}{267} = 65.28 \approx 65$ Contractors

Consultant = 6

Regulatory = 4

For the client, consultant and regulatory body, the samples are taken as completely.

3.8. Selected Sample construction parties

Based on the sampling method and criteria cited above, the researcher selected Eighty-Three (83) construction parties, which participated on public building housing projects in Addis Ababa City.

3.9. Data collection

In this research, methods of data collection include questionnaire with personal interview and site visits. The site visits involved observations where the researcher sought to find out how monitoring and controlling practices; and to provide a compendium on high factors building construction used on those public building projects.

3.10. Analysis and Findings

The sample for this study was relatively small. As a result, the analysis had combined all groups of respondents (clients, consultants, contractors& Regulatory) in order to obtain significant results. Data was analyzed by calculating frequencies and Relative Importance Index (RII). The Relative Importance Index (RII) is calculated as follows

(Aibinu & Jagboro, 2002)

$$RII = \sum W/(A \times N) = (1n1 + 2n2 + 3n3 + 4n4 + 5n5)/\mathrm{N}$$

Where RII = relative importance index; W = weighting given to each factor by respondents (ranging from 1 to 5); A = highest weight (i.e., 5 in this case); and N = total number of respondents. The RII value had a range of 0 to 1 (0 not inclusive); the higher the RII, the more important was the factor of monitoring and controlling practices.

Where:

N = Total number of respondents

ni = the variable expressing the frequency of the *I* th response.

n5= Number of frequency 'extremely factor' response,

n4= Number of frequency 'very factor' response

n3 = Number of frequency 'moderately factor' response

n2 = Number of frequency 'slightly factor' response.

n1 = Number of frequency 'not factor response.

3.11. Validity and Reliability

3.11.1. Validity

Validity is concerned with whether the findings are really about what they appear to be about (Sounders et. al., 2003). Validity defined as the extent to which data collection method or methods accurately measure what they were intended to measure (Sounders et. al., 2003). Numbers of different steps are taken to ensure the validity of the study:

- Data is collected from the reliable sources, from respondents who had experience in housing construction.
- Survey question are made based on literature review and frame of reference to ensure result validity.

3.11.2. Reliability

Pilot study of the questionnaire is achieved by a scouting sample, which consisted of 16 questionnaires. These questionnaires were distributed to team leaders, projects managers, and office Engineers, construction engineers, site engineers and expert engineers at head office and projects around Addis Ababa first to give their comment on the questions and then to fill the questionnaire.

After making some amendments according to the comments questionnaires were distributed to test the reliability of the questionnaire returned back. The reliability of an tool according to Saunders et al. (2009) is the degree of consistency which measures attribute, in particular, whether or not it will reliable findings at different times and under different conditions, such as with different samples. Internal consistency involves relating the responses to each question in the questionnaire with those to other questions in the questionnaire. It therefore measures the consistency of responses across either all the questions or a sub-group of the questions from the questionnaire. There are a variety of methods for calculating internal consistency, of which one of the most frequently used is Cronbach‘s alpha.

The reliability test depicts the consistency degree of the data collected. The data collected (total respondents and contributing factors) in this study was analyzed with SPSS version 27

to calculate the value of Cronbach's alpha of the survey results. The internal consistency of the questionnaire used to achieve the objectives was indicated by the estimated value of SPSS 27, which was 0.71. As a result, the information gathered through the questionnaire was trustworthy.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Results

The findings based on the analysis of the data that was gathered are explained and discussed in this chapter. By combining the data from three different sources—questionnaire results, interview results, and document review results—the survey's findings were discussed results. The discussion aims to achieve the study's goals and respond to the research questions.

In this chapter, the findings from the analysis of eighty-three (83) questionnaires using SPSS version 27 and the Relative Important Index (RII) are discussed. The findings are intended to provide details about the sample size, response rate, and the characteristics of Ethiopia's contracting companies, particularly those in the Addis Ababa. Based on their relative means, it also included the ranking of project monitoring and controlling practices on public housing construction projects.

4.2. General Information about Respondents

Research objectives involve collecting demographic information from diverse respondents, including education, work experience, and job position. 83 questionnaires covering the monitoring and controlling of construction projects were given to the respondents of the professional. However, 55 questionnaires were gathered, with 66 percent of them generating usable responses required as shown in the table 4.1 below. An interview and relevant documents have also been examined. In addition to this, the response rates among the groups of contracting companies, these rates are 58.46% Contractors, 100% Regulatory, 85.71% Consultants and 100% for Clients.

Table 4.1 Questionnaire response rate among the groups of construction parties

Contractual Parties	Target population	Questionnaire Distribution	Number of responses	Percentage of responses against distribution (%)
Owner\Client	7	7	7	12.7
Contractor	250	65	38	69.1
Regulatory	4	4	4	7.3
Consultant	7	7	6	10.9
Total	**267**	**83**	**55**	**100**

4.2.1. Response rate

Out of the 83 questionnaires distributed on the contracting companies, 55 responses were received with 66 % return rate in this study. The other 28 questionnaires as follows: 14 (17%) have not been received, 8 (10%) are uncompleted and 6 (7%) are illogical or incorrect responses, see figure 4.2

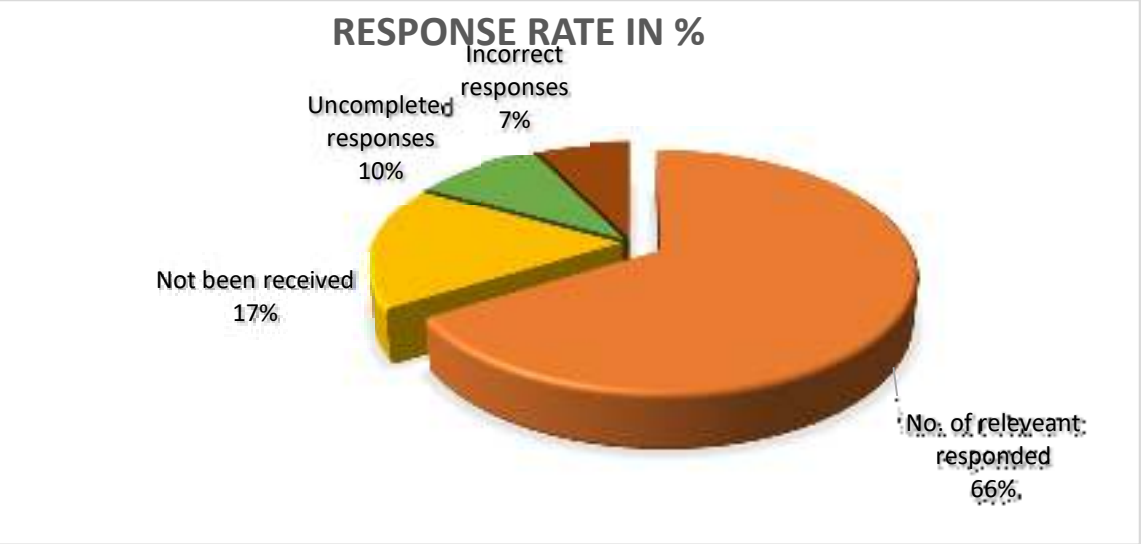

Figure 4.1 Questionnaire Response rate

4.2.2. Academic Qualifications of respondent

The respondents' academic backgrounds were evaluated. As a result, out of 55 participants, first-degree degrees account for 53%, followed by master's degrees 44%, PhDs 3%, and diplomas 0%. The respondents' educational backgrounds, which are displayed in figure 4.2 below, indicate that they have an adequate level of education to render the information they acquired reliable.

Figure 4.2 Academic qualification of respondent

4.2.3. Respondent's experience

Regarding the respondents' work experience, About 7 of contracting companies have 0-5 years of experience and 20 of them have 5- 10 years of experience, 10 have 11-15 years of experience, 8 them have experience 15-20 years of experience, 5 they have 21-25 years of experience and while 5 of them have more than 25 years of experience. Table 4.2 below demonstrates these experiences. The fact that 87.3% of respondents have worked for more than five years demonstrations they have suitable job experience to trust the data they have collected and that it is reliable.

Table 4.2 Relevant respondents working experience

Work experience	**Frequency**	**Percent**
0-5	7	12.7
5-10	20	36.4
10-15	10	18.2

15-20	8	14.5
20-25	5	9.1
More than 25	5	9.1
Total	**55**	**100.0**

4.2.4. Position of respondents in the organization

Regarding the Position of respondents in the organization, most (27%) of respondents are Residential engineers, followed with Project manager 24%, 14.5 % each for Project leader and other and 10.9% project managers and 9.1% project regulatory respectively. It is important for the professionals of these three organizations (client, consultant and contractors) to be able to understand the required responsibility, capacity or role in ensuring completion of a project successfully.

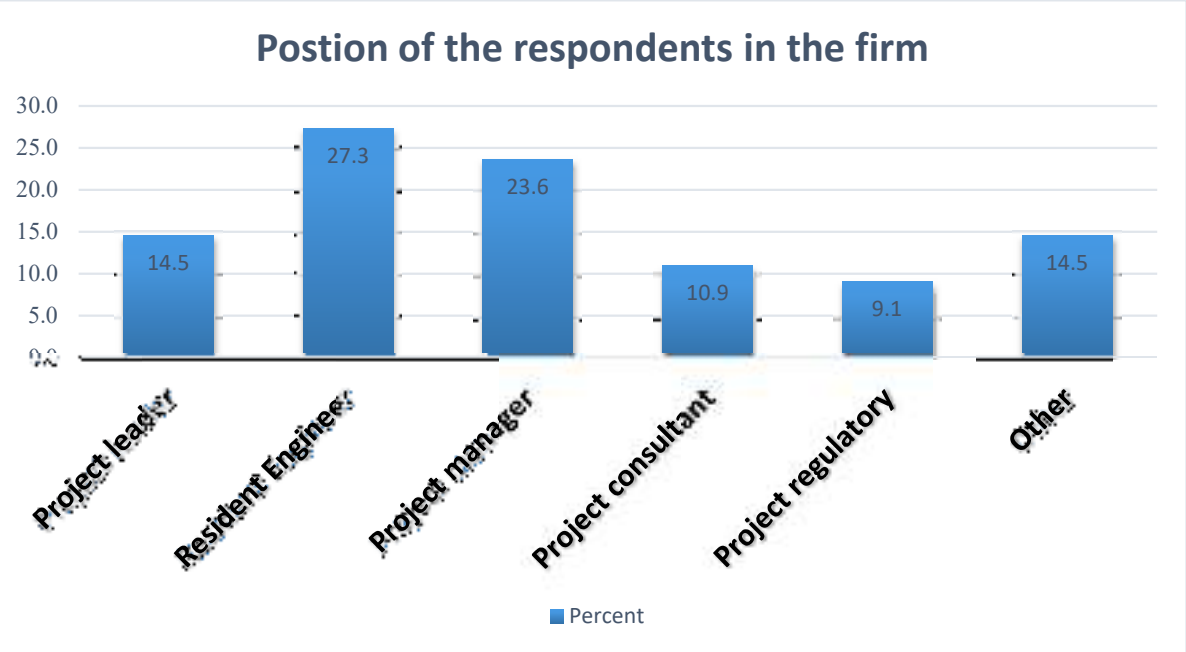

Figure 4.3 Position of the respondents in the firm

4.3. The factors that affect monitoring and control practices

The findings of this study give an idea of the relative importance index and rank of the factors that influence the monitoring and control practices used during the public housing construction projects in Addis Ababa. The summary rating and Relative Importance Index for each factor are displayed in Table 4.3 below.

Table 4.3 Summary of RII of factors project M&C practices

Factor group	No.	Factor of project monitoring and control practices	Respondent Scores					RII	Ranks
			1	2	3	4	5		
Scope factors	1	Cause of boundary project	1	8	18	26	2	0.673	35
	2	Keep the scope realistic	4	12	13	15	11	0.662	38
	3	Project scope management plan	0	8	13	25	9	0.727	23
	4	Scope baseline	2	3	26	13	11	0.702	28
	5	Change management plan	2	11	13	24	5	0.669	36
	6	Scope Variance	2	2	17	30	4	0.716	25
	7	Quantified evaluation of project	4	15	4	25	7	0.658	39
	8	Scope change within time, cost and quality change	0	1	6	25	23	0.855	2
	9	Delay in approving major changes in scope	1	2	6	38	8	0.782	11

		of work by consultant							
	10	Project authorize action confirmed with owner	0	7	28	12	8	0.676	34
Project cost factors	11	Changes to cost baseline	2	4	4	35	10	0.771	13
	12	Cost performances to detect variances	4	2	9	24	16	0.767	14
	13	Determining resource requirements	0	10	14	26	5	0.695	30
	14	Performance report	0	6	16	23	10	0.735	21
	15	Ongoing control of project finances	2	7	14	17	15	0.731	22
	16	Cost planning during design stage	0	3	13	31	8	0.760	16
	17	cost variations	0	0	13	22	20	0.825	4
	18	In adequate design within site work	4	10	15	19	7	0.655	40
	19	Price fluctuations	1	1	6	22	25	0.851	3
	20	Modifying cost during construction	2	5	3	30	15	0.785	10
	21	Budget Updates	4	10	3	10	28	0.775	12
	22	Delay corrective Action	1	7	16	15	16	0.738	20
	23	Change Order by Engineer	1	7	20	20	7	0.691	31
	24	Delays in decisions making	3	2	10	27	13	0.764	15

	25	Estimate at Completion	5	14	4	17	15	0.684	32
Schedule Factors	26	Budget Updates	5	9	9	27	5	0.665	37
	27	Managing the actual changes	3	7	18	11	16	0.709	26
	28	Using schedule Baseline	4	9	22	14	6	0.633	46
	29	Adopting realistic times for estimating;	4	7	20	20	4	0.647	42
	30	Construction Schedule (Master Schedule)	4	5	10	26	10	0.720	24
	31	Resource schedule	0	8	1	30	16	0.796	7
	32	Time scheduling to minimizing variation	3	3	14	19	16	0.753	17
	33	Working as per schedule	0	4	9	25	17	0.800	6
	34	Additional Planning	2	12	20	16	5	0.636	45
	35	Schedule Updated	5	5	17	14	14	0.698	29
	36	Effect have schedule	4	10	12	20	9	0.600	55
	37	Use of Software and tools for Schedule control	4	4	14	25	8	0.705	27
Quality factors	38	Shortage of material	1	2	7	34	11	0.789	9
	39	High quality of required works	5	8	22	16	4	0.622	49
	40	Quality inspection delay	7	9	17	16	6	0.618	50

	41	Rework due errors	4	15	14	14	8	0.625	48
	42	Produce quality deliverables	10	11	9	17	8	0.607	53
	43	Project Success in quality customer satisfaction	7	8	15	17	8	0.640	44
	44	Clear scope and quality of work control	9	9	16	14	7	0.604	54
	45	Poor quality of work as a result of shortage of funds	9	13	13	12	8	0.589	58
	46	Plan quality identifying quality requirements	12	9	19	8	7	0.560	62
	47	Quality Policy, Procedures and Standards	5	15	13	15	7	0.615	51
	48	Poor quality of construction	9	13	12	13	8	0.593	57
	49	Effective quality planning	5	13	14	15	8	0.629	47
	50	Late delivery of materials	5	4	6	27	13	0.742	19
	51	Specification	2	13	16	17	7	0.651	41
	52	Control charts & analysis	6	9	9	19	12	0.680	33
Stakeholders Engagements factors	53	Lack awareness of all project	6	8	14	22	5	0.644	43
	54	Project team needs to identify engagement	11	5	16	16	7	0.611	52
	55	Payment delay	2	4	6	21	22	0.985	1

	56	Lack of follow up the work progress	3	6	18	23	5	0.469	64
	57	Ineffective project planning & scheduling	2	3	16	16	18	0.793	8
	58	Political situations/ unpredictability(ie protest)	9	11	7	13	15	0.745	18
Communication factors	59	Written communication	1	6	7	26	15	0.822	5
	60	Electronic communication	7	11	14	12	11	0.596	56
	61	Oral communication	8	9	4	29	5	0.575	60
	62	Project communication plan	7	9	12	20	7	0.538	63
	63	Lack of communication b/n 3C's	0	12	22	15	6	0.447	65
	64	Lack of General support to contractor	3	12	22	13	5	0.404	66
	65	By communicating to reduce conflict of project	0	13	11	24	7	0.585	59
	66	The effectiveness of controlling information	7	6	18	13	11	0.571	61

Based on the above table 4.3, the top five factors that highly project monitoring and controlling factors is Payment delay 1st (RII= 0.985), Scope change within time, cost and quality change 2nd (RII=0.855), Price fluctuations 3rd (RII=0.851), cost variations 4th (RII=0.825) and written communication 5th (RII= 0.822).

4.3.1. Scope factors

There are ten sub factors listed under the project scope control factor, and each one is ranked based on its relative importance index (RII) both inside and across their respective groups. With a relative importance index of 0.855, the scope control factor is ranked second out of six groups of factors that affect project monitoring and control practices on public housing construction projects. This means that the factors listed in this group are one of the most important factors in project monitoring and control practices. Table 4.4 provides a summary of the project scope control relative significance index (RII) and rank.

Table 4.4 RII and rank of Project scope factors

Factor group	**No.**	**Factor of project monitoring and control practices**	**Respondent Scores**					**RII**	**Ranks**
			1	**2**	**3**	**4**	**5**		
Scope factors	1	Cause of boundary project	1	8	18	26	2	0.673	35
	2	Keep the scope realistic	4	12	13	15	11	0.662	38
	3	Project scope management plan	0	8	13	25	9	0.727	23
	4	Scope baseline	2	3	26	13	11	0.702	28
	5	Change management plan	2	11	13	24	5	0.669	36
	6	Scope Variance	2	2	17	30	4	0.716	25
	7	Quantified evaluation of project	4	15	4	25	7	0.658	39
	8	Scope change within time, cost and quality change	0	1	6	25	23	0.855	2

	9	Delay in approving major changes in scope of work by consultant	1	2	6	38	8	0.782	11
	10	Project authorize action confirmed with owner	0	7	28	12	8	0.676	34

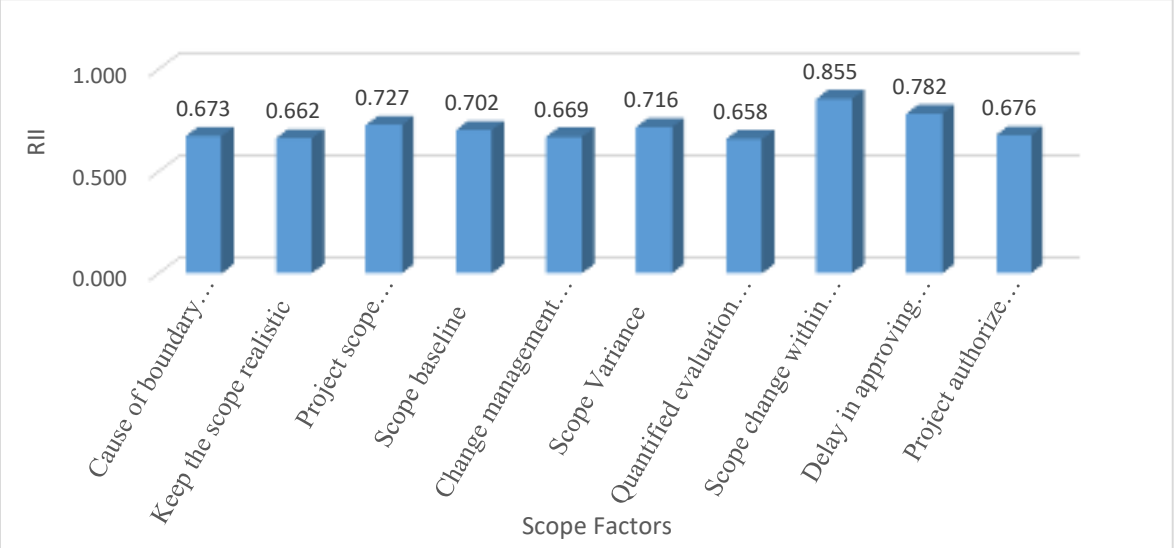

Figure 4.4 Relative importance index and rank of Project scope factor

From project scope control group Scope change within cost, time, and quality change is ranked in the 1st position with RII of 0.855 and also ranked in 2nd place from all factors with RII 0.855.This demonstrates that scope, cost, and quality changes have to be closely monitored, controlled, and improved. Scope, cost, and quality changes should be the main goals of project monitoring and control factors in order to complete the task within the specified budget and time. Delay in approving major changes in scope of work by consultants ranked 2nd from this group but ranked on 11th from overall factors. The project scope management plan, which is ranked 3rd in its group and 23th overall, is one of the most important components of project control and monitoring processes. Scope Variance, Scope baseline and Project authorization confirmed with the owner ranked 4th, 5th, and 6th from their group and 25th, 28th and 34th from overall factors respectively. Despite being ranked 35th overall, Cause of boundary project is the factor that is ranked 7th. Change management

plan, Keep the scope realistic and Quantified evaluation of the project were placed 36th, 38th, and 39th on the overall list of variables, and ranked 8th to 10th in their group, respectively, with RIIs of 0.669, 0.662, and 0.658.

Best Practices for Avoiding Scope Problems: -Scope change within time, cost and quality change: Don't scope change make projects so large that they can be completed within time, cost and quality change. Delay in approving major changes in scope of work by consultant: Involve users in project scope management assign key users to the project team and give them ownership of requirements definition and scope verification on time. Cause of boundary project: Use off the latest technology whenever possible many Engineers enjoy using the latest and greatest technology, but business needs, not technology trends, must take priority.

4.3.2. Cost factors

Project cost factors group have 15 sub factors, which ranked according to their relative importance index (RII) value. The study identified the core factors that project monitoring and controlling practices, under project cost control factors including: Changes to cost baseline, Cost performances to detect variances between construction parties, Determining resource requirements, Performance report, Ongoing control of project finances, Cost planning during design stage, Cost variations, Price fluctuations, Cost escalation, Modifying cost during construction, Budget Updates, Delay corrective Action, Estimate at Completion, Delays in decisions making and Change Order by Engineer.

This group of factor ranked on 2nd with RII of from 6 major groups of factors. Any Cost control problems reduce the output of monitoring and controlling practices. The relative importance index (RII) value and rank in group and overall rank monitoring and controlling factors are summarized in the below table 4.5

Table 4.5 RII and rank of Project cost control factors

Factor group	**No.**	**Factor of project monitoring and control practices**	**Respondent Scores**					**RII**	**Ranks**
			1	**2**	**3**	**4**	**5**		
Project cost factors	11	Changes to cost baseline	2	4	4	35	10	0.771	13

	12	Cost performances to detect variances	4	2	9	24	16	0.767	14
	13	Determining resource requirements	0	10	14	26	5	0.695	30
	14	Performance report	0	6	16	23	10	0.735	21
	15	Ongoing control of project finances	2	7	14	17	15	0.731	22
	16	Cost planning during design stage	0	3	13	31	8	0.760	16
	17	cost variations	0	0	13	22	20	0.825	4
	18	In adequate design within site work	4	10	15	19	7	0.655	40
	19	Price fluctuations	1	1	6	22	25	0.851	3
	20	Modifying cost during construction	2	5	3	30	15	0.785	10
	21	Budget Updates	4	10	3	10	28	0.775	12
	22	Delay corrective Action	1	7	16	15	16	0.738	20
	23	Change Order by Engineer	1	7	20	20	7	0.691	31
	24	Delays in decisions making	3	2	10	27	13	0.764	15
	25	Estimate at Completion	5	14	4	17	15	0.684	32

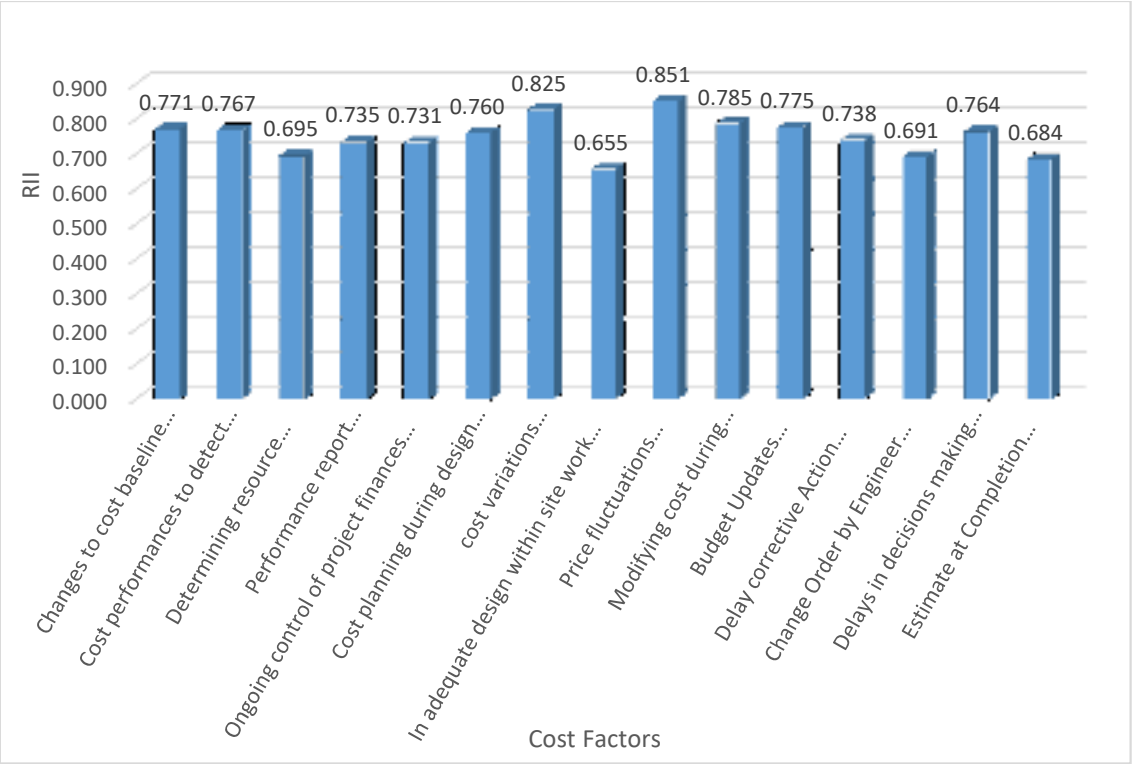

Figure 4.5 Relative importance index and rank of Project Cost factor

Price fluctuation of material is the mostly factors of cost monitoring and controlling practices and ranked 1st from its group with RII 0.851 and 3rd from overall factors. Cost variations, Modifying cost during construction, Budget Updates, Inadequate design without site investigation and Changes to cost baseline are ranked from 2nd to 5th in their group with RII of 0.825, 0.785, 0.775 and 0.771 respectively but ranked 4th, 10th, 12th, and 13th from the overall factors. Cost performances to detect variances, Delays in decisions making, Cost planning during design, Delay corrective Action, Performance report, Ongoing control of project finances and Determining resource requirements and ranked on the 6th to 12th place in their group with RII of 0.767, 0.764, 0.760, 0.738, 0.735, 0.731 and 0.695 respectively but ranked 14th, 15th, 16th, 20th, 21th, 22th and 30th from the overall factors. Change Order by Engineer, Estimate at Completion and In adequate design within site work ranked 13th to 15th respectively but ranked 31th, 32thand 40th position with RII value of 0.691, 0.684 and 0.655 respectively.

4.3.3. Schedule factors

A contractor can usually observe that the time normally estimated to complete the task has been significantly shortened in a regular building project. The development construction business

generally refers to the decrease of the time required to complete a project as schedule. Schedule control is challenging because it causes disagreements between owners and contractors and has a number of negative impacts on project monitoring and controlling processes.

Controlling the schedule is essential. A construction party's failure to adhere to a schedule can negatively impact the work in a number of ways. These include friction on the job, substandard output in quality, effective of time and cost a high turnover of Client, consultant, contractors, and many of the public body construction functional problems that you wish to avoid.

Managing project scheduling is an essential aspect of project construction, particularly for projects that have budget and time as their primary goals. Whether a project is completed on schedule or not has little impact on whether parties make money or lose money on their investment. In that scenario, a wide range of techniques and tools have been created to facilitate improved project scheduling, and the vast majority of project planners make extensive use of these tools.

There are 12 sub-factors related to Schedule factor are shown in table 4.6. These sub-factors includes: Schedule changes, Additional Planning, Working as per schedule, Time scheduling to minimizing variation, Construction Schedule (Master Schedule), Schedule Updated, Resource schedule, Use of Software and tools for Schedule control, Adopting realistic times for estimating, managing the actual changes and Using schedule Baseline, schedule control factor is ranked on the 4th position from overall factors with RII of 0.800.

Table 4.6 RII and rank of Project schedule control factors

Factor group	**No.**	**Factor of project monitoring and control practices**	**Respondent Scores**					**RII**	**Ranks**
			1	**2**	**3**	**4**	**5**		
Schedule Factors	26	Budget Updates	5	9	9	27	5	0.665	37
	27	Managing the actual changes	3	7	18	11	16	0.709	26

	28	Using schedule Baseline	4	9	22	14	6	0.633	46
	29	Adopting realistic times for estimating;	4	7	20	20	4	0.647	42
	30	Construction Schedule (Master Schedule)	4	5	10	26	10	0.720	24
	31	Resource schedule	0	8	1	30	16	0.796	7
	32	Time scheduling to minimizing variation	3	3	14	19	16	0.753	17
	33	Working as per schedule	0	4	9	25	17	0.800	6
	34	Additional Planning	2	12	20	16	5	0.636	45
	35	Schedule Updated	5	5	17	14	14	0.698	29
	36	Effect have schedule	4	10	12	20	9	0.600	55
	37	Use of Software and tools for Schedule control	4	4	14	25	8	0.705	27

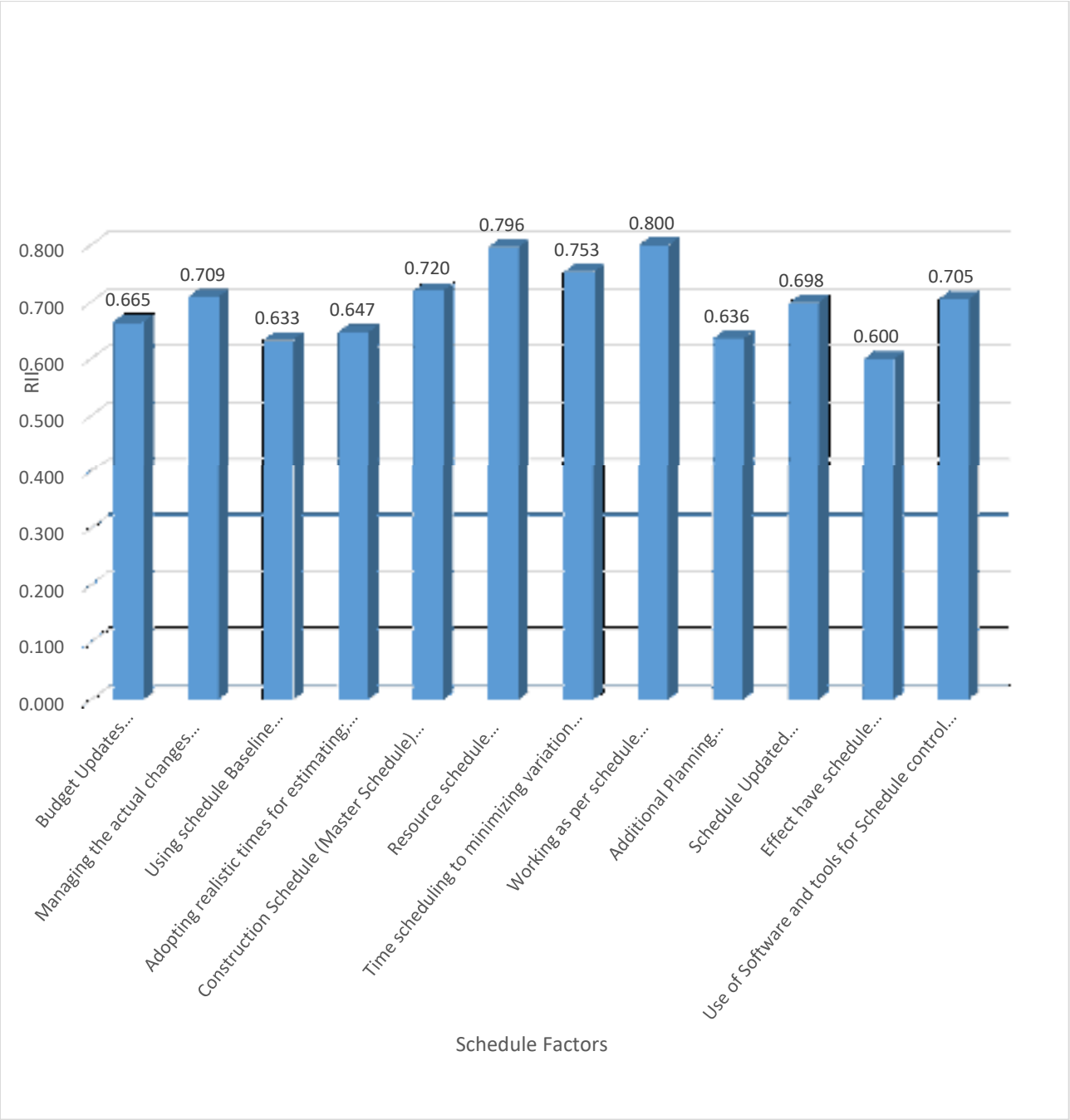

Figure 4.6 Relative importance index and rank of Project Schedule factor

4.3.4. Quality factors

Quality factors includes: Shortage of material, Poor quality of construction, Effective quality planning, Specification, Control charts & analysis, Late delivery of materials, Quality inspection delay, Rework due errors, Clear scope and quality of work control, High quality of required works, Poor quality of work as a result of shortage of funds, Produce quality deliverables, Plan quality identifying quality requirements, Project Success in quality customer satisfaction, quality Policy and Procedures and Standards. This factor is

ranked 6th (RII=0.783). The relative importance index and rank of Quality factor is summarized in the following table 4.7.

Table 4.7 RII and rank of Project quality control factors

Factor group	No.	Factor of project monitoring and control practices	Respondent Scores					RII	Ranks
			1	2	3	4	5		
Quality factors	38	Shortage of material	1	2	7	34	11	0.789	9
	39	High quality of required works	5	8	22	16	4	0.622	49
	40	Quality inspection delay	7	9	17	16	6	0.618	50
	41	Rework due errors	4	15	14	14	8	0.625	48
	42	Produce quality deliverables	10	11	9	17	8	0.607	53
	43	Project Success in quality customer satisfaction	7	8	15	17	8	0.640	44
	44	Clear scope and quality of work control	9	9	16	14	7	0.604	54
	45	Poor quality of work as a result of shortage of funds	9	13	13	12	8	0.589	58
	46	Plan quality identifying quality requirements	12	9	19	8	7	0.560	62
	47	Quality Policy, Procedures and Standards	5	15	13	15	7	0.615	51

	48	Poor quality of construction	9	13	12	13	8	0.593	57
	49	Effective quality planning	5	13	14	15	8	0.629	47
	50	Late delivery of materials	5	4	6	27	13	0.742	19
	51	Specification	2	13	16	17	7	0.651	41
	52	Control charts & analysis	6	9	9	19	12	0.680	33

The following graph shows the graphical representation of Quality factors

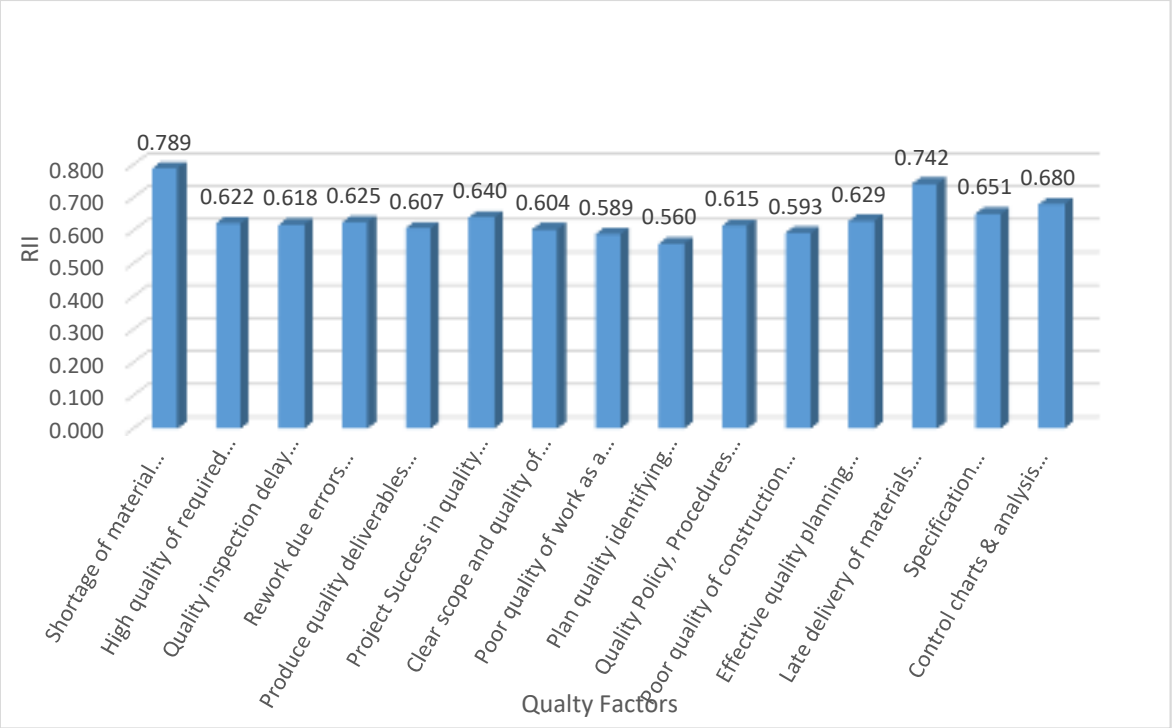

Figure 4.7 Relative importance index and rank of Project Quality factor

The above table and graph show the ranking factors for the quality control factor group. Shortage of material was ranked first in the quality factor group, with an RII of 0.789, and was 9th among all 66 factors of project monitoring and controlling practices. Late delivery of materials was ranked 2nd in quality factor group, with an RII of 0.742, and 19th among all 66 factors of project monitoring and controlling practices.

Control charts & analysis, Specification, Project Success in quality customer satisfaction, Effective quality planning, Rework due errors, High quality of required works, Quality

inspection delay, Late delivery of materials, Quality of work control, Quality policy and Procedures and Standards, Produce quality deliverables, Clear scope and Poor quality of construction as a result of shortage of funds ranked from 3rd to 13th position and ranked on 33th, 41th, 44th, 47th, 48th, 49th, 50th, 51th, 53th, 54th, and 57th respectively in quality control factors in group and with RII 0.680, 0.651, 0.640, 0.629, 0.625, 0.618, 0.615, 0.607, 0.604 and 0.593 ranks respectively among all 66 factors of project monitoring and controlling practices.

Poor quality of work and Plan quality identifying quality requirements ranked 14th and 15th quality factors in group and 58th and 62th among all 66 factors with RII 0.589 and 0.560 position in overall rank of factors schedule controlling factors.

4.3.5. Stakeholder Engagement factors

Stakeholders engagements of control is the process of monitoring overall project stakeholder relationship and adjusting strategies and plans for engaging stakeholders. Law and order, Security of project site are essential for high monitoring and controlling practices on housing building construction. Project Stakeholder Engagement control including:-Payment delay, Lack of follow up the work progress, Ineffective project planning &scheduling, Political situations/ unpredictability (i.e. protest), Lack awareness of all project, Project team needs to identify engagement the relative impotence index rank of stakeholder engagement control factors are summarized in the below table 4.8

Table 4.8 RII and rank of Project quality Stakeholders Engagements factors

Factor group	**No.**	**Factor of project monitoring and control practices**	**Respondent Scores**					**RII**	**Ranks**
			1	**2**	**3**	**4**	**5**		
Stakeholders Engagements factors	53	Lack awareness of all project	6	8	14	22	5	0.644	43
	54	Project team needs to identify engagement	11	5	16	16	7	0.611	52

	55	Payment delay	2	4	6	21	22	0.985	1
	56	Lack of follow up the work progress	3	6	18	23	5	0.469	64
	57	Ineffective project planning & scheduling	2	3	16	16	18	0.793	8
	58	Political situations/ unpredictability(ie protest)	9	11	7	13	15	0.745	18

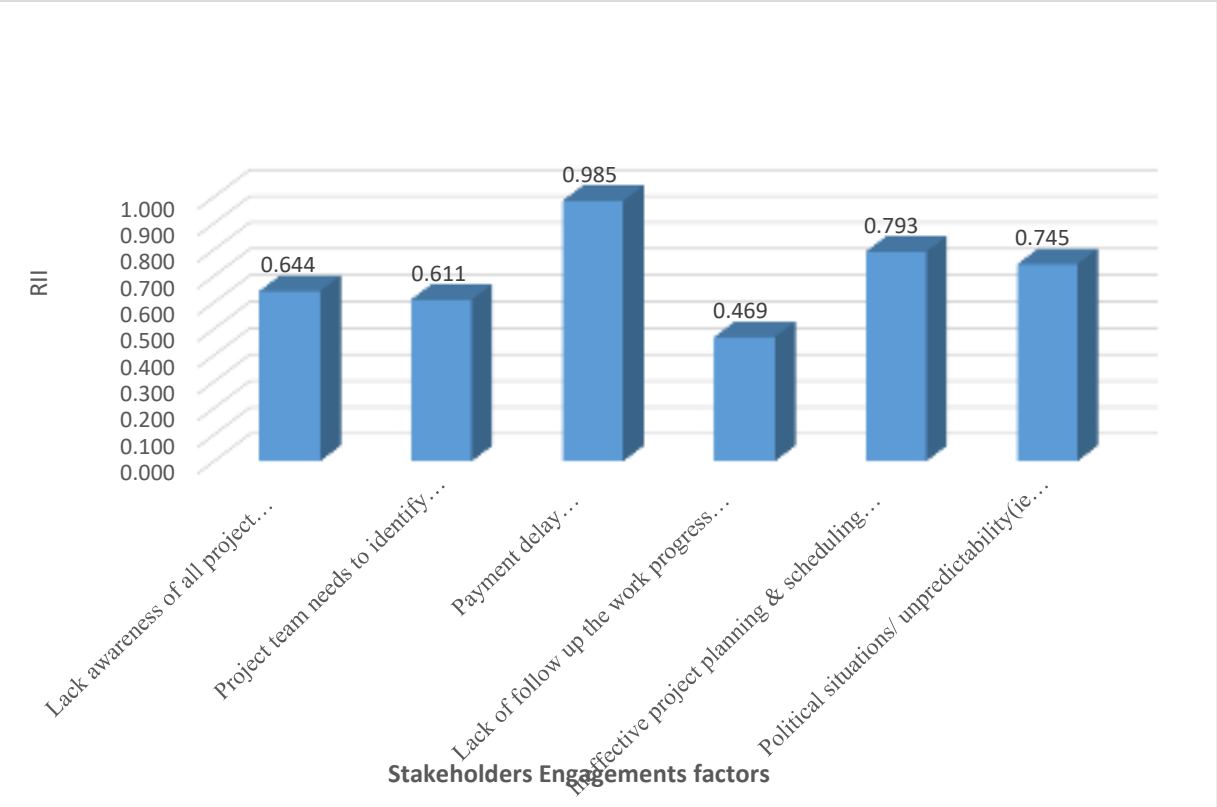

Figure 4.8 Relative importance index and rank of Project Stakeholders Engagements factor

Payment delay is ranked on the 1st position from this group with RII of 0.985 and ranked 1stin the total ranking from 66 factors while; Ineffective project planning & scheduling, Lack of follow up the work progress, Political situations/unpredictability (ie protest), Project team needs to identify engagement and Lack awareness of all project is ranked 2nd to 6th position from this group and 8th,18th,43th,52th and 64th factors position

in overall ranking respectively with RII of 0.785, 0.785, 0.612, 0.600 and 0.588 from their group.

Output of Stakeholders factors: Work performance information, change requests, project management plan updates, project document updates and organizational process assets updates.

4.3.6. Communication factors

A project's timely completion depends on effective communication. Poor communication will discourage employees. Delays will result from errors that require repeat work, ignorance that causes time loss, and misinterpretation. While there are countless options for communication, there are technical challenges. Other common problems associated with communication in construction include comprehending the chain of command and ongoing human activity related to the project, as well as anticipating potential problems in the future. These problems can be avoided by organizing regular project management team conferences.

Communication management issue was graded within their cluster and out of the sixty six list of things of project watching and dominant practices consistent with their importance is shown in the Communication control factor was ranked 4th in their group and out of the 66 list of factors of project monitoring and controlling practices according to their importance is shown in the following table 4.9.

Table 4.9 RII and rank of Project quality Communication factors

Factor group	**No.**	**Factor of project monitoring and control practices**	**Respondent Scores**					**RII**	**Ranks**
			1	**2**	**3**	**4**	**5**		
Communication factors	59	Written communication	1	6	7	26	15	0.822	5
	60	Electronic communication	7	11	14	12	11	0.596	56
	61	Oral communication	8	9	4	29	5	0.575	60

	62	Project communication plan	7	9	12	20	7	0.538	63
	63	Lack of communication b/n 3C's	0	12	22	15	6	0.447	65
	64	Lack of General support to contractor	3	12	22	13	5	0.404	66
	65	By communicating to reduce conflict of project	0	13	11	24	7	0.585	59
	66	The effectiveness of controlling information	7	6	18	13	11	0.571	61

Written communication is the most significant factor of project monitoring and controlling practices from this group of factors ranked 1st and 5rd position in overall ranking with RII of 0.822. Electronic communication is ranked 2nd from this group and ranked 56th position in the overall rank with RII of 0.596. Lack of communication b/n 3C's is also caused by lack of communication in manpower, work areas, or project size, delay of project, quality, cost and schedule. This occurs when communication is diverted from contractor, client, consultant and public body to analyze and plan contract changes, expedite delayed material, manage added crews, or other changes not in the original work scope and schedule. By communicating to reduce conflict of project, Oral communication, The effectiveness of controlling information, Project communication plan, Lack of General support to contractor, Project communication plan and Lack of communication b/n 3C's are ranked from 3rd to 8th position and ranked 59th, 60th, 61th, 63th, 65th, 66th, position in the overall ranking respectively and with RII of 0.585, 0.575, 0.571, 0.538, 0.447 and 0.404 out of 66 factors.

The following figure 4.10 shows the relative importance index (RII) and rank of communication control factors.

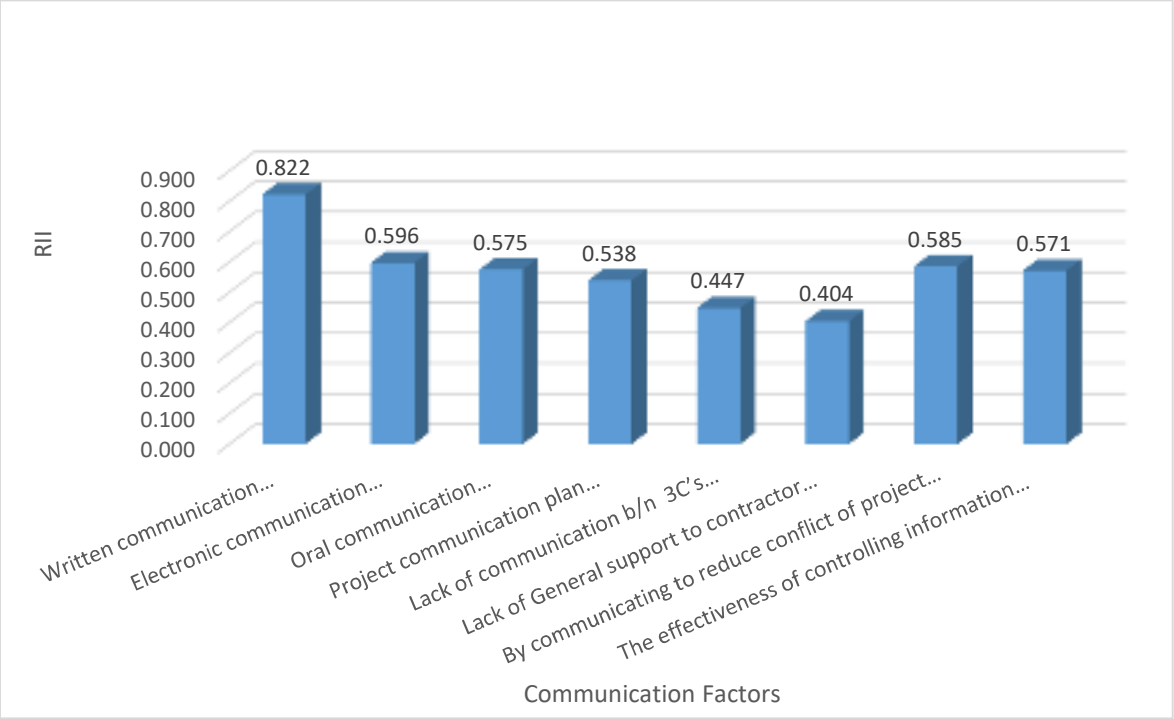

Figure 4.9 Relative importance index and rank of Project Communication factor

4.4. To evaluate monitoring and controlling practices

In view of describing the evaluation of Project Monitoring & Control, the respondents were requested to indicate their levels of Project evaluates monitoring and controlling practices on housing building construction in Addis Ababa City. There are 5 sub evaluate to list and each of them are ranked according to their relative importance index (RII).

Table 4.10 RII and rank of an evaluation of monitoring and controlling practices

No.	To what extent do you agree with the statement of evaluate to take action projects?	Respondent Scores					RII	Ranks
		1	2	3	4	5		
1	Reduce project delivery costs and increased profits	3	4	8	29	11	0.716	4
2	Higher degree of project successes increases competitive	0	6	11	14	24	0.982	1
3	Project requirement leading to motivated staff	0	3	26	20	6	0.436	5
4	Produce quality deliverables	0	2	16	22	15	0.745	3
5	Customer advantage arising to meeting expectations	5	2	12	15	21	0.884	2

The following figure 4.10 shows the relative importance index (RII) and rank of evaluate monitoring and control practices on housing building constructions.

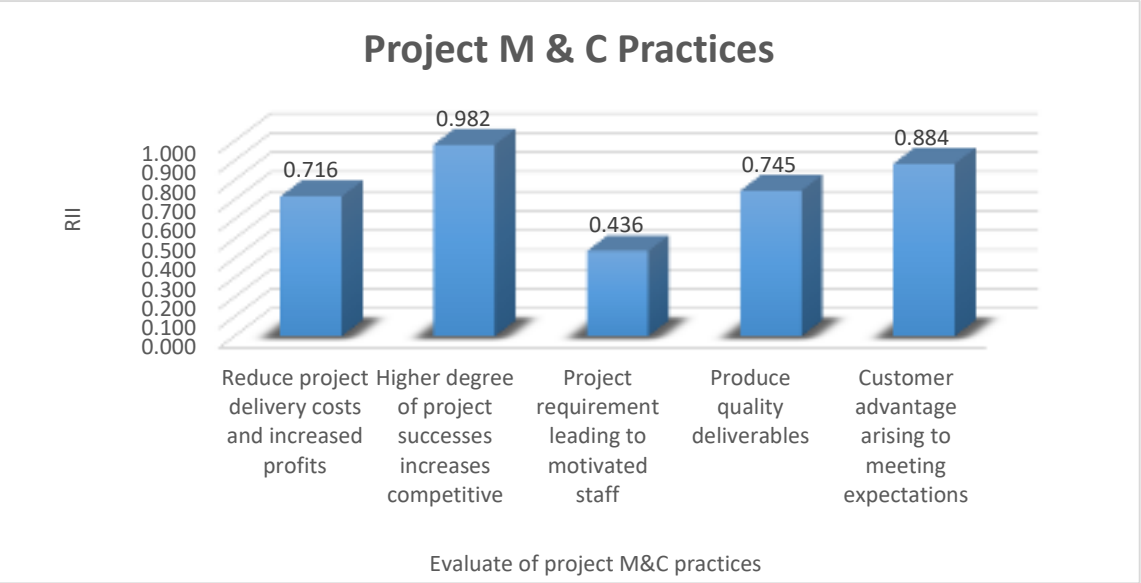

Figure 4.10 RII and rank of an evaluation of monitoring and controlling practices

Higher degree of project successes increases competitive is the most significant evaluate monitoring and control practices and from this group of evaluate ranked 1st position in overall ranking with RII of 0.982. Customer advantage arising to meeting expectations and is ranked 2nd position in the overall rank with RII of 0.884. Project requirement leading to motivated staff, Reduce project delivery costs and increased profits and Project requirements leading to motivated staff are ranked from 3rd to 5thposition in the overall ranking respectively and with RII of 0.745, 0.716, and 0.436 out of 5 evaluate monitoring and controlling practices on housing building construction projects in Addis Ababa.

4.5.An impact of lack monitoring and controlling practices

Interviews were conducted with the four project participants the consultants, the contractors, the regulatory body, and the client each of whom assessed the case from their perspective. The research results from impact projects are given in accordance with opinions, scientific studies, and lessons learned.

4.5.1. General impact of lack monitoring and controlling practices

The questions were summarized and focused more impacts successful completion and sustainable construction. The results exposed that the key monitoring and controlling

practices in Addis Ababa City Housing construction projects are factors affect time, cost and quality most on construction projects.

1) **Impact of time: -** It outlines the effect of the amount of time that a project's improper scheduling causes to generate project delays. Time-related issues include shifting weather patterns, road accessibility, material availability on site, tracking systems, and approval levels required for project scheduling. The contractors, client, regulatory bodies, and consultants believe that the following are the challenging variables of time for successfully completing on schedule:
    - Bad weather condition change to affect schedule
    - Accessibility problem not consider during schedule
    - Lack of communication between parties.
    - Inadequate design without site investigates.
    - Delay in payment by client progress work done.
    - Mismanagement by the contractor and the consultant to complete and deliver project on time.
    - Price fluctuation of the construction materials.

2) **Impact of Cost**

It is defines the impact of cost by that price baseline could also be modified to change initial contract cost and actual cost to variance. An impact of cost for successful completion cost factors an opinion of the contractors, client, regulatory and consultants are as follows:-

- Cost overrun.
- Increasing the variation change.
- Additional budget required.
- Delay Change order by client.
- In case Inadequate design to affect cost change.
- Termination of contract.
- Difficulty in financing the construction project by contractor.

3) **Impact of quality**

Quality impact is lack of monitoring and controlling practices in Housing building projects not completed in the given time. An impact of quality for successful completion

on quality problem the opinion of the contractors, client, regulatory and consultants are as follows:-

- Rework due to errors by contractor.
- Poor site management by contractor.
- Inadequate materials delivered on site.
- Design data is not available at the right time causing changes to the design at the time of construction.
- Less quality and reworks by contractor due to work speeding.
- Construction planning by contractor.
- Poor qualification of contractor's staffs.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The study aims at assess the practice of monitoring and control in the public housing construction projects in Addis Ababa.

5.1.1. Factors that affect project M & C practices on construction

The questionnaire of this study considered 66 factors which factors that affect monitoring and controlling practices on public building construction and those factors were distributed into six groups namely, Scope factors, Cost factors, Schedule factors, Quality factors, Stakeholders Engagements factors and Communication factors. The most factor of project monitoring and controlling practices is Payment Delay whose face monitoring and controlling problems on construction site, it is necessary to concentrate on the major factors such as: Payment Delay, Scope change within time, cost and quality change, Price fluctuations, Cost variations and Written Communication. The most important factors are grouped in the project cost control which this implies Any Cost control problems reduce the output of monitoring and control practices.

Therefore, the results from analysis ranked from the overall factors are payment delay the most significant factors that affect monitoring and controlling practices on public housing construction projects with RII 0.985.

5.1.2. To evaluate monitoring and controlling practices

Project evaluates monitoring and control practices on public housing construction in Addis Ababa City. There are 5 sub evaluated to list and each of them are ranked according to their relative importance index (RII). The Higher degree of project successes increases competitive is the most significant evaluate monitoring and controlling practices. From this group of evaluate ranked 1st position in overall ranking with RII of 0.982, so for project monitoring and controlling practices are the most important to Higher degree of project successes increases competitive.

5.1.3. An impact of lack monitoring and controlling practices

The four parties to the project comprising of the consultants, the contractors, regulatory and client were interviewed, each evaluating the case through their point of view. The major impact lack of monitoring and controlling practices are time delay, cost increase and quality factors from initial contract on this project are originated by the Employer, Contractor, regulatory and Consultant.

5.2. Recommendations

5.2.1. The recommendations to upgrade knowledge of m &c practices

The four parties to the project comprising of the consultants, the contractors, regulatory and client were interviewed, each evaluating the case through their point of view, according to scientific study, opinion and recommends are the following summarize:-

1. **Measure performance**

To see whether the project is going effectively or not, must evaluate the performance. One way to tell whether or not the anticipated budgets will be used to finish the project is by investigating at the cost performance of the project. The project's schedule performance might indicate whether or not the timetable and schedule are going to be met.

2. **Take action to control the project**

Actions, management points, and necessary activities are implemented to have control over the project. If the project is departing from the baseline plan, these steps indicate it. There are some recommended practices to implement for effective project monitoring and control for a productive project.

3. **Request changes**

Modification may be requested to fulfill the planned values once more.

4. **Perform integrated change control**

Performing an integrated change control evaluates the changes and its impacts on the project. Then, a correct amendment/change implementation is planned to minimize**.**

5. **Approve or reject changes**

The method used for project monitoring and control may accept or reject modifications. The amendment instrument panel reviews proposed changes; if this board rejects the amendment, it will not be put into effect.

6. **Inform stakeholders of approved changes**

The amendment/change instrument panel is approving an amendment. Because, the previous arrange, scope, and targets have an amendment. So the stakeholders should be notified concerning this alteration/change.

7. Manage configuration

The configuration of a project describes the significant and properly operating combination of various modules or elements. In order to confirm healthy project progression, the configuration is managed.

8. Gain acceptance from customer

Once the project deliverables are completed, presented to the client. If the deliverables meet the necessities in agreement with the client, within the starting, the client accepts the project and shutting part is triggered.

9. Perform quality control

Quality control activities check the standard attributes of the delivered outputs. For instance, the product of a project would possibly meet the budget and schedule targets. But the standard necessities may not meet the customers' expectations. In this case, the project is going to be thought of as failing likewise.

10. Report on project performance

Since estimating and project performance is measured throughout monitoring and controlling, project performance reports square measure sent to relevant stakeholders throughout this part in addition.

11. Perform risk audits

Risks might affect a project drastically. Therefore, every anticipated risk should be documented, and risk response ways for every risk should be planned just in case a risk happens.

12. Manage reserves

Reserves are planned to accommodate costs of risks and unexpected situations in projects. For instance, a 10% from the budget reserve can be planned to accommodate impacts of risks. Or, if the project duration is 12 months, an additional 2 months can be planned as a buffer to overcome any kind of risks that might occur during the project. These reserves square measure managed in in monitoring and controlling part.

13. Administer procurements

Tools, equipment or resources will be outsourced from a provider throughout a project. Administration of those purchases, outsourcing, and leasing activities are done throughout monitoring and control part of a project.

5.2.2. A future framework for monitoring and controlling practices

The suggested framework focuses a significant value on the application of principles to the monitoring and control of building project operation. The framework's goals are to assist construction parties in:

- Identify what could be done to tackle or counter balance these challenges (what to do),
- Identify how to address these challenges (how to do it) and
- Realize the possible outcome (results), which are monitor and control practices

Based on the questioner survey, the respondent identifies the major factors of m &c practices and its future framework to monitor and control practices on construction projects in the table 5.1.

Table 5.1 A framework for monitoring and controlling practices

Major factors of monitor and control practices on construction project	**What to do to**	**How to do it**	**Result**
Payment Delay	Prepare good project management	Government order to achieve a timely payment for the contractor	Good Project monitoring and controlling practices
Scope change with time, cost and quality change	careful planning, design M&C the project	Should be investigate site work before design	
Price fluctuation	Sufficient management skills	Sufficient construction material store with time	
Cost variations	Prepare effective cost management	Timely delivery of materials, Prevent detect production Understand client needs and Expectation	
Written Communication	Prepare good communication between parties	Improve communication among Players	

To obtain the right outcome for the client, a successful project needs careful planning, organization, monitoring, and control throughout the project. To guarantee a financial gain for the contractor and to deliver a timely and satisfactory result for the client, effective planning, organization, monitoring, and control are critical. Effective communication between all stakeholders is essential to the successful execution of construction projects.

Managers must be open to change in order to facilitate effective teamwork on construction projects. Employees must be able to work in groups, and businesses must prioritize their clients. Organizational cultures that hinder lean construction must be changed. Partnerships must be meaningful when team members are given decision-making authority.

The way participants in a construction project understand the process will determine how the project is managed. The key techniques that should be used to improve the application of main principles include educating staff members about lean concepts and addressing the concerns and uncertainties that lead firms to conceal knowledge rather than share it. To effectively integrate material management on building projects, it was important to strengthen technological capabilities. In order to guarantee that technical capabilities are improved, managers have to understand standards, use them to define normal and abnormal circumstances, and create understandable, readily accessible visual controls at every level to support standard monitoring and improvement.

One explanation for the inefficiency of the building industry could be the absence of standards. Additionally, managers must uphold their own self-discipline, mentor and coach colleagues to keep to policies and guidelines, and respond promptly and investigate any deviations from the standard. Standardized construction features should also be encouraged in order to enhance the practices of monitoring and control construction projects. Within an organization, there are numerous ways to communicate, such as by signals and verbal. An organization's ability to function depends on its level of authority, control, and motivation. Effective worker communication is necessary to coordinate efforts and increase the quality of the work. Effectiveness, accuracy, usefulness, and completeness are qualities of communication that improve work output and quality.

5.2.3. Recommendations for Future study

Federal and state governments invest significant amounts of capital on construction of building projects, public institution, condominiums housing construction, road projects, railway, hydropower and other mega projects. So, a study similar to the present research was needed for public building projects, road projects construction and other mega projects in Ethiopia to find factors that affect the monitoring and controlling practices of construction projects, which help government to minimize unnecessary cost escalations and project schedule delays.

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APPENDICE

APPENDIX –A

QUESTIONNAIRE SURVEY FOR THESIS PAPER THE FACTORS THAT AFFECT

MONITORING AND CONTROLLING

PRACTICES ON PUBLIC HOUSING CONSTRUCTION PROJECT IN

ADDIS ABABA CITY.

Adama Science and Technology University

School of Civil Engineering and Architecture

Department of Civil Engineering

Academic Research Questionnaire

Dear Respondent, I Dagmawi Asnake, a postgraduate student pursuing a Master's Degree in Construction Engineering and Management at Adama Science and Technology University, School of Civil Engineering and Architecture. As part of this course, I am carrying out a research on Project Monitoring and controlling Practices. This questionnaire is designed to collect data on "Assessment on monitoring and control of Public housing construction: In case of Addis Ababa City Administration housing construction project office" You have been selected to take part in this study as a respondent. The data collected from this survey is used only for an academic purpose. Thus, the study upholds the principles of 'do no harm'; the data will be treated confidentially. Honesty is expected at most from the responders.

To contact the researcher, use the following addresses:

Phone: +251924312680/+251940426183

Email: dagmawiasnake6@gmail.com

Part 1: Personal and General Organization Information

✓ Please respond by ticking (“√”) appropriate in box (□)

1. Type of Organization (Respondents designation)

□ Owner/Client	□ Regulatory	□ SMME contractor
□ Contractor	□ Consultant	Other Specify_____

2. Years since your organization established

□ Less than 5	□ 5-10	□ 11-15	□ More than 15

3. Which the following relative you professional?

□ Level/10+ 0r Diploma	□ Masters	□ Level
□ degree	□ PhD	□ Other_____

4. Relevant Work experience (Year)

□ 0-5	□ 10-15	□ 20-25
□ 5-10	□ 15-20	□ more than 25

5. Which of the following describe your responsibility on project?

□ Project leader	□ project manager	□ project regulatory
□ Contractor	□ project consultant	□ Other

6. Total number of projects worked in the last 5 years

□ Less than 10	□ 11 -20	□ 21-30	□ More than 30

7. Value of projects worked total executed in the last five years: (in ETB)

□ Less than 10 Million	□ 30-60 million	□ 90-120 million
□ 10-30 million	□ 60-90 million	□ More than 120 million

8. If contractor, indicate Class of the company

Bc,	□ Grade (1-3)	□ Grade (4 & 5)	□ Grade (6 & 7)
GC	□ Grade (1-3)	□ Grade (4 & 5)	□ Grade (6 & 7)

Part 2: General Research Questions

1. **What the factors that affecting monitoring and controlling practices on public housing constructions?**

The given below are factors influencing projects monitoring and controlling practices on public building constructions projects. Please indicate the significance of each factor by ticking the appropriate boxes. Add any remarks relating to each factor on the last column e.g. as to the reasons, the critical factors or the solutions.

(1) = not factors (4). = very factors

(2) = slightly factors (5). = extremely factors

(3). = moderately factors

No	**The factor of project M&C practice on public housing construction**	**Ordinary Scale**				
	Group 1:- Scope factors	**1**	**2**	**3**	**4**	**5**
1	Cause of boundary project					
2	Keep the scope realistic					
3	project scope management plan					
4	Scope baseline					
5	Change management plan					
6	Scope Variance					
7	Quantified evaluation of project					
8	Scope change within time, cost and quality					
9	Delay in approving major changes in scope of work by consultant					
10	Project authorization confirmed with owner					
	If other, please specify					
	Group 2:- Cost factors					
1	Changes to cost baseline					
2	Cost performances to detect variances					
3	Determining resource requirements					
4	Performance report					
5	Ongoing control of project finances					

6	Cost planning during design stage					
7	Cost variations					
8	Inadequate design without site investigation					
9	Price fluctuations					
10	Modifying cost during construction					
11	Budget Updates					
12	Delay corrective Action					
13	Estimate at Completion					
14	Change Order by Engineer					
15	Delays in decisions making					
	If other, please specify					
	Group 3:-Schedule Control					
1	Schedule changes					
2	Managing the actual changes					
3	Using schedule Baseline					
4	Adopting realistic times for estimating;					
5	Construction Schedule (Master Schedule)					
6	Resource schedule					
7	Time scheduling to minimizing variation					
8	Working as per schedule					
9	Additional Planning					
10	Schedule Updated					
11	Effective schedule					
12	Use of Software and tools for Schedule control					
	If other, please specify					
	Group 4:-Quality factors					
1	Shortage of material					
2	High quality of required works					

3	Quality inspection delay					
4	Rework due errors					
5	Produce quality deliverables					
6	Project Success in quality customer satisfaction					
7	Clear scope and quality of work control					
8	Poor quality of work as a result of shortage of funds					
9	Plan quality identifying quality requirements					
10	quality Policy, Procedures and Standards					
11	Poor quality of construction					
12	Effective quality planning					
13	Late delivery of materials					
14	Specification					
15	Control charts & analysis					
	If other, please specify					
	Group 5:-Stakeholders Engagements factors					
1	Lack aware\ness of all project					
2	Project team needs to identify engagement					
3	Payment delay					
4	Lack of follow up the work progress					
5	Ineffective project planning & scheduling					
6	Political situations/ unpredictability(ie protest)					
	If other, please specify					
	Group 6:- Communication factors					
1	Written communication					
2	Electronic communication					
3	Oral communication					
4	Project communication plan					
5	Lack of communication b/n 3C’s					

6	Lack of General support to contractor					
8	By communicating to reduce conflict of project					
9	The effectiveness of controlling information					
	If other, please specify					

2. **How to evaluate factors of monitoring and controlling practices on public housing constructions?**

Please rate the following benefits arising from project monitoring and controlling practices, so insert the relevant value (number) to the benefits

(1) = Strongly disagree (2) = Disagree (3) = Neutral (4) = Agree (5) = strongly agree

No	**Group 1:-To what extent do you agree with the statement of evaluate to take action projects?**	**Ordinary Scale**				
		1	**2**	**3**	**4**	**5**
1	Reduce project delivery costs and increased profits					
2	Higher degree of project successes increases competitive					
3	Project requirement leading to motivated staff					
4	Produce quality deliverables					
5	Customer advantage arising to meeting expectations					
	If other, please specify					

Part III additional questions. Please tick the appropriate response where applicable,

1. Which software do you apply for monitoring and controlling the project?

- ☐ Primavera
- ☐ Microsoft project

☐ Excel sheet

☐ Others (.....)

2. Does your company formally participate in the monitoring and controlling effort?

☐ Yes, if the owner is Addis Ababa City Administration housing construction project office

☐ Yes, for any project

☐ No

☐ I don't know

3. Does your enterprise employ a construction montoring and controlling specialist firm?

☐ Yes

☐ No

☐ I don't know

4. How would you describe the level of detail of the monitoring and controlling techniques used in your monitoring and controlling of the projects?

☐ not very detailed

☐ detailed

☐ very detailed

5. How often would you revise your project plan ?

☐ Never

☐ Daily

☐ Weekly/bi-weekly

☐ Monthly

☐ Quarterly

☐

6. Which of the following answers below would best describe the frequency of monitor and control of the projects' progress in your company?

☐ Never
☐ Daily
☐ Weekly/ biweekly
☐ Monthly
☐ Every quarterly

7. How often do you require the sub-contractors or supplier to submit their detail activities schedule for you in advance to adjust your actual schedule?

☐ Never
☐ Daily
☐ Weekly
☐ Monthly
☐ Every quarterly

8.how do you describe your enterprises project progress monitoring and evaluation ?

☐ Not good
☐ Good
☐ Best

Part 4: Open Questioners

1. What factor that affecting monitoring and controlling practices?

_____

_____

_____

2. Who construction parties beneficial by project monitoring and controlling practices on public housing construction?

_____

_____

_____

3. Who should take action project monitor and control practices on public housing construction ?

_____

_____

_____

4. What are future framework for developing project monitoring and controlling practices on public housing constructions?

_____

_____

_____

5. If you have comments regarding the factors that affecting monitoring and controlling practices on public building construction project.

_____

_____

_____

Interview question

1) From your experience, how could monitor and controlling practices expressed in public housng construction projects?
2) What do you think impact of monitoring and controlling practices in the construction company?
3) What are the factors that you think will affect the monitoring and controlling practices construction projects during construction phase? Please explain with example.