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ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

DEPARTMENT OF PROJECT MANAGEMENT

**DETERMINANT FACTORS OF CONSTRUCTION PROJECT
SUCCESS: THE CASE OF FEDERAL HOUSING CORPORATION
BUILDING PROJECT**

By: Hayat Mohammedseid

ID No.: GSD/0114/12

ADVISOR: Worku Mekonnen (PhD)

**Project work submitted to the School of Commerce of the Addis Ababa
University in Partial fulfillment of the requirements for the award of Master of
Arts Degree in Project Management**

March, 2023

Addis Ababa, Ethiopia

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STATEMENT OF CERTIFICATION

This is to certify that this research project by Hayat Mohammedseid, entitled “Determinant factors of construction project success: the case of federal housing corporation building project” submitted for partial fulfilment of the requirements for the degree of Master of Arts in Project Management complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

Approved by:

Advisor

Signature

Internal Examiner

Signature

External Examiner

Signature

DECLARATION

I, Hayat Mohammedseid, hereby declare that this study entitled “Determinant factors of construction project success: the case of federal housing corporation building project” is my own original work. It has not been submitted for fulfilment of a degree to another university and that all reference materials used for the project have been appropriately acknowledged.

Name: _____

Signature: _____

Date: _____

ACKNOWLEDGMENT

First and foremost, I am grateful to Almighty Allah for blessing me with health and strength. I want to extend my sincerest appreciation to Dr. Worku Mekonnen, my advisor, for his tireless guidance and invaluable insights during the project's progress. I am also thankful to the Addis Ababa University School of Commerce for providing me with the opportunity to pursue my studies and for creating a supportive learning environment. I acknowledge the Federal housing corporation Gerji site project teams for their assistance and for allowing me to conduct this research. Lastly, I am grateful to my family, friends and colleagues for their support and encouragement during this study.

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Acronyms

PMI	Project management institute
PMBOK	Project management book of knowledge
FHC	Federal housing corporation
WDI	World development indicator
CSF	Critical success factors
KPI	Key performance indicator
DB	Design and Build
QMS	Quality management system
SPSS	Statistical package for social sciences
BIM	Building information modelling
RII	Relative importance index

Abstract

The success of a construction project is determined and measured by a variety of factors. This research study examines the factors determining the success of the FHC Building Project specifically in gerji apartment construction project. It also assesses the criteria that measure project success. The instrument used for the data collection was a structured questionnaire and the target population consisted of seventy eight professionals comprised of clients, contractors, consultants and other responsible stakeholders, subcontractors and intermittent engineers that directly participated in the construction project. The methods employed were frequency, percentage, mean score, standard deviation and relative importance index was used for rank. Eleven success criteria and twenty four success factors were identified that determine project success. The result showed that completion on time or earlier, completion within budget, accomplishment of scope and accomplishment of quality i.e. technical specification are the most significant criteria to measure the construction projects' success. The study found that project manager & team competence, accurate schedule and financial planning, timely & comprehensive control and use of construction technology are the most significant factors that determine construction projects success. Therefore, adequate selection process for the project manager is recommended in order to ensure project success. Accurate schedule through project management tools has to be prepared before project execution starts. Timely and comprehensive control of scope, quality and time line has to be done in order to make sure the project is on track. Different construction technologies have to be adopted in order to reduce project time and cost. Finally, team commitment can be achieved through clear role and responsibility, rewarding systems and managing conflict in order to achieve project success. The results of this study can be used for better planning and inform decisions related to the management of future construction projects.

Keywords: project management, project success, success criteria, success factors

CHAPTER ONE

1. Introduction

1.1 Background of the study

Globally, the construction sector is worth 1.7 trillion dollars and accounts for five to seven percent of the gross domestic product in most nations (WDI, 2019). It contributes significantly to global gross capital formation, which accounts for 21% of the gross domestic product. It is evident that economic growth depends on the construction industry, as it has a significant impact on almost every aspect of the economy. There is no denying the sector's contribution to economic growth; constructed assets include buildings, highways, water dams, utility systems, schools, and clinics.

Particularly in developing nations, the building industry is sometimes considered as a major force behind economic expansion. In order to support local employment and boost economic efficiency, the sector can efficiently mobilize and use local human and material resources in the construction and maintenance of housing and infrastructure. Due to significant increases in infrastructure and building investments in Ethiopia, the construction industry solely experienced annual growth of 11.6%. (Ethiopian Economic Association, 2006).

Ethiopia is currently engaged in massive development projects for public and private real estate, highways, water dams, networking infrastructure, and other things. Due to growing design complexity and stakeholder participation, modern construction projects present substantial challenges for both clients and contractors to complete the project successfully.

The majority of governments, users, and communities place an emphasis on the success of construction projects. The macroeconomic growth of those projects and the microeconomic growth of individual lives are both impacted by their performance.

Project success is referred to in the literature in a variety of ways, including completion "on time, under budget, and to specification," success of the generated product, and success in accomplishing the project's commercial goals. Additionally, these measures are frequently disputed, making it challenging to assess whether there is indeed a problem (Parker, 2009).

When a project meets its technical performance objectives and goals and the organization, project team, and users are all highly satisfied with the project's outcome, it is said to have been a success overall.

The micro and macro perspectives are two groups into which the project success criteria are split. The macro viewpoint is assessed on time, satisfaction, utility, and overall operation whereas the micro viewpoint is measured on time, cost, quality, performance, safety, and so on.

The analysis of key success factors and project success is thought to be a method of increasing a project's efficacy. Project management practices, project procedures, project-related factors, human-related variables, and external environment are the five primary areas into which the assessment of success factors has been proposed. Time, cost, quality, management, technology, safety, organization, and environment in the building project have been examined by the main categories of success criteria. (Chan, A.P.C. and Chan, A.P.L. 2004)

Project success is said to be influenced by the utilization of construction technology, efficient project management, close follow-up, work behaviour and leadership, team capability, and stakeholder participation.

The success of building projects is influenced by a variety of major and minor elements. This study aims to identify the factors that determined the construction project success in federal housing corporation, Gerji site apartment buildings.

Federal Housing Corporation

Prior to being run as a development firm, the company was created as a rental housing management organization in accordance with Decree No. 58/1968. Since the year 2000 E.C., it has operated under the name Government Housing Agency and under that name it has carried out its duties.

The following aims are listed in Article 5 of the Council of Ministers Regulation No. 398/2009 issued to create the Federal Housing Corporation: -

- Building, renting, selling, and purchasing residences for various reasons.
- To oversee and lease the federal government's homes and properties;
- To manage and make required repairs and modifications in order to safeguard and maintain federal government homes and structures;
- To make sure that the homes and goods are in good condition.
- To establish and implement a modern home management system to properly manage the federal government's homes. (Federal housing corporation, 2019)

Gerji apartment buildings

The Gerji village project site that is located around Gerji, Addis Ababa, with a plot size of 30,000 m². The client is Federal housing corporation. This project was constructed by Ovid construction PLC in collaboration with Kumkang Kind, a South Korean Building technologist. It is a construction of 16 blocks (B+G+9 and B+G+10) that accommodate 500 housing units, amenities and compound work. What makes this project unique is that it uses a south Korea's formwork technology that was adopted in Ethiopia for the first time. The project period was 18 months.

The project was declared by the government and stakeholders as the project was completed within budget, on time and with the required standard.

Ovid construction plc

Ovid construction plc, established in 2013, is a design and build company with a Grade -1 building construction license. Ovid is ISO certified and the quality management system is one of the competencies of the company. The company ensures customers satisfaction and trust by providing high quality products and high services that are useful, safe and reliable.

Ovid was formed with the objective of promoting modern building systems that will decrease the dependence of the Ethiopian construction industry on conventional building methods, which are inactive in terms of executing project works, finishing qualities and durability. The founder has brought in vast industrial experience and knowledge and values a cost effective yet efficient approach to construction. Ovid Construction is a pioneer in adopting alternative building materials in the country and has gone through various stages of development, and has introduced several advanced building technology systems. (Ovid group, 2021)

1.2 Statement of the problem

The construction industries are now in an active phase in Ethiopia. Unfortunately, a number of the projects are struggling with difficulties including time and budget overruns. The quality criteria established by the architects and engineers are not met by the built structures. Most of the customers lose interest. As a result, there is a great deal of research on the reasons why quality requirements aren't reached as well as the reasons behind time and cost overruns.

The main problem with projects management practices have always been mentioned as planning, project implementation, cost and time overruns and quality non-achievement. The

main success factors are more useful in decision-making support; more player-based research studies should be conducted (Alias, 2014).

If project managers are not conscious of the criteria that would affect their goals established from the inception phase then the project will not be successful. MSFs will become a instrument by which project managers can evaluate their companies. Success factors will become a gauge by which project managers can evaluate their companies (Steinfort et al., 2007).

Wai (2012) argued that project success in the construction industry is a vague concept, as there are many stakeholders, a high level of risk, and elements susceptible to outside factors such as political and economic. It is difficult to clearly determine if a project is successful or not, as some criteria may be fulfilled while others are not. The researcher also pointed out that context-driven research into the success factors of a project has been gaining traction in recent years, but noted that its implications are mainly limited to the countries where the data has been collected. He suggested that further research should be done to accommodate the nature and framework of the local construction industry.

There are very little construction projects in Ethiopia that are considered a success. Those projects have delivered the output results according to the set standard and quality. These projects budgets didn't surpass the allocated amount and they completed the projects according the contract time. A lot of publications can be found on what makes a projects considered as a success i.e. using critical success factors. Those CSF are well defined and considering all aspects of internal, external, macro and micro levels. However, little literature is found in Ethiopia on how those projects become successful. What affects project success? As a project has many stakeholders, which of those affects the success? What consideration are taken on the planning stage? those major questions that this thesis is aiming to answer. It also anticipates that it will be a basis for future studies.

Mohammad (2012) discovered factors affecting the performance of a building construction project, by obtaining information from contractors and consultants via questionnaire and using the factor analysis approach to examine the results. However, the case project didn't apply a new construction technology. Additionally, client's perspective is crucial in the study of project success.

Further to those problems identified in relation to the project, the researcher has observed that there is a shortage of studies with the focus on success factors in Ethiopia especially apartment projects of wide scope. Due to the above reasons, the researcher believes that factors that could contribute to the success of the projects has to be studied and recommendation be made for the successful accomplishment of the existing and future similar projects.

In summary, this project work addresses the above concepts and fills the knowledge gap by determining the factors for the construction project success from the client, contractor, consultant side in federal housing corporation apartment buildings.

1.3 Objective of the research

1.3.1 General objective

The general objective of this project work is to know and rank project success criteria and the factors that determine the project success for federal housing corporation buildings.

1.3.2 Specific objectives

The specific objectives are;

- To identify the success criteria in FHC projects
- To evaluate the factors that determine the project success
- To determine the level of influence of these factors project success

1.4 Basic research questions

The research attempted to get an answer to the following questions after a detailed observation on the topic, in order to achieve a practical conclusion.

- What are the major criteria that measure a construction project success?
- What are the factors that determine the success of federal housing corporation apartment buildings?
- What is the level of influence of the external and internal factors on project success?

1.5 Significance of the study

Construction projects are one of the most expensive and time consuming developments. They involve a wide range of parties, including communities and governments. A construction project's success or failure has a significant impact on the parties involved and end users. If it

fails, millions of dollars are at risk, as well as the end users' safety and the economy. On the other hand, a project's success benefits local economies, governments, and people's quality of life. This study highlights the key variables that influence the Federal Housing Corporation's construction project standards. It will be used as basis for detailed research. It will give on the insights of what is required from involved parties. Future projects will take the experience of the mentioned projects to apply to their projects in order to achieve the project success.

1.6 Scope of the study

This research aims to study the practical determinants of a construction project success. The research is done on a selected construction project of federal housing corporation, Gerji site apartment buildings. The construction was started on September, 2021 and completed on April, 2022. The project is considered a success because it has accomplished the milestones and project deliverables it set out to do. Therefore, major companies and individuals that were involved widely and contributed to the success will be incorporated in this research.

1.7 Limitation of the study

One of the limitations of the research is that it is limited on gerji project. Some of the data and conclusions given might be specific to this one project. So for further studies, the area of the study can be enlarged. Respondent that are selected in the study are only above the level of engineers. Supervisors and foreman workers could be taken into account in future studies, as these people have the knowledge of the ground level realities. Another limitation is that few of the respondents were reluctant to respond to the questionnaires. Time and budget constraint is also a limitation to this study.

1.8 Organization of the study

This research is organized in a such way that all relevant topics are sequenced in a standard manner. The study includes five chapters. The first chapter is an introduction and is comprised of background, problem statement, research objectives, research questions, significance of the study, scope of the study and the limitations. The second chapter is a review of the relevant literatures on the topic. Methodology of the research will be covered in the third chapter. Chapter four is the data collection and analysis. And the final chapter i.e. chapter five will discuss the conclusion and recommendation.

CHAPTER TWO

2. Literature Review

2.1 Introduction

This chapter of the research presents the review of related literatures in the selected study area. It is separated into three subsections: theoretical review, empirical review and the conceptual framework. Theoretical views about factors determining the success of projects are reviewed from different website articles and books.

2.2 Theoretical review

2.2.1 Concept of project management

A project is a unique, transient endeavour, undertaken to achieve planned objectives, which could be defined in terms of outputs, outcomes or benefits. (Ireland, 2002).

Project is a unique process, consist of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective confirming to specific requirements, including the constraints of time cost and resource (ISO 2003).

PMBOK - A project is a temporary endeavour undertaken to create a unique product, service, or result (PMBOK 2004).

An organization of people committed to a certain goal or purpose is called a project. Projects typically entail significant, costly, unusual, or high-risk undertakings that must be finished by a specific date, for a specific sum of money, and within a specific range of performance expectations. All initiatives must at the very least have clearly defined objectives and enough resources to complete all necessary activities (Tuman, 1983).

A project is a unique group of organized actions with clear beginning and finishing points that are carried out by a person or organization to accomplish specific objectives under predetermined time, financial, and performance constraints. Projects may be carried out to boost revenue, such as putting measures in place to improve cash flow, or they may be infrastructure projects that demand additional expenditure and resources in order to alter the capital base of the company. It must meet three fundamental criteria: the project must be completed on time; the project must be accomplished within the budgeted cost and the project must meet the prescribed quality requirements (Gardiner 2005).

These conditions will be graphically represented by the well-known project triangle. Few businesses prefer the term "efficiency" over "quality," but the principle is still the same: the project's operating requirements has to be met.

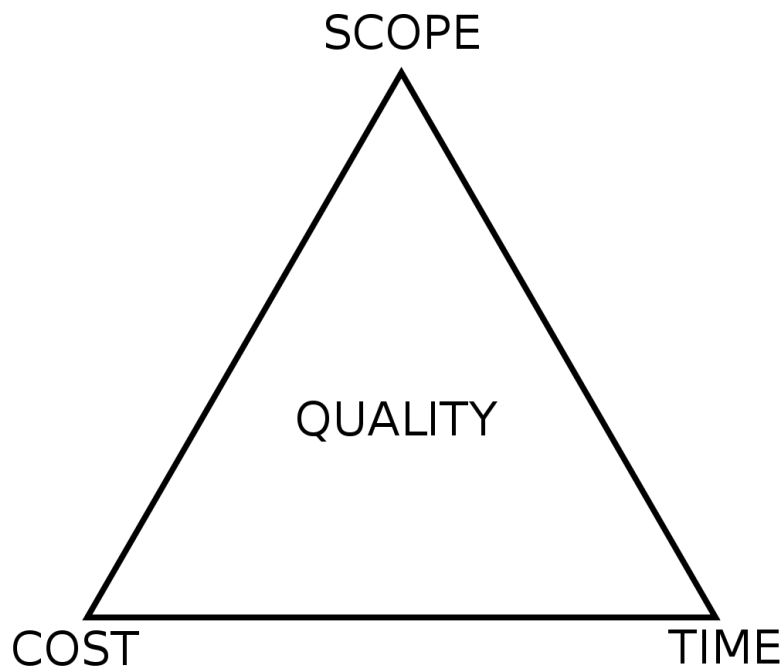


Figure 2-1 Project triangle (PMI, 2008)

The amount of time allotted to finish a project is referred to as the time constraint. The project's budgeted amount is referred to as the cost constraint. The project's final product is what is meant by the scope constraint. These three limits frequently conflict with one another: a larger scope typically entails more time and money; a limited timeframe may entail higher costs and a smaller scope; and a limited budget may entail both a larger timeframe and a smaller scope.

The goal of project management is to equip the project team, not only the project manager, with the instruments and methods necessary to structure their work in accordance with these constraints.

The use of information, skills, tools, and procedures in project management is done in order to meet or surpass stakeholder expectations (PMBOK, 2004). The project manager must be familiar with project management in order to assure the success of a project.

These are typically demonstrated by the manager's ability to plan, organize, monitor, and control all aspects of a project, as well as by the motivation of all project implementation teams that have taken part in achieving project deliverables well within anticipated timeline, budget, and level of scope (PMI, 2008). This indicates that knowledge, capabilities, project

management tools, as well as techniques must be applied to project operations in order to achieve project objectives (PMI, 2008). A project is described by Gardiner (2005) as a series of actions involving the planning, controlling, and management of all project components. It also requires inspiring project teams who were involved in its implementation to meet the intended goals on schedule, within the allocated budget, and with quality and performance.

According to Gardiner (2005) definition, "managing" and "effectively" are two essential components of a project's success. While "managing" involves the standard management tasks of planning, monitoring, controlling, and motivation, "successfully" entails executing project tasks on budget, on schedule, and with the intended quality.

Project management processes

A project management life cycle, as defined by the Project Management Institute's Guide PMBOK (2008), consists of five distinct phases: initiation, planning, execution, monitoring, and closure. These phases work together to transform a project idea into a working product.

➤ Project initiation

During the initial step, the project's goal and feasibility are decided. It will be decided whether or not this project is a suitable fit at this crucial stage of the procedure. If necessary, a feasibility review is conducted, and the results are used to produce a suggested solution or plan.

After everything is decided, a project initiation documentation is created. The project initiation guideline, which establishes the framework for the construction timetable, is one of the most significant project management artifacts.

➤ Planning phase

The team lists all of the necessary tasks during the project planning phase. It is still ongoing, and the project is nearing completion. The project's timetable, budget, and financing are the most crucial factors to take into account during the planning phase. The group is developing the strategy that must be applied in consideration of such conditions.

Another name for it is scope management. Another crucial document that must be created is a work breakdown structure (WBS), a checklist that divides all required labour into more manageable, smaller groupings.

Once the project's budget, schedule, and scope have been decided upon, it is ready to begin. The following stage in this essential phase is risk assessment. Now that the project's potential obstacles are all in view, the team can brainstorm some viable solutions. An effective information circulation among the project stakeholders will be established via a communication plan, which is also required.

➤ Execution phase

The construction project management strategy is implemented during the execution phase. This method is often divided into two steps: executing and monitoring (controlling). The project team makes sure that all required tasks are finished. Progress is being tracked concurrently, and modifications are being made as needed.

A project manager often spends the majority of the time monitoring, redirecting activities as needed, and maintaining project control.

➤ Monitoring and controlling

The third and fourth phases of project management process are not always sequential. By running concurrently with project execution, the project monitoring and controlling stage makes sure that goals and project deliverables are met.

By developing Critical Success Factors (CSF) as well as Key Performance Indicators (KPI), the project manager can ensure that no one deviates from the original plan as a project manager.

The manager is also in charge of objectively tracking the effort and expense incurred throughout the process during the monitoring phase of project management. This tracking is crucial for current projects as well as ensuring that the project stays under budget.

➤ Closing phase (closure)

The last step marks the project's official completion. The project manager is noting what went well and highlighting any potential errors. The team then creates a project summary, calculates the overall budget, and offers updates on any ongoing initiatives.

The project study would offer practical suggestions for upcoming building projects, as well as an evaluation of potential failures.



Figure 2-2 Project management process (PMI, 2008)

According to PMBOK (2004), a knowledge area is a specific area of project management that has been identified, is defined by its knowledge requirements, and is specified in terms of the processes, practices, inputs, output, tools, and techniques that make up that area. Despite their connections, the knowledge areas usually established individually from a project management standpoint. The following ten Knowledge Areas have been recognized by the book:

1. **Project Integration Management:** Identifies, defines, combines, unifies, and coordinates the many processes and project management tasks within the Project Management Processes.
2. **Project Scope Management:** comprises the procedures necessary to ensure that the project consists of the work necessary to finish it successfully.
3. **Project Schedule Management:** includes the procedures needed to oversee the project's timely completion.
4. **Project Cost Management:** includes all of the procedures necessary to plan, estimate, budget, finance, fund, manage, and control costs in order to accomplish the project within the approved budget.
5. **Project Quality Management:** Plans, manages, and controls project and product quality standards in accordance with the organization's quality policy in order to fulfil stakeholders' expectations.
6. **Project Resource Management:** includes the procedures for locating, acquiring, and managing the resources required for the project's effective completion.
7. **Project Communications Management:** consists of the procedures necessary to guarantee the timely and suitable planning, gathering, creation, distribution, storing, retrieving, management, control, monitor, and final disposition of the project information.

8. **Project Risk Management:** includes all of the steps involved in planning, identifying, analysing, and responding to risks on a project. It also mentions monitoring such risks.
9. **Project Procurement Management:** includes the procedures required to obtain the goods, services, or outcomes required from outside of the project team.
10. **Project Stakeholder Management:** Includes the steps necessary to identify the individuals, teams, or organizations that the project may affect or that it may affect, to evaluate stakeholder expectations as well as their effects on the project, and to create the necessary management strategies for successfully involving stakeholders in project planning and execution.

One or more knowledge Areas may be necessary to meet the needs of a particular project, for instance, construction may call for management of finances or safety and health. (PMBOK, 2017)

Construction project management

Any construction project is built on the basis of project management. According to Roberts and Wallace (2004), project management is involved with the entire project life cycle, including planning and overseeing the undertaking from inception to conclusion.

The guidance, control, and oversight of a project from its inception to conclusion can be summed up as construction project management. According to Westerveld (2003), it is the planning, coordination, and control of a project on behalf of a client from inception to completion. This involves identifying the client's objectives in terms of utility, operation, quality, time, and cost, establishing relationships among resources, integrating, monitoring, and controlling the project's contributors and their output, as well as evaluating and choosing alternatives in an effort to satisfy the client.

The complete satisfaction of the client's requirements for a project that is viable in terms of functionality as well as budget is the ultimate objective of construction project management. There are many different kinds of construction projects, including heavy civil, industrial, commercial, and residential. Particularly in developing countries, the building industry is sometimes considered as a major force behind economic expansion. When building and maintaining housing and infrastructure, the sector can efficiently deploy local human and material resources to support local employment and boost economic effectiveness. (Pheng and chuan, 2006).

2.2.2 Project success

The majority of governments, users, and communities place a high value on the success of construction projects. Due to rising design complexity and stakeholder participation, modern construction projects present substantial challenges for both clients and contractors to complete the project successfully (Doloi, 2009). Project success has also been extensively covered in the literature on project management by numerous scholars. The majority of project success researches have concentrated on aspects of how it is measured and other particular elements influencing project success (Wang and Huang, 2006).

For an architect, or interior designer a project's success is based on its aesthetic performance; however, for a contractor, a project's success is determined by whether the contractor makes a profit on it (Chan, Scott and Lam, 2002).

When a project is finished on schedule, on budget, and to everyone's satisfaction, it is deemed a success. Success is also defined as achieving results that are significantly better than those that are typical or expected in terms of cost, time, quality, and safety. Due to the involvement of various stakeholders in today's complicated project environment, the definition of "success" has undergone several revisions. In order to assist project participants in finishing projects with the desired results, the idea of project success has been developed with criteria and standards (Chan, Scott and Lam, 2002).

However, despite numerous research, there is still disagreement regarding the crucial success criteria for construction projects. Therefore, this idea remains somewhat unsolved. When a project meets its technical performance objectives and goals and the organization, project team, and users are all highly satisfied with the project's outcome, it is said to have been a success overall. Project success is concerned with the ultimate project objectives, and project management success is closely related to the successful completion of cost, schedule, and quality objectives (Pheng and Chuan, 2006).

2.2.3 Project success criteria

the success criteria and the success factors are two similar ideas that need to be distinguished from one another. To improve the likelihood that a project will succeed, it is necessary to first identify the pertinent success criteria before determining the success elements (Muller and Turner, 2007). Although success factors are the primary subject of this article, success criteria must also be taken into consideration.

Muller and Turner (2007) defined success criteria as elements that gauge project success. It is necessary to establish comprehensive criteria that take into account stakeholders' interests and perspectives because their perceptions of project success may differ. In addition to the golden triangle i.e. time, budget, and quality, Westerveld (2003) emphasizes the significance of stakeholders' satisfaction as a key success criterion and adds that various time lags should be taken into account. Setting up a set of standards that would apply to any project type is unrealistic (Mir and Pinnington, 2014). The size, complexity, period, type, and stakeholder requirements of any project should be taken into account when determining the success of the project.

This increased degree of complexity while approaching components of projects' success is typical and influenced by the dynamic situation where initiatives are implemented. While the lists of success criteria are frequently expanded with measurable and non-measurable items in project management literature, in practice project managers must cope with circumstances where projects are implemented without clearly stated success criteria. Davis (2004) lists "success criteria must be agreed upon with stakeholders at the start of the project, and regularly at the configuration review points during the project" as one of the factors for success.

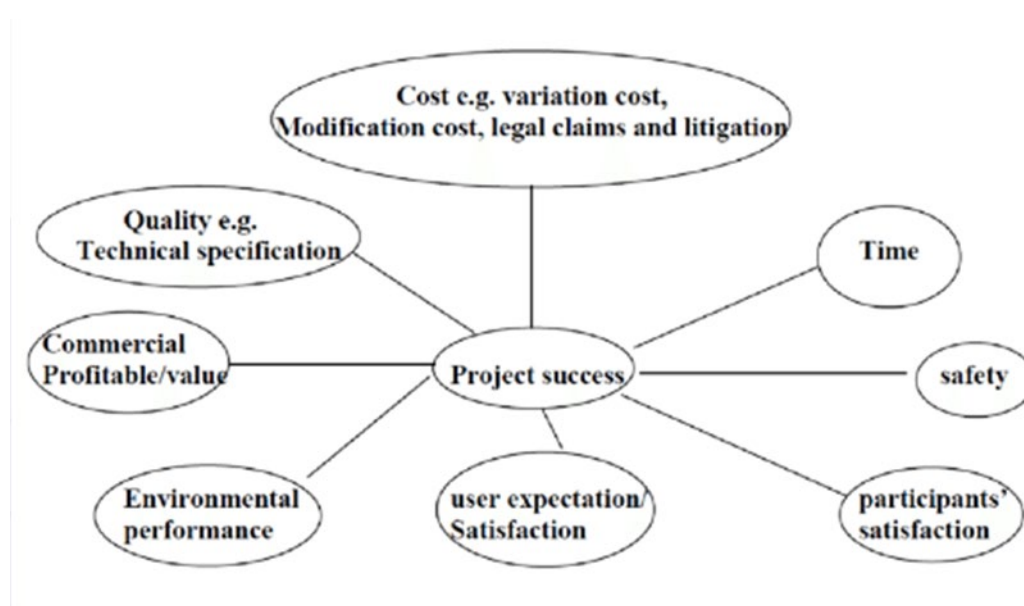


Figure 2-3 Analysis of project success criteria (Dosumu and Onukwube, 2013)

2.2.4 Project success factors

Different project success variables have been identified globally in a variety of initiatives. As key success variables in projects, community involvement, project goals, technical innovation,

political risk, timeline duration urgency, financial agreement, legal considerations, and implementation method have all been identified (Park, 2009). Rehman and Ogunlana (2009) conducted research in Thailand on the crucial success criteria in large-scale construction projects. Their analysis showed how different projects had different success criteria. According to their research, key project success criteria include customer involvement, project employees, and planning and control of the project. Ann (2006) looked into CSFs used in project briefings for construction in his study. The briefing process is a requirement for successful project execution. This process entails communicating to project participants the actual views and needs of the clients. In their study, clear and detailed briefing documents, open and efficient communication, client intentions and objectives that were clear, as well as a project's goal and objectives that were clear, were all considered essential success factors.

Success Factors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Community Engagement	X									X							
Objective management	X	X	X				X		X		X	X					X
Technical factors																	
Uncertainty/risk management	X						X						X				
Commitment of participants	X	X							X				X				
Financial support			X			X						X					X
Legal factors				X													
Interface towards surrounding projects				X	X												
Top management support		X		X	X	X	X				X		X	X			X
Availability of Manpower				X			X				X						
Communication channels		X		X		X			X		X						
Project organization			X	X	X	X								X			X
Performance management	X												X				
Demand creation				X													
Resolution										X							
Precise project budget estimate		X					X										X
Nature and market conditions	X																
Stakeholder management	X			X							X		X			X	X
Stable framework condition	X	X		X													
Design management																	
Project planning and control	X	X			X					X			X			X	X
Environmental factors/politics	X	X							X								
Mutual relationship				X									X				X
Innovation concept	X		X				X	X									X
Contract strategy	X		X														X

(1) Morris and Hughes (1987), (2) Ugwu et al. (2007), (3) Marterella (2007), (4) Park (2009), (5) Iyer and Tha (2006), (6) Belassi and Tukei (1996), (7) Gartner group (2004), (8) Pinto and Kharbanda (1995), (9) Cleland and King (1983), (10) Boyer et al. (2008), (11) Clarke (1999), (12) Cooke-davie (2002), (13) Muller (2005), (14) Rockart (1979), (15) Rahman (2009), (16) Ann et al. (2006), (17) Arain (2007).

Table 2-1 Summary of literature reviews on factors determining project success

Construction technology effect for project success

the effectiveness of construction projects' innovation. Various performance types and stages are possible for innovation performance. The project has improved in terms of cost, schedule, quality, and safety, and innovation has a favorable effect on project and company performance (Davis, 2004). According to Ghaben and Jaaron (2017), innovative practice had wider enterprise-level advantages, such as enhancing corporate image, customer and end-user satisfaction, and future business cooperation opportunities, in addition to many project-level benefits like reducing the construction time and cost, superior quality, and improving environmental performance.

However, there aren't many empirical research on the innovative performance of Chinese construction projects; instead, they tend to concentrate on enterprise management. For instance, Zhou and Tang (2015) discovered supply chain synergy influenced product and process innovation in a favourable way. Enterprise performance is positively impacted by supply chain management and product innovation, and product quality can also have a favourable influence. The majority of study upon that innovation performance of building projects conducted by Chinese and foreign academics has concentrated on project level as well as organizational levels. The construction enterprise points to the investment matter or investor of the construction project, and its scope is greater than the scope of the project. It should be noted that a construction project is indeed a capital construction project that is strictly implemented in accordance with capital or wealth construction procedures. A business may include several building projects. Consequently, the execution of a project may have a favourable effect on the performance of the firm.

It is made clear what influences building project innovation and how well it performs. How can the method of action of various construction project elements on the performance of the construction project innovation be established? Academics generally held the view that input and output were the primary metrics for assessing innovation performance (Mir and Pennington, 2014). This implies that the input, or innovation-influencing element, can be thought of as the independent variable and the output, or innovation performance, as a dependent variable.

2.3 Empirical literature

In his thesis on the factors influencing the performance of building projects in the Gaza Strip, Rehman (2009) found that the owners, consultants, and contractors all agreed that the following

factors were most crucial: the average lag time due to closure and material shortages, the availability of resources as predicted throughout the project period, the project manager's leadership skills, the instability of material prices, the availability of highly trained personnel, and the efficiency of equipment. In the study on factors influencing construction project outcomes, it was found that foreign professionals' involvement in the project, public officials examining the project, as well as close supervision while new construction methodologies are used were major factors that lead to project success. (Rehman, 2009)

The absence of precise information about the soil nature, weather also traffic conditions is one aspect that contributes to poor performance. (Davis 2004). The performance of construction costs was examined on Nigerian construction sites. According to the paper, factors that contribute to cost overruns include project complexity, project term shortening, fraudulent tactics, insufficient planning, inflation, frequent variation requests, and inexperienced contractors. Fetene, (2008) stated the causes and effects of cost overruns on public and private building construction projects have been studied in Ethiopia. The data showed that 67 of the construction projects for the 70 public buildings experienced cost overruns. The cost overrun rate for particular projects ranges from 0% to 126% of the contract value.

According to a research by Ahadzie and Proverbs (2008), on the factors impacting cost performance data of Indian construction projects, the project manager's competency as well as support from top management are found to considerably increase the quality performance of the construction project.

Morris and Hughes (1987), investigated the relationship between construction project performance in India, team composition, and project leadership. When the hypotheses were put to the test, it was found that there was a strong correlation between the project leader's professional experience and background, leadership style, team dynamics, and overall project success. The profession of the project leader had no significant impact on the success of the project as a whole.

Mohammad (2012) discovered factors affecting the performance of a building construction project, by obtaining information from contractors and consultants via questionnaire and using the factor analysis approach to examine the results. According to the study, the characteristics of the site layout, the knowledge and experience of the site staff, the characteristics of the design documents, the use of equipment, materials, labour and quality management systems,

and the owner's prompt decision-making are the factors that affect the quality of the projects. The type of reward system and the political climate are additional elements that affect quality.

2.4 Research gaps

Davis (2014) investigated the factors that affect building project success. The study looked into the variables that affect a building project's success. The goals are to discover project success variables that already exist and to look at how relevant an index of these success criteria is for building projects.

Yifru (2019) investigated how external environmental factors affected the success of an organization that was building saving houses in Addis Ababa. She came to the conclusion that other elements, in addition to this, also affect project performance. Other elements include legal, institutional, and physical ones, but the researcher focuses on PEST, a group of four macroenvironmental characteristics that are frequently employed in environmental scanning.

Little research is found on the major factors that determine projects success in developing countries. Similarly, there is no abundant studies conducted on the success criteria of construction in developing countries. Additionally, no detailed research has been conducted on the effects of applying construction technology on projects success in addition to the above mentioned factors.

2.5 Conceptual framework

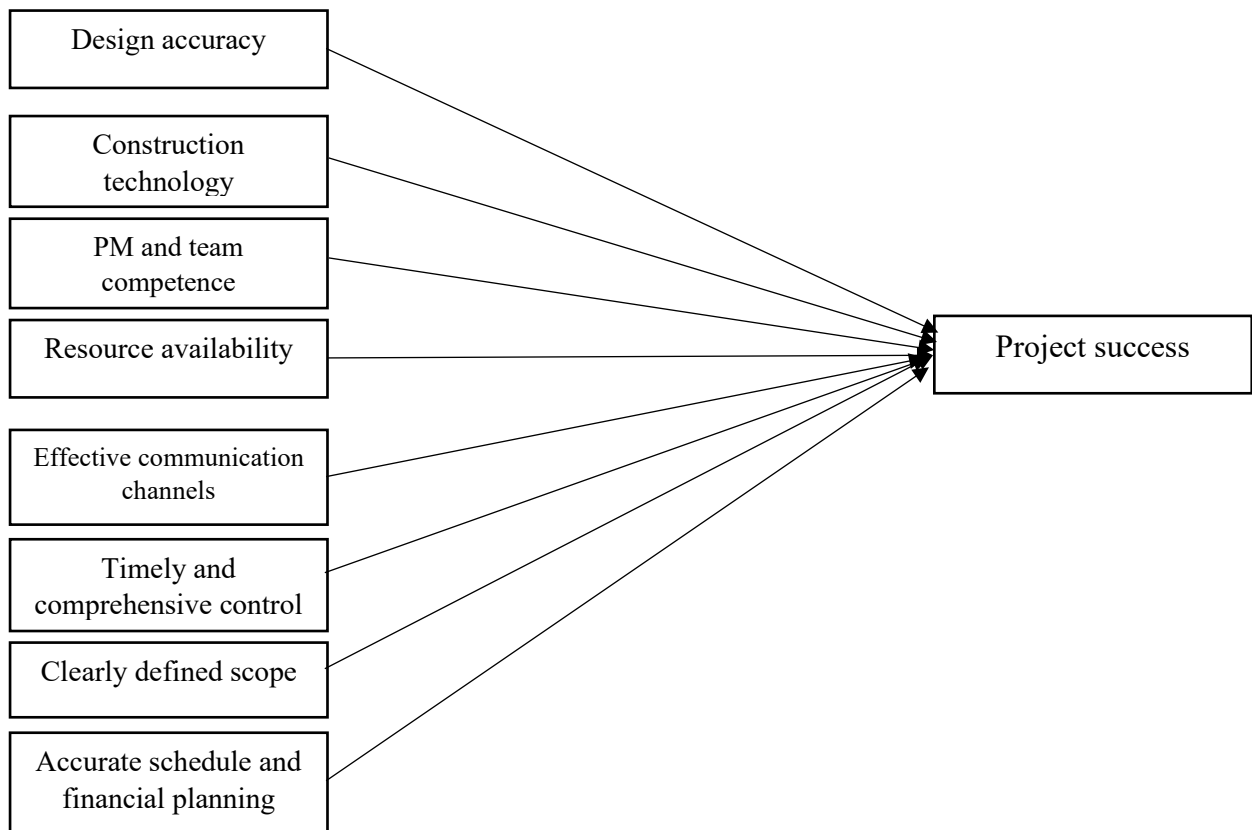


Figure 2-4 Success factors identified

CHAPTER THREE

3. Research methodology

3.1 Introduction

This chapter will cover the research methodologies that were applied in this study. The research design, target population, sample sizes, sampling procedure, sampling collection technique, research tools, and data collection methodologies are all covered in this chapter. Additionally, it describes the data's analysis and presentation.

3.2 Research approach

There are three types of research methodologies: quantitative, qualitative, and mixed. According to Kothari (2004), the methods are not opposites or separate categories but rather different points on a continuum. In contrary to the qualitative method, which focuses on the subjective evaluation of attitudes, opinions and behaviour, the quantitative method entails the collection of data in quantitative form that can be subjected to comprehensive quantitative analysis in a formal manner. Both qualitative and quantitative research methods were used by the researcher. the quantitative technique for closed-ended questions and the qualitative approach for document reviews and open-ended questionnaire questions.

3.3 Research design

The study is aimed to assess the factors that determine the success of a construction project success for selected projects of federal housing corporation project located in Addis Ababa, Ethiopia. According to, a descriptive survey is a way to collect data by interviewing or distributing a questionnaire to people (Orotho, 2003). The researcher used descriptive type of research method in order to assess and investigate the existing success factors affecting construction project performance.

Kothari (2004) stated that descriptive study refers to studies that focus on describing the features of a certain person, circumstance, or group. This design also considers if specific variables are connected. Thus, the study aims to assess the connection of those success factors with building construction project success.

3.4 Research population and sampling

3.4.1 Population

Neuman (2000) gave the definition of target population as the collection of all components that make up a particular, clearly defined group that will be examined and utilized to extrapolate the study's findings.

The populations of the study were the clients, consultants and contractors that participated in the selected construction project i.e. federal housing corporation, Gerji site. According to the archived data of the project, the professionally that participated on the project from beginning to end are 78. This doesn't include foreman and daily laborers and intermittent professionals. Therefore, the total population size of the study was considered 78 professionals comprised of the above mentioned organizations.

3.4.2 Sampling technique

Four project sectors were chosen using the stratified random sampling approach in order to get a representative sample from each sector. The population was separated into a number of subpopulations under stratified sampling, each of which was more homogeneous or uniform than the overall population (the various subpopulations are referred to as "strata"). Then, to create a sample, the researcher chose objects from each stratum. The ability to obtain more accurate estimates for each and every stratum was made feasible by the fact that each stratum is more similar than the entire population. The strata of the sectors were: (1) Client (2) Consultant and (3) Contractor.

3.4.3 Sample Size

In the above section, the total population for this study is 78 professionals who participated directly on the case project from beginning to end. According to Cochran (1977) the following equation is used to determine sample size as follows.

$$n = \frac{Z^2 P Q N}{e^2(N - 1) + Z^2 P Q}$$

Where, **n** = sample size of the participants unit

P = proportion of success =80%

Q = 1 – p= Proportion of fail=20%

e= Standard error=5%

N = Total participant unit=78

Z = standard normal variable and value that corresponds to 95% confidence limit, which is equal to 1.96

d = Allowable error (0.05 or 5%)

By inserting the variables in the above equation (Equation 3.2),

$$n = \frac{(1.96)^2 * .8 * 0.2 * 78}{0.05^2(78 - 1) + (1.96)^2 * 0.8 * 0.2}$$

n=53

Therefore, the sample size was calculated to be 53.

3.5 Data collection methods

Both primary and secondary sources were used to get the data for this study. The primary data has been gathered through questionnaire (including open ended and closed ended question). The secondary data has been gathered through archived documents review, literature, books and website articles.

3.6 Research instrument

The study used a field survey as its primary methodology for identifying the variables that affect the success of construction projects. The relative simplicity of getting standard data suitable for meeting the aims of this study makes questionnaire-based surveys successful. Various success factors are chosen in accordance with the literature mentioned. In order to conduct the study, a questionnaire was created and responses from construction industry professionals were gathered. The survey's questionnaires are designed based on a determination of the success elements. Clients, contractors, consultants, and site engineers are distributed thorough questionnaires, and the results are gathered.

The questionnaire required the respondents to rank their answers using Likert five-point scale. The values are represented as follows:

- 1 = Extremely unlikely
- 2 = Unlikely
- 3 = Neutral,
- 4 = Likely
- 5 = Extremely likely

3.7 Data analysis

Data were organized to be analysed using both quantitative data analysis methodologies after the necessary and suitable data were collected. The collected data from closed ended questionnaire were analysed statistically using statistical package for social sciences (SPSS), excel and google forms. Data is presented and summarized in charts, graphs, and tables in a descriptive way. Qualitative data was used to back up the collected data in the study. Additionally, open-ended questions and documents review helped determine whether there are any additional aspects that are not mentioned in the questionnaire that may affect the success of the project's performance.

3.8 Validity and reliability

Validity

Validity implies the degree to which the research instrument measures what it is designed to measure and whether or not it provides adequate coverage of research objectives. In other words, it means the accuracy of a test. It is concerned with whether the findings are really about what they appear to be about (Saunders et al., 2009). The researcher used expert opinions for the surviving process and literature reviews were done to help and to establish validity. Accordingly, this study used measures already validated by other researchers in the topic in terms of content and construct validity.

Reliability

Reliability refers to the degree to which a research tool consistently measures the variable it intends to measure. (Eagle and Schutt, 2014). A reliability test was performed using Cronbach 's alpha statistics.

Success criteria

		No. of respondents	%
Cases	Valid	41	100.0
	Excluded	0	.0
	Total	41	100.0
Reliability Statistics		Cronbach's Alpha	No. of factors
		.784	11

Success factors

		No. of respondents	%
Cases	Valid	41	100.0
	Excluded	0	.0
	Total	41	100.0
Reliability Statistics		Cronbach's Alpha	No. of factors
		.759	24

Table 3-1 Reliability score for success criteria and success factors from SPSS (own source)

According to Lance, C. E. & Michels, L. C. (2006), a reliability score of 0.7 is the minimum universally used criteria for data reliability. The above table indicates the reliability of the scales used was higher than 0.7 which shows a good internal consistency among the measurement items and shows that the selected instrument correctly measures the variables selected.

3.9 Ethical considerations

Ethics refers to the appropriateness of behaviour in regard to the rights of others who become the topic of your work or are affected by it. The definition of ethics given by Blumberg (2005) is "moral principles, norms, or standards of behaviour that influence moral decisions about our behaviour and our relationships with others." The term "anonymity" refers to hiding the participants' identities in all written materials that come from the study.

To ensure the confidentiality and privacy of the information given by the respondents, they were advised not to write their names and any other personal information on the questionnaire that wasn't requested. They were assured that the responses were only used for academic purposes and that they were kept confidential. The introductory section of the questionnaire clearly describes the purpose of the study and benefit of the research to respondents in order to motivate them to participate in the study and for them to provide relevant information about the company under study. Finally, all respondents participated in the study voluntarily.

CHAPTER FOUR

4. Data Analysis and Interpretation

4.1 Introduction

This chapter includes data presentation from closed-ended questionnaires and interviews, as well as data analysis and discussion. In the project work, data was collected and carried out in the study area, with data collected from selected samples.

The study questions and questionnaire sections are organized into three groups. Gender, age, organization type, company, job description and construction industry experience are all included in the first part. In the second part, the different success criteria that measure the construction project success are discussed. And thirdly, the success factors that determine the project success are presented by the participants which include contractor, consultant and clients of federal housing corporation apartment projects. Finally, the criteria to measure project success and the factors that determined project success were ranked by relative importance index.

As previously stated, the factors were rated using a Likert's scale on a five-point scale from 1 to 5 on a scale of extremely significant, very significant, moderately significant, slightly significant and not significant with the findings of the questions being presented and evaluated accordingly.

4.2 Data Cleaning

Before the acquired data was evaluated, data filling, cleaning, and processing were performed. These procedures allow to achieve of a more reliable data analysis. All respondents responded to all the questions and there were no data discrepancies that occurred. Therefore all 41 questionnaires are accepted.

Finally, the processed data was analyzed using Google format and SPSS (2022). Both tools are used to convey the outcome.

The survey results are shown below in three sections, each analyzed and presented separately.

4.3 Response rate

A total of 53 surveys were distributed via Google's format through mobile technology. The targeted participants were clients, contractors, consultants, and sub-contractors from the federal

housing corporation apartment project. Of the 53 questionnaires, 41 were collected having filled completely and on time. The total response rate is 77.4%. This rate is considered to be acceptable since it is more than 70% as stated by (Mugenda and Mugenda 1999).

Organization	Questionnaire distributed	Questionnaire Returned	Missing	percent of return
Client	11	8	3	72.7%
Contractor	24	18	6	75.0%
Consultant	18	15	3	83.3%
Total	53	41	12	77.4 %

Table 4-1 Responses for distributed questionnaires (Own Source)

As shown in the table above, of the 41 returned questionnaires, 8 questionnaires were from the client professionals, 18 from contractors and subcontractors and 15 from consultant engineers.

It demonstrates that all three organizations were involved in responding to the questionnaire and making recommendations based on their understanding of the criteria that measure project success and the factors that determine the success of the project at federal housing corporation building projects.

4.4 Demographic Characteristics of Respondent

The table below summarises the demographic data of the participants that participated in the study.

1	GENDER		Male	Female				Total
		Frequency	28	13				41
		Percentage	68.3%	31.7%				
2	AGE		< 25	25 - 40	41 - 55	> 55		
		Frequency	1	25	14	1		41
		Percentage	2.4%	61%	34.1%	2.4%		
3	LEVEL OF EDUCATION		Diploma	Degree	Masters	PHD		
		Frequency	3	61	13	2		41
		Percentage	2.4%	73.2%	19.5%	4.9%		

4	ORGANIZATION TYPE		Client	Consultant	Contractor			
		Frequency	8	15	18			41
		Percentage	19.5%	36.6%	43.9%			
5	WORKING POSITION		Client representative	Design engineer	Office engineer	Project coordinator	Project manager	
		Frequency	4	8	10	5	1	
		Percentage	9.8%	19.5%	24.4%	12.2%	2.4%	
			Site engineer	Sub-contractor	Technical advisor	Others		
		Frequency	7	3	2	1		41
		Percentage	17.1%	7.3%	4.9%	2.4%		
6	WORK EXPERIENCE		0-5	6-10	11-15	16-20	>21	
		Frequency	-	10	19	9	3	41
		Percentage	-	24.4%	46.3%	22%	7.3%	

Table 4-2 Demographic characteristics' of respondents extracted from SPSS (own source)

As presented in table 4.2, 68.3% of the respondents were male and 31.7% of them were female. This shows that there are more male employees than female employees on the project selected for this study. This only demonstrates that there were more male engineers that participated. The gender of the employees has no effect on the study because the sample population of the study was professional engineers that directly participated in the selected projects.

With respect to age, most of the respondents i.e. 61% were within the range of 25 and 40, which is the young engineering population. The majority of respondents (73.2%) have a bachelor's degree, and 19.5% have a master's degree, as seen in the table above.

Three major organization types were identified that participated in the study. The three major parties involved in any construction project are the client, the contractor (including sub-contractors) and the consultant. The above table illustrates that professionals from all three have participated in the survey. The contractors' personnel hold the majority with 43.9%, next is the consultants with 36.6% and the clients with 19.5%. the survey design was done in a stratified manner to include similar proportions from all parties. This design is to make sure

that respondents are participates proportionally from all groups and to increase the effectiveness of the study results.

The above table also demonstrates the number of participating professionals that responded to the questionnaire with eight different positions. The designation of the respondents shows a wider variety of professionals relevant to the construction project.

Finally, table 4.2 demonstrates the frequency and percentage of the different participants working positions. This data shows that many professionals in different working positions have given their opinions on the study area which increases its reliability.

Work experience is a relevant factor in any study. Table 4.1 demonstrates that the majority of respondents, 19 (46.3%) have a relevant of 11-15 years in the construction industry.

4.5 The analysis of criteria factors

4.5.1 Frequency and percentage of criteria factors

Different variables were utilized to ask the respondents about the criteria factors that measure the success of construction projects in the case of federal housing corporation, Gerji apartment project. These variables were Not significant, Slightly significant, Moderately significant, Very significant & Extremely significant.

Frequency has been utilized to determine the group of participants who agreed on the significance rating point and a percentage is used to determine the proportion of all participants who selected the same category of significance for each factor.

The frequency and percentage of the criteria to measure the project success were determined using a questionnaire survey research approach and analyses using statistical SPSS software (SPSS 2022).

Success criteria		Extremely significant	Very significant	Moderately significant	Slightly significant	Not significant
Completion on time or earlier	Frequency	35	5	-	1	-
	Percentage	85.4%	12.2%	-	2.4%	-
Accomplishment of quality	Frequency	28	9	3	1	-
	Percentage	68.3%	22.0%	7.3%	2.4%	-
Completion within budget	Frequency	32	8	-	1	-
	Percentage	78%	19.5%	-	2.4%	-
Meeting partner's and stakeholders' expectations.	Frequency	12	11	16	2	-
	Percentage	29.3%	26.8%	39%	2.9%	-
Accomplishment of scope	Frequency	29	9	2	1	-
	Percentage	70.7%	22.0%	4.9%	2.4%	-
Workers' safety	Frequency	4	17	16	4	-
	Percentage	9.8%	41.5%	39%	9.8%	-
High participants satisfaction	Frequency	5	11	24	1	-
	Percentage	12.2%	26.8%	58.5%	2.4%	-
Participation of large amount of manpower	Frequency	2	3	11	7	18
	Percentage	4.9%	7.3%	26.8%	17.1%	43.9%
User expectation and satisfaction	Frequency	4	8	26	2	1
	Percentage	9.8%	19.5%	63.4%	4.9%	2.4%
Commercial profitability/value	Frequency	3	10	21	7	-
	Percentage	7.3%	24.4%	51.2%	17.1%	-
Use of renewable energy	Frequency	4	5	21	9	2
	Percentage	9.8%	12.2%	51.2%	22%	4.9%

Table 4-3 Frequency and percentage of success criteria (own source)

As it is shown in the table above, all 41 respondents replied and selected the level of significance to the eleven criteria factors to measure the success rate of construction projects. The frequency and respective percentage of the level of significance have been analyzed using SPSS software.

The frequency is then used to calculate the mean, standard deviation and relative importance index which then was used to rank and analyze the results.

Completion on time or earlier, which is the length of time it takes to complete the project is an important factor in the success of many projects. Stakeholders consider a construction project

successful if the deliverables are produced by the project team within the determined time frame. As table 4.4 demonstrates, of the 41 respondents, 35 (85.4%) consider that completion of the project on time or earlier is an extremely significant factor and 5 (12.5%) participants replied that it is a very significant factor to measure project success.

Accomplishment of quality refers to the completion of the project to a high standard that meets all of the specifications and requirements set out at the beginning of the project. Quality assurance measures, such as inspections and tests, are used to ensure that the project is completed to an acceptable quality level. 28 (68.3%) consider that accomplishment of quality is an extremely significant factor and 9 (22%) participants replied it is a very significant factor to measure project success.

Completion within budget is also another success criteria that implies the project is finished within the predetermined budget and does not go over the allocated budget. This is an important goal for construction projects, as it ensures that the project is completed without any additional costs. 32 (78%) consider that completion within budget is an extremely significant factor and 8 (19.5%) participants replied that it very significant factor to measure project success.

Meeting partners' and stakeholders' expectations is one of the factors to success. The stakeholder of the project has predetermined project outputs and deliverables that must be met. 12 (29.3%) consider that meeting partners' and stakeholders' expectations is an extremely significant factor and 16 (39%) participants replied that it is a moderately significant factor to measure project success.

Accomplishment of scope means to achieve specific project goals, deliverables, tasks and overall boundaries of the project. 29 (70.7%) consider that accomplishment of scope is an extremely significant factor and 9 (22%) participants replied that it is a very significant factor to measure project success.

Workers' safety refers to the provision of a safe environment, safe equipment, tools and safety procedures in the construction area in order to ensure workers' health and safety. 17 (41.5%) consider that workers' safety is a very significant factor while 16 (39%) participants replied that it is only a moderately significant factor to measure project success.

High Participants satisfaction is achieved through effective ways of harmonious cooperation, task/team conflict management and goal commitment, good relationship with the project managers. 11 (26.8%) consider that high participants satisfaction is a very significant factor

while 24 (58.5%) participants replied that it is only a moderately significant factor to measure project success.

Participation of large amount of manpower means that the number of human resources that took part in the project is relatively large. 18 (43.9%) consider that participation of large amount of manpower is not a significant factor to measure project success while 11 (26.8%) participants replied that it is a moderately significant factor to measure project success.

User expectation and satisfaction is defined as the project’s performance and comfort levels with regards to quality, looks and so on according to the user’s expectations. 8 (19.5%) consider that user expectation and satisfaction is a very significant factor while 26 (63.4%) participants replied that it is only a moderately significant factor to measure project success.

Commercial profitability/value; although different projects have different goals, commercial value is the worth given to the project by the public and the monetary profitability of the projects. this doesn’t apply to all projects as different construction project have different purpose and goals. 10 (24.4%) consider that commercial value is a very significant factor while 21 (51.2%) participants replied that it is only a moderately significant factor to measure project success.

Use of renewable energy refers to the utilization of sources of energy that are naturally replenished or renewed on a human timescale. It includes sources such as solar, wind, geothermal, hydroelectric, and biomass. 21 (51.2%) consider that the use of renewable energy is a moderately significant factor while 9 (22%) participants replied that it is only a slightly significant factor to measure project success.

Before going into the identification of success factors, the researcher aimed to find out whether the federal housing corporation apartment project is considered a successful project. Below are the responses.

Is the FHC Gerji project successful?	Frequency	Percent
Yes	36	87.8%
No	5	12.2%
Total	41	100%

Table 4-4 Frequency and percent of response to FHC project is successful (own source)

Different professionals from the three organizations i.e. clients, contractors and consultants participated in the study. As it is shown in the above table, most of the respondents i.e. 36(87.8%) stated that the construction project was successful while 5 (12.2%) stated that they don't consider the project to be successful. FHC gerji project is selected as a case study to identify and assess the different criteria that measure project success as well as the success factors that determined the project success. The above table shows that the majority of the respondents consider the project to be a success, which strengthens the research outcomes and analysis.

4.5.2 Descriptive statistics analysis of criteria factors

After the frequency and percentage were calculated, the mean and standard deviation were calculated using the SPSS software.

The levels of significance were converted into numbers using the Likert scale as shown below.

Extremely significant = 5

Very significant = 4

Moderately significant= 3

Slightly significant = 2

Not significant = 1

Relative importance index (RII) is a method used to rank factors in their importance according to the participants response. For each factor RII was calculated as follows:

$RII = \frac{\sum W}{(A * N)}$ Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight, and N is the total number of respondents. The higher the value of RII, the more important the criteria is for success. The relative importance index is used to rank the success criteria and analyze them on their level of the significance according to the responses.

Success criteria	Mean	Std. Deviation	Relative importance index (RII)	Rank
Completion on time or earlier	4.80	0.558	0.961	1
Completion within budget	4.73	0.593	0.946	2
Accomplishment of scope	4.61	0.703	0.922	3
Accomplishment of quality i.e. technical specification	4.59	0.741	0.917	4
Meeting partners' and stakeholders' expectations.	3.8	0.928	0.761	5
Workers' safety	3.51	0.810	0.702	6
High participants satisfaction	3.49	0.749	0.698	7
User expectation and satisfaction	3.29	0.814	0.659	8
Commercial profitability/value	3.22	0.822	0.644	9
Use of renewable energy	3.0	0.975	0.600	10
Participation of large amount of manpower	2.12	1.208	0.424	11

Table 4-5 Mean, standard deviation, RII and rank of success criteria (own source)

The mean of a dataset is the sum of all values divided by the total number of values. It's the most commonly used measure of central tendency and is often referred to as the average. The results demonstrate that the participants consider that all criteria are significant to measure project success. However, the rank of the significance of those factors is discussed below.

From the study, completion on time or earlier, completion within budget, accomplishment of scope, accomplishment of quality, and meeting partners' and stakeholders' expectations are top ranked criteria to measure the success of a project. This study shows that completion on time or earlier was the most significant criteria to measure the success of a project, with a mean of 4.80. Completion within budget was the second most significant criteria with a mean of 4.73. Accomplishment of scope and accomplishment of quality i.e. technical specification were in third and fourth rank with a mean of 4.61 and 4.59 respectively. The fifth success criteria in the rank to measure the construction projects is 'meeting partners and stakeholders' expectations' with a mean value of 3.80.

Completion on time or earlier is a key element in determining a construction project's success. Projects that are completed on or before their scheduled completion date are seen as successful and can bring greater value to the clients. Delays in completion can lead to several problems such as additional costs, disputes between the contractor and the client, and loss of reputation for the contractor. In addition, delays can have a negative effect on the morale and performance of the workers, leading to further delays and inefficiencies. The completion of a project on or before its scheduled completion date is a critical success factor and is essential to the success of the project.

Completion within budget is another factor that is important to the success of a construction project. Construction projects often have tight budgets and any overspending can have a major impact on the overall success of the project. It is important that the project is delivered on or under budget so that the client is not overburdened with additional costs. If a project is not completed within budget it can lead to financial losses for the client and can damage the reputation of the contractor.

The accomplishment of scope is also an important factor in determining a construction project's success. The scope of a project must be clearly defined before it begins. If the scope of the project is not met, then it can lead to several problems such as delays and cost overruns. The contractor must be able to complete the project according to the agreed upon the scope in order to ensure the success of the project.

Accomplishment of quality is also an important factor in the success of a construction project. It is important that the quality of the work is up to the standards of the client. Poor quality work can lead to delays and additional costs, as well as a loss of reputation for the contractor. It is important that the contractor is able to deliver quality work that meets the expectations of the client.

Finally, meeting partners' and stakeholders' expectations is also an important factor in determining the success of a construction project. Partners and stakeholders in a project have a vested interest in its success and it is important that their expectations are met in order to ensure the success of the project. It is important that the contractor is able to meet the expectations of their partners and stakeholders in order to ensure the success of the project.

On the other hand, 'commercial profitability/value', 'use of renewable energy' and 'participation of large amount manpower' were ranked as the least significant criteria factors to measure the construction project success with a mean value of 3.22, 3.00 and 2.12

respectively. Although these criteria may not be as important as the others, they still have an impact on the success of a construction project.

Commercial profitability is important as it helps to ensure that the project is profitable and is valued by the public. If the project is not profitable, then it will not be able to generate enough revenue to cover its costs and make a profit. The use of renewable energy is important because it helps to reduce the project's carbon footprint and lessen its environmental impact. Lastly, the participation of large amounts of manpower is important because labor inclusive works are essential to developing countries as it gives job opportunities to the community.

4.6 Descriptive statistics analysis of success factors

After the frequency and percentage of the significant level of the success factors were calculated, the mean and standard deviation are computed using the SPSS software. The levels of significance were converted into numbers using the Likert scale as shown below.

Extremely significant = 5

Very significant = 4

Moderately significant= 3

Slightly significant = 2

Not significant = 1

Similarly, the relative importance index was calculated for each success factor and rank of the importance of the success factors was given according to their RII as follows:

Success factors	Mean	Std. deviation	Relative importance index (RII)	Rank
Project manager and team competence	4.68	0.789	0.936	1
Accurate schedule and financial planning	4.61	0.802	0.922	2
Timely and comprehensive control	4.56	0.778	0.912	3
Use of construction technology	4.54	0.743	0.908	4
Project team commitment	4.46	0.869	0.892	5
Problem solving skills	4.44	0.838	0.888	6
Clearly defined scope	4.41	0.838	0.882	7
Availability of fund	4.20	0.843	0.84	8
Design accuracy	4.10	0.539	0.82	9
Effective communication channels	4.02	0.880	0.804	10
Use of advanced software (such as BIM)	3.63	0.799	0.726	11
Resource availability	3.51	0.779	0.702	12
Effective procurement	3.46	0.778	0.692	13

Table 4-6 Mean, standard deviation, RII and rank of success factors top ranked (own source)

Construction projects are complex and require a multitude of factors in order to be successful. Construction projects require a variety of elements such as effective management, accurate planning, and timely execution. In order to ensure the success of a construction project, the project manager and team must be competent in all aspects of the project. Accurate schedule and financial planning are also key to success, as well as timely and comprehensive control, use of construction technology, and project team commitment.

The statistics show that ‘Project manager and team competence’ is the most significant factor that determines construction projects success with a mean of 4.68. The second most significant factor is ‘Accurate schedule and financial planning’ with a 4.61 average. ‘Timely and comprehensive control’ and ‘Use of construction technology’ are in third and fourth rank with

a mean of 4.56 and 4.54 respectively. The fifth success factor in the rank for construction projects is 'Project team commitment' with a mean value of 4.46.

The study found that project manager and team competence is the most significant factor that determines the success of a construction project. This is because a competent and experienced project manager is essential to the success of the project. A project manager is responsible for setting the project goals, managing the schedule, and budgeting the project. They must also be able to lead the project team and ensure that everyone is working together to achieve the desired outcome. A competent project manager is able to effectively manage the project's scope, schedule, budget, and quality. They are also able to identify and resolve any problems that may arise and communicate effectively with the team and stakeholders.

Accurate schedule and financial planning are another critical factors that contributes to the success of a construction project. The project manager must create a realistic and achievable timeline for the project that meets the needs of the stakeholders. They must also devise a budget that is realistic and achievable. Accurate schedule and financial planning help to ensure that the project is completed within the specified timeframe and budget. It also helps to reduce the risk of cost overruns and delays.

Timely and comprehensive control is another important factor for success in construction projects. the project must be monitored, controlled and evaluated effectively and in a timely manner. This includes tracking progress, monitoring budgets, milestones, solving problems in each stage, make necessary changes and ensuring that the project is being completed according to the agreed-upon timeline. Timely and comprehensive control helps to minimize risks and ensure that the project is completed as planned.

The use of construction technology is also essential for successful construction projects. Construction technology can help to minimize project costs, reduce construction time while improving quality. Most projects who have used modern formwork construction technologies have been successful.

Project team commitment is another important factor for success in construction projects. The project team must be committed to the success of the project and willing to work together and extended hours to achieve it. This includes working collaboratively to identify and resolve any issues, and communicating openly and effectively. The project team must also be willing to adjust and adapt to any changes in the project scope or timeline.

Below is the table for the rank for the second part of the success criteria that determine project success.

Success factors	Mean	Std. deviation	Relative importance index (RII)	Rank
Clients' support	3.44	0.838	0.688	14
Previous construction technology experience	3.22	0.791	0.644	15
Political stability	2.78	0.962	0.556	16
Community engagement	2.76	0.830	0.552	17
Low inflation	2.41	0.741	0.482	18
Comfortable work environment (such as offices)	2.22	1.061	0.444	19
Number of employees	2.12	1.166	0.424	20
Seniority of staff (years of experience)	2.02	0.987	0.404	21
Project location	2.00	0.894	0.400	22
Simplicity of project nature	1.92	0.894	0.384	23
Small project size	1.88	0.927	0.376	24

Table 4-7 Mean, standard deviation, RII and rank of success factors least ranked (own source)

On the other side, 'project location', 'simplicity of project nature and 'small project size' were ranked as the least significant success factors for the construction project success with a mean value of 2.0, 1.92 and 1.88 respectively.

The project location, simplicity of project nature and small project size are often thought to be among the most important, this study has found that they are actually the least significant for project success compared to the others with a mean value for these three factors is 2.0, 1.92, and 1.88 respectively.

A project located in a remote area can be difficult to access and may require additional resources and time to complete, affecting the projects' success. Furthermore, remote areas may

not have adequate infrastructure, such as transportation and communication systems, to support the construction process.

The simplicity of the project nature is another factor that can affect one's project's success slightly. Projects that are overly complex may be more difficult to manage and may take longer to complete. This can lead to a higher likelihood of errors and delays, which can affect the success rate. Similarly, smaller projects may be easier to manage, as they require fewer resources and less time to complete.

In addition to the close ended questions, few opened ended question were also added for the respondents to answer to. To the open-ended question "In your opinion, what other criteria measure construction project success?", few respondents mentioned some success criteria factors. 2 respondents stated that 'environmental factor' shall be included in the criteria to measure construction project success.

Additionally, to the open-ended question "In your opinion, what other factors determine project success in construction projects?", some responses were the same as the factors already identified and written on the questionnaire. The following 9 responses were given from 9 different respondents:

- The construction methodology and the construction team management and commitment
- High participation of the client in supply of materials and finance support
- Good monitoring and evaluation practices
- Good leadership.
- Skilled labor for the new construction technology
- Work quality assurance
- Cost optimization
- Risk taking behavior
- Backwards integration of supply chain

Most of the responses given are consistent and similar to what is found in the quantitative analysis.

The construction methodology, construction team management, and commitment are some factors that determine and influence a project's success. The construction methodology employed will determine the quality of the project's end product. The construction team must

be managed well to ensure the project's goals are met. The team's commitment is important to ensure the project is completed on time and within the budget.

The construction methodology involves the use of new construction technologies and skilled labour. This will ensure the project is completed as per the latest standards and is completed in the most efficient manner. The use of new technologies will also reduce the cost of the project and ensure the project is completed on time.

The construction team must be managed well to ensure the project's goals are met. The team must be comprised of skilled professionals with the necessary knowledge and experience to complete the project in a timely and cost effective manner. The team must also be provided with the necessary resources to complete the project in an efficient manner.

The client's participation in the project is also important. The client must provide the necessary materials and financial support to ensure the project is completed on time and within the budget. The client must also monitor the progress of the project and evaluate the quality of the work being done.

Good leadership is also essential for the success of a project. The leader must be able to motivate the team and ensure that the project is completed as per the goals and objectives. The leader must also be able to take risks and make decisions quickly.

The quality of the work must be assured. This can be done through work quality assurance mechanisms such as inspections and quality control checks. It is also important to ensure that the project is completed within the budget and on time. Cost optimization is important to ensure the project is completed within the budget.

Risk taking behaviour is also important for project success. The team must be willing to take risks in order to ensure the project is completed as per the goals and objectives and try new mechanisms and techniques that make the work easier and better.

Finally, backwards integration of the supply chain is important. This will ensure that the necessary materials and resources are available for the project on time and at the right cost. This will also ensure that the project is completed on time and within the budget determining its success.

CHAPTER FIVE

5. Summary, Conclusion and Recommendations

5.1 Introduction

This research aimed to identify and assess success criteria as well as success factors and their influence on the successful completion of projects in a selected building construction of federal housing corporation. This chapter of the study contains summary of major findings, conclusions and recommendations based on the results obtained.

5.2 Summary

This research has strived to identify and assess the success criteria and factors that determine the success of construction project in federal housing corporation apartment buildings. Different criteria and factors have been selected which include political, economic and financial, technological factors.

To investigate the influence of those factors, survey was made among 49 professionals from client, contractor and consultant organization. The participants were comprised of client representatives, technical advisors, project managers, design engineers, site engineers and so on. The response rate was 83.67% with 41 returned questionnaires. Among them 68.3% were male, 61.0% were between the ages 25-40, 73.2% had bachelor's degree, 43.9% were from the design and build contractor side and 46.3% had 11-15 years of relevant work experience in Ethiopian construction industry.

As mentioned in the introduction part, the selected project for the study is federal housing corporation apartment project in order to assess the different criteria that measure project success as well as the success factors that determined the project success. Hence, to identify whether the project is considered successful or not, a question was included in the survey. 36 (87.8%) of the participants replied that the project is considered a successful construction project and 5(12.2%) of the participants replied that they don't consider the project is successful. The majority of the respondents consider the project to be a success, which strengthens the research outcomes and analysis.

According to the static results, 'completion on time or earlier' is the most significant criteria to measure the construction project's success with a mean of 4.80. The second most significant criteria is 'completion within budget' with a 4.73 average. 'Accomplishment of scope' and 'accomplishment of quality i.e. technical specification' are in third and fourth rank with a mean

of 4.61 and 4.59 respectively. The fifth success criteria in the rank to measure the construction projects is 'Meeting partners and stakeholders' expectations' with a mean value of 3.80. those results are consistent with some of the studies made.

Dosumu and Onukwube (2013) identified the major success criteria to be time, cost, quality and achieving project scope. Westerveld (2003) emphasizes the importance of stakeholders' satisfaction as a main success criterion, complementary to the golden triangle of time, budget and quality, and adds that different time lags should be considered.

In summary, the study found that meeting deadlines, cost control and high quality outcomes are the most important criteria for the success of a construction project. Even though commercial profitability, the use of renewable energy and the participation of large amounts of manpower are ranked as the least significant criteria to measure project success, they should also be taken into consideration. These criteria are not as significant as the others to measure the project success, but they still have an impact on the success of the project. Therefore, it is important to ensure that all of the criteria are taken into account when measuring the success of a construction project.

On the next part to identify the factors to determine and influence project success, the statistics show that 'project manager and team competence' is the most significant factor that determine construction projects success with a mean of 4.68. The second most significant factor is 'accurate schedule and financial planning' with a 4.61 average. 'Timely and comprehensive control' and 'use of construction technology' are in third and fourth rank with a mean of 4.56 and 4.54 respectively. The fifth success factor in the rank for construction projects is 'Project team commitment' with a mean value of 4.46.

Rehman (2009) stated that success factors vary across various projects. Their findings revealed project planning and control, project personnel competence and willingness and involvement of client as critical factors influencing project success.

Ozorhon (2013) found that innovation has improved the project in terms of cost, time, quality, and safety and has a positive impact on project performance and enterprise performance.

In summary, the success of a construction project is most determined by a variety of factors. The study found that project manager and team competence, accurate schedule and financial planning, timely and comprehensive control, use of construction technology and project team commitment are the most significant and essential factors to the success of a construction

project and should be taken into consideration when planning and executing a construction project.

This study found that the project location, simplicity of project nature, and small project size are the least significant factors for construction project success. These factors can still have an influence on the success of a project, but their impact is minimal compared to other factors, such as project management, communication, and the quality of materials and resources. As such, it is important for construction companies to focus their efforts on other areas to ensure the success of their projects. However, the study found that if the above top ranked success factors are satisfied, even bigger and complex projects can be successful.

Additionally, the study found that the construction methodology, construction team management, and commitment are important factors that determine and influence a project's success. The construction methodology must employ new technologies and skilled labour, the construction team must be managed well and the client must be involved in the project. Good leadership, work quality assurance, cost optimization, risk taking behaviour, and backward integration of the supply chain are also important for project success.

5.3 Conclusion

The objective of the study was to assess success criteria and the main factors that determined and influence the federal housing corporation apartment construction project success. In order to do this, the researcher has identified different factors based on intensive literature review, considering the unusual characteristics of development projects and personal observation of the researcher on the project under study. The researcher then assessed what the influence of those factors on the success of projects are by using different research techniques outlined earlier in the paper.

Accordingly, the following conclusion can be made based on the results obtained above.

The federal housing corporation apartment project is considered be successful. The use of adopted construction technology on the project was its major success factor.

Completion on time or earlier, completion within budget, accomplishment of scope and accomplishment of quality i.e. technical specification are considered major criteria to measure construction projects consistent with the golden triangle that is time, cost and quality. Meeting partners' and stakeholders' expectations, workers' safety, high participants' satisfaction and user expectation and satisfaction are a medium significant criterion to measure the success. Commercial profitability/value, use of renewable energy, participation of a large amount of

manpower are considered minor significant to measure the construction project success of federal housing projects.

In the next part, once it was established that the federal housing project is considered successful, the research strived to identify and rank the success factors that determined its success. Accordingly, the following conclusion is drawn.

Project manager and team competence, accurate schedule and financial planning, timely and comprehensive control, use of construction technology, project team commitment, problem solving skills, clearly defined scope, availability of funds and design accuracy are the major factor that determines construction project success.

Effective communication channels, use of advanced software (such as BIM), resource availability, effective procurement, clients' support, previous construction technology experience, political stability and community engagement moderately affect project success.

Lastly, low inflation, comfortable work environment (such as offices), number of employees, seniority of staff (years of experience), project location, simplicity of project nature and small project size are minor factors for project success and are considered to have little significant influence on determining construction project success.

5.4 Recommendations

The main purpose of assessing the success criteria and the factors that determine the selected building construction project is to accomplish the project success by understanding how success is measured and what the major success factors are. Understanding them and applying them will improve the success rate of construction projects.

Federal housing corporation apartment project was considered successful. Other projects can gain experience and the practices applied to this project in order to improve their project success rates.

The highly significant success criteria are completion on time or earlier, completion within budget, accomplishment of scope and accomplishment of quality i.e. technical specification. Knowing and understanding how project success is measured will help the involved parties to emphasize and focus on the criteria from project initiation to project closure.

After identifying and assessing the project success criteria, the project participants i.e. the client, the contractor and the consultant have to work on the major success factors to ensure that their project is successful by focusing on those factors and utilizing the project

management book of knowledge areas. The highly significant success factors with the highest influence are project manager and team competence, accurate schedule and financial planning, timely and comprehensive control, use of construction technology, project team commitment.

In summary, the following recommendations are given. Adequate selection process for the project manager has to be done. Accurate schedule through project management tools such as Gantt charts and critical path method has to be done before project execution starts. Clear financial planning of material, labour and equipment has to be done. Timely and comprehensive control of scope, quality and time line has to be done in order to make sure the project is on track. Different construction technologies have to be adopted in order to reduce project time and cost. Finally, team commitment can be achieved through clear role and responsibility, rewarding systems and managing conflict in order to ensure project success.

The significance level of ‘participation of the client in the supply of materials, foreign finance support, good leadership, and cost optimization’ is recommended for further studies.

The use of new or adopted construction technology is found to be one of the most significant factors to determine the FHC construction project success. Further study on how applying construction technology and how it improves project performance and success is also recommended for future research.

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Appendix A

Questionnaire on “Determinant factors of construction project success: the case of federal housing corporation building project”

Dear respondents,

My name is Hayat Mohammedseid, a Post graduate student at Addis Ababa University. I am conducting research for the fulfillment of my Masters of Arts in Project Management titled “Determinant factors of construction project success: the case of federal housing corporation building project”. The main objective of this research is to assess and rate the different factors that determined the success of the Gerji construction project and to provide recommendation based on the findings.

The questionnaire has three parts. Part one is about the general background of the respondent, part two is about the success criteria and part three is about the factors that determine project success. At the end, there is space provided to write additional factors if you have any.

I kindly invite you to be a part of this research and request you to assist me in completing this brief questionnaire.

The information provided will only be used for research on an academic purpose and your kind assistance in this regard is highly appreciated.

General Directions

- Please don't write your name.
- Please try to answer all questions based on the instructions provided.
- For multiple questions please give your appropriate answer by putting “X” in the space provided.
- Please give your short, brief and honest answer for questions that require opinions.
- Please be informed that the information you give will be kept confidential, hence try to express your ideas freely.

Thank you in advance for your cooperation

Part One: Respondent and Company Profile

1. Gender

Male

Female

2. Age

Below 25

26 - 40

41 - 55

Above 56

3. What is your educational background?

Diploma

Bachelor's degree

Master's degree

PhD

4. Which organization were you from while FHC, Gerji construction project was executed?

Contractor

Consultant

Client

Other: _____

5. What is your position in the company?

Project coordinator

Client representative

Project manager

Technical advisor

Office engineer

Sub-contractor

Design engineer

Site engineer

Other _____

6. How many years of relevant work experience in the construction Industry in total do you have?

0 - 5 years

6 - 10 years

11 – 15 years

16 - 20 years

above 20 years

Part Two

Questionnaire related to Success criteria of Project

In your opinion, please rate the following criteria in their level of significance to measure the success of the FHC construction projects.

Not significant=1, Slightly significant=2, Moderately significant =3, Very significant=4,

Extremely significant=5

Success criteria	Not significant	Slightly significant	Moderately significant	Very significant	Extremely significant
Completion on time or earlier					
Accomplishment of quality i.e. technical specification					
Completion within budget					
Meeting partners and stakeholders' expectations.					
Accomplishment of scope					
Workers' safety					
High participants satisfaction					
Participation of large amount of manpower					
User expectation and satisfaction					
Commercial profitability/Value					
The use of renewable energy					

1. In your opinion, what other criteria measure construction project success?

Part three

Questionnaire related to factors determining project success

In your opinion, please rate the following factors in their level of significance in determining the success of FHC apartment construction project.

Not significant=1, Slightly significant=2, Moderately significant =3, Very significant=4,

Extremely significant=5

Success factors	Not significant	Slightly significant	Moderately significant	Very significant	Extremely significant
Accurate schedule and financial planning					
Project manager and team competence					
Number of employees					
Design accuracy					
Project location					
Use of construction technology					
Previous construction technology experience					
Small project size					
Clients' support					
Low inflation					
Resource availability					
Simplicity of project nature					
Effective communication channels					
Problem solving skills					
Clearly defined scope					
Project team commitment					
Political stability					
Community engagement					
Effective procurement					
Seniority of staff (years of experience)					

Use of advanced software (such as BIM)					
Timely and comprehensive control					
Comfortable work environment (such as offices)					
Availability of fund					

2. In your opinion, what other factors determine project success in construction projects?

3. In your opinion, is the federal housing corporation, Gerji apartment building construction considered successful?

Yes _____ No _____

Thank you

Appendix B

Frequency and percent of success factors from SPSS

Accurate schedule and financial planning

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	2	4.9	4.9	4.9
	3	2	4.9	4.9	9.8
	4	6	14.6	14.6	24.4
	5	31	75.6	75.6	100.0
	Total	41	100.0	100.0	

Project manager and team competence

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	2	4.9	4.9	4.9
	3	2	4.9	4.9	9.8
	4	3	7.3	7.3	17.1
	5	34	82.9	82.9	100.0
	Total	41	100.0	100.0	

Clearly defined scope

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	2	4.9	4.9	4.9
	3	4	9.8	9.8	14.6
	4	10	24.4	24.4	39.0
	5	25	61.0	61.0	100.0
	Total	41	100.0	100.0	

Design accuracy

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	3	4	9.8	9.8	9.8
	4	29	70.7	70.7	80.5
	5	8	19.5	19.5	100.0
	Total	41	100.0	100.0	

Project location

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	13	31.7	31.7	31.7
	2	17	41.5	41.5	73.2
	3	10	24.4	24.4	97.6
	5	1	2.4	2.4	100.0
	Total	41	100.0	100.0	

Use of construction technology

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	3	6	14.6	14.6	14.6

	4	6	14.6	14.6	29.3
	5	29	70.7	70.7	100.0
	Total	41	100.0	100.0	

Clients' support

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	3	7.3	7.3	7.3
	3	23	56.1	56.1	63.4
	4	9	22.0	22.0	85.4
	5	6	14.6	14.6	100.0
	Total	41	100.0	100.0	

Low inflation

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	1	2.4	2.4	2.4
	2	27	65.9	65.9	68.3
	3	8	19.5	19.5	87.8
	4	5	12.2	12.2	100.0
	Total	41	100.0	100.0	

Effective communication channels

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	1	2.4	2.4	2.4
	3	12	29.3	29.3	31.7
	4	13	31.7	31.7	63.4
	5	15	36.6	36.6	100.0
	Total	41	100.0	100.0	

Simplicity of project nature

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	14	34.1	34.1	34.1
	2	15	36.6	36.6	70.7
	3	10	24.4	24.4	95.1
	4	2	4.9	4.9	100.0
	Total	41	100.0	100.0	

Problem solving skills

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	2	4.9	4.9	4.9
	3	3	7.3	7.3	12.2
	4	11	26.8	26.8	39.0
	5	25	61.0	61.0	100.0
	Total	41	100.0	100.0	

Number of employees

		Frequency	Percent	Valid Percent	Cum. Percent
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Valid	1	17	41.5	41.5	41.5
	2	10	24.4	24.4	65.9
	3	6	14.6	14.6	80.5
	4	8	19.5	19.5	100.0
	Total	41	100.0	100.0	

Political stability

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	1	2.4	2.4	2.4
	2	18	43.9	43.9	46.3
	3	14	34.1	34.1	80.5
	4	5	12.2	12.2	92.7
	5	3	7.3	7.3	100.0
	Total	41	100.0	100.0	

Community engagement

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	3	7.3	7.3	7.3
	2	10	24.4	24.4	31.7
	3	23	56.1	56.1	87.8
	4	4	9.8	9.8	97.6
	5	1	2.4	2.4	100.0
	Total	41	100.0	100.0	

Seniority of stuff (years of experience)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	16	39.0	39.0	39.0
	2	11	26.8	26.8	65.9
	3	11	26.8	26.8	92.7
	4	3	7.3	7.3	100.0
	Total	41	100.0	100.0	

Use of advanced software (such as BIM)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	1	2.4	2.4	2.4
	3	20	48.8	48.8	51.2
	4	13	31.7	31.7	82.9
	5	7	17.1	17.1	100.0
	Total	41	100.0	100.0	

Small project size

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	18	43.9	43.9	43.9
	2	12	29.3	29.3	73.2
	3	9	22.0	22.0	95.1
	4	2	4.9	4.9	100.0

Total	41	100.0	100.0
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Effective procurement

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	4	9.8	9.8	9.8
	3	17	41.5	41.5	51.2
	4	17	41.5	41.5	92.7
	5	3	7.3	7.3	100.0
	Total	41	100.0	100.0	

Project team commitment

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	1	2.4	2.4	2.4
	3	7	17.1	17.1	19.5
	4	5	12.2	12.2	31.7
	5	28	68.3	68.3	100.0
	Total	41	100.0	100.0	

Timely and comprehensive control

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	1	2.4	2.4	2.4
	3	4	9.8	9.8	12.2
	4	7	17.1	17.1	29.3
	5	29	70.7	70.7	100.0
	Total	41	100.0	100.0	

Comfortable work environment (such as offices)

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	1	12	29.3	29.3	29.3
	2	13	31.7	31.7	61.0
	3	13	31.7	31.7	92.7
	4	1	2.4	2.4	95.1
	5	2	4.9	4.9	100.0
	Total	41	100.0	100.0	

Availability of fund

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	2	2	4.9	4.9	4.9
	3	5	12.2	12.2	17.1
	4	17	41.5	41.5	58.5
	5	17	41.5	41.5	100.0
	Total	41	100.0	100.0	