College Of Business and Economics
School of Commerce
Master of Project Management Program

Assessment of Performance Evaluation and Challenge of Design-Build Project Delivery System: The Case of Gergi Modern Housing Construction Project

By:

Getnet Mersha

Adviser:

Wubshet Bekalu (PhD)

A Project Work Submitted to Addis Ababa University School of Commerce in the Partial Fulfillment of the Requirements for Master of Arts Degree in Project Management

June 2022

Addis Ababa, Ethiopia

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STATEMENT OF DECLARATION

I, Getnet Mersha the undersigned, declare that this research is my original work and has not been presented for a degree in any other university and that all sources of materials used for this research have been duly acknowledged.

_____	_____	_____
Name (candidate)	Signature	Date

STATEMENT OF CERTIFICATION

This is to certify that Getnet Mersha has carried out this research project work on the topic entitled "Assessment of Performance Evaluation and Challenge of Design-Build Project Delivery System: - The Case of Gergi Modern Housing Construction Project" under my supervision. This work is original in nature and it is sufficient for submission for the partial fulfillment for the award of Degree of Masters of Art in Project Management.

Wubshet Bekalu (PhD)

Signature _____

Date _____

Addis Ababa University

College of Business and Economics

School of commerce

Department of Project Management Approval

This is to certify that this project work prepared by Getnet Mersha by the title of "Assessment of Performance Evaluation and Challenge of Design-Build Project Delivery System: the Case of Gergi Modern Housing Construction Project". Which is submitted in partial fulfillment of the requirements for the Degree of Masters in project management, complies with the regulations of the University and meets the accepted standards with respect to originality and quality

APPROVED BY BOARD OF EXAMINERS

Wubshet Bekalu (PhD)	_____	_____
Advisor	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date

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First, I thank Almighty God for giving me strength and health to complete this project work in such a difficult and hard time.

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ABSTRACT

In Ethiopia, mega projects have been implementing using Design- a build delivery system. These projects consume huge financial resources and are expecting to deliver outputs that significantly improve the social and economic issues of the society. Gerji modern housing construction project is one of the projects implementing the Design- build delivery system. The main objective of this study is to determine the Performance practice of the design-Build (DB) delivery system in the project and the factors that lead to its success or failure, assess how the client requirements have been managed and the challenges that occurred during the implementation of the DB contract. The methodology applied for this study was a descriptive method with a mixed approach. As the study focuses on assessing the performance of the mentioned project, this study used primary and secondary data gathered using the instrument of a questionnaire survey and interviewing from the key project team members. The sample design used in this study was census and questionnaires were distributed to all 25 targeted respondents in person and through e-mail to be fill out and returned. The collected data was analyzed using quantitative and qualitative method, then performance and the challenges exist in the DB project was evaluated using performance measuring criteria like time, cost, quality, stakeholder satisfaction, and functionality of deliverables. Overall, the study's findings show that based on the mentioned performance measuring criteria with minor schedule dalliance and cost overrun the project was effectively and efficiently accomplished to its intended objectives.

Keywords: *Design-Build (DB) delivery system, Project performance, performance measure*

ABBREVIATIONS

DS	Delivery System
DBB	Design –bid-build
IPD	Integrated Project Delivery
CMAR	Construction management at risk
DBDS	Design- build Delivery System
TDS	Traditional delivery system
GC	General Contractor
CM	Construction Manager
PM	Project manager
DBIA	Design Build Institute of America
CII	Construction Industry Institute
PMBOK	Project management body of knowledge
GMP	Guaranteed maximum price
ERA	Ethiopian Road Authority
CSFs	Critical Success Factors
TOR	Term of Reference

TABLE OF CONTENTS

LIST OF TABLES

LISTS OF FIGURES

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Every project whether they are small or large size, has common characteristics. They are time-bounded; budget-constrained and produce distinct products. On the other hand, within every project, the expected products are unique and they required special management knowledge and skill. When project participants are greater than one, further documents and agreements are needed to manage and control the interest of parties. Contract agreement is one of the documents that legally bind the project participants' right and responsibility .within the contract agreement the project delivery system, duties, and responsibilities of participants shall be included in the contract agreement (PMI, 2004).

In Ethiopia, the recent fast population growth is not supported with the necessary economic and social provisions, which resulted in complicated urban challenges. One of the challenges is the wide gap between the demand and supply of residential housing (Alexandratos, 2005). Studies show that the gap between housing supply and demand gradually become one of the most serious social problems, especially in the capital city, Addis Ababa (Goodfellow, 2017).

Gergi modern housing construction project is one of the efforts made by the government to address the housing demand of the country. The project is a large-scale type project, which is fully funding by the government and expected to deliver hundreds of residential housing units. The project has intended to supply housing amenities for ministers, government higher officials, and diplomatic community (Betochmagazine, 2020).

The project uses modern construction methods. One of its modernity is concrete the molds (aluminum formwork) types. The formwork was fabricated before the start of construction targeting to save time of formwork assembling and modification in each slab and column construction. This fast erection trend helps to shorten the construction time as well as project time. On the other hand, using the type of modular formwork creates some restrictions for design freedom (Lema, 2006).

1.2 Background of the Organization

Federal Housing Corporation was re-established by the government proclamation of 398/2009 in February 2009 entrusted with the responsibility to construct, buy a building, and provide rental services for, people representatives, Ministers, and other appointed higher officials.

In previous years, the establishment of the corporation was originated four decades in 1974, during this time the military "dergue" regime has taken the superpower of the country. Subsequently, the regime declared that extra urban houses and land were seized. Following this, the agency for the administration of rented houses was established and assigned to administrate the seized urban houses. Starting From that time, the organization has been providing government houses ranging from residential to business units with affordable rental prices.

For the past 45 years, the Agency was frequently reforming and continuing its service under different names. During this period, the organization has been providing houses to federal and regional government officials, government and non-government organizations, members of the house of people representatives, civil servants, foreign diplomats, international organizations, and other city dwellers. The corporation has been renovating the houses and providing other services to tenants' .in doing so the organization has passed through different reforms to enable it to deliver better results.

In recent times, after it named Federal housing corporation (FHC), the organization has been constructing high rising residential and commercial buildings in different location of the capital city. Out of these projects, Gergi modern housing construction project is one of the projects that is constructing by Ovid construction Group as DB builder and FHC as Employer.

1.3 Problem Statement

In modern construction projects, selecting suitable project delivery systems are important to the successful project accomplishment (Ahmed & El-Sayegh, 2021). The type of delivery systems is selected based on their Design and product specifications, type and complexity, level of technology requirements, and public policy directives (Chen, Liu, Li, & Lin, 2011). In Ethiopia for instance, research shows that most construction projects utilize the DBB delivery systems (Tadesse & Dinku, 2017). However, when the project is large and complex, need special skills and advanced technology, a design and build (DB) delivery system has been applied.

The major problem, associated with the Gergi modern housing construction project, is the frequent change of scope. Because of change in scope, the cost and time of the project varies consequential; the employer requirement might violate and result to employer dissatisfaction.

There are many types of research previously conducted on problems of construction management's practice showing time, quality, and cost management problems of the construction industry. Some studies like (Tariku, 2016) discussed theories of project delivery methods, comparing one another on their advantage and limitations, but not studied the performance and practice of PDS in Construction project-based works. So unlike (Bekele, 2017) this study is targeting to study the performance of DBDS, how the management has practically carried out, and how the client requirement has managed in the project deliverables, especially on housing projects. In addition, the study aimed to assess the challenges encountered in managing the DB systems on the construction Project and finally generate the recommendation regarding the performance of the design–build delivery system.

1.4 Research Question

Despite the many advantages of design-build (DB) delivery system over other forms of delivery, in applying the DB delivery system to projects like the Gergi Modern housing project, many questions is arising regarding the management and performance of the DB delivery system in the project. Among the arising questions some of them are considered as research question for this study. Therefore, the study will try to search for answers to the following questions.

- What is the level of performance evaluation practice of design-build delivery system?
- How was the client requirement managed in the contract?
- What are the challenges of managing the design-build delivery system?
- What are the advantages of applying the design-build delivery system over the conventional DBB delivery system?

1.5 Research Objectives

1.5.1 General objective

The general objective of this study is to assess the performance of the DB delivery system specific to the Gergi modern housing construction project and the challenges encountered during the

implementation of the design-bid (DB) contract delivery system. Finally, reach to conclusions and recommendations.

1.5.2 Specific objective

The specific objectives of the study will be:

- To assess the performance evaluation practice of the design-build delivery system.
- To assess how the client requirements are managed in project deliverables.
- To explore challenges during the implementation of the design-build contract.
- To assess the advantages of applying the design-build delivery system over the conventional DBB delivery system.

1.6 Significance of the study

Since the DBDS is the emerging delivery system in Ethiopia (Sisay, 2017). Large and public projects like massive housing projects, dam projects, and road and infrastructure projects are expecting to implement using this delivery system. So, studies have to conduct on the performance of the DB Delivery system that gives basic experience and knowledge in managing the system for future similar projects, especially in large and technologically advanced projects. Thus, this study attempts to put a contribution by assessing the performance Practice of the DB project and challenges that encounter in implementing the contract.

1.7 Scope and limitation of the study

This study focuses on the DB delivery system that involves only two actors (owner and design-builder) in the contract. The study is limited to a Gergi modern housing Construction project. More specifically, it focuses on Assessing the Practical performance and challenges of the DB delivery System in the Gergi Modern Housing Construction Project.

1.8 Structure of Research

This research consists of five main chapters:

Chapter 1: Introduction: This chapter presents the background of the organization and the study, statement of the problem, objectives of the research, research questions, significance and scope and limitations of the research

Chapter 2: Literature review: This chapter shows a detailed review of concepts and definitions to identify the main factors affecting the performance and key performance indicators for DB Delivery System.

Chapter 3: Research methodology: This chapter presents the methodologies used in this research study to achieve the required objectives and to answer the research questions.

Chapter 4: -Result analysis and discussions: This chapter presents the Data analysis, Interpretations of the result, and discussion on research results.

Chapter 5: Conclusions and recommendations: Summarize the major findings, conclusions derived from the analysis, and forward recommendations.

1.9 Definition of the key term

Performance: Is meeting the expectation of customers or compliance to the specifications of customers in the time scheduled, quality specified, and budget allocated.

Project Performance: The degree to which a project meets the execution objectives and contract parties' requirements.

Project environments: Is all the internal and external forces that exert or influence specific project work.

Project Delivery System: Comprehensive process of assigning contractual responsibilities for designing and constructing a project, which should include the definitions of the project scope, contractual responsibilities, inter-relationships of the parties, and the processes for managing time, cost, safety, and quality.

Design- builds Delivery System: Is a project delivery method in which the owner\client selects an organization that will complete both the design and the construction of a project under one agreement.

Project Performance Measurements: The process of evaluating Project performance relative to a defined goal.

Project Success: The ability of the project to meet the objectives of time, cost, and quality, as well as satisfy of the project stakeholders.

Public Projects: Any project planned or undertaken by the City or any governmental entity for construction, reconstruction, maintenance, or repair of public facilities or improvements.

CHAPTER TWO: LITRATURE REVIEW

2.1 Introduction

In this section the researcher presented review of related literature which focuses on performance evaluation and project delivery system. To begin, the researcher reviewed the general overview and basic definition of project delivery and project. The researcher also looked at the current state of performance evaluation methods that are being used. In addition, there is information about and DB delivery challenges in the construction industry. Other literature relevant to the topic and demonstrating empirical results were also evaluated and regarded as a source of evidence for ensuring the accuracy of the research findings.

2.2 Theoretical Review

2.2.1 General Overview

Project Delivery is a comprehensive process including planning, design, and construction required to execute and complete a building facility or other type of project. Choosing a project delivery method is one of the fundamental decisions owners make while developing their acquisition strategy. For the owner, it is important to Consider and examine every Type of project Delivery option concerning the company Strategies, financial capabilities Internal Controlling System and Required level of Scope and Quality (Touran & Lopez,2007).

There is no best project delivery system that laterally suitable for the projects. However, for the best of the project and for the benefit of the owner, Projects Were comparatively selected. Selecting delivery method for any project must start with a good understanding of choices available. In order to select Suitable Project delivery systems, the owner set Criteria of which consider the internal Conditions of the organization.

Project considerations have fundamental impacts on the delivery method selection. These considerations include a realistic budget, a schedule that contains a reasonable performance period, a responsive and quality design process, a risk assessment with allocation of risks to the appropriate parties and recognition of the level of expertise within the owner's organization (Owner's Guide to Project Delivery Methods, 2012).

The recent trend in Ethiopia, the Majority of Construction projects are delivered using the DBB called Traditional delivery systems (TDS). The DBB delivery system is suitable and incorporates the three Prime groups of actors i.e. owners, Designers, and Contractors, Each player has their responsible. DBB is also advantageous in creating competency and transparency. But, In the traditional delivery system most of the projects are exposed to variation and increased in initial cost, the risk is absorbed by the employer Design-Build (DB) system is currently used in some projects to reduce suffering from design problem and construction risks that could bring variation, claims, and disputes of traditional delivery method. Moreover, the most important reason is the need for urgency for the completion of projects for the economic development of the country (Lema, 2006).

2.2.2 The Project Environment

Not two projects are the same. Even if their scope and objectives are the same, they will execute in different environment. According to Peter Landau (2021), how to Manage Project Environment from Initiation to close, defines a project environment is all the internal and external forces that exert on specific project management.

Project Environment Characteristics Mainly consists of Schedule, Scope definition, resource availability and the risk association to the project. There are things from inside and outside that can affect Project's schedule, budget, team morale and much more. To be successful the project team expected to understand their project environment.

In every phase of the project, it is Important to take in to account the Project environment. Some factors that needed to consider by project teams summarized in the following table 2.1.

Table 1: Project Environment Factors

	Environmental Factors	**Considered Conditions**
	Internal Environmental Factors	
1.1	Organization Staff	Required Staff Training & Skill Motivations System Staff Common Objective

1.2	Organization Resource	Human Resource Budget Resource Material Resource
1.3	Communication	Communication media Communication language Communication infrastructure
1.4	Organizational Culture	Competence Culture Collaboration Culture Recognize achievements
	External Environmental Factors	
2.1	✓ Geographical Environment of project location	Local climate conditions Geographical nature Availability of Local materials Site Access Conditions Infrastructure condition
2.2	Political Environment in which the project exists	Local policy Corruption level Political Stability Trade control
2.3	✓ Regulatory and Legal Environments in which project Exist	Lows of Taxation Restrictions on human and materials Environmental Regulations
2.4	✓ cultural and religious environment in which the project exists	Cultural restrictions Holidays and working hours Social welfare
2.5	✓ Availability of technological tools ,skills, and Experience	Skilled human resource Availability Local material Availability Availability of utilities

2,6	✓ Who are the Project Stockholders	Stockholders Expectation Stockholders Risk Attitude Stockholders Priority
2.7	✓ Economic Environment in which project Exist	Interest rate Inflation rate Price Fluctuations Market Trend Exchange Rate

Source: Peter Landau (2021), how to Manage Project Environment from Initiation to close.

2.2.3 Overview of Project Delivery System

Project delivery method is a process by which a project is comprehensively designed and constructed for an owner and includes project scope definition; organization of designers constructors and various consultants. Choosing suitable Project delivery is critical decisions for the owner. To choose suitable project delivery system, the owner must have a good understanding of choice availability of delivery types. Most studies agree that there is no perfect project delivery method. Every project is unique and has its own unique set of challenges. Therefore, industry consensus is that every project should be considered on a case-by-case basis to determine the most appropriate project delivery method. (Owner's Guide to Project Delivery Methods, 2012).

2.2.4 Type of Project Delivery System /Options

Project delivery is the contractual relationships in which all the requirement and obligations Put together in agreement so that all participating parties obeys to deliver project requirements. According to the definition of Michael Kenig projects delivery is “comprehensive process of assigning the contractual responsibilities for designing and constructing a project. “According to (owner’s guide to project delivery methods) there are different project delivery systems. The most common and widely used delivery systems are Design-Bid-Build (DBB) called (the traditional delivery system), Design-Build (DB) Construction Management-at-Risk (CMAR), and integrated project delivery (IPD).

In this literature, the four mentioned delivery systems would review with regard to Construction projects particularly with their implication to housing construction projects.

2.2.4.1 Design-Bid-Build (DBB) /the traditional delivery system

DBB is well known type of delivery system that promotes competitions and transparency. It is also called traditional delivery system because it is frequently used type of delivery system in which the process follows each steps linearly without over lapping. DBB is the most commonly paired with low bid procurement.

In this form of DS there are three distinct phases: the design phase, the bid phase, and the build phase. This DS is common everywhere suitable for prolonged Projects for which the owner closely works with the designer and engineer to get benefit from lower bid price for their projects. There are three active participants in this DS, the owner (project sponsor), the designer (Design professionals), and the builder called the contractor. Either the Owner first enters into a contract with a design professional firm an architect's or an engineer, the responsibility of the designer is to prepare the design of the project. As a result, the design, set forwarded in construction plans and specifications, and put out for bid. The contract for construction is then awarded to whichever general contractor (GC) has submitted the lowest priced bid, provided that the bid is responsive and that the Owner is satisfied with the low bidder carrying out the work.

In the bidding, process the contractor need to review the design the contract documents and ask the designer for clarification questions so that the contractor is clear with the bid document and prepare their bid. During the bidding phase multiple bidders can bid for the single project. After the submission of their respective bids the designer or the owner representatives will review each bid then the awarded will be given based on specific criteria to the best fit for the owner's needs. The following defining characteristics identify Design-Bid-Build:

1. Three prime players—owner, designer, contractor
2. Two separate contracts—owner-designer, owner-contractor
3. Final contractor selection is based on Low Bid

The tri-party relation between the owner, designer and contractor can be illustrated in a triangular. As it is shown in figure 2.1 below, the contractual relation between parties in the DBB delivery method is branched in to two directions. Owners enter to contract with the consultant (Architect/engineer) and the contractor separately. The consultant and the contractor will have only administrative relation (The Alberta Association of Architects, 2005)

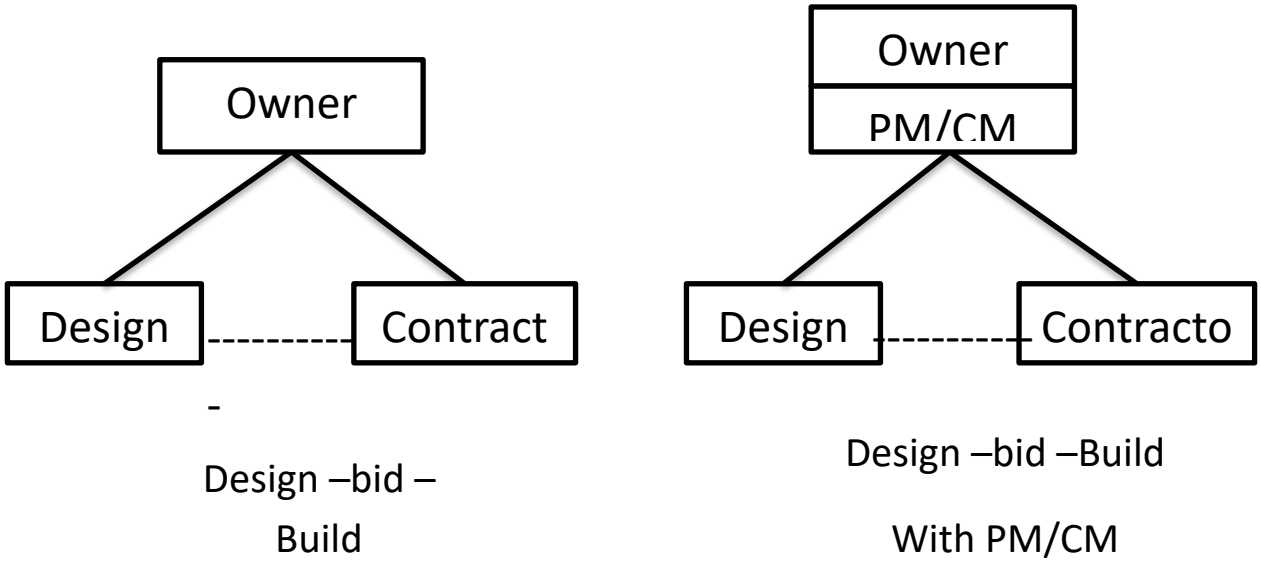

Figure 1: DBB Participants Relations

Though the DBB delivery system advantageous for the owner's in lower bid price for their project, it also have its drawback and challenges. The main problems regarding the process is the excessive need of time for processing bid phases and the construction may not begin until the design is completed.

According to The Alberta Association of Architects (2005) the following lists describe the common characteristics of the DBB Systems;

- This method is widely applicable, well understood, and has well-established and clearly defined roles for the parties involved.
- Process may have a longer duration when compared to other delivery methods since all design work must complete prior to solicitation of the construction bids.
- Construction may not begin until the design and procurement phases are complete.
- Construction planning based on completed documents
- Risk Allocation: Design risk (quality) allocated to Designer; Construction risk (cost and
- Schedule) allocated to general contractor; Owner is responsible for adequacy and completeness of design.
- The cost of construction is generally fixed prior to starting construction, assuming that change orders are kept to a minimum

- Payments must flow through the layers of contractors and suppliers, delaying payment may bring clam from the contractors.

DBB is best suited for projects that are budget sensitive, but are not especially scheduled sensitive and not subject to change and the Owner can completely control the design. Typical Advantages and disadvantages of DBB system are: Simpler process to manage, fully defined scope before the Start of the project, Both design team and contractor accountable to Owner, Lowest price proposed and accepted; pricing, including contractor fee and overhead, developed competitively "best price".

Disadvantages: Longer schedule duration than other methods, Price not established until bids received; may require redesign and rebid if bids exceed budget, Quality of contractors and subcontractors not assured, Cost estimates change during design process, fosters adversarial relationships between all parties; increases probability of disputes, no design phase input from contractor on project planning, budget or estimates, change orders and claims may increase final project cost.

2.2.4.2 Design-Build (DB)/Turnkey

Design-build is a form of project delivery in which the owner contracts with a single entity (design-builder), to provide both design and construction services. The design-build entity may be a single firm, a consortium of experts or a joint venture. The Contractor most often leads the design-build team (Alberta Association of Architects, 2005).

In DB delivery system, the owner Enters a Single contracts with a DB team. The DB teams which can be a joint venture of a Designer team and constructer team. A contractor team Collaborate with a designer team as a subcontracted entity who work together for the fulfillment of the project objectives, or a single firm capable of performing both design and construction. The Contractor is usually the lead members of this sort of team. One variation of the typical DB team structure, known as fee-paid developer, involves the owner engaging a developer, which then selects its own designer and contractor partners. However, formulated, the DB team performs the complete design of the facility, usually based on a preliminary scope or design presented by the owner. At some point early in the process, through a prescribed process, the DB team will establish a fixed price to complete the design and construction of the facility. Once underway, the DB team is

then responsible for construction of the project, and for all coordination between design and construction. (Alberta Association of Architects, 2005).

The following defining characteristics identify Design-Build:

Two prime players— owner and design-build entity

2. One contracts—owner – design- builder
3. Final contractor selection is based both price and Qualifications

On the other hand, if the owner requires the advice of expertise with overall process and may acts as owner's representative, he may hire CM to engage in the project work. The CM can be a staff member or third- party firm.

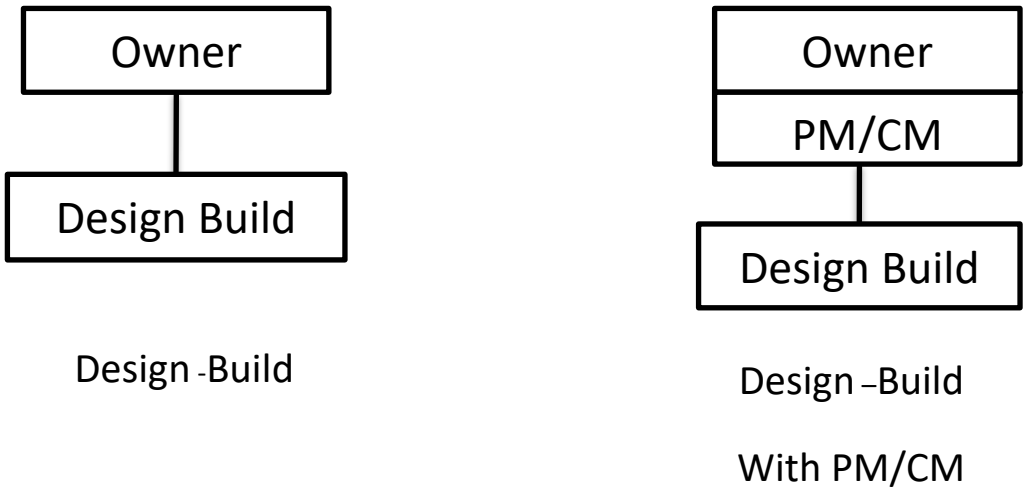

Figure 2: Design –Build Participants relations

a) The Different Verities of Design Build Delivery System

Within the overall concept of design and build, a number of names have emerged to. describe that might be called different "varieties" of design and build procurement (Rowlinson, 1988; Rowlinson, 1987; Janssens, 1991; Building Market Report, 1992; and Akintoye, 1994).To be effective In DBDS is the three main players shall work together in different obligations and commitments'. in Accordance of the project nature and agreements of players the Portion of duties and responsibilities are given to the main players . Based on to the tasks given to the parties the DB delivery system is classified in four forms described as follow.

Package Deal: This is the traditional form of design and build where the client inputs to design is relatively little and the principal part of design and construction tasks undertaken by the DB Contractor.

Design and Manage: In this variety, the DB contractor is employed to undertake the majority, if not all, of the design and is responsible for the overall management of the project.

Novation Design and Build: in this form the client involves his own Architect as part of contractor's team on to the design and build contractor so that he conform the client's need is included in the design.

Develop and Construct: in this variety of DB, the contractor take over the design that developed by client's consultants. Here the contractor's task is to develop the details and construct the work.

b) Risk Analysis Related to DB Delivery system

Since the design-build team is working together from the outset, DB offers the opportunity to save time and money. However, the advantages of the system are offset by a significant loss of control and involvement by the owner and other stakeholders. Accordingly, it is difficult for the owner to verify that it is receiving the best value for its money without having a great deal of transparency in the DB team (Alberta Association of Architects, 2005).

The primary caution for an owner considering DB is that the owner should carefully consider the level of involvement it requires for a successful project. First, the owner needs to recognize the effort and completeness that must be behind its initial scope/preliminary design which forms the basis of its contract with the design-builder. Often, the owner will require additional consultants to help it develop the scope or preliminary design, in the role of a traditional design firm (Alberta Association of Architects, 2005).

Owners with highly specialized program needs may not find it advantageous to turn over responsibility to an outside DB team without ensuring adequate levels of oversight and communication. For example, a government owner constructed a high-technology research facility involving highly specialized equipment using the DB delivery method. During project development, the DB team made several key design and equipment selection decisions without

full involvement of the owner, resulting in an unsatisfactory facility that required costly changes before the facility could be used as intended.

With this lesson in mind, DB is best suited to conventional projects for which project requirements can be clearly defined and for which expertise is widely available. For example, an office facility might be a project ideally suited for DB. In a project of this type, the owner is not assuming undue risk in conceding control over the project, and may benefit from the advantages of DB.

Another primary consideration of the owner is proper selection of the DB team. Since the owner selects a team that has been created prior to selection, it may be difficult for the owner to maintain the proper balance of design expertise, financial capability, construction experience, and experience in DB team roles. In particular, the owner should strongly favor DB teams with a successful track record working together on previous similar projects in the same DB roles. More so than in any other delivery system, the success of a DB project may hinge on the initial selection process.

According to Alberta Association of Architects (2005) typical advantages of this system include: DB can produce a project more quickly than a conventional DBB, there is a single point of responsibility for design and construction. cost efficiencies can be achieved since the contractor and designer are working together throughout the entire process, reducing fragmentation and adversarial relations between designers and constructors, Minimizing Project owners' risk transferable due to Designers' faults, employers' responsibility to co-ordinate interfaces between different project elements is Avoided, Single point accountability minimizes the opportunity to claims by the contractor due to Design related issues, coordination between design and construction processes will also be enhanced, the client budget or financial requirement is defined early enough in the development Process, the disadvantage of this delivery system is loss of control, cost of tender and cost of risks, difficult for Owner to evaluate the GMP or determine whether the best price has been achieved for the work. Costs more than traditional bid due to reduced competition in pricing of contractor overhead, fee and sub-contract costs, the Costs of project will be more than traditional bid due to reduced competition in pricing of contractor overhead, fee and sub-contract costs, the increase in risk transferred onto the contractor will be counter balanced by the increase in contract prices, which can be taken to include these costs of risks, DB Suited for a project of

Large projects that are schedule sensitive, difficult to define or subject to potential changes; also for projects requiring a high level of construction management due to technological requirement , multiple phases, technical complexity or multi-disciplinary coordination.

2.2.4.3 Construction Management

I) Construction Management-at-Risk (CMAR)

Construction Manager at Risk, also called CM @ Risk or simply CMAR, is also a derivative of the Design-Bid-Build process. Instead of the designer overseeing the design process and construction quality, A construction manager (CM) is hired early in the design process to deliver an early cost commitment and to manage issues of schedule, cost, construction, and building technology. Once hired, the CM stands in as the owner's representative and advocate in every step of the construction process from preconstruction, to design and bidding, through construction. This makes CMAR ideal for project owners who want an expert's help managing their project or communicating between parties, and sometimes CMAR allows owners to remove themselves from the majority of the construction process altogether. [Gordian- Comparing 5 Delivery Methods for Construction Projects]

In Such management service the CM responsible for preparation of cost models, advice on the time and cost consequences of design and construction decisions, scheduling, cost control, coordination of construction contract negotiations and awards, timely purchasing of critical materials and long-lead-time items, and coordination of construction activities.

CM also provides advisory professional management assistance to the owner prior to construction, offering schedule, and budget and constructability advice during the project planning and design phases

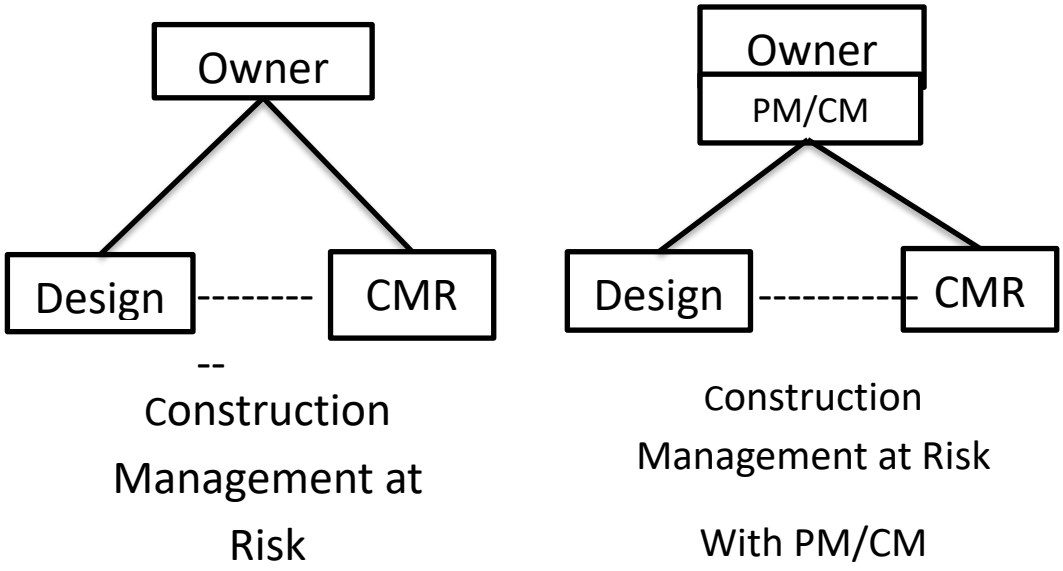

Figure 3: CMAR Participants Relations

Important feature of CMAR is where an independent professional (CM) Reduce the risk of the owner by interring subcontract agreements. Often, the CM is also the contractor.

II) Construction Manager – Agency

Also referred as CM (Agency) in which the Agency acts as the Owner's representative during each Stage of the project. The CM (Agency) is often the Owner's trusted Professional who advises the owner and control in all aspect of the projects' design, scheduling, Constructability, Value- engineering, and negotiates with Architects, Contractors, and Subcontractors. In this system the CM (Agency) is only the adviser of the owner. The Majority of the risks related to budget and schedule during construction phase goes to the owner Shoulder.

2.2.4.4 Integrated project delivery (IPD)

Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. (The American Institute of Architects [AIA National]: Integrated Project Delivery: A Guide, 2007 Version)

2.2.4.5 Multi-Prime

Multi-Prime is commonly utilized within a Design-Bid-Build process. In Multi-Prime project delivery, the owner contracts directly with multiple contractors or trades to complete construction. Thus, the owner acts as the general contractor/construction manager on its own project. The method optimizes the owner's control over the trades and reduces construction cost by eliminating the general contractor/construction manager's fee and general conditions costs. In essence, the owner is thought to get the project "wholesale." (The American Institute of Architects [AIA National]: Integrated Project Delivery: A Guide, 2007 Version)

2.2.5 Selecting Project Delivery System for Construction Project

The selection of an appropriate PDS is the basis of success in every construction project and has never been an easy job due to the characteristics of procurement systems. Before selecting project delivery system, the project firm should have basic understanding of project Characteristics, the environment in which the project exist and Goals that Expected from the project. In choosing project delivery to the best fit and requirements of the owner and the project, the owner should consider several factors in making the decision some of the factors are project size, project complexity, need of technology, legislative and regulatory requirements, tolerance for risk, Desired level of involvement, owner's resource and capabilities.

Factors that considered in selecting appropriate delivery system are discussed as follow.

Budget

Budget is the most considerable factors in selecting PDS. when considering project extremely important when considering which PDS to select. Setting a realistic budget before design helps to secure financing, minimize cost overrun during Implementation phase. so the owner must decide on the budget figure and the potential risk level of exceeding the budget. Once a project is underway, change orders are an inevitable occurrence and are commonly from cost overruns.

Design

Of primary importance to the owner is that the desired facility functions as envisioned while successfully fulfilling the needs of the owner and users. Therefore, the design team should be well qualified in the type of facility being designed. In addition, the owner must ensure that the

program needs are clearly conveyed to the design team. Since the design of the facility must be buildable and design intent must be properly communicated, the owner requires that the design documents are constructible, complete, clear and coordinated. The documents should properly incorporate unique features of the site to include subsurface conditions, interfaces with adjoining properties, access, and other characteristics. Owners must decide how much control they need to have over the design elements of a project.

Owner Expertise

To help determine which project delivery method to choose, keep in mind the owner and their expertise. It is important to keep in mind the company's knowledge of construction, especially in regards to projects in similar scope and size. In addition, staff members that help oversee the process should be familiar with the construction processes. Extensive expertise is not critical for the success of a construction project, but it will help choose the best project delivery method for the building.

Schedule

The owner has similar needs in the area of scheduling. The dates of design commencement, construction completion and ultimately the operation of a new facility can be critical for selection of project type, either in terms of generating revenue from the facility, or in terms of providing needed functional space by a particular deadline

Risk

The owner requires an understanding of the risks involved in construction, and should make a conscientious decision regarding allocation of these risks among project participants, so that all areas of exposure are properly understood. In considering risk allocation, the owner should strive to assign risks to those parties that can best exercise control over those aspects. For example, it would typically be problematic to require that the contractor correct problems due to design errors or changes at no extra cost since a contractor generally has little control over the cause or magnitude of such errors or changes. An owner must decide how much project risk they are comfortable in assuming.

2.2.6 Criteria for Project delivery system

For procurement of the construction delivery system, the procuring body uses various Selection criteria. The following chart illustrates different criteria used to selecting suitable delivery system for the project.

Table 2: Procurement of delivery systems and selecting Criteria

	Project Delivery Systems	**Design- bid Build(DBB)**	**Design–build (DB)**	**Construction management at risk(CM@R)**	**Integrated project delivery(IPD)**
Selecting Criteria					
Selection based on price only		Most common	Common	Rear	Rear
Selection based on Qualification only		Rear	Most Common	Common	Most Common
Selection is based on a weighted combination of Price and qualification		Common	Common	Most Common	Common

Source: CMAA Owner's Guide to Project Delivery Methods - August 2012

2.2.7 Challenges of DB delivery System in Public Projects

DB project Delivery is one of the recently emerging delivery system that is practicing in many public and private construction projects in the country. When it is looked back in the history of construction project, DB delivery system is adopted by the ERA to deliver large road and bridge infrastructural projects (Marzuki & Tamin, 2017).

Marzuki & Tamin (2017) explains that the application of DB delivery systems is more successfully to large and complex projects. This system significantly reduces the delivery time and the cost of projects. However, DB system is mistreated by several reasons. Before and selecting this delivery system, the owner should understand the design -build process and make

some preparation on internal capability of team members also the owner need to aware of the implications of its decisions and actions through a good understanding of the consequence from the contractors perspectives .

According to Sisay (2017) Research work entitled "*Study on the challenges of DB delivery system in Ethiopia road project"*. some of the challenges and drawback of DB delivery system in Ethiopia were: Lack of the required experience and expertise with the local contractors, Client itself was not having the required experience for the DB delivery method, Lack of well-established pre-contract planning, Local contractors lacked proficient design, Sometimes the local contractors tendency to underbid' the works, No clear guidelines for procurement of goods and services, Financial incapability and Inadequate equipment of local contractors, Poor contract document especially employer's requirement and particular conditions of contract, Delayed design approval on the employers representative side, Employer's representative lack of confidence to give professional judgment whenever necessary, Lack of teamwork between the contracting parties and Problem on entertaining of change and variations.

2.2.8 Construction Projects performance and measurement

2.2.8.1 Project performance

Performance is taking of a complete serious of action that integrate skill and knowledge to produce a valuable result (Elger, 2008). A project is considered to have achieved a high level of performance if it is accomplished on time, within budget, good quality level and provides high level client satisfaction (Ghadamsi & Braimah, 2012). Project performance is to be successful if the project meets up the practical performance provisions that planned to be carried out, and if there is a sense of fulfillment regarding the ending result (Crawford, 2000). According to Maina and Gathenya (2014) a project is classified as a good performance if it is employed in accordance of the pre-determined criteria of time, cost, all the set goals and accepted for use by the customer.

Theodore (2009) identified the main performance criteria of projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting. Success of projects is connected to the instant and financial plan, value requirement and client's approval. Additionally,

PMBOK (2013, p.34) note that concerning development achievement when be considered in conditions of carrying out the project inside the limit of scope, time, cost, quality, resources, and risk as accepted among the project managers and management. However, an unsuccessful scheme is depicted as one overdue, used more finances, gone outside its scope or eventually given up for lost.

Generally, a project is said to be doing well when the project is on time and within budget, with in scope, with in the contentment of the clients or project stakeholders, meeting of its objective, value requirement, project peril, wellbeing values, health, ecological, intellectual and safety necessities (Storm & Janssen, 2004). A number of issues were established by researchers that considerably influence project performance and very important to the project manager to know and predict the future of the project, in addition to monitoring and evaluation of the project progress. The fortitude and classifying of a project as performing or not is personal managers or parties involved. For example a project which was loped more than funds and late but was able to achieve its goals and specification of the organization can be measured as doing well by partakers whereas it can be considered as a failure by others since it registered as a loss for revenue and other working costs.

2.2.8.2 Performance measurement

Performance measurement is a systematic way to evaluate the inputs and outputs in manufacturing operations or construction activities and is a tool for continuous improvement (Takim et al., 2002) the study explain the element of success in a project deals with efficiency and effectiveness measures. Efficiency measures refer to schedule, budget, specification, and safety and would only be achieved through having standards, systems, and methodology. Effectiveness measures refer to user satisfaction, the use of the project, fitness for purpose, and free from defects.

The level of project objectives achievement can also show project effectiveness. The main priorities of the project objectives achievement are project tasks and criteria, such as meeting project time, budget, and technical specifications. In line with Takim, Ikediashi et al. (2012) mention that performance evaluation compares the actual and expected performance in terms of effectiveness, efficiency, and quality regarding skill and product. Lauras et al. (2010) use project

tasks, performance indicators (time, cost, quality, and risk), and performance triptych (effectiveness, efficiency, relevance) to analyze project performance. Effectiveness describes whether the results of the project meet the objectives. Efficiency indicates whether the resources used well to attain the result.

Researchers describe Project performance measurement in different ways, some researcher describes performance measurement in association with project objectives. Based on (Love and Holt, 2000, Chan et al., 2001)), explains performance measurement as a systematic method as a tool to evaluate the inputs and outputs in the process of project execution for constant enhancement. Therefore, the concept of performance measurement adopted from the perspective of project successfulness measured from the point of project objectives.

2.2.9 Project Success factors

A construction project is considered successful when it is completed within the given time and budget, and is to the client's satisfaction. Additionally, the project success is defined as the ability of the project to meet the objectives of time, cost, and quality, as well as satisfying the project stakeholders.

Many factors influence the degree of project success. Project success factors refer to a set of circumstances, facts, or influence, which contribute to the project outcomes. The project manager's managerial skills, team members' commitment and their technical background, project attributes, and environmental factors, Communication system, are all critical project success factors

Chan and Scott and Chan (2004) define a conceptual framework to describe factors affecting success of a construction project: Project Management Actions, Project Procedures, External Environment, Communication system, Procurement method, Economic environment, and Client's experience.

2.2.10 Project Performance measuring criteria

To say a project is successful or unsuccessful there should be some explanation that supporting the statement. In Measuring the Project performance level with defined criteria's, helps to know the level of project success , the strength and weakness and other features of project component.

Rose (1995), defines Project performance measurement as" The process of evaluating performance relative to a defined goal. It provides a sense of where we are and where we are going .Rose further stated that measurement could guide steady advancement toward established goals

The common and widely accepted criteria's of performance measure of project are based on time, cost and quality. However, Kumaraswamy and Thorpe (1999) considered variety of criteria in measuring performance. This include meeting budget, Schedule, workmanship quality, stakeholder's satisfaction transfer of technology and health and safety.

Therefore, for this study among the mentioned variables six of them are considered as criteria for measuring project performance. They are Cost, Time, Quality, Clients Satisfaction, Health and Safety and functionality.

i) Cost performance

Cost is defined as the degree to which the general conditions promote the completion of a project within the estimated budget (Bubshait and Almohawis, 1994). Salter and Torbett (2003) indicated that cost variance was the most common technique used to measure design performance. The overall cost that a project incurs from inception to completion, which includes any costs arise from variations, modification during construction period and the cost arising from the legal claims, such as litigation and arbitration. It can be measured in terms of unit cost, percentage of net variation over final cost (Chan and Tam, 2000).

Cost variance is a very important factor in measuring project performance because it indicates how much the project is over or under budget. Andi and Minato (2003) used cost variance to measure project performance caused by defective design in Japan's construction industry. Similarly, Georgy et al (2005) suggested the element of cost to measure the performance of engineering projects.

In this Study, cost variance is calculated by the variance between the actual cost and the budgeted cost of a project.

ii) Time performance

Construction projects need to be complete on time, as the clients, users, stakeholders, and the general public usually look at project success from the macro views where their first criterion for project success appeared to be the completion time (Lim and Mohamed, 2000). Salter and Torbett (2003) and Odeh and Battaineh (2002) mentioned that time variance is one of the techniques for assessing project performance in construction projects. The element of time could indicate to project managers that the project was not running as smoothly as scheduled. Furthermore, Latham Report in 1994 suggested that ensuring timely delivery of projects is one of the important needs of clients of the construction industry. Construction time can be regarded as the elapsed period from the commencement of site works to the completion and handover of a building to the client. The construction time of a building is usually specified before the commencement of construction. Construction time can also be deduced from the client's brief or derived by the construction planner from available project information.

iii) Quality performance

In the construction industry, quality is defined as the totality of features required by a product or services to satisfy a given need, or fitness for purpose (Parfitt and Sanvi do, 1993). In other words, the emphasis of quality in construction industry is on the ability to conform to established requirements. Requirements are the established characteristics of a product, process or service as specified in the contractual agreement and a characteristic is any specification or property that defines the nature of those products, processes or services, which are determined initially by the client. In order to achieve a completed project that meets the owner ' s quality expectations, all parties to a project must acquire an understanding of those expectations, incorporate them into the contract price and other contract documents to the extent possible, and commit in good faith to carry them out (Ganaway, 2006)

iv)Clients' satisfaction

In the construction industry, client's satisfaction has remained an elusive and challenging issue for some considerable time. Dissatisfaction is widely experienced by clients of the construction sector and may be caused by many aspects but is largely attributable to overrunning project costs,

delayed completion, inferior quality and incompetent service providers including contractors and consultants (Contract Journal, 2004).

Client's satisfaction is therefore a fundamental issue for construction participants who must constantly seek to improve their performance if they are to survive in the global marketplace. In the construction industry, the measurement of client 's satisfaction is often associated with performance and quality assessment in the context of products or services received by the client. Parasuraman ,(1988);Soetanto and Proverbs,(2004), Usually the client ' s requirements are to get construction needs translated into a design that specifies characteristics, performance criteria and conformance to specifications, besides to get the facilities built within cost and time (Ahmed and Kangari, 1995).

v) Health and safety

Health and safety are defined as the degrees to which the general conditions promote the completion of a project without major accidents or injuries (Bubshait and Almohawis, 1994). The measurement of safety is mainly focused on the construction period as most accidents occur during this stage. Throughout the world, construction industry is known as one of the most hazardous activities. Thousands of people are killed and disabling injury annually in industrial accident. Construction workers worldwide have three times more chances of dying and two times of getting injured than any worker of other economic activity (Sousa and Teixeira, 2004). In Malaysia, Social Security Organization reported out of the total of 73, 858 industrial accidents recorded in 2003, 4654 were occurred in construction industries with 2 per cent or 95 cases resulting in deaths. There is no single reliable measure of health and safety performance. Traditionally, the safety performance measured through injury statistic. The main purpose of measuring health and safety performance is to provide information on the progress and current status of the strategies, processes and activities employed to control health and safety risks. Effective measurement not only provides information on what the levels are but also why they are at this level, so that corrective action can be taken.

vi)Functionality

Chan (2001) considered 'functionality' as one success measure that is made in the post construction phase when the project is finished and delivered to service. Kometa et al (1995) opined that there would be no point in undertaking a project if it does not fulfill its intended function at the end. This indicator correlates with expectations of project participant and can best be measured by the degree of conformance to all technical performance specification(Chan et al , 2002). Both financial and technical aspects implemented to technical specification should be considered, achieving the fitness for purpose objective. Songer and Molenaar (1996) defined specification as workmanship guidelines provided to contractors by clients or clients ' representatives at the commencement of project execution. The measure of technical specification is to the extent that the technical requirements can be achieved. In addition to that, Songer and Molenaar (1997) consider meeting specification as one success criterion for design-build projects that is consistent with the measurement of technical performance, which is to be measured in both the preconstruction and construction phases when the technical requirements are laid down.

2.2.11 Key Performance Indicators' in DB construction projects

Performance measurement requires an appropriate indicator, which is used as a benchmark or expected performance standard and can describe project performance accurately. Performance indicators must be able to determine the measurable evidence that proves the planned effort has achieved the expected results (Takim et al., 2002).

In DB project, the measurement of project performance is done by using the effectiveness, efficiency and relevance measures. This performance measuring indicators indicates not only the result of project work but also the all processes that happened during the project execution. According to Yuristanti, Wiguna, & Budianto (2020) the three measuring criteria of project performance illustrated as follow; *Effectiveness:* Reflected by the quality of project result. *Efficiency:* assessed by resource usage and *Relevance:* measured by the objectives/ goals achieved in the project.

2.3 Empirical Review

2.3.1 Factor affecting Construction Project performance

Different study identified different factors which affect project performance. To summarize the literature studies of the most commonly identified factors were presented in table -3 below. Table 3: Success or failure factors, which affect the Construction, project performance

No	Studies	Identified factors affecting CPP
1	Chua, D. K. H., Kog, Y.-C., and Loh, P. K. (1999). "*Critical success factors for different project objectives."* Journal of Construction Engineering and Management, 125(3), 142-150	· Adequacy of plans specifications, · Constructability.
2	Toor, S. R., and Ogunlana, S. O. (2009). "*Construction professionals' perception of critical success factors for large-scale construction projects." Construction Innovation: Information, Process, Management, 9(2), 149-167*	· project planning and control, · personnel, · Client involvement.
3	Larsen, J. K., Shen, G. Q., Lindhard, S. M., and Brunoe, T. D. (In Press). "*Factors Affecting Schedule Delay, Cost Overrun, and Quality Level in Public Construction Projects."* Journal of Management in Engineering, 04015032	· Improper planning or lack of project planning, · Errors or absent in consultant follow up. · Errors or omissions in construction work

2.3.2 Practice of Project Delivery system in Ethiopia

Globally, the design-build system was used in the olden days, for instance, during the construction of the pyramids. However, the method is still considered to be one of the innovative methods in the construction industry. This is because the approach was not scientifically acknowledged by then (in the olden days), and its Conditions of Contract have not been realized until the 1970s.

Design Build Institute of America (DBIA) also indicates that compared to the design-bid-build and construction management-at-risk delivery methods, the trend for adopting the design-build approach is increasing since 1995, when only 5percent of the projects were delivered via the design-build method.

According to Lema (2006) it can be seen that design build project has an advantage of saving time and assure better quality and the current performance of the project is promising, it is ahead of schedule and all the design- build team members are involved in reviewing the design to ensure the quality of the product. The owner's involvement during both in design and construction phase is limited.

Regarding Ethiopia context, in the earlier years practice, majority of construction projects are implementing the design –bid- build - traditional delivery system. DBB delivery system considered, as it was the only Delivery practice in previous years. Due to it's easy to manage, fully defined scope, and low price. The DBB delivery system let it preferred by the client.

In the 1970s, large firms began to offer both design and construction services in order to provide project owners with a single source for project delivery at the beginning, but this delivery system was limited to huge and complex industrial projects. According to (Eshetu M., April 2012). In the end of the 1990s ERA had started to implement the DB delivery system to road projects that financed by him. that time based on the data (Abubeker ,2013) among 15 road projects were in progress only 0.28 percent are in cost incremental beyond the initially estimated cost and about 8.9 percent are in time over run . This figure indicate that DB contract has small amount of cost and time overrun compared to DBB contract type. Which is in DBB cost and time overrun is 32.6 percent and 28.2 percent respectively.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the elements of methodology that will used to apply in the study. In this section, the research design, research approach, populations and sampling procedure, the target population, source of data, data collection instruments, and data analysis methods will be discussed.

3.2 Research Design and Approach

Research Designs are plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis. (Cresswell, 2009). Since the objective of this study was to describe the practical performance Assessment of the DB delivery system for the specific housing construction Project, a Descriptive research method was adopted. Descriptive research is a type of research that describes a population, situation, or phenomenon that is being studied. In addition, it is very useful when conducting research whose aim is to identify characteristics, frequencies, trends, correlations, and categories

As this paper planned to study the existing performance evaluation practice and challenges faced during the application of the DB delivery system for the Gergi housing Construction project, a mixed approach both qualitative and quantitative was used. In Qualitative, research approach we gain a detailed understanding of a particular research topic. This is achieved by having relatively fewer respondents and small but focused sample-based data.

3.3 Population and Sampling

3.3.1 Target Population

In this study due to the small group of employees that are engaged in the project work, the target population are limited to project design consultants who have been participated in reviewing the Design work, Client engineers who are deployed in management and project follow up work, and DB builders' engineers and management teams. Hence, the number of total populations involved in this project are 25.

3.3.2 Sample Design

Because the number of project design consultants, Client engineer's and DB builders engineers and management teams working on the project is limited, the researcher intends to conduct a census of respondents from all workers. Taking the entire population into account aids in determining and obtaining high-quality relevant information on the topic. Therefor all the target population were taken as a sample. Therefore 25 respondents were selected from the client, DB builder, and design reviewer teams.

The selection of interview respondent was using non-probability (deliberative) technique. The deliberative choice of interview respondents helps collect the desired and quality information. For the interview the project manager and coordinator were selected as the respondent.

3.4 Data Source and Data Collection instrument

The data source for this study employed both primary and secondary data sources. The first-hand data will be collected by using open-ended questionnaires and semi-structured interviews. While, secondary data will be collected from the organization's website, magazine, project plans, progress reports, site dairy books, and other publications.

For primary data collection, questionnaires were distributed to the site and office engineers involved in project management teams, and semi-structured interviews were conducted to project managers who manage the project.

The questionnaire that is used for this study is composed of two parts. The first part is designed to collect the demographic information from each respondent. The second part contains information to assess variables of project performance and prepared on a five-point scale ranging from "1=Strongly Disagree" to "5=Strongly Agree".

3.5 Method of Data Analysis

After collecting responded data, the data are checked and examined for completeness and clarity. The findings of this study were interpreted using a descriptive method of data analysis. Generalizations were also made based on the results of the study.

Mixed approach research aimed to get a better understanding through firsthand experience, background information, truthful reporting, and clarify problems with assumptions made. Then establish research priorities.

The data from the interview and secondary data sources will triangulate with the questionnaire generated data to describe the process of comparing concurrently collected qualitative findings. The questionnaires generated based on the literature review. The secondary data helps to interpret the findings of the questionnaires and the interview.

3.6 Scale Reliability and Validity

To test the reliability and ensure the validity of the research. Proper due attention was given in sampling and data collection, careful consideration was given to the arrangement of the study questionnaire and research design. A detailed literature analysis was conducted both from international journals and from safety guides created by international institutes in order to assess the safety management practices used.

3.7 Ethical Consideration

The researcher addressed ethical considerations of confidentiality and privacy of all individual respondents. The information collected from the respondents was kept confidential. In addition, all ethical and legal issues will remain in confidence and handled professionally. Moreover, the purpose of the study disclosed in the introductory part of the questionnaire

CHAPTER FOUR: RESULT ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter deals with data analysis and interpretations. The required Data for the study have been collected from the project site, client contract administration, project follow up directorate, and from design reviewer consultant through Sami- structured questionnaires. In addition, the secondary data were collected from reports and contract documents.

4.2 Response Rate

The study targeted 25 respondents who actively participated in the project work. Out of the distributed questionnaires to 23 respondents' 19 questionnaires, representing 82.6 percent of the total questionnaires, were filled and returned. However, 17.4 percent of the questionnaire are not completed and/or returned.

Table 4: Questionnaires Distributed and response rate

Categories of Respondents	No of questionnaires Sent	No of questionnaires returned	No of complete response	Percentage response (percent)
Client	4	4	4	100
Design reviewer	9	8	7	77.7
DB Builder (construction & design.)	10	8	8	80.0
Total	**23**	**20**	**19**	**82.6**

Source: own survey, 2022

4.3 Demographic Characteristics of the respondents

In The following Section, demographic information of the respondent is presented based on their gender, age, educational level, and work experience. This information has been collected from part –I of providing questionnaires.

Table 5: Demographic characteristics of the respondent

Description		Frequency	Percentage (percent)
Gender	Male	14	73.7
	Female	5	26.3
Age	21-30 yrs	7	36.8
	31-40 yrs	9	47.4
	41-50 yrs	3	15.8
	> 50 yrs	0	0
Educational Level	Diploma	0	0
	First Degree	12	63.2
	Master's degree	6	31.6
	PhD	0	0
Experience of the respondent in construction projects	2-4 yrs	6	31.6
	4-6yrs	2	10.5
	6-8yrs	1	5.3
	8-10yrs	1	5.3
	>10yrs	9	47.4

Source: own survey, 2022

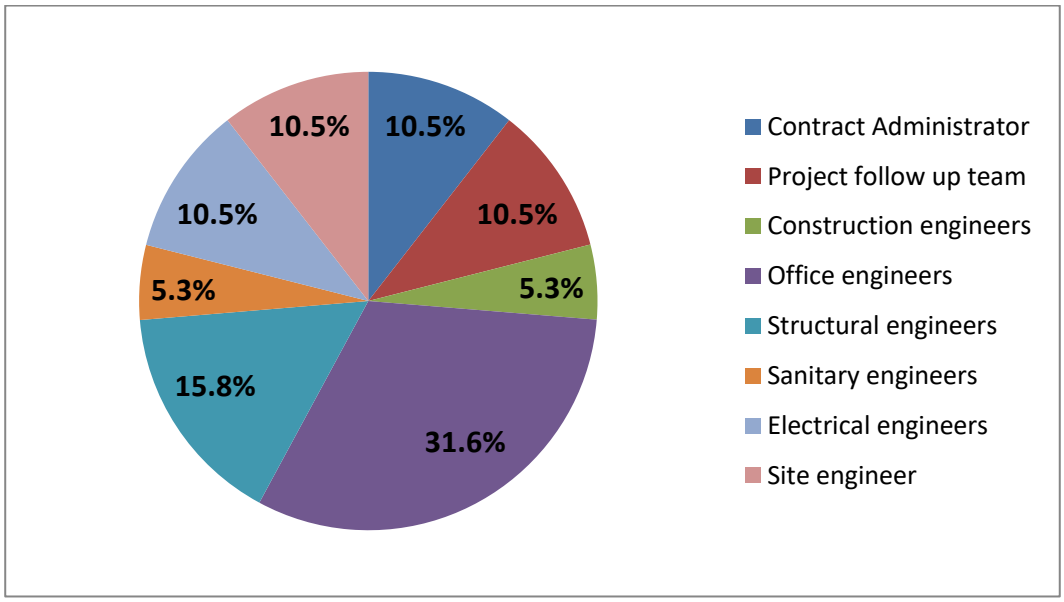

Figure 4: Respondents' Role and responsibility in the project

Source: own survey, 2022

As seen from table 5, the gender distribution of the respondent is 73.7 percent of males and 26.3percent of females. Regarding their educational level, 63.2 percent of the respondents hold a

first degree, and 31.6percent holds a second degree. The respondent's work experience related to construction projects classified as 31.6 percent are under four years' experience, 15.8 percent are from 4 to 8 years, 5.3percent of them are 8 to 10 years, and 47.4percent more than ten years. Concerning their position in the project, 10.5percent, 10.5percent, 36.8 percent, and 42.1percent of them are client contract administrator and project follow up teams, Design reviewer teams, and DB builder teams or contractor teams, respectively.

Generally, most of the respondents are male, hold a first degree, and have more than ten years of experience on construction projects.

4.4 Overview of project Status

Gergi Modern housing project is one of the new experiencing projects in the country. The project Contract incorporates the design and building of 16 (Sixteen) Higher officials (VIPs and VVIPs) in two types of apartment buildings that will complete all associated modern facilities and compound infrastructure works as per the employer's requirement and approved contractor's proposal. The project plot area is around 29000m2, which has previously owned by the FHC.

According to the project teams' information, the project Status is on final stage of completion. Recently, at the time of data collection, the major elements of the project were completed but still, some elements of work; electrical, sanitary, and finishing works were about to finish within weeks.

4.5 Study Findings and Discussions

Analysis of the data has done using the qualitative data analyzing method considering the research questions and objectives. Each concept has discussed according to the respondents' view of FHC (Employer) Representatives, Design-builder, and Design reviewers.

To assess the performance level of the project in association with time, cost, quality, client requirement (satisfaction), and functionality, relative questions were asked to project participants. Accordingly, the responses of participants have discussed in the upcoming sub-sections.

In this study the mean score more than, 1.5, 2.5, 3.5, and 4.5 is considered as the value of the next higher score and vice versa.

4.5.1 Project Performance Related to Time (Schedule)

In this section, questions were asked to respondents that relate to measuring the time (schedule) performance. Hence, the responses are analyzed and presented in table 6 below.

Table 6: Data on Time related performance

Q	List of factors	Frequency (%)					Mean	Std. Deviation
		1	2	3	4	5		
1	The project was delivered as per contract period	5.3	21.1	36.8	21.1	15.8	**3.21**	**2.884**
2	As DB contractor's early involvement in designing Phase, assist him to visualize more of detail design & shorten project period.	0	5.3	5.3	57.9	31.6	**4.16**	**3.699**
3	There was schedule delay due to client frequent shaft of requirement or scope change	0	31.6	10.5	52.6	5.3	**3.32**	**2.938**
4	As both the designing and construction, responsibility is given to the DB builder, reducing communication cannel and project time.	5.3	10.5	26.3	42.1	15.8	**3.53**	**3.162**
5	Due to minimum involvement of the client in schedule follow up, the project period is elongated.	15.8	10.5	36.8	36.8	0	**3.05**	**2.714**
6	Overlap of design and construction phases in DB reduced overall project time.	0	10.5	15.8	42.8	31.6	**3.95**	**3.539**
7	In general, The overall project period reduced in DB contract than Traditional (DBB) form of delivery system	0	5.3	21.1	47.4	31.6	**4.05**	**3.613**
	Grand mean and Standard Deviation						**3.61**	**3.221**

Source: survey *Data, 2022*

As presented in table 6, the respondents' mean score regarding time performance has ranged from 3.05 to 4.16, and the grand mean is 3.61. It shows that the project has some schedule slippage from the intended time frame of the project. While in other measures, the respondents agreed with a mean score of 4.16 and a standard deviation of 3.699 that early participation of DB contractors in design preparation helps to understand it in detail. As a result, the contractor knows every design aspect ahead and uses alternative work methodology that minimizes the project period.

They also agreed that, with a mean score of 3.95 and 3.539 standard deviations, preparing the design while the construction is in progress affects the project duration by reducing the overall project time.

Regarding the delay in design due to shaft of requirement by the client, with 3.32 mean value and 2.938 standard deviation, respondents agreed that there is a frequent shaft of requirements (scope change) that results to project time extension. When it looked on the involvement of the Employer on project follow up, according to the analyzed mean score of 3.05, there was little involvement of employer on schedule follow up. This trend contributes for project time elongation.

The result from the analysis confirms that as compared to the DBB delivery system, the DB delivery system is more time-efficient and effective than the traditional DBB system with mean score and Standard deviation of 4.05 and 3.613 respectively.

The grand mean of 3.61 and grand standard deviation of 3.221 shows that the project which implements the DB system is successful in time performance. As per the interview of project participants the teams are highly committed for better schedule performance accomplishment.

Also, in other research findings (S. Ratnasabapathy and R. Rameezdeen ,2019) concluded that the DB delivery system shows best performance both in cost & time. According to (Florence Ling, Edwin Leong,2015) findings also show that all clients, architect and contractors generally agree that DB projects can be completed in a shorter time. The main reason for this is contractors ‘early involvement in the project, giving them the opportunity to contribute to the design upstream of the construction process.

4.5.2 Project Performance Related to Cost

The respondents were asked about performances of the project, related to the cost used directly to project activity. Hence, the responses of respondents have presented in Table 7 below.

Table 7: Data related to Cost performance

Q	List of factors	Frequency (%)					mean	Std. Deviation
		1	2	3	4	5		
1	The Project was completed as per the allocated budget or under budget	10.5	26.3	21.1	36.8	5.3	**3.00**	**2.695**
2	As both the responsibility of design and construction have given to the DB contractor, the overall project costs have minimized	5.3	5.3	21.1	63.2	5.3	**3.58**	**3.162**
3	Because the DB designer and builder work closely, the additional cost incurred due to design and construction errors have minimized.	5.3	5.3	42.1	26.3	15.8	**3.44**	**2.991**
4	The Early involvement of the contractor in the design allows him to cost saving design solutions and construction methods applied by the contractor.	0	5.3	26.3	63.2	5.3	**3.68**	**3.212**
5	The initial cost is much higher than the traditional delivery method due to the absence of cost competition in the early procurement phase.	0	5.3	21.1	57.9	10.5	**3.78**	**3.228**
6	DB system allows early knowledge of maximum project cost, it Assists the client in managing the project cash flow in a better way.	0	0	10.5	68.4	21.1	**4.11**	**3.613**
7	The risk of cost variation has a minimum in the DB delivery system compared to the traditional (DBB) delivery system.	5.6	0	11.1	66.7	16.7	**3.89**	**3.372**
	Grand mean and Standard Deviation						**3.64**	**3.219**

Source: survey *Data, 2022*

As shown from the table 4.4 above respondents were asked to respond whether the project is completed as per the allocated budget or above budget. According to the response with 3.00 mean score and 2.695 Standard deviations most respondents were not sure that the project has completed as per the allocated budget.

Early participation of the contractor in design work and giving both the responsibilities of design and construction works to the contractor, benefits the project in cost-saving with a mean score of 3.68 and 3.58 respectively.

From the result of data analysis with a mean score of 3.44, when the DB designer and the contractor work closely in Design preparation errors has minimized. Thus, the additional cost required for error correction was saved. The respondents also asked to compare the initial cost of the project with the DBB delivery method. Due to the absence of cost competition in the early procurement phase, the initial project cost of the DB delivery system was higher than the traditional delivery method, with a mean score of 3.78 and standard deviation 3.228.

One of the advantages of the DB delivery system is early knowledge of total project cost, helps the employer manage the cash flow in better ways. Thus, this finding supported the above statement with 4.11 mean score and 3.613 Standard deviations that the DB system allows early knowledge of maximum project cost and Assists the employer in managing the project cash flow in better way.

The respondents have asked about the risk level of cost overrun in the DB project compared to the DBB project. The result shows that with 3.89 mean scores, the risk of cost overrun is lower in DB projects as compared to that of traditional DBB projects.

Generally, according to the analysis and presentation in table 4.4, the grand mean and grand standard deviation are 3.64 and 3.219 respectively. This tells us the project has been executed with better cost performance.

4.5.3 Project Performance Related to Quality

Quality is one of the performance criteria in construction projects. To assess the quality level of the project, questionnaires related to quality assessment has sent to the respondents, and their responses are presented in table 8 below.

Table 8: Data related to quality performance

Q	List of factors	Frequency (%)					mean	Std. Deviation
		1	2	3	4	5		
1	The final project output fulfilled the intended project quality	5.9	0	17.6	64.7	10.5	**3.78**	**3.261**
2	The overall design qualities meet the expected design standards.	0	15.8	15.8	52.6	15.8	**3.68**	**3.277**
3	The DB builder gives more attention to cost and schedule but little attention to quality.	36.8	15.8	26.3	21.1	0	**2.32**	**2.103**
4	The project team's technical capability and commitment affect the project's overall quality	0	36.8	10.5	31.6	21.1	**3.37**	**3.061**
	Grand mean and Standard Deviation						**3.29**	**2.948**

Source: survey *Data, 2022*

As seen in table 8, with mean scores of 3.78 and 3.68, the final project outputs attained the intended quality. Regarding attention given to the quality, based on the responses, with a mean value of 2.32, the respondents believe that project quality has not been compromised. The result also shows, with a mean score of 3.37, that the influence of team capability and commitment affected the project's output quality.

The response obtained from the interview and project inspection, quality has maintained as per the required standard, as the grand mean and grand standard deviation scored 3.29.and 2.948. Generally, as per the result questionnaire survey analyses with grand mean score of 3.29 and information obtained from the interview, the projects was effective in quality performance.

Also, from the research (Florence Ling, Edwin Leong,2015) finding confirms that the Design-Build delivery is better suited to handle changes and ensuring the highest quality.

4.5.4 Managing Client Requirements in the DB project

Since the DB project has characterized by a single point of contract system between the client and the contractor in which both designing and construction responsibilities are given to the contractor. Though, the system brings an advantage to the Employer by minimizing risk. It also has a drawback to the client in controlling project activity.

Table 9: Data related to client requirements

Q	List of factors	Frequency (%)					mean	Std. Deviation
		1	2	3	4	5		
1	The final project deliverables increased the client's satisfaction.	0	7.1	21.4	64.3	7.1	**3.71**	**3.251**
2	On the TOR, the total client requirements have incorporated in the initiation and design phase.	5.6	11.1	22.2	61.1	0	**3.39**	**2.981**
3	During the implementation phase, scope Changes initiated by the contractor (DB designer) affect the client requirements and deliverable amenities.	11.8	5.9	41.2	41.2	0	**3.12**	**2.744**
4	Due to the less involvement of the client in the project activities, the contractor uses this coincidence to take advantage of compromising the client's requirement.	5.6	33.3	44.4	16.7	0	**2.72**	**2.309**
	Grand mean and Standard Deviation						**3.24**	**2.822**

Source: survey *Data, 2022*

As per the analysis result shown in table 9, final project deliverables increased client satisfaction with mean 3.71. Also, on the TOR client requirements have been incorporate in the initiation and design phase with mean of 3.39. Regarding change of scope, with mean score of 3.12, scope changes were occurred; as a result, employer's requirement and the deliverable amenities are affected.

In generally regarding with employer's requirement performance criteria, with grand means of 3.24 and grand standard deviation of 2.822, the employer has satisfied with the project deliverable also his expectations and requirements are maintained.

4.5.5 Functionality Performance

Table 10: Response data related to functional performance

Q	List of factors	Frequency (%)					mean	Std. Deviation
		1	2	3	4	5		
1	The final project amenities have delivered as per the specification and the standards.	0	16.7	27.8	33.3	27.8	**3.68**	**3.309**
2	The functional quality of DB projects satisfies the client's requirements	0	5.6	16.7	61.1	16.7	**3.89**	**3.432**
	Grand mean and Standard Deviation						**3.79**	**3.370**

Source: survey *Data, 2022*

Based on the analyzed data in table 10, regarding the standards and specifications of delivered amenities and functional quality of the project, respondents agreed with grand mean of 3.79 and grand standard deviation of 3.370 that the project achieved the intended functional performances.

Summarizing the performance of the Gerji modern housing construction project, which implements the DB Delivery system, according to the response given in the above analysis table, the grand mean and corresponding standard deviation were analyze and summarized in table 11. Regarding time, cost and quality performance efficiency, as per the arithmetic explanation of time, cost, and quality performance, the grand mean scores are 3.61, 3.64 and 3.29 respectively. These explain that the project was successful with time, cost and quality efficiency. To these ends, researches underpin that construction projects with the traditional DBB delivery system contract. Mostly have problems of time and cost overrun that affect project performances. Thus, as per the findings of this study, the DB contract system can be best alternative to accomplish projects with better schedule and cost performance.

Regarding the performance of functionality and Employer satisfaction, the grand mean score for client requirement and functional performance is 3.24 and 3.79 respectively. This score explains that the project was successful with client satisfaction and expectations. The following table and figure aggregate the overall performance level of the project.

Table 11: Grand mean of project's performance variable

Project Performance Variables	Grand Mean score
Time performance	3.61
Cost performance	3.64
Quality performance	3.29
Client satisfaction level	3.24
Functionality performance	3.79

Source: survey *Data, 2022*

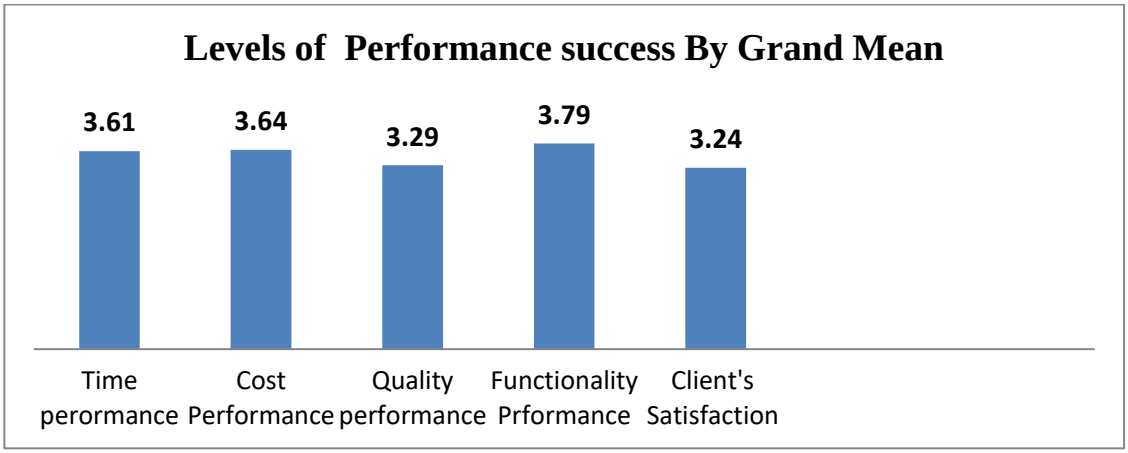

Figure 5: The Level of Performance Successes

Source: survey *Data, 2022*

4.5.6 Responses to Challenges on Project Performance

Regarding the challenges occurred in project activity, specifically related to DB contract, respondents were asked the following questions which are most likely occurred and have direct effect on project performance. Accordingly, they are asked to choose and order on their effect on performance. The listed potential challenges were obtained from previous studies.

Table 12: Challenges in DB project

	Sort of challenges	Frequency	Percentage	Rank
A	Communications gap between the contracting parties.	5	27.8	5
B	Unavailability of required expertise with DB project management experience	9	50.0	2
C	Poor contract documents especially, on employer‘s requirements and particular conditions of contract	2	11.1	7
D	Poor scope definition, insufficient planning, and preparation for the project	9	50.0	2
E	Delayed design approval on the employer's representative side	13	72.2	1
F	Financial incapability of contractor	0	0	10
G	Financial incapability of client	1	5.6	9
H	Week management system; Cash flow management problem of the contractor	5	27.8	5
I	Poor design performance by DB Designer	8	44.4	4
J	Excessive Price escalation	2	5.6	9

Source: survey Data, (*2022)*, Sisay (2017), a Thesis Study on the “Challenges of DB Delivery System in Ethiopian Road Authority Project,” Addis Ababa University School of civil and Environmental Engineering.

Table 12 above shows the top–four challenges that influence project performance concurred by the respondents are;

- ✓ Delay in design approval from the employer’s representative side.
- ✓ Unavailability of required expertise with DB project management experience
- ✓ Poor scope definition, insufficient planning, and preparation for the project
- ✓ Poor design presentation by DB Designer

CHAPTER FIVE -CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This last chapter of the study presents the summary of major findings which are obtained from the response of the research questionnaire and interview of the participant. The conclusion drawn from the findings and the interview with respect to the research question and the recommendation are also presented.

5.2 Summary of Findings

The main objective of this study is to assess the performance levels of the DB contract system and the challenges encountered throughout the construction of Gerji Modern housing construction project. This study has been conducted to find the performance level of the project relative to its Schedule (time) management, Cost-effectiveness, quality level, management of client needs in the design and construction phase, and functionality performance. In addition, the study assessed the most frequent challenging factor faced during project work.

Generally, the findings of the study underpinned that the project's performance concerning effective use of time is satisfactory. The final project output fulfilled the intended project quality. However, team capability and commitment affected the quality of project. Regarding the cost performance, the project was completed as per the allocated budget. but the initial contract amount is higher.

The Employer's requirements were maintained. Regarding the functionality performance, the project deliverables have delivered as per the specification and the standards.

5.3 Conclusions

Based on the findings and data analysis of the study, the following conclusions have established the performance of the DB contract system in the case of Gerji Modern housing construction Project.

- ✓ The DB contract system, as compared to the DBB delivery contract, implementing the DB delivery system, the overall project schedule performance is satisfactory. But, the initial contract cost of the project is higher than that of DBB due to the absence of cost competition in the early procurement phase.
- ✓ Early knowledge of maximum project cost allows the employer to manage the project cash flow in better way. Additionally, the Risk of cost variation to employer side has been avoided because cost variations incurred from inflation and other factor were absorbed by the DB builder.
- ✓ The study justifies that the early involvement of the DB builder or contractor assists him with an in-depth understanding and review of the design. As a result, design errors minimized. Even if an error is occur they get enough time to amend the design without affecting the construction time.
- ✓ As both responsibilities of design and construction work were given to a single entity (DB builder), the project is successful in both Time and cost performance. And the Quality is not compromised while there is no employer in the close controlling system.
- ✓ DB projects require qualified, competent, and skilled professionals to deliver projects with intended objectives.
- ✓ The project outputs have been completed as per the specification and the standards of the contract agreement.
- ✓ The most frequently challenging experience that the project teams were facing are; Delay in design approval from the employer's representative side, Unavailability of required expertise with DB project management experience, Poor scope definition, insufficient planning and preparation for the project, and Poor design presentation by DB Designer are the main challenges.

5.4 Recommendations

Based on the above findings and the study objectives, the researcher would like to suggest the following recommendations.

- ✓ The Employer should give enough time for the preparation and planning phases.
- ✓ However, the DB Contract system is effective in time. Due to the absence of price competition in the procurement stages, the initial cost of the project is higher. Thus, if there is some

mechanism for a price-competitive procurement system for DB delivery system it will be more advantageous for the employer to contract projects with reasonably minimum price.

- ✓ The employer should control the builder for the deployment of qualified and competent professionals in the DB-type projects. Deploying the relevant professionals helps to amplify the success of the project.
- ✓ The scope and Employer requirements should be clearly specified in the initiation and design phase.
- ✓ To manage the project schedule effectively, the design review and approval process should be done within required time.
- ✓ Due to better performance of time and cost in the DB contract system, it is recommendable to implement the Design-build delivery system for large and complex projects.

5.5 Recommendation for Further Study

- ✓ Research can be carried out on how the DB delivery system are affecting the cost, schedule, and quality performance of construction projects and contribute to the development of the country.
- ✓ Since performance evaluation and DB delivery system is such a large topic, study into methods of performance evaluation on other construction areas such as motorways, dams, rail lines, demolitions, and maintenance can be done.
- ✓ Research can be extended to include challenges of DB delivery system in all of government owned projects.

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Appendix I: Research questionnaire

ADDIS ABABA UNIVERSITY

School of Commerce

Department of Project Management

Dear Respondent,

I am a postgraduate student at Addis Ababa University School of Commerce. I have prepared this questionnaire in order to conduct a study for the partial fulfillment of the requirements for the Award of a Master's Degree in Project Management at the University. The title of the research work is, "**Assessment of Performance evaluation and challenge of Design- build delivery system the case of Gergi Modern housing construction project. "** hence, to gather the required information for the study, I kindly request your assistance in responding to the questions listed below.

Any information you present will be kept absolutely confidential and will only be used for academic purpose.

Thank you in advance for taking your time to complete the questionnaire.

With Regard

Getnet Mersha

Please note the following instruction

- ✓ You are not expected to write your Name
- ✓ Please put (√) on the rectangular space or write your respond on the provided space for back ground information.

PART I – Background Information

1. Sex : a) male ☐ b) Female ☐
2. Age: a) 21—30 ☐ b) 31- 40 ☐ c) 41- 50 ☐ d) above 50 ☐
3. Educational back ground: a) Diploma ☐ b) First degree ☐ c) Master's degree ☐
   d) PhD ☐
4. Your work experience In construction project/s a) 2- 4 years ☐ b) 4- 6 years ☐
   c) 6 – 8 years ☐ d) 8- 10 years ☐ more than 10 ☐
5. Your position in the project_____

PART II – Question about the project performance

Please use the following key for your respond –

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	2	3	4	5

1. Question related to Design- build (DB) Schedule, budget and quality performance level

How do you experience and information you have on the project, to what extent do you agree with the following performance statements. Put √ sign on your agreed box.

No	Questions	1	2	3	4	5
	Time performance					
1	The project was delivered as per contract period					
2	As DB contractor's early involvement in designing Phase, assist him to visualize more of detail design & shorten project period.					
3	There was schedule delay due to client frequent shaft of requirement or scope change					
4	As both the designing and construction, responsibility is given to the DB builder, reducing communication cannel and project time.					
5	Due to minimum involvement of the client in schedule follow up, the project period is elongated.					
6	Overlap of design and construction phases in DB reduced overall project time.					
7	In general, The overall project period reduced in DB contract than Traditional (DBB) form of delivery system					

	B. Cost performance					
1	The Project is completed as per the allocated budget or under budget					
2	As both the responsibility of design and construction have given to the DB contractor, the overall project costs have minimized					
3	Because the DB designer and builder work closely, the additional cost incurred due to design and construction errors have minimized.					
4	The Early involvement of the contractor in the design allows him to cost saving design solutions and construction methods applied by the contractor.					
5	The initial cost is much higher than the traditional delivery method due to the absence of cost competition in the early procurement phase.					
6	DB system allows early knowledge of maximum project cost, Assists the client in managing the project cash flow in a better way.					
7	The risk of cost variation has a minimized in the DB delivery system compared to the traditional (DBB) delivery system.					
	Quality Performance					
1	The final project output fulfilled the intended project quality					
2	The overall design qualities meet the expected design standards.					
3	The DB builder gives more attention to cost and schedule but little attention to quality.					
4	The project team's technical capability and commitment affect the project's overall quality.					
	Client requirement					
1	The final project deliverables increased the client's satisfaction.					
2	On the TOR, the total client requirements have incorporated in the initiation and design phase.					

3	During the implementation phase, scope Changes initiated by the contractor(DB designer) affect the client requirements and deliverable amenities.					
4	Due to the less involvement of the client in the project activities, the contractor uses this coincidence to take advantage of compromising the client's requirement.					
	Functionality					
1	The final project amenities have delivered as per the specification and the standards.					
2	The functional quality of DB projects satisfies the client's requirements					

2. In your understanding, which areas of project activity (time, cost or quality) does the DB contract significantly successful. Describe them

_____

_____

_____

_____

3. From the following listed challenges, choose one or more major challenges that project team frequently faced in Appling the DB contract. Circle your answer/s on the corresponding letters/s.

A. Communications gap between the contracting parties.

B. Unavailability of required expertise with DB project management experience

C. Poor contract document especially on employer's requirement and particular conditions of contract.

D. Poor scope definition , insufficient planning and preparation for the project

E. Delayed design approval on the employers representative side.

F. Financial incapability of contractor

G. Financial incapability of client

H. Week management system; Cash flow management problem of the contractor

I. Poor design performance by DB Designer

4. Please describe other challenges that the project practically facing .List them on the space provided

_____

_____

_____

_____

5. Please, list the challenges in order. (Of their most challenging to least challenging to) project performance.

_____

Thank you

Appendix II: Interview Questions

Dear Sir,

First of all I would like to express my deepest gratitude for your cooperation in answering for the Following interview questions.

My name is Getnet Mersha I am a postgraduate student of Addis Ababa University, School of Commerce; department of Project Management. Currently, I am conducting a research entitled "Assessing the Performance and challenge of Design- build delivery system the case of Gurgi Modern housing construction project as a partial fulfillment of study work requested for MA degree. The purpose of the study is to assess the performance of the Design –build (DB) delivery system and its challenges and success on implementing the delivery system.

Questions

i. What is the your roll and responsibilities in the project?
ii. How do you evaluate the project performance practice of the project terms of cost? Time? And quality?
iii. To what extent did the scope change occurred .and its effect on cost and project duration due to scope change.
iv. Since the project is DB delivery system, both the responsibility of design and construction given to DB contractor, how the client requirement was managed.
v. What are challenges you faced during design phase? And implementation phase? And how did you solved them?

Thank you!