



**JIMMA UNIVERSITY
JIMMA INSTITUTE OF TECHNOLOGY
SCHOOL OF GRADUATE STUDIES
FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING
CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR**

**PERFORMANCE OF PROJECT CONSULTANTS IN PUBLIC
BUILDING CONSTRUCTION PROJECTS: IN CASE OF JIMMA TOWN**

A Research Submitted to School of Graduate Studies, Jimma University, Jimma Institute of Technology, Faculty of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree Master of Science in Construction Engineering and Management

By

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DECLARATION

I declare that this research entitled “Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town” is my original work and has not been submitted as a requirement for the award of any degree in Jimma University or elsewhere.

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ABSTRACT

Currently, Ethiopian's construction industry is in a struggle of undertaking mega projects that demands huge physical resources, finance and political decisions. However, the lion share of design preparation and supervision part were goes to the consultant firms. Therefore, the project consultants play a very significant role in providing services in the production of well-coordinated design, timely supervision and proper contract administration from the beginning to the completion of the project. This helps to overcome the very common problems of projects such as claims, project delay, poor quality product and greater uncertainties of project cost. Beside, when the consultancy services are not effectively and properly delivered, it is very difficult to ensure the successful completion of the primarily objectives of the given projects.

Therefore, this study aims to assess the major factors affecting the performance of project consultants, their impacts on project success and remedial measures in case of Jimma Town. To achieve the objectives of this study purposive sampling technique and descriptive type of research design were used. Questionnaire survey was conducted using 68 identified factors which are categorized into 9 groups. 52 Questionnaires were distributed, and 46(88.11%) questionnaires were returned. The results were analyzed using Microsoft Excel, and SPSS then ranked using Relative Importance Index (RII) and presented by tables and charts.

Accordingly, the top five most important factors agreed by clients, consultants and contractors were: Management related factor, Environment related factors, Material related factors, political and economic related factors and design and supervision related factors respectively. Unfortunately, occurrence of claim and disputes on contractors, demolition and rework, project delay and wastage of construction materials were ranked as the most common effects due to inadequate project design and supervision consultancy service. Adversarial relationship among the contracting parties, increased project cost, delay of payment, productivity loses and contract cancellation were also forwarded from interviewers as the serious impacts in the study area. Furthermore, Continuing client and contractor involvement in the design and supervision management/ lean construction approach, Working cooperatively together, sharing the same vision and objectives for the project, Involving all project teams in decision making processes, Spending sufficient time and money in project planning, Design and supervision, Practicing consultancy performance appraisal, Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone, Mission-focus/priority-setting, Training design and supervision personnel available across all disciplines and Framing the contracting arrangement around goodwill and fair dealing in an open communication environment respectively were ranked as the highest remedial measures.

Finally, the study conclude that; there were still numerous factors affecting the performance of project consultants within a projects and this also influences time, cost and quality performance of public building construction projects in Jimma Town.

Key words: *Construction industry, Design supervision, Project consultant, Project success*

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TABLE OF CONTENTS

DECLARATION	I
ABSTRACT	II
ACKNOWLEDGMENT.....	III
LIST OF TABLES	VIII
LIST OF FIGURES	IX
ABBREVIATION.....	X
CHAPTER ONE	1
1. INTRODUCTION	1
1.1 Background of the study	1
1.2 Statement of the problem	2
1.3 Research questions.....	3
1.4 Research Objectives.....	4
1.4.1 General Objective	4
1.4.2 Specific Objectives	4
1.5 Significance of the study.....	4
1.6 Scope of study.....	4
1.7 Limitation of the study.....	5
CHAPTER TWO	6
2. LITERATURE REVIEW	6
2.1 Overview.....	6
2.2 Construction industry development in Ethiopia: Scenario	7
2.3 Main Parties involves in construction projects	8
2.3.1 Client/Owner.....	8
2.3.2 Engineer/Consultant.....	8

2.3.3 Main Contractor	9
2.3.4 Sub-Contractor	9
2.4 Relationship among the parties involved in construction project	10
2.5 Construction Project Performance Criteria	11
2.6 Project Design and consulting firm.....	12
2.6.1 Project Design and consulting phase	13
2.6.2 Design deficiency in construction project.....	14
2.6.3 Improving the Quality of Design Consultancy Service	15
2.7 Construction Project Consultants Performance	16
2.7.1. Role and Responsibilities of the construction Project Consultants	16
2.7.2. Leadership Skills of construction Project Consultants	18
2.8 Factors affecting the performance of project design and supervision consultants	19
2.8.1 Barriers hindering the Implementation of consultancy service in project	20
2.9 Construction Projects Supervision	21
2.9.1 Need for Project Supervision on Construction Sites	21
2.9.2 Role and Responsibilities of Construction Site Supervisors.....	22
2.9.3 Factors Affecting performance of Project Supervisors.....	22
2.10 Impacts of Inadequate project design and supervision consultants performance on project success.....	23
2.10.1 Experience from studies conducted in Ethiopia.....	24
2.11 Remedial measures for improving design consultants and supervisors' performance	25
CHAPTER THREE	26
3. RESEARCH METHODOLOGY	26
3.1 Study area.....	26
3.2 Research Design.....	26

3.3 Study Variables.....	27
3.4 Population and Sampling Technique	27
3.5 Data Source and Collection Methods	28
3.6 Data Presentation and Analysis	28
3.7 Reliability of the Research.....	29
3.8 Ethical consideration.....	30
3.9 Plan for dissemination.....	30
3.10 Research Beneficiaries.....	30
CHAPTER FOUR.....	31
4. RESULT AND DISCUSSION	31
4.1 Questionnaire distribution rate.....	31
4.2 Background of the respondents	31
4.2.1 Firms role in the project.....	31
4.2.2 Position in the Projects.....	32
4.2.3 Work Experience	32
4.3 Factors affecting the performance of project consultants in public building construction projects.....	33
4.3.1 Management related factors.....	33
4.3.2 Design and supervision related factors	35
4.3.3 Time related factors	37
4.3.3 Cost related factors	38
4.3.4 Quality related factors.....	39
4.3.5 Material related factors	40
4.3.6 Health and Safety related Factors	41
4.3.7 Political and economic related factors	42

4.3.8 Environment related factors.....	43
4.4 Relative importance index for group of factors affecting the performance of project consultants.....	44
4.5 Reliability check using Cronbach’s Alpha	45
4.6 Impacts of inadequate project consultant’s performance on the success of public building projects.....	46
CHAPTER FIVE	51
5. CONCLUSION AND RECOMMENDATION.....	51
5.1 Conclusion	51
5.2 Recommendations.....	52
REFERENCES	54
APPENDIX A1: QUESTIONNAIRES FOR CONSTRUCTION STAKEHOLDERS	59
APPENDIX A2: Interview Questions	66
ANNEX B1: Factors affecting the performance of project design and supervision consultants.	69
ANNEX B2: Impacts of Inadequate project design and supervision consultancy service on project success	73
ANNEX B3: Remedial measures of reducing impacts due to inadequate project design and supervision consultants on project success.....	74
ANNEX C: Reliability check using Cronbach’s alpha.....	76

LIST OF TABLES

Table 2. 1 Roles And Responsibilities Of Project Consultants In Different Construction Stages	17
Table 2. 2 Leadership Skills Of Project Consultants In The Construction Industry.....	18
Table 4. 1 Rate of Response.....	31
Table 4. 2 Management Related Factors Affecting The Performance of Project Design and Supervision Consultant	33
Table 4. 3 Design And Supervision Related Factors Affecting The Performance of Project Design And Supervision Consultant	35
Table 4. 4 Quality related factors affecting the performance of project design and supervision consultant.....	49
Table 4. 5 Relative Importance Index For Group of Factors	44
Table 4. 6 Reliability Check/ Cronbach's Alpha	45
Table 4. 7 Impacts of Inadequate Design And Supervision Constancy On Building Project Success	46
Table 4. 8 Remedial Methods To Be Taken	48

LIST OF FIGURES

Figure 2. 1 Contractual relationship among the parties	11
Figure 3. 1 Study area lactation.....	26
Figure 3. 2 Population and sampling process	27
Figure 3. 3 Data source and collection procedure	28
Figure 4. 1 Firms in the project	31
Figure 4. 2 Respondents position within the project.....	32
Figure 4. 3 Respondents work experience	33
Figure 4. 4 Time related factors	37
Figure 4. 5 Cost related factors	38
Figure 4. 6 Material related factors.....	40
Figure 4. 7 Health and safety related factors	41
Figure 4. 8 Political and economic factors.....	42
Figure 4. 9 Environment related factors	43

ABBREVIATION

BC	Building Contractor
FIDIC	Federation International Des Ingenieurs Conseils
GC	General Contractor
GDP	Gross Domestic Product
JIT	Jimma Institute of Technology
JU	Jimma University
RC	Road Contractor
RII	Relative Importance Index
UCBP	University Capacity Building Program

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Construction industry has been booming without interruption and its contribution to the development of economy in general and economy of individual country of the world in particular has also become remarkable in the recent decades (Gizaw, 2021). The products of this industry provide the necessary public infrastructures and private physical structures for many daily activities such as services, commerce, utilities and other industries (Mohd Nawi, et al., 2014). The need of infrastructural developments and the number of international construction enterprises (overseas experts, contractors, consultants, construction managers having desire to participate in such developmental project, in particular in the developing countries) is increasing (Gizaw, 2021). Hence, this increased complexity, uncertainty, and time pressure in construction projects have increased the need for cooperation among different project actors; the differences in perceptions among the parties of the projects, conflicts are inevitable (Khekale & Futane, 2015). This indicates that there is need for proper relationship between the parties for effective delivery of the construction project with in specified time, cost and quality (Biketi, et al., 2017). However, construction project is called successful, when it is completed within the time, cost, and quality specified at the beginning of the project (Shahraki, et al., 2018). Hence, the quality of design and project supervision has direct impact on project success (Pandit, et al., 2015). Kimingi & Olango, 2020) noted that, project supervision is the process of ensuring that the project is built in accordance with the requirements of the contract documents, approved plans, specifications, building code standards and applicable local codes and ordinances. Though, adequate design consultancy and quality of supervision exercised at planning and production stage are the best ways of achieving construction project quality delivery. Hence, design and supervision consultants contribute a significant role for delivery of a construction project within budgets for the expected purpose. For designs to be effective, inputs to the design phase have to be as per the requirements of the client, codes of practices, rules and regulations of the input activities. When the actual inputs do not meet the requirements of the inputs to the design phase, inadequacy of inputs occur. These inadequacies lead to ineffective designs resulting in negative effects on the performance of construction projects (Daluwatte & Ranasinghe, 2020). However, design consultancy services like

counseling services, feasibility studies, preparation of detailed design and its development, preparation of contract documents, specialized design supervision, project and program management is needed over the entire project lifecycle. Hence, project owners should have to select a responsible consultant or a team of consultants for design and supervision of works during the selection process (Choudhry, 2016). Moreover, it is crucial to understand the aims of consultant and supervisors to develop design consultancy and supervision collaboration in practice. Therefore, this study aims to assess the major factors affecting the performance of design and supervision consultants of public building projects in case of Jimma town.

1.2 Statement of the problem

Internationally construction projects exhibit time and cost overrun (Pandit, et al., 2015). Though, delivering the agreed scope of a construction project within the agreed cost and time frame is a challenge. These cause significant impacts on the construction industry requiring additional resources such as materials, human resources, machinery, fuel and others (Daluwatte & Ranasinghe, 2020). Similarly, in Ethiopian's construction industry the lion share of design preparation, consultancy and supervision part were goes to the consultant firms. So, the design responsibility is transferred from the owner organization to the Consultant who is responsible for the design and supervision management in the Project and to be delivered by the design procedure system (Bassa, et al., 2019). Hence, project consultancy services problems have many negative impacts on project progress which has created wide ranges of discrepancies among stakeholders of the project. If project consultancy services are not effectively and properly delivered, it is very difficult to ensure the successful completion of the primarily objectives of the given projects. One important factor in maintaining and controlling project performance or success is through continuous supervision. Thus, the success of these projects is very important (Shahraki, et al., 2018).

Unfortunately, lack of information about the type of contracts, the conditions of contracts, major design issues, standard specifications and major design criteria to managers and engineers who works in consultant offices are one of the major problems that construction industry sector in Ethiopia is still suffering and generates many problems during the execution (Bassa, et al., 2019). Similarly, FIDIC guidelines for integrity management in consulting state that one of the important factors in success of a project is obtaining the services of the most-competent and most-

experienced consultant. Also, the combination of design and supervision in construction project consulting services is not clear. Nor is it clear how consultants are selected for construction projects (Choudhry, 2016). Hence, construction project involves different stages that are followed for the projects to be executed. Designing is one among the stages involved. What is expected to be executed is what had been designed but things may be different from this expectation. Accordingly, design issues have led to some reworks in construction projects and resulted into 5 to 20% increase in the project cost (Suleiman & Luvara, 2016). Also, there are usually a lot more tasks to do than any one person could do him or herself, and supervisors are often the ones who delegate, making sure that the right people are doing the right jobs, and that they're doing them both properly and on time (Emmanuel, et al., 2020). Though, better design and supervision consultant performance has a major role in the production of well-coordinated design, timely supervision and proper contract administration which helps to overcome the very common problems of projects such as clients and contractor claims, extension of time, poor quality project product and greater uncertainty on project cost and completion of the project as per schedule (Suleiman & Luvara, 2016).

Furthermore, in the study area/Jimma, it had been observed that some contractors employ site supervisor who are technically not capable of doing the job. Some employ even their relatives with little or no experience in construction, that earn less than their counterparts involved in the construction process. This often leads to low self-esteem, lack of coordination and poor supervision among others. In comparable manner most of the public building projects found in Jimma town faces design and construction supervision problems which leads to project failure in terms of time, cost and specified quality. Hence, there is no any previous research studies conducted to solve project consultant's issue in public buildings. On this note, the researcher motivated to seek such knowledge gap by evaluating the major factors affecting the performance of project consultants' in public building construction projects in case of Jimma Town.

1.3 Research questions

1. What are the factors affecting the performance of project consultants' in public building projects?
2. What are the impacts of inadequate project consultant's performance on the success of public building projects?

3. How to minimize impacts due to inadequate project consultants' performance on the success of public building projects?

1.4 Research Objectives

1.4.1 General Objective

The general objective of this study is to assess the major factors affecting the performance of project consultants in public building construction projects in Jimma town.

1.4.2 Specific Objectives

- ✓ To identify the major factors affecting the performance of project consultants in public building construction projects in Jimma Town.
- ✓ To evaluate the impacts of inadequate project consultants performance on the success of public building projects in Jimma Town.
- ✓ To determine the remedial measures of minimizing the impacts due to inadequate project consultants' performance on the success of public building projects?

1.5 Significance of the study

The result of this study will contribute to Ethiopian construction industries effectively through identifying and managing challenges related to project design and supervision consultant's services. In addition, the result of the research will help project owners by being as a practical guide line for selecting appropriate consultants who keep their interest on behalf of them. The study will also serve as a reference for those who are interested to conduct further research on related areas.

1.6 Scope of study

Construction project design and supervision consultancy services were involved in numerous sectors like building, highway, waterworks, railway and etc. But this study will be limited to assess the factors affecting the performance of project design and supervision consultants in public building construction projects in Jimma Town. The participants of this study were the construction stakeholders and consultancy professionals who are involved in public building construction projects.

1.7 Limitation of the study

During the study, the researcher was faced the following limitations those could negatively influence the progress of the study, some of them are: - lack of previously documented secondary data regarding design consultancy problems and finding data from different professionals due to their continual appointments to give the necessary information. Another limitation was unwillingness of the respondent to fill the provided questionnaires' and giving the necessary information's for the researcher during interview in the case study area. This unwillingness of the respondents makes the researcher to spend a lot of time on elaborating the purpose and benefits of the research.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Overview

Construction industry is highly risk prone, with complex and dynamic project environments creating an atmosphere of high uncertainty and risk (Junior, et al., 2017). This industry is also one of the largest industries which contribute to about 10% of the gross national product in industrialized countries. However, it is at or near the top in the annual rate of business failures and resulting liabilities compared to other industries (Mahamid, 2017). In accordance to the literature review, the construction industry activities give tremendous impacts in every aspect of the economy; which is why it is one of the industries that has been categorized as economic driver, particularly in developing countries (Lagiman, 2017). The total annual revenue of almost \$10 trillion and added value of \$3.6 trillion, the construction industry accounts for about 6% of global GDP. Also, the author mentioned that the GDP contribution of the Ethiopian construction industry has been raised to 5.6% and approaches to the sub-Saharan average 6% (Hailu, 2018).

The products of this industry also provide the necessary public infrastructures and private physical structures for many daily activities such as services, commerce, improving the infrastructure system and providing employment opportunities for locals. The industry is not only important for its finished product, but it also employs a large number of people (directly and indirectly) hence the effect on the economy of a country during the actual construction process (Mohd Nawi, et al., 2014). This industry is also a complex and competitive environment in which participants with various professions, views, talents, goals and levels of knowledge of the construction process and each expects to make the most of its own benefits work together (Khekale & Futane, 2015). Hence contractors, consultants, clients, suppliers and subcontractors are one among the main parties involved in projects under construction industry (Biketi, et al., 2017). However, the differences in perceptions among the parties of the construction projects, conflicts are inevitable (Khekale & Futane, 2015). As a result, construction firms bear various failures, such as, failure of abiding by quality and operational requirements, cost overruns and uncertain delays in project completion, low productivity and inadequate customer satisfaction (Junior, et al., 2017). However, construction starts with planning, design and consulting service, financing and continuous supervision until the structure is ready for occupancy. So, each type of construction project

requires a unique team to plan, design, construct and maintain. Though, the construction team who work in such critical construction tend to have a high skill and high levels of training to address the sensitive and complicated challenges. Therefore, either the companies or individuals engaged in the business of construction are commonly referred to as construction contractors since they operate under a construction contract agreement with the client (Assbeihat, 2018). This indicates that there is need for proper relationship between the parties for effective delivery of the construction projects with in budgeted cost, time frame and specified quality (Biketi, et al., 2017).

2.2 Construction industry development in Ethiopia: Scenario

From 2001 onwards, the construction industry in Ethiopia is developing tremendously. Since, the country has been implementing significant number of programs/projects which include the university capacity building program (UCBP), the housing development program and the road sector programs among others (Zewdu & Aragaw, 2015).

Currently, Ethiopia is in a struggle to undertake mega projects that demands huge finance and political decisions. At the moment, this idealistic view is becoming reality guaranteed by the nation's dedication and ability to fund major projects from domestic sources. This has resulted in astonishing growth trajectory whereby the average GDP growth of 11 percent over the past 8 years has been achieved. Theses fast growth of the construction industry resulted in increased in the number of contractors joining the industry. During the period 2000 up to 2008, the number of contractors increased by 1.9121. Consequently, there are a total of 7259 building contractors (BC), road contractors (RC) and general contractors (GC) registered during the 2014/15 budget year as implied by the Ministry of Urban Development, Housing and Construction of Construction Industry Development and Regulatory Bureau. The numbers of larger contractors up to level three are: 263 BC1/RC1/GC1; 73 BC2/RC2/GC2; 163 BC3/RC3/GC3. Considering the high role of the construction sector in the industry and the demand to participate more contractors in the sector, the former Ministry of Urban Development and Construction revised its guideline and developed the "Amended Directives for the registration of Construction Professionals and Contractors No. 23/2013". On top of the private sector, authorities and government agencies are involved in construction of infrastructures by employing in house advisors. As a result, considerable numbers of expertise were employed. Nevertheless, the construction work performance in building construction does not progress as it was supposed to be within the last 50 years (Zewdu, 2016).

Despite its prominent role, the construction industry in Ethiopia, like in other developing countries, faces many challenges in its practice. Some of these challenges are project overruns, poor quality, inappropriate procurement systems, conflict between parties and a failure to cope with project requirements and the inability to adopt best practices (Ayalew, et al., 2016).

2.3 Main Parties involves in construction projects

A construction project normally involves many parties in order to provide good productivity of a construction project. The involvement of the client as owner, consultant, main contractor and subcontractor continuously are essential to make sure the project is in track and is able to be completed as demanded by the owner. A highly effective team can gain a great outcome, by establishing good working relationship and conducive environment while minimizing conflict in the project team. With reference to this working concept, collaboration between parties as a team will ensure all the knowledge and experiences can meet the needs in today's world and also in future (Lagiman, 2017).

2.3.1 Client/Owner

Client is the party that has the authority in making decision especially on goals, objectives, and parameters as well as the time that the project can start to commence since they are the owner of the project. Every project is unique since every client has different perspective and idea that will later be elaborated by a team of consultant's led by an architect. The client is the initiator and financier to the entire construction project. The different owner (client) will think from different perspectives. They will always put the value of management as their main priority to ensure their investment worth every cent (Lagiman, 2017).

2.3.2 Engineer/Consultant

Lagiman, (2017) noted that, Consultants- normally involved in the initial stage of a construction project and their presence at the early stage is usually beneficial to the client. Consultant will be in charge in project budgeting and management, to advice the client and give solutions for any issue that may arise with regards to their design, to prepare feasibility study before construction work starts and to take care of space relationship. Consultants consist of a team that was appointed by the client to perform the given task for the construction project. According to Tai et al. (2008), consultant should work as a team with architect, engineer, quantity surveyor and other related consultant to discuss and work together in order to resolve any issue pertaining the project.

Therefore, communication and trust are a vital factor to all consultants in ensuring the success of the project, by allowing a smooth planning of the project and getting the project to complete within the given timeline (Rahmana, et al., 2013).

2.3.3 Main Contractor

Main contractor has their own field of specialization such as building industry, commercial, industrial and for mega project. The main contractor would prepare budget and planning schedule right from the design phase until the completion inspection of the project. The main contractor normally will liaise with all the consultants when there is issue aroused. This is to ensure the project can complete within the given time, under designated cost and following all the required specs for a good quality end product (Lagiman, 2017).

Rahmana, et al., (2013) mentioned in his studies that collaboration is necessary in construction project to ensure the success of a project, especially to the main contractor that holds the greatest responsibilities towards the development of the project. Their scope of works includes planning, coordinating and supervising their subcontractor when delivering the construction project. The main contractor undertakes the project based on the client needs. They need to proactively seek for new projects and any available opportunities, in order to build new networks and creating a long-term relationship with other industry's player. Contractor also will be involved in training owner's personnel about the operation of the building systems and may be required to provide maintenance during post construction (Lagiman, 2017).

2.3.4 Sub-Contractor

Most major construction works at site are performed by the subcontractor and the main contractor role has become limited in the execution of work at site. Main contractor would select the subcontractor through bidding process. Awarding a project to the right subcontractor is critically important as it may affect the overall project performance. The main contractor will need to do a background study on their financial status, technical ability and gather other information that may be helpful about their subcontractor (Hartmann, et al., 2009). The common practice when selecting a subcontractor is through the 'lowest bidding'. Although when the main contractor is very well aware about problems that may arise later, particularly on issue regarding poor quality of workmanship and low productivity. This also can avoid claims and disputes. Thus, the main contractor has to do a list of supplementary selection criteria such as looking at its past

performance, financial status and team working capacity that will give more impact on the final output performance of the main contractor. There are some factors that need to be taken into consideration before selecting subcontractor that includes:

- a. Subcontractor's capacity of resources
- b. Their past performance records
- c. Company reputation and,
- d. The ability to complete the work on time

A good integration between the subcontractor and the main contractor could assist in many aspects like timely completion, improved quality and at the same time can help in improving environmental issues, health and safety (Lagiman, 2017).

2.4 Relationship among the parties involved in construction project

Relationship is generally understood as a commitment by parties involved in a project to work closely or cooperatively, instead of competitively or adversarial. It is a long-term commitment between two or more organizations to implement a structured collaborative approach that facilitates team work across contractual boundaries for the purposes of achieving specific business objectives. It involves the building of harmonious working ties between stakeholders by aligning of shared goals and objectives. To improve the relationship between main contractors and subcontractors, the documentation between main contractors and subcontractors regarding designs, drawings, plans, schedules and management systems should be clear and complete (Fagbenle et al., 2018).

Also, Yong (2015) stated that, the subcontract is relative to the general contractor. The contractor should not expect to escape from the legal and economic responsibilities in the contract through the subcontract, but it should still take full responsibility for the subcontractor's work. And the subcontractor is just bearing the responsibilities and performing the corresponding duty in contract. The relationship between the subcontractor and the contractor is the subcontract relation. The subcontractor's field work should be arranged and scheduled by the contractor. There are no direct legal responsibilities, obligations or rights between engineers and subcontractors. However, the subcontractors must get the engineers' review and approval, from the signing to the construction of the subcontract is inseparable from engineers. Engineers shall have the right to instruct and decide subcontractors after being confirmed by contractors. Subcontractors must comply with the construction instruction confirmed by contractors. Due to that the subcontract contract is the

agreement between the subcontractor and the contractor, from a legal point of view, there is no contractual relationship between the owner and the subcontractor. The owner has neither the rights nor the contractual obligations to the subcontractor. Unless otherwise specified in the contract, the subcontractor has no rights to directly contact with the owner about payment, claim and working time. All the contacts with the owner must be through the contractor. According to the contract, in some cases, the owner can directly pay to specified subcontractors (Yong, 2015). The relationship among subcontractor, contractors, engineers and owners is shown in Figure 2.1.

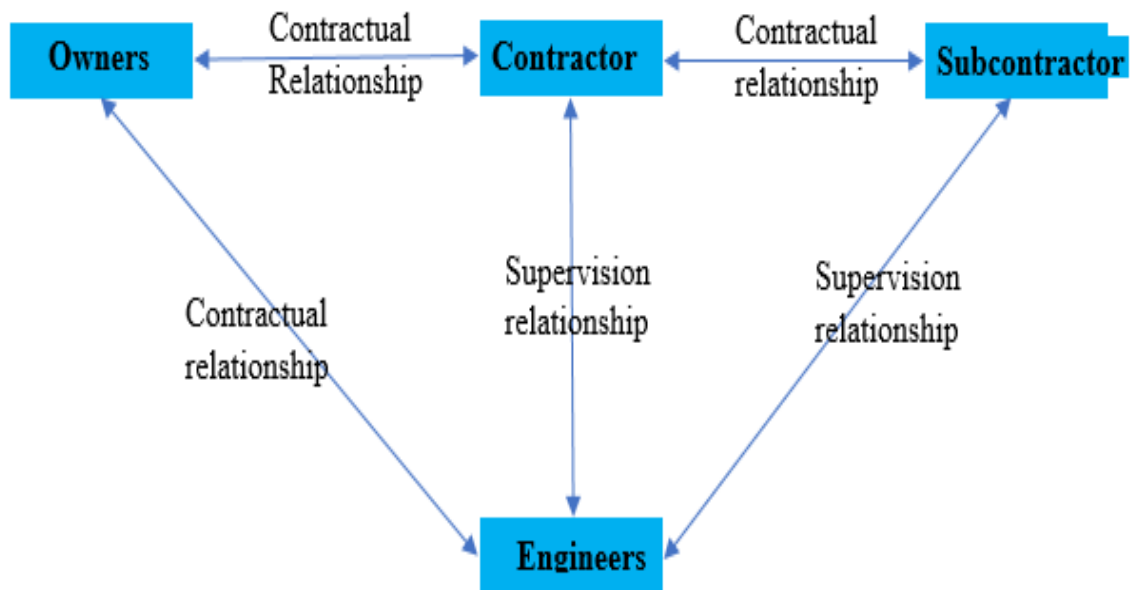


Figure 2. 1 Contractual relationship among the parties

2.5 Construction Project Performance Criteria

Performance is a critical concern and the success of the construction projects will face several challenges during project delivery. According to research, due to different interpretations of success or failure by different participants in construction projects, classification of a project into a good project or a failure project is difficult. Hence, the concept of project success and performance metrics is still ambiguous, and this is due to variations in expectations of project success among stakeholders of various projects in a project (Gunduz & Almuajebh, 2020). Traditionally, researchers and organizations have focused on the three project performance criteria of cost, time and quality. Recently, many studies have, however, included other performance aspects, such as health and safety performance, customer satisfaction and innovation (Eriksson &

Westerberg, 2017). Hence, Masengesho, et al., (2021) noted these six criteria as project performance criteria:

1. Budget performance
2. Schedule performance
3. Employer satisfaction
4. Task-orientation
5. Contractor satisfaction
6. Project manager satisfaction

Also, the author was split the crucial performance factors in a modern format into four main groups of:

1. Factors depending on project
2. Factors depending on team members and the project manager
3. Dependent elements in structure of organization
4. Factors which rely on the external environment

In addition to studying the contracting concept of civil-constructing projects and library materials, the author was conducted interviews with project managers on the following selected seven performance criteria like Effective factors in project management, Employer related factors, Project logistics related factors, Consultant design team related factors, Contractor related factors, Project manager related factors, and Environmental factors related to the project's business environment to satisfy standard specifications (Masengesho, et al., 2021). However, this study focuses on identifying the impacts of factors related to design consultant and supervision team on the performance of construction project. These factors can serve as a guideline while undertaking any projects related to this team in construction industry.

2.6 Project Design and consulting firm.

According to Ethiopia Construction industry the lion share of design preparation part goes to consultant firms (Bassa, et al., 2019). Design is a process of creating the description of a new facility, usually represented by detailed plans and specifications. In an integrated system, the planning for both design and construction can proceed almost simultaneously, examining various alternatives which are desirable from both viewpoints and thus eliminating the necessity of extensive revisions under the raise of value engineering.

Furthermore, the review of designs with regard to their constructability can be carried out as the project progresses from planning to design. A consulting engineer is defined as a professional who primarily has two mixed areas of expertise: practical professional experience and those of a business individual who applies his capabilities in delivering the services to the clients for a fee (Choudhry, 2016).

As the terms is commonly used, consulting engineering includes not only consultation, advise, Contract Administration, and expert testimony, but also the furnishing of extensive and diversified services by engineering firms especially organized and maintained for that purpose. Hence, the design responsibility is transferred from the owner organization to the Consultant who is responsible for the design management in the Project and to be delivered by the design procedure system. Lack of information about the type of contracts, the conditions of contracts, major design issues, standard specifications and major design criteria to managers and engineers who works in consultant offices are one of the major problems that construction industry sector is still suffering and generates many problems during the execution (Atout, 2016). Therefore, the owner of a project needs to select a responsible consultant or a team of consultants for design and supervision of works during the selection process (Choudhry, 2016).

2.6.1 Project Design and consulting phase

Projects designer are not finalizing the design without completing accurate comprehensive documents prepared by specialists through the phases of process and procedures due to the complexity of the required information. These phases interact with each other in a way to guarantee that the design match the client's requirements as well as being constructible. Briefing, feasibility, outlines proposal, scheme design, detailed design, contract preparation, construction and commissioning are the common design phases. The resident engineer of the project should be familiar with these phases so he can argue, discuss and communicate with all project participants mainly the project contractor. Failure of design manager from the consultant side in identifying, describing, quantifying and specifying the working elements of the project precisely will affect the project performance. The Consultant should be fully aware of his duties to avoid any problem which may affect the design process. Hence the consultant of the project has to concentrate during each phase of design to ensure that it will be accomplished on time, for example, the unrealistic of project duration, foreign designers and consultants, unusual growth of construction industry, the exceptional features of architecture. The design manager and resident engineer should

make sure that their team members are applying all techniques and implications of design management process during design phases and construction phase. The resident engineer should have contractual, technical and financial experience in construction projects. The consultancy firm must appoint on the experienced and qualified design manager to coordinate and communicate with project design team and other project stakeholder especially the client and the architect to make sure that project objectives are very clear and can be achieved as per the client requirements. al details in the design of projects, and international consultant establishments, firms and office. However, design manager and resident engineer must check the contract documents to eliminate all discrepancies before inviting tenders for biddings the projects. Therefore, consultancy firm should confirm in writing the difficulties of the execution of the problematic items in design and tender documents to minimize the technical inquire which might be raised by the contractor during the execution (Atout, 2016).

2.6.2 Design deficiency in construction project

Many problems occur in schematic and detailed design where conflicts between structural and services drawings becomes the norm. This creates difficulties in getting the approval of the final detailed design and other tender documents from state authorities. Another major factor caused by the Consultant firm is the inability of effectively managing and preparing the contract document including bill of quantities and the approved drawings which creates a large margin of errors and omission in quantities. Poor appreciation of the design management process is another factor that causes design deficiency by the Consultant firm (Atout, 2016). Also Abdalaziz, (2009) in his study revealed that, design deficiency as "any inconsistency in the drawings and / or the specifications which results in a facility which will not adequately perform its intended mission". He also categorized most design deficiencies as one of the following three types:

1. Contract documents conflict: discrepancies between drawings and specifications.
2. Interdisciplinary coordination errors: conflicts or interference problems between structural, mechanical and electrical.
3. Technical compliance discrepancies: non adherence to the appropriate design guidelines, technical specifications and building codes.

The author concluded that, inadequate and deficient design impacts directly on the efficiency of the construction process. Unfortunately, contractors are often supplied with

project design documents that are considered to be substandard or deficient due to incomplete, conflicting or erroneous information. Also, a large proportion of rework and non-conformance costs are also directly due to deficiencies in design and contractual documents and in the transfer of information during the design process. The finding of the research indicates that, found that on average 78% of the total numbers of contract deviations identified were design related and that these deviations made up 79% of the total deviation costs. Additionally, the researcher found that design deficiencies or inconsistency were responsible for 56% of all contract modifications.

Ideally, if there is no design deficiency, four parties are satisfied which are: owner, building codes and regulations, contractor and design professional (Abdalaziz, 2009)

2.6.3 Improving the Quality of Design Consultancy Service

According to study conducted by Abdalaziz, (2009) the design process to work effectively, a collaborative working environment needs to be in place. By promoting high levels of collaboration and communication within the project team, lean design processes can assist in enabling design solutions to be more integrated, coordinated and focused on delivering value to the end customer. The author also revealed, Australian Construction Industry Forum (2003) improved a guide which establishes a number of principles and protocols to guide practices of both the client and the consultant. So hereinafter sets of protocols that have been developed:

1. Client brief and project establishment by establishment of well-defined client brief comprising key drivers and parameters such as: budgets, functions and quality.
2. Consultant selection by making the consultant fees commensurate with the effort required and selection based on non-price and price criteria to establish value and ensure selection assessment practices are ethical and transparent.
3. Team formation and project integration through clear understanding of roles, responsibilities and obligations of all parties, then establish and agree a design review process including review points and agree milestones for client and project team
4. Quality management incorporating project implementation, design by:
 - ✓ Actively consider total cost of project (over the life cycle) as part of the design and contractual documents process.
 - ✓ Develop and agree upon a range of Quality Management Tools including checklists, review procedures and audit processes.

- ✓ Use of technology by consultants to assist in documentation control and coordination.

2.7 Construction Project Consultants Performance

Many construction projects are finished without any conventional project consulting practices. Most of the time these projects are frequently plagued by delays, poor quality, and cost overruns. The key is not just to finish a project, but to finish it correctly. If the project finishes with poor quality, large cost overruns, or continuous delays, likely, you and your company will not get the maximum return on your investment from the time and energy you spend. Therefore, to realize project management, firstly you must understand what a construction project is (Cheung, et al., 2004). The management of all sorts of construction projects needs the professional knowledge and comprehensive knowledge system of the organization. The project consultants are characterized by knowledge, performance, and interpersonal skills (Nikumbh & Pimplikar, 2014). The project consultant has no specific definition. Most definitions describe management consulting in terms of the tools, roles, responsibilities, and services provided by skills to perform tasks assigned by the client or project owner (Ismail, 2006). The role and responsibilities of project consultants in the construction industry are very broad and depending on their skills and current experiences. Therefore, if the client looks for expert knowledge or advice on certain engineering issues or any issues involving engineering issues, consultation is required (Nikumbh & Pimplikar, 2014). The project consulting team will provide the right help at the right time to help the clients overcome current obstacles or avoid high-level errors in the future, and determine and implement problem solutions faster, thereby saving you time and money. Without an excellent performance of the project consulting team, it is difficult to ensure the success of the project. Besides, to make the project successful, the manager needs effectively and efficiently to complete the work of the team members. This, together with the introduction of project consultants' knowledge brings about project success (Masengesho, et al., 2021).

2.7.1. Role and Responsibilities of the construction Project Consultants

With its professional knowledge and ability, the project consultants have been undertaking several responsibilities in the construction project for a long time. Hence, the appointment of the project manager will influence the success or failure of the project. Therefore, a successful project consultant should perform several roles and responsibilities at the same

time, and play a vital role in all stages of the construction project (the initial stage, design stage, construction stage, pre-construction stage, and post-construction stage) (Masengesho, et al., 2021).

Table 2. 1 Roles and responsibilities of project consultants in different construction stages (Masengesho, et al., 2021).

Project Stages	Role and Responsibility
Initial	Feasibility studies and plans; identify stakeholders who may influence project decisions, activities, and results; recording information about stakeholders including benefits, participation, influence, and the potential effect on the success of the project.
Design	Review the green design concept, last drawings, and environmental documents and specifications; and coordinate the design process so that they can deliver the project following established stakeholders and/or client requirements.
Pre-construction	Arrange bidding documents; contractor qualification; bid evaluation; define the project; project management; architects and consultants' appointment; design process management; set sustainable development targets; provide project cost estimates; set schedules for the incorporated project teams.
Construction	Monitoring project quality and time; supervising contract changes; information management; team coordination; appointing contractors; site and plan management; safety management; coordination with customers, architects and other consultants; procurement management; considering the environmental effect of the project; control possibilities of risk for avoiding the increase of costs; and control the added chain.
Post-construction	Packaging and sealing technical and commercial; last cost report; monitoring whether all sustainability standards are met; and providing customers and end-users with construction documents related to operation and maintenance.

2.7.2. Leadership Skills of construction Project Consultants

The construction industry needs mainly leadership because the success or failure of construction projects largely depends on who leads and coordinates them (Zulkiffli & Latiffi, 2019). However, 80% of project failures are caused by poor leadership, including insufficient leadership, lack of teamwork, low efficiency of problem-solving and weak communication skills (Almansour, 2012). In addition, some losses or failures of the construction industry have become the object of constant criticism particularly its fragmentary and bad records on project quality, waste, financial claims, safety, and efficiency (Masengesho, et al., 2021). One of the reasons for these failures is poor leadership. According to the Project Management Association (PMI), to ensure the effectiveness of project management, project management professionals need to have skills, comprehensive management expertise, and other capabilities. Strict project management skills help to effectively manage the project process (Zuo, et al., 2018). Research shows that there is a powerful correlation between project consultants' leadership skills and project success. The leadership skills, characters, behavior, and attitude of project consultants are very vital because their daily activities affect the behavior and their team members' success. Therefore, according to the literature, the eight leadership skills of construction project consultants in the construction projects are shown in Table 2.2 below (Masengesho, et al., 2021).

Table 2. 2 Leadership skills of project consultants in the construction industry (Masengesho, et al., 2021).

Skills	Description
Communication skill	It involves the ability to exchange information with individuals or groups. This means that the project consultant needs to successfully communicate with stakeholders to accomplish their sustainable development goals. Adapting the different views of the project team and stakeholders on sustainability to ensure the success of the project.
Motivation skill	Motivation skill is the ability to make a person achieve their targets. Motivation is a skill that the project consultant can use to ensure that the project team can achieve the project objectives on time according to the budget. However, the lack of such motivation often conducts to conflicts, strikes, insufficient productivity, pressure, and project failure.

Decision making and problem-solving skill	Including the ability and capability to determine and solve problems. Decision-making is a procedure of gaining the team's commitment to sustainability and collective support. However, problem-solving is a procedure for analyzing sustainability criteria and naming possible solutions.
Conflict management skill	It is the ability to resolve conflicts positively. Conflict management is also regarded as one of the crucial soft skills for a project consultant to achieve project success.
Delegation skill	It includes working with subordinates to determine direction, authority, and responsibility. Without this skill, the project consultant's ability to manage the team and deliver outcomes will be limited. This is very significant to make full use of the project team, and the project consultant provides the ability and capability to pay attention to the real situation.
Planning and goal setting skill	It includes the planning process and the ability to accomplish the wanted aims. In the process of planning and scheduling, a project consultant should regard the effect of green standards on the overall progress of construction projects. In addition, setting feasibility or viable and sustainable priorities during a construction project will help to demonstrate a framework or model for all future conclusions making.
Team building skill	A team is defined as a team of person who has skills that are devoted to common goals and are mutually responsible for their achievements. The project consultant should also be involved in team-building skills to ensure the success of the project.
Negotiation skill	It includes the ability to find common ground and achieve agreements to solve problems. Project consultants need to use negotiation skills throughout the project life cycle.

2.8 Factors affecting the performance of project design and supervision consultants

According to Suleiman & Luvara, (2016) noted that, unrealistic period to design, failure of a consultant to provide adequate and clear information in the tender documents; errors and

omission of consultants, changes made as a request of a consultant, consultants who are not familiar with the regulations and construction permits, presence of conflicts between contract documents, low consultant fee and poor coordination of design team members, lack of consultant's knowledge of available material and equipment, underestimate of the cost of the project, unclear and inadequate details in drawings and production of Structural detail does not match Architectural detail as consultant related factors affecting consultants in project. Also, Masengesho, et al., (2021), categorized that inadequate technical background, Poor relationship among team members, Ability to coordinate, Ability to make decisions, when necessary, Competence of the team, Ability to delegate authority and Ability to work as a team as project management related factors affecting performance of consultants. Similarly, he identified that Accurate and reliable budget estimate, Ability to foresee and budget for potential inflation, Excessive variation orders, proper planning and scheduling of works and Creativity in controlling their own cost and developing their efficiencies as cost management related factors. Additionally, he showed that Design team experience, Delay in producing design document, adequate material test records, Excessive variation orders and Excessive errors or omission as quality related factors. Also, he identified that Coordination of contractors' work promptly, Timely decision making, Timely submission of reports, payment certification, and claims and Time for completing major specified work sections as time related factors. Political influence from higher authority, Economic influence in terms of remuneration and allowances, Social in terms of family relations, Weather influence and Level of technological advancement as environment related factors Lastly, he categorized that, Project type, Project value, Project duration and urgency as other factors (Masengesho, et al., 2021). Inspection process during the work operations, the approval process duration of submittals and approvals of project materials and the technical site experience of the inspector or supervisor who gets the instruction from the Consultant resident engineer are also factors attributes on project performance (Atout, 2016).

2.8.1 Barriers hindering the Implementation of consultancy service in project

According to the study conducted by Masengesho, et al., (2021) noted that Lack of knowledge and experience in addition to the senior management opposition, Lack of training opportunities in project consulting, Lack of well-trained project consulting professionals, in suitability for low-cost project, the higher management does not believe in the benefits of project consulting, Too expensive to carry out project consulting,

Interruption to normal work schedule, Lack of knowledge and practice in project consulting, Lack of local project consulting guidelines and information and other factors, like the nature of works and the owner of the project are the barriers to implement efficient consultancy service in construction project.

2.9 Construction Projects Supervision

Project supervisors are often the ones who delegate, making sure that the right people are doing the right jobs, and that they're doing them both properly and on time. Project supervision is understood to be all activities undertaken to secure effective and efficient delivery of the project outputs and achievement of project outcome. Project supervision covers monitoring, evaluative review, reporting, and technical assistance activities to identify project challenges, ascertain, prepare and recommend solutions to at the earliest possible time (Emmanuel, et al., 2020). Hence, Successful delivery of construction of projects within the measurable tenets is driven by effective site supervision. Nevertheless, the inability of many supervisors to organize, communicate with workers, and direct activities sufficiently is primarily connected to the quality of the construction. So, one of the most important parts of supervision work comes in terms of managing, motivating, and encouraging staff (Emmanuel, et al., 2020). Generally, construction supervision is a collective problem solving medium and as such is one of the most effective tools of ensuring project success. It must be gear towards ensuring high quality standard of work and the processes engaged in carrying them out by the parties involved (Shahraki, et al., 2018).

2.9.1 Need for Project Supervision on Construction Sites

Supervision is considered as a means to enhance staff development and helps to equip the workers with the professional knowledge and skills necessary to do their job effectively and gives workers the opportunity to communicate, coordinate, and cooperate with one another as a team (Shahraki, et al., 2018). Also, Emmanuel, et al., (2020) noted that, supervision is needed in construction projects based on the following reasons:

- ✓ To ensure that specified standards are maintained
- ✓ To ensure that works are completed on time and schedule
- ✓ To ensure that operators put honesty in their work
- ✓ To compile a final report on the construction activities

- ✓ To determine whether the contractor meets the requirements for performing construction activities, regulated by the law and
- ✓ To immediately inform the appropriate authority with all the disadvantages or irregularities perceived during construction work and the measure to be taken.

2.9.2 Role and Responsibilities of Construction Site Supervisors

The main responsibility of a site supervisor is to see to the execution of daily activities on site to the required specification through the provision of good leadership. The work crew and individuals look unto him for direction as to what is expected of them. In other words, he assigns responsibilities to site operatives in line with programme of work. Also, the author observed that site supervisors are called by different names in the construction industry depending on company or site. Such names include site manager, general foreman, site coordinator, and site agent. Anyone identified as a site supervisor according to is not only expected to have the required skill but also able to transfer the skill to others working under him. He reports directly to the project manager or construction director depending on the title the officer bears. He describes the level of a supervisor as higher than site operatives but below the rank of full management. He describes a supervisor as a middle man between the management and the operatives. It is in the consideration of this status that sixty to hundred decisions taking on site in respect of time, cost, quality and safety at work are taken by supervisors (Attar, et al., 2012). Hence, the quality of work done is dependent on the skillfulness of those involved and the key to achieving this good quality work is site supervisors. Hence, their role in the success or failure of any project cannot be overemphasized (Emmanuel, et al., 2020).

2.9.3 Factors Affecting performance of Project Supervisors

Studies have shown that projects with good supervision are nearly twice as satisfying as projects with poor performance. In other words, the important factor in sustaining quality and building reinforcement is continuous supervision over projects. According to FIDIC survey conducted in 2001, it was found that poor quality is the main problem in developing countries, and one of its main reasons is reduced proper supervision over the projects (International Federation of Consulting Engineers, FIDIC). So, we can state that poor supervision over the projects is one of the significant and fundamental factors that lead to the quality loss in construction projects. The main factor of supervision in the construction industry is supervisor engineers (The role of engineering supervision over construction,

2014). Unfortunately, the poor performance of supervisor engineers caused lack of sufficient quality and strength in many urban constructions. Unofficial statistics indicate that 99% of supervisor engineers just sign the supervision form and do not have a permanent presence in the project, and there is no system to monitor their job. According to the surveys conducted in Tehran regarding the poor performance of engineers involved in the construction industry, 62% of statistics relate to the poor performance of supervisor engineers, which such poor performance results in quality decline (Shahraki, et al., 2018). In a perfect world, building projects from the inception will be executed smoothly, within the stipulated time, within cost budget and in conformity with required standard, but the fact is, we don't live in a perfect world, hence, the need for contractors and site supervisors to anticipate problem that could occur during building production process before agreement to any contract. If anything goes wrong during construction process the hammer falls on the quality of supervision. Supervision entails the planning, implementation, coordination and monitoring of site work, materials, labor, plants and equipment. For adequate supervision to be achieved, certain measures must be in place and without this measure's supervision will fail. Communication, Constant variation, Lack of planning, inadequate documentation of day-to-day activities on site, Employment of quacks, Indiscipline, Low motivation is such factors that could affect supervision. Hence, Project supervisor's competence is a crucial factor affecting site supervision. A good supervisor needs to be able to 'make things happen' when confronted by obstacles. Some people refer to this as having 'problem-solving skills' but it's also about being innovative and thinking 'outside the square'—being creative and seeing solutions others just don't. The success of a project invariably depends on the level of supervision of the project or the managerial skills of the project manager or the site supervisor (Emmanuel, et al., 2020). Generally, the factors affecting project supervision are categorize in Supervision-related factors, Design-related factors, Management-related factors, Health & Safety-related factors, Financial-related factors, Materials-related factors, and External-related factors in general (Getu, et al., 2021).

2.10 Impacts of Inadequate project design and supervision consultants performance on project success

The volatility and complex nature of construction have increased the degree of uncertainty involved in the planning and execution stages. Unlike manufacturing, construction has

conventionally separated planning and design from construction processes which have resulted in some scope and design related changes during the construction (Dosumu & Aigbavboa, 2017). Separation of design and construction has led to severe problems in which designs are made without concerns for build ability or productive economies thereby impacting the performance of the projects negatively. The effect of these changes has resulted in issues of cost overrun, schedule delays and productivity loss. Combination of aforementioned have a detrimental effect on the overall project cost. Even in well-managed projects, the design changes can directly impact the cost in a range from 2.1% to 21.5% of total construction cost (Aslam, et al., 2019). Han, et al., (2013) concluded that design errors have led to some reworks in construction projects and resulted into 5 to 20% increase in the project. Hence, many studies have been conducted on identifying the causes associated with design changes, which depends on the type of project and regional demography. Generally, design changes occur due to actions interconnected to owners, consultants and contractors (Hui Yap & Skitmore, 2018). Few researchers have considered clients as the primary force behind design changes, whereas others have blamed consultants for frequent changes. All the same, contractors have also been identified as the leading players in creating events leading to the design changes (Aslam, et al., 2019).

2.10.1 Experience from studies conducted in Ethiopia

Study conducted by Asmerom, (2021) in Addis Ababa, on the effects of design change due to lack of consultants performance confirmed the percentage occurrence rate of the following impacts on project success, due to inadequate project consultants performance such as:-

- | | |
|--|--|
| ✓ Increase in project cost 89.91% | ✓ Decrease in quality of work 74.62% |
| ✓ Demolition and rework 85.88% | |
| ✓ Results dispute among parties 76.97% | ✓ Conflicts between the Parties 75.43% |
| ✓ Decrease in Productivity 72.94% | |
| ✓ Delay of project 92.77% | |
| ✓ Wastage of material 75.63% and | |

Similarly study conducted by Bassa, et al., (2019) on Causes and Effects of Design Change in Building Construction Projects in Three Selected Southern Ethiopia Zones confirmed the occurrence of the following impacts:

- | | |
|-----------------------------|------------------------|
| ✓ Completion schedule delay | ✓ Poor project quality |
| ✓ Increase in project cost | |

- | | |
|--|---|
| ✓ Disputes and excess claims among contracting parties | ✓ Increase in Overhead Expenses |
| ✓ Wastage of materials during rework | ✓ Delay in Payment |
| ✓ Contract cancellation | ✓ Deaths of workers due to unsafe building structures. |
| ✓ Adversarial behavior and diminished reputations | ✓ Productivity degradation and |
| | ✓ Working extra hours (overtime) to meet deadlines of the project |

2.11 Remedial measures for improving design consultants and supervisors' performance

Encouraging teamwork, sharing the same vision and objectives for the project, Communication between all parties in decision making processes from project inception to completion, select all service providers on the basis of value and competency not on the basis of lowest price alone Listening to subordinates or supervisee, Identifying and analysis of all risks and uncertainty inherent in the project and its circumstances, Continuing client involvement in the design and supervision management, Continuing involvement of contractor with experience in the design and supervision process, Mission-focus/ priority-setting, Spend sufficient time and money in project planning and design, Being Realistic or setting achievable targets, Conducting Performance appraisal, Encouraging positivity, Framing the contracting arrangement around goodwill and fair dealing in an open communication environment, Accepting challenges during execution of work, Being transparent to subordinate, Providing room for Training design and supervision personnel available across all disciplines to gain experience and competition learning, Continuing professional development for ensuring that staff maintain up-to-date qualifications and competency standards, Understand and encourage the role of technology in the delivery of projects by all stakeholders, Insisting on accountability, Taking responsibility and giving praises, Allowing room for innovations, Celebrating with employees after achieving milestones and Delegation ability are the measures to improve supervisors performance (Abdalaziz, 2009) & (Emmanuel, et al., 2020).

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Study area

This research was conducted in the South-Western part of Ethiopia at Oromia Regional State Jimma Zone, Jimma Town at a driving distance of 345 km from Addis Ababa. Jimma is one of the ancient and largest towns in the country and its temperature ranging between 20°-30°C. Also, the geographical location of the town is 7° 39' 0" N and 36° 52' 30" E and elevation vary from 1700m-2000 m above sea level.

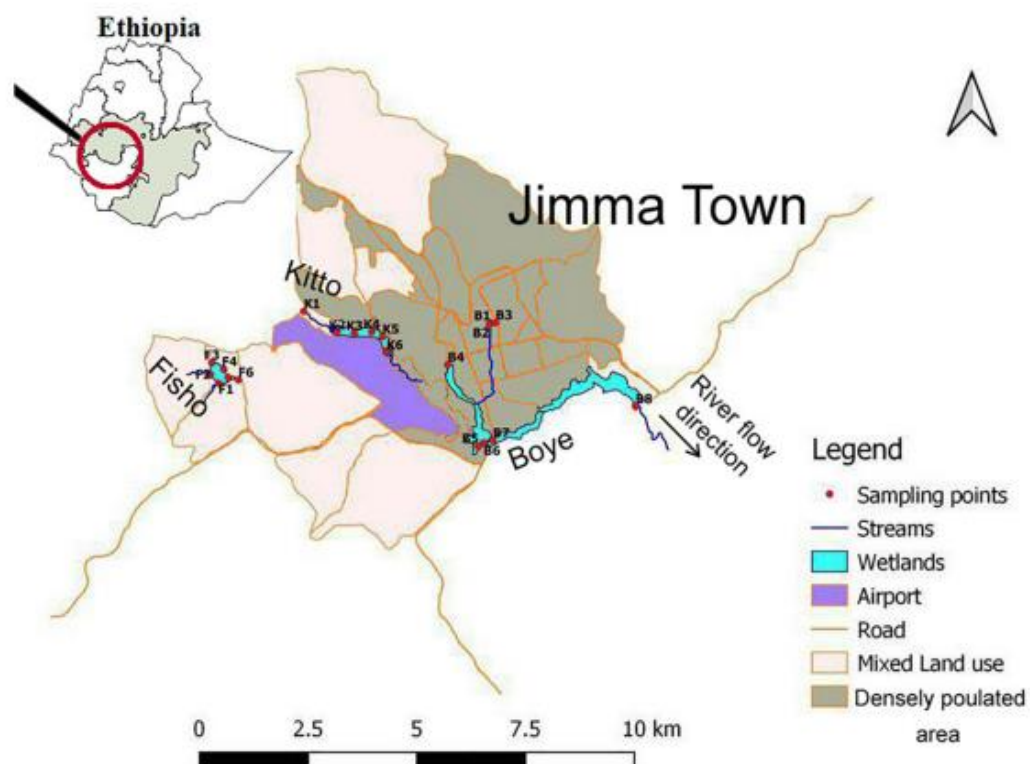


Figure 3. 1 Study area (G/Maryam, 2021).

3.2 Research Design

After identification of the research problem, setting the objectives for the research, selection of a representative sample size from the population, descriptive research design method was carefully designed to achieve the mentioned objectives. This design was used to analyze the effects of inadequate project consulting service on the performance of public building construction projects. Hence, detail review of the related literatures, site observations, questionnaire survey and interviews were also conducted to accomplish the objectives. Accordingly, mixed approaches of Qualitative and Quantitative data analysis

methods were used to determine the severity of design and supervision consultants related factors on the performance of building construction projects.

3.3 Study Variables

Two types of study variables were used in this paper. Those are dependent variables and independent variables.

A. Dependent variable

- ✓ Performance of project consultants

B. Independent variables

- ✓ Management
- ✓ Design
- ✓ Project Time
- ✓ Material cost
- ✓ Quality
- ✓ Health and safety
- ✓ Political and economic issues
- ✓ Environment

3.4 Population and Sampling Technique

Due to COVID-19 Pandemic, situations are changed, especially construction industry development rate were slowdown all over the world. Also, construction materials cost inflations due to national trade limitation were occurred. Hence, most of the construction industries in Ethiopia have been paused for suspension and some are fully terminated by contract cancellation made by contracting parties. But some construction projects still forward to do their work to accomplish on the schedule time. So, the researcher was selected such active building construction projects at Jimma town to collect relevant data based on sampling technique and analyzed it to launch the research objectives. Therefore, the target population for the study was active building construction projects and the respondents were clients, contractors, and consultants' those are working within such active building construction projects at Jimma Town. As a result, the researcher used Non-probability, Purposive sampling technique (considering all active building construction projects in to the study).

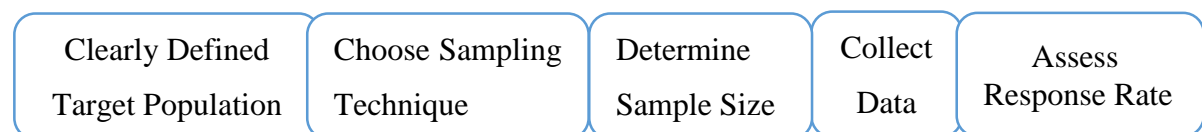


Figure 3. 2 Population and Sampling Process (GIZAW, 2021).

3.5 Data Source and Collection Methods

Both primary and secondary data were used as a tool to gather the necessary information. Primary data will be conducted to engineering construction professionals, among each contracting parties by using well prepared questionnaires in order to gather relevant data about the major factors affecting the performance of project consultants and magnitudes of each factor's occurrence in their construction site. Also, Interview questions were conducted for respective personnel in order to gather further information's about data collected through questionnaires.

The secondary data were collected from reviewing related literatures including books, journals of various authors, contractual arrangement documents, construction site diaries, site addenda's, reports containing background information's and other relevant documents.

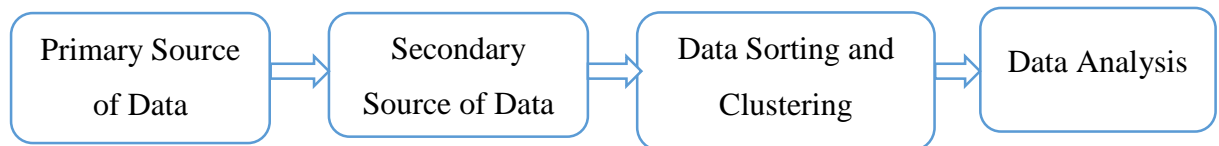


Figure 3. 3 Data source and Collection Procedure (GIZAW, 2021).

3.6 Data Presentation and Analysis

The researcher was conducted quantitative questions for the respondents and review relevant documents and related reports to gather statistical data for accomplishing the research objectives. However, data analysis is a process of putting facts and numbers together to address a research topic. The information for this study was acquired by a questionnaire, interview, and observation. The information was then sorted, grouped, processed, and displayed. In addition, the questionnaire responses were based on a Likert-scale of five ordinal measure scales of: (1) very low effect, (2) low effect, (3) moderate effect, (4) high effect and (5) very high effect. These five-point Likert scale technique has also been practical for many constructions management research (Islam, et al., 2019). The numerical score of Relative Importance Index (RII) Technique is used to determine the relative importance of the various Factors and calculated by using the following formula (Rajgor, et al., 2019).

$$RII = \frac{\sum w}{A \times N} \dots\dots\dots [Eq. (1)]$$

Where:

RII: Relative Importance Index

W: Weighting given to each factor by the respondent

A: The highest weight (5) and

N: Total number of respondents.

However, these five important levels are transformed from RI values: very high (H) ($0.8 \leq RI \leq 1$), high (H-M) ($0.6 \leq RI \leq 0.8$), medium (M) ($0.4 \leq RI \leq 0.6$), low (M-L) ($0.2 \leq RI \leq 0.4$) and very low (L) ($0 \leq RI \leq 0.2$) (Akadiri, et al., 2012). Accordingly, the data were analyzed using Microsoft Excel, SPSS and RII to get the Statistical optimal discrete values and presented through tables, charts and figures.

3.7 Reliability of the Research

Data quality is very important issue with all types of data obtained from questionnaire survey, observation and interview. In this research the quality of data enhanced by confirmed reliability and validity of the research. Reliability is, the extent to which a measurement of a phenomenon provides stable and consist result. Hence, in this study used Cronbach's Alpha coefficient to check quality of Reliability Test. Whereas, Validity is explaining how well the collected data covers the actual area of investigation, in this study the validity will be checked by correlation analysis. The formula that determines Cronbach's alpha is fairly simple and makes use of the number of variables or question items in the instrument (k) and the average correlation between pairs of items (r) (Smith & Samantha, 2018)

$$\alpha = \frac{Kr}{1 + (K-1) * r} \dots\dots\dots [Eq. (2)]$$

Where: -

A: Cronbach's Alpha coefficient

K: Amount of item/ number of variables

R: Average correlation between pairs of items

An acceptable alpha value: -

0.9 to 1.0 Excellent	0.6 to 0.7 Questionable
0.8 to 0.9 Good	0.5 to 0.6 Poor
0.7 to 0.8 Acceptable	0.0 up to 0.5 Unacceptable

Hence, the Alpha value in the case of this study was 0.860, with a range of 0.8 to 0.9 the indicator of Good result. As a result, the closer the alpha value is to one, the stronger the reliability of the items in the instrument under consideration.

3.8 Ethical consideration

A formal letter was obtained from Faculty of Civil and Environmental Engineering, chair of Construction Engineering and Management Stream. The study's goal and objectives were then clearly explained to the company and the appropriate stakeholders. Thus, the Data gathered after the participants' consent was gained, and the privacy of the research participants was maintained during the process. Moreover, credits were given for different authors previously conducted a study on related areas and acknowledged by citing their name and referencing their materials. Furthermore, the author could not plagiarize others' work without citation.

3.9 Plan for dissemination

The result of the study was presented to Jimma University Institute of Technology, Faculty of Civil and Environmental Engineering for Post Graduate Program in Construction Engineering and Management Department, and a copy of it were be kept in Jimma University Institute of Technology library for all concerned individuals.

3.10 Research Beneficiaries

After the completion of the research the international community and construction parties interested to understand factors affecting performance of design and supervision consultants and their severity on the success of construction project will be benefited from the result of the study. The study will also be used as a benchmark for the researchers who have interest to conduct further study on related area.

CHAPTER FOUR

4. RESULT AND DISCUSSION

This chapter comprises the analysis, presentation of the data, and interpretation of the results of this study. It is necessary to analyze the data collected to answer the research questions, to complete the study properly and meet the research objectives. Hence the findings of the study were interpreted according to the aims and objectives of the study that were appropriate for the establishment of abstract, conclusion and forward recommendations.

4.1 Questionnaire distribution rate

Throughout conducting the survey, a total of 52 questionnaires were distributed as planned for the respondents. Out of these, 49(94.23%) of the questionnaires were retrieved and 46(88.11%) of them were finally used for analysis because the remaining 3(6.12%) out of the retrieved questionnaires were not correctly filled as well as completely reviewed by the respondents.

Table 4. 1 Rate of Response

Questionnaire	Respondent			Frequency	Response Rate (%)
	Owner	Consultant	Contractor		
Distributed	17	14	21	52	100.00%
Returned	15	14	20	49	94.23%
Valid among returned	13	13	20	46	88.11%

4.2 Background of the respondents

4.2.1 Firms role in the project

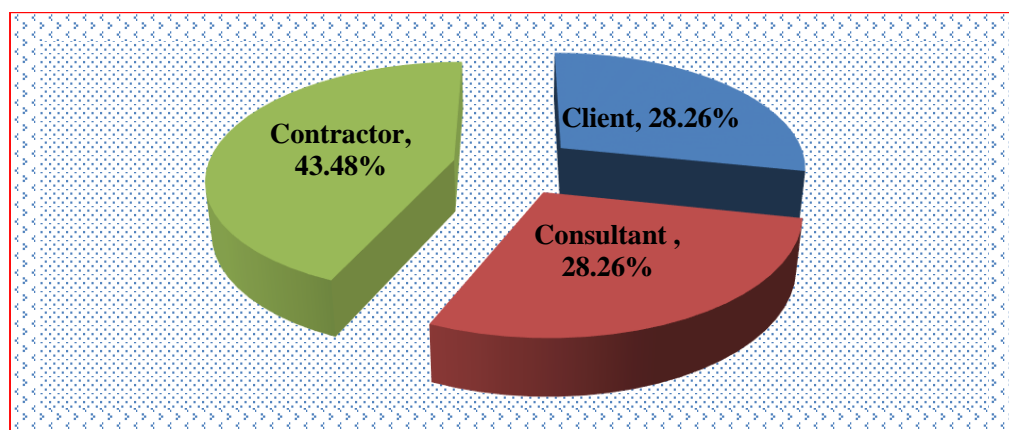


Figure 4. 1 Firms in the project

The data labeled on Pi-chart in figure 4.1 shows that, the study was conducted and discussed based on the data acquired via questionnaire and Interviews in accordance with the firm's role within a project. Accordingly, the total responded questionnaire that was used for analysis and discussion were a total of 46(100%):- 13 of Client's (28.26%), 13 of Consultants 1(28.26%) and 20 of contractors (43.48%). This indicates that the Client, Consultant and Contractors are the main role players during responding questionnaires' and interview on behalf of other stakeholders.

4.2.2 Position in the Projects

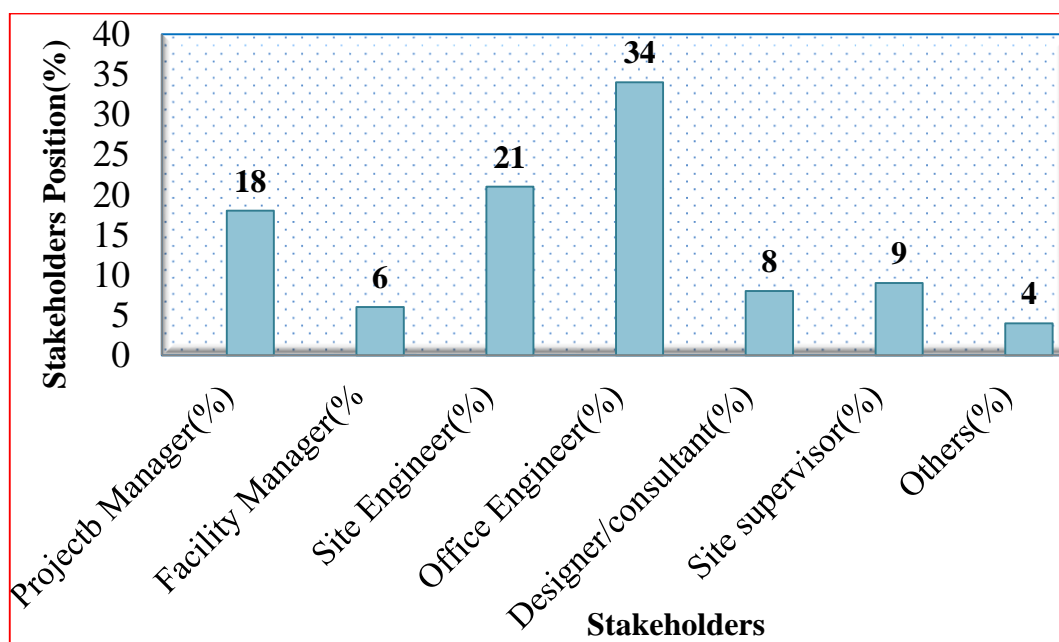


Figure 4. 2 Respondents position within the project

As shown on figure 4.2, in this study the data is collected from different positions with different Firms:-project managers (18%), Facility manager (6 %), Site Engineers (21%), Office Engineer (34%), Design Engineers (8%), Site Supervisors (9%), and others (4%). This indicates that, the result of the study contains the inclusive perspective of these parties on the factors affecting the performance project design and supervision consultants.

4.2.3 Work Experience

Work experience of the respondents in the case of this study were assessed and categorized in to five groups based on their number of years they spent on building construction projects: Those having experience less than 1 year were (2%), 1 to 5 years (29%), 6 to 10 years (48%) and above 10 years were (21%) as labeled on the chart.

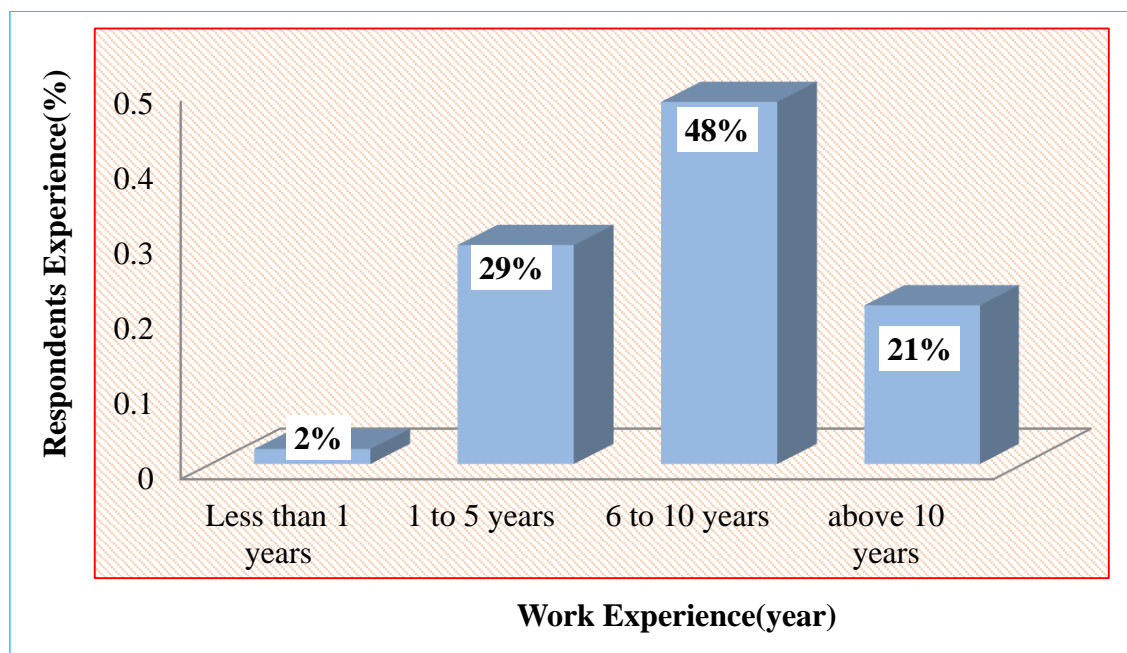


Figure 4. 3 Respondents work experience

From figure 4.3, it is simple to understand that, from the conducted survey of the work experience of the respondent's, majority of the respondents had enough experience in construction projects. This implies that the respondents were able to supply all of the required information for all of the asked questionnaire's questions.

4.3 Factors affecting the performance of project consultants in public building construction projects

4.3.1 Management related factors

Table 4.2 shows relative importance index and rank of management related factors that affect the performance of project consultants within construction projects. From the listed thirteen(13) factors, the top five(5) significant factors that the clients, consultants, and contractors agreed on as the main influencing factors based on the calculated average RII values and over all rank, were presented.

Table 4. 2 Management related factors affecting the performance of project design and supervision consultant

S. No	Management related Factors	Client	Consultant	Contract or	Average RII	Over all rank
		RII	RII	RII		
1	Professional inability background	0.769	0.738	0.610	0.706	3 rd

Performance of Project Consultants in Public Building Construction Projects: In case of
Jimma Town

2	Lack of cooperation/team work amongst the parties	0.80	0.738	0.550	0.696	4 th
3	Inadequate client's relationship with design and supervision team members	0.815	0.830	0.740	0.795	1 st
4	Insufficient project documents and planning of workload	0.830	0.707	0.370	0.636	7 th
5	Inability to delegate authority	0.631	0.600	0.450	0.560	12 th
6	Lack of coordination among members with consultancy team	0.692	0.784	0.400	0.626	9 th
7	Allocation of staff to more than one project in the same time	0.569	0.846	0.470	0.628	8 th
8	Leaving design issues to be sorted out in the construction process	0.615	0.600	0.590	0.602	10 th
9	Lack of making rapid and precise decision when necessary	0.784	0.676	0.560	0.674	6 th
10	Selection of design consultants on the basis of lowest price selection strategy (Lowest bid approach)	0.846	0.661	0.520	0.676	5 th
11	Insufficient and missing input information from the client	0.60	0.601	0.600	0.600	11 th
12	Unstable client's requirements	0.584	0.450	0.390	0.475	13 th
13	Change in project requirements by stakeholders at later stages	0.753	0.753	0.730	0.746	2 nd

From the data presented in the table, it is simple to understand that, Inadequate client's relationship with design and supervision team members (RII=0.795, R=1), Change in project requirements by stakeholders at later stages (RII=0.746, R=2), Professional inability/background (RII= 0.706, R=3), Lack of cooperation/team work amongst the parties (RII=0.696, R=4) and Selection of design consultants on the basis of lowest price selection strategy or Lowest bid approach (RII=0.676, R=5) were the top influencing factors among those has RII value between 0.6 and 0.8. This indicates that these factors has high impact on the performance of project consultants. This indicate that this top five ranked factors are more important from the clients', consultants and contractors point of

view and highly existed in building construction projects in Jimma Town and affects the performance of project design and supervision consultants working with in the projects. Hence, project managerial staffs should have to be careful of their cooperation work during their tendering process for selecting the right person with of required profession and project execution teams. Inability to delegate authority (RII=0.560, R=12) and Unstable client's requirements (RII=0.475, R=13) has RII value between 0.4 to 0.6. This indicates that these factors has medium impact on the performance of project consultants. However, almost all results labeled in the table indicate that, all the listed factors affect the performance of design and supervision consultants ranging from medium to high effects. This study confirms the research conducted by (Masengesho, Wei, et al.,(2021) Relationship between project Consultants performance and project successes in the Rwandan construction industry. Similarlry,this finding confirms the results of research conducted by Getu, et al.,(2021) on Factors Affecting Supervision Practice of Public Building Construction Projects in Dire Dawa Administration.

4.3.2 Design and supervision related factors

Factors were distributed among different ranks with regard to relative importance index value and overall ranking of "Design and supervision related factors "category; Based on the severity, the top five of them were ranked as factors those has high impact on the performance of project consultants. These sever factors are agreed by the clients, consultants and construction contractors and derived from table 4.3.

Table 4. 3 Design and supervision related factors affecting the performance of project consultant

S. No	Design and supervision related factors	Client	Consultant	Contractor	Average RII	Overall rank
		RII	RII	RII		
1	Lack of time available for checking and correlating all the information on all design documents	0.708	0.661	0.640	0.670	6 th
2	The failure of a consultant to provide adequate and clear information in the tender documents; errors and omission of consultants	0.646	0.615	0.470	0.577	8 th

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

3	Unfamiliarity of the design consultants with the regulations, local conditions, construction permits and standard specifications	0.753	0.723	0.570	0.682	4 th
4	Lack of consultant's knowledge on available construction materials, equipment and techniques that will be used in the project site	0.769	0.723	0.600	0.697	3 rd
5	Lack of consultant experience on similar projects	0.560	0.615	0.480	0.552	10 th
6	Lack of consultant full-time involvement on project site	0.738	0.815	0.600	0.718	1 st
7	Improper supervision of works executed by contractor	0.553	0.600	0.390	0.515	12 th
8	The presence of conflicts between contract documents	0.569	0.538	0.480	0.529	11 th
9	Unclear and inadequate details in drawings	0.676	0.677	0.390	0.581	7 th
10	Insufficient design reviews with relevant parties	0.430	0.477	0.750	0.553	9 th
11	Copying and modifying design and reports from previous work to minimize time and cost	0.830	0.769	0.540	0.713	2 nd
12	Inadequate/ineffective use of new technology	0.846	0.677	0.510	0.678	5 th

Hence the data labeled in the table shows that the top five factors out of the listed factors were: Lack of consultant full-time involvement on project site(RII=0.718, R=1), Copying and modifying design and reports from previous work to minimize time and cost(RII=0.713, R=2), Lack of consultant's knowledge on available construction materials, equipment and techniques that will be used in the project site(RII=0.697, R=3), Unfamiliarity of the design consultants with the regulations, local conditions, construction permits and standard specifications(RII=0.682, R=4) and Inadequate/ineffective use of new technology(RII=0.678, R=5). This result show that these top five factors are more

important from the clients', consultants and contractors point of view and highly existed in construction projects and highly affects the performance of project design and supervision consultants working with in construction projects. However, the average RII values ranging between 0.6 to 0.8 of the factors labeled in the table indicates that the factors has high impact on the performance of project consultants and average RII values ranging between 0.4 to 0.6 indicates the factors those has medium impact on the performance of project consultants. Hence, the finding of this study confirm with the result of study conducted by Abdalaziz,(2009) Factors Affecting the Quality of Design and Contractual Documents in Gaza Strip. Gaza.

4.3.3 Time related factors

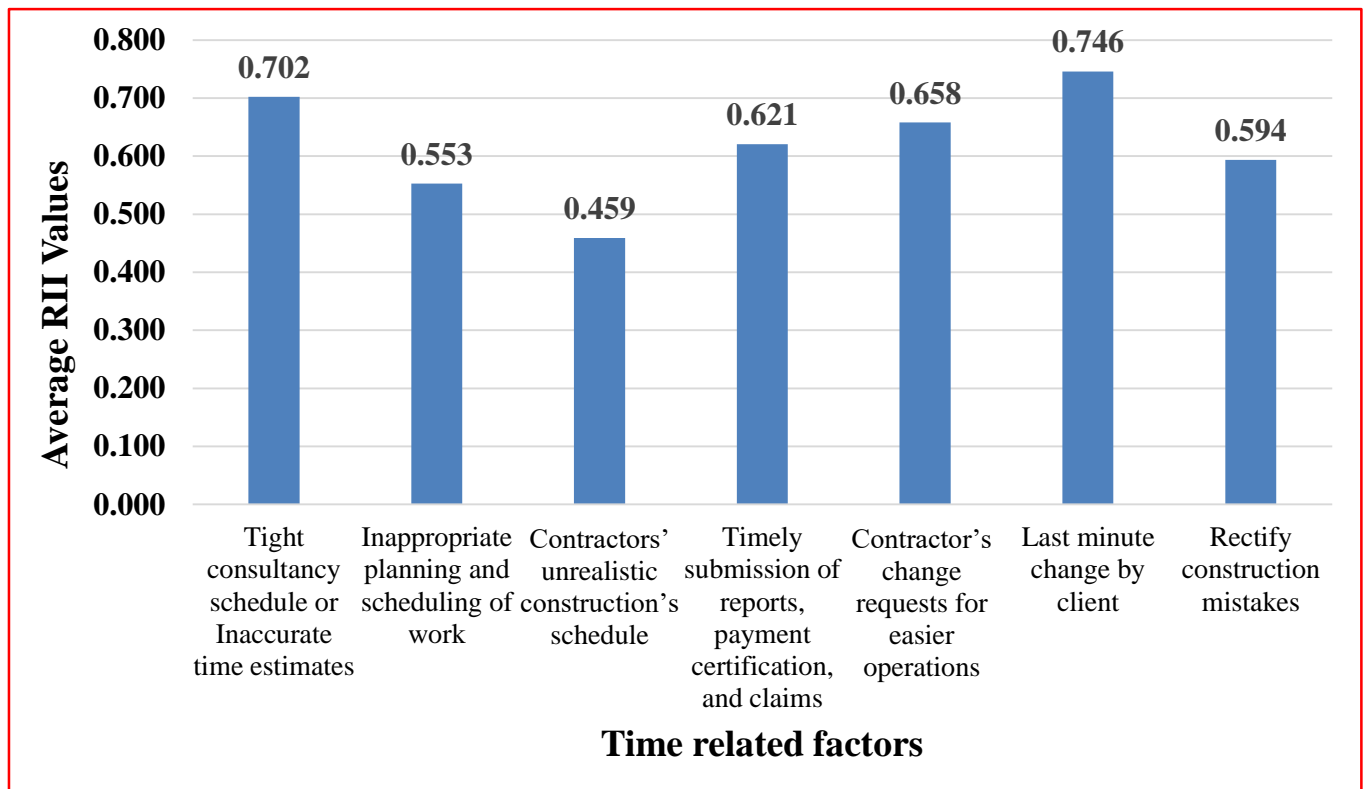


Figure 4. 4 Time related factors

Figure 4.4 shows the rank of Time related factors affecting the performance of project design and supervision consultants. Hence, Last minute change by client, tight consultancy schedule or inaccurate time estimates, Contractors change request for easier operation and timely submission of reports, payment certification with average RII values of 0.746, 0.702, 0.658 and 0.621 were ranked as 1st, 2nd, 3rd and 4th respectively based on their severity of high impact on the performance of project consultants. Similarly, Rectifying construction mistakes, Inappropriate planning and scheduling of work and contractors unrealistic

construction's schedule with average RII values of 0.594, 0.553 and 0.459 were ranked as 5th, 6th and 7th respectively based on their severity of medium impact on performance of consultants. Generally, the average RII value for all time related factors were ranging from 0.4 to 0.8. This indicates that time related factors has medium to high impacts on the performance of project consultants working in building construction project. Hence, the findings of this study confirms study conducted by Masengesho, Wei, et al.,(2021) Relationship between Project Consultants' Performance and Project Success in the Rwandan Construction Industry.

4.3.3 Cost related factors

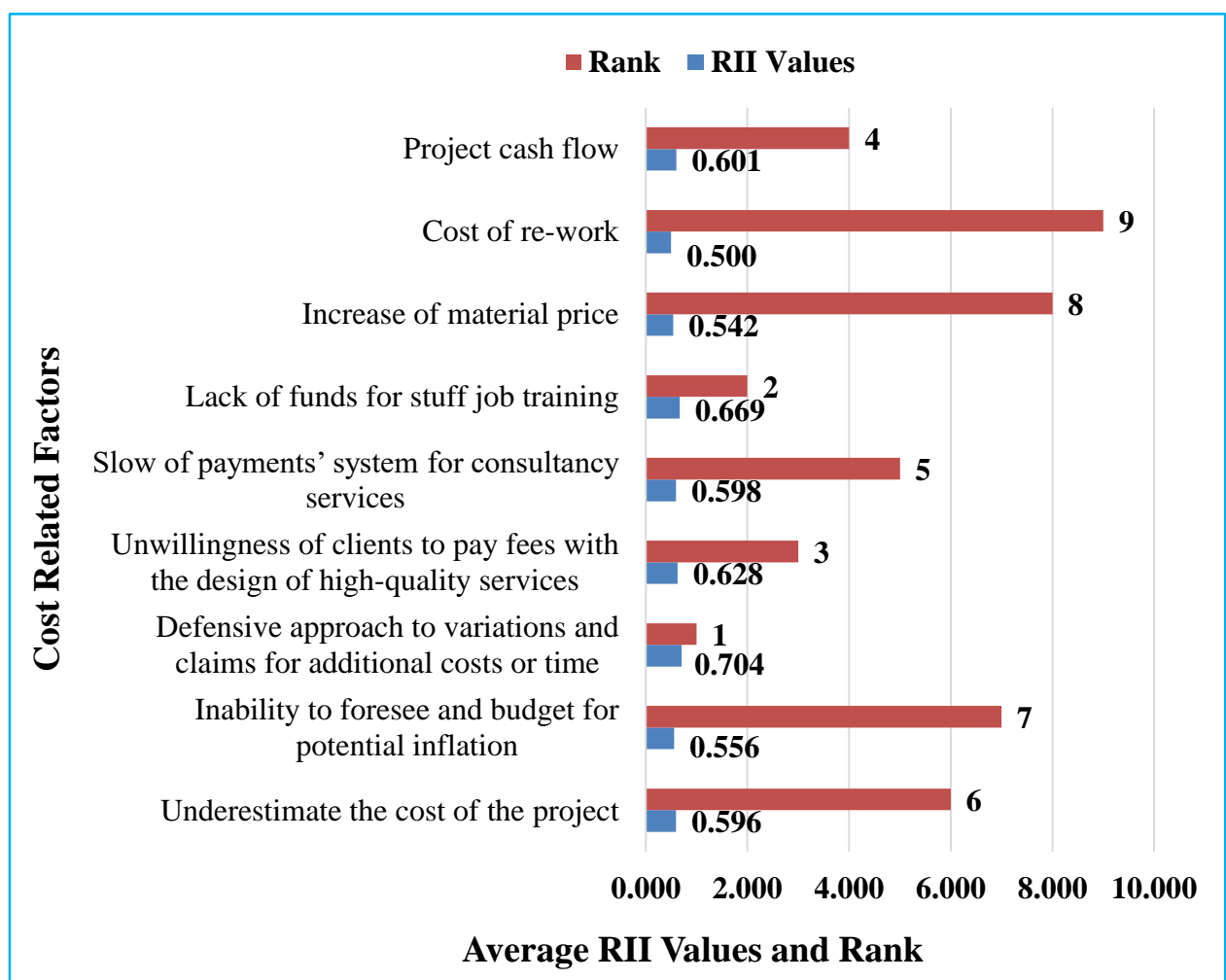


Figure 4. 5 Cost related factors

As presented on figure 4.5, defensive approach to variations and claims for additional costs or time, Lack of funds for staff job training, unwillingness of clients to pay fees commensurate with the design of high-quality services and Project cash flow with average RII values of 0.704, 0.669, 0.628 and 0.601 respectively were ranked as first, second, third

and fourth by client, consultant and contractor with severity of high impact on the performance of project consultants. Also, Slow of payments' system for consultancy services, Underestimate the cost of the project, Inability to foresee and budget for potential inflation, increase of construction material price and cost of re-work with average RII values of 0.598, 0.596, 0.556, 0.542 and 0.500 respectively were ranked as fifth, sixth, seventh, eighth and ninth. This implies that the factors has medium impact on the performance of project consultants working in Jimma town public building construction projects. Generally, the importance index values of almost all cost related factors presented on the chart indicates that the factors has medium to high impacts on the performance of project consultants from the respondents (client, consultant and contractors) point of view. This findings of this study confirms a research conducted by Getu, et al., (2021) on factors Affecting Supervision Practice of Public Building Construction Projects in Dire Dawa Administration.

4.3.4 Quality related factors

Table 4. 4 Quality related factors affecting the performance of project consultant

S. No	Quality related factors	Client	Consultant	Contractor	Average RII	Over all rank
		RII	RII	RII		
1	Lack of qualified consultant's staff	0.631	0.708	0.470	0.603	4 th
2	Poor consultancy training and education system	0.800	0.785	0.678	0.754	1 st
3	Unclear statutory regulations, approvals and requirements	0.446	0.631	0.280	0.452	9 th
4	Increase in the overall complexity of projects	0.554	0.585	0.390	0.509	8 th
5	Adequate material test records	0.692	0.662	0.360	0.571	6 th
6	Excessive variation orders	0.646	0.569	0.570	0.595	5 th
7	Lack of advanced construction technology methods	0.785	0.785	0.540	0.703	2 nd
8	Lack of ability to solve problems	0.569	0.677	0.690	0.645	3 rd
9	Lack of motivation skill for innovations	0.585	0.585	0.440	0.536	7 th

Table 4.4 shows the average relative importance index and rank of quality related factors that affect the performance of project consultants within construction projects. From the listed nine factors, the top four significant factors that all clients, consultants, and contractors agreed on as high influencing factors based on their calculated average RII values and over all rank, were: Poor consultancy training and education system (Av. RII=0.754, R=1), Lack of advanced construction technology methods (Av. RII=0.703, R=2), Lack of ability to solve problems (Av. RII= 0.645, R=3), and Lack of qualified consultant's staff (RII=0.603, R=4) respectively. Similarly, Excessive variation orders (Av. RII=0.595, R=5), Adequate material test records (Av. RII=0.571, R=6), Lack of motivation skill for innovations (Av. RII=0.536, R=7) and Increase in the overall complexity of projects (Av. RII=0.509, R=8) were decided as factors those have medium impact on the performance of construction consultants. Unclear statutory regulations, approvals and requirements with average RII value 0.452 were ranked as the last factor which has medium impact on consultant's performance. Hence, all the results labeled on the table indicates that, the listed factors have impacts ranging from medium to high on the performances of project consultants. This study confirms the research conducted by Masengesho, Wei, et al.,(2021) Relationship between project Consultants performance and project successes in the Rwandan construction industry. Similalry,the findings of this study confirms the results of research conducted by Getu, et al.,(2021) on factors Affecting Supervision Practice of Public Building Construction Projects in Dire Dawa Administration.

4.3.5 Material related factors

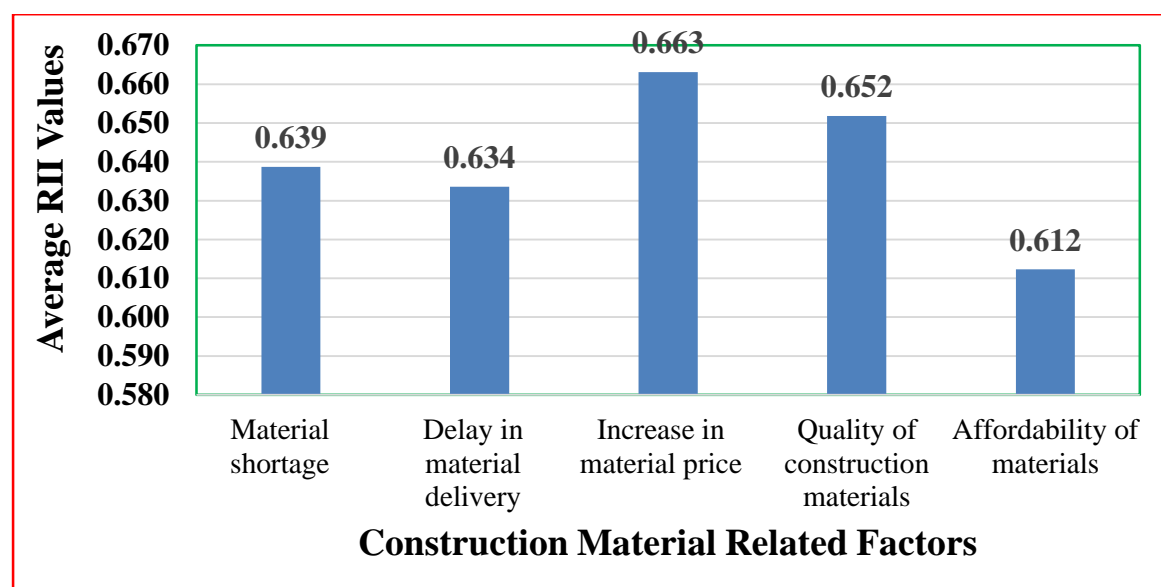


Figure 4. 6 Material related factors

From the calculated average RII values labeled on figure 4.6, it is simple to understand that increase in construction material price with average RII of 0.663 was ranked 1st. Hence, it is not surprising that this factor is more important to the contractors than others because this increase in material price is one of the most current critical problems in construction industries in developing countries like Ethiopia. Similarly, quality of construction material, construction material shortage, delay in material delivery and affordability of materials with calculated average RII values of 0.652, 0.639, 0.634 and 0.612 respectively were ranked as 2nd, 3rd, 4th and 5th. The RII values of all factors were ranging between 0.6 to 0.8. This indicates that material related factors has high impact on the performance of project consultants working in Jimma town public building projects. Generally, the finding of this study also confirms study conducted by Getu, et al., (2021) on factors Affecting Supervision Practice of Public Building Construction Projects.

4.3.6 Health and Safety related Factors

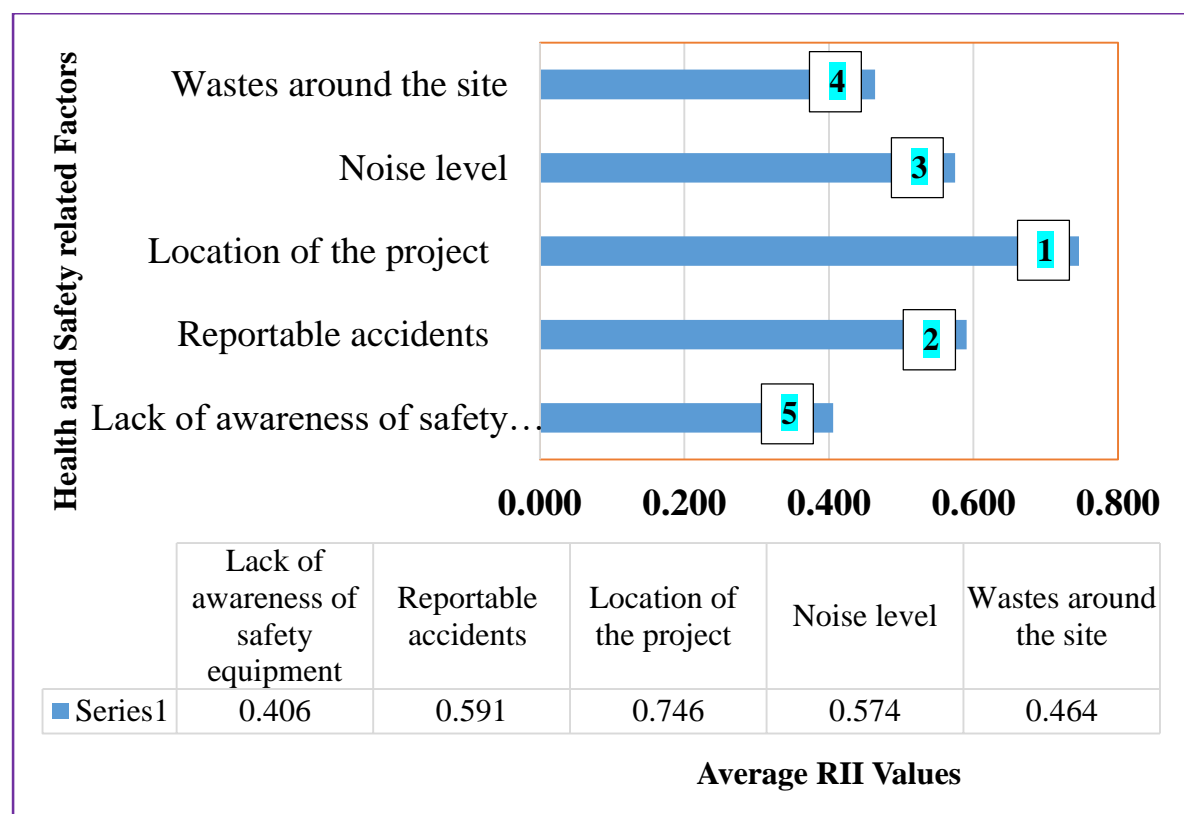


Figure 4. 7 Health and safety related factors

The results presented on the chart shows that project location was ranked in the first position all by client, consultant and contractors with calculated average RII value of 0.746. This value indicates that project location has high impact on the performance of project

consultants. This factor can also be designated as vital for three parties, and it has a similar rank for all parties as it significantly affects project consultancy and supervision practice of projects found in rural and inaccessible locations. Reportable accidents and noise level has been ranked in the second and third position with calculated average RII vales of 0.591 and 0.574 respectively. The RII values of this factor shows that the factors has moderate impact on the performance of consultants. Wastes around the site and lack of awareness of safety equipment were ranked as fourth and fifth position with average RII values of 0.464 and 0.406 respectively. This RII values indicates that the factors has medium impact on the performance of project consultants within public building construction projects in Jimma town. This findings of this study confirms a research conducted by Getu, et al., (2021) on factors Affecting Supervision Practice of Public Building Construction Projects in Dire Dawa Administration.

4.3.7 Political and economic related factors

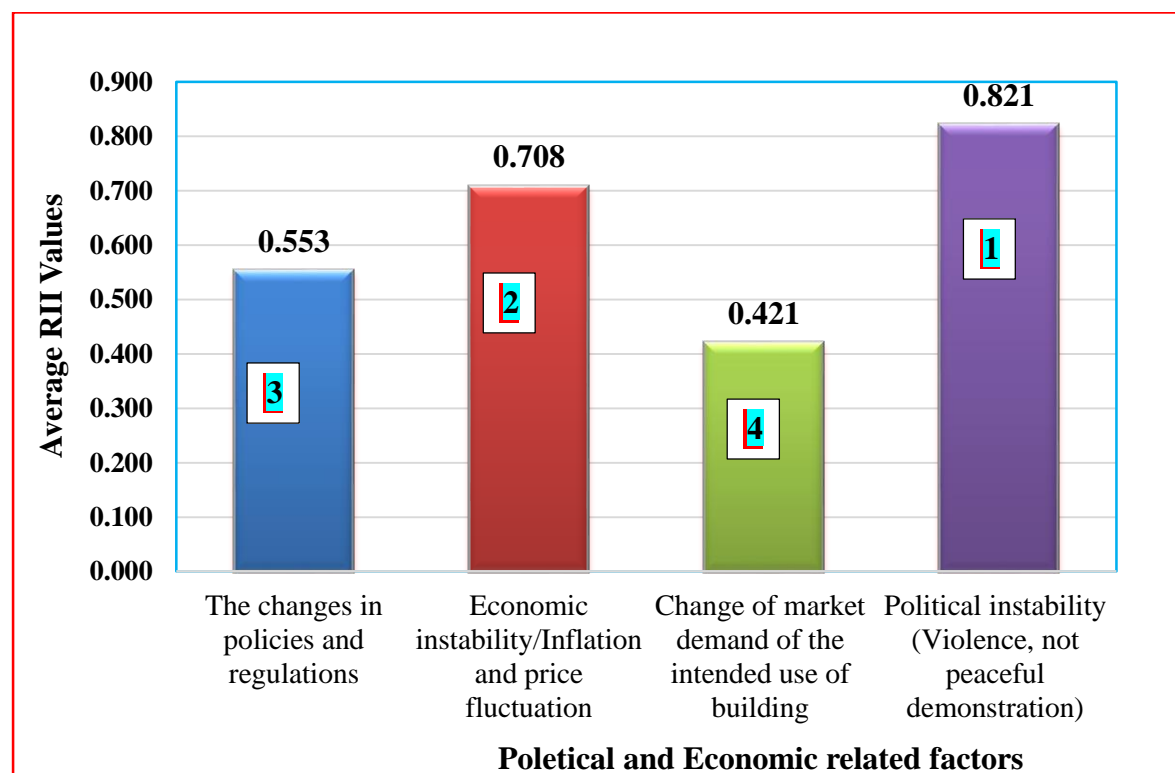


Figure 4. 8 Political and economic factors

As shown in figure 4.9, Political instability (Violence, not peaceful demonstration) was ranked first all by client, consultant and contractor respondents with calculated average relative importance index of 0.821. The RII value of this factor ranges from 0.8 to 1. This indicates that the factor has very high impact on the performance of project consultant

within public building construction projects in case of Jimma Town. This also indicates that, Political instability has very high impact on the performance of other stockholders working in construction industries. Similarly, Economic instability/Inflation and price fluctuation was ranked with average RII values of 0.708. This also indicates that the factors has high impact/severity on the performance of project consultants. Hence, changes in policies and regulations and change of market demand of the intended use of building were ranked third and fourth respectively by the respondents based on its calculated average RII of 0.553 and 0.421. This implies that these two factors has medium impact on the performance of project consultants based on their severity.

4.3.8 Environment related factors

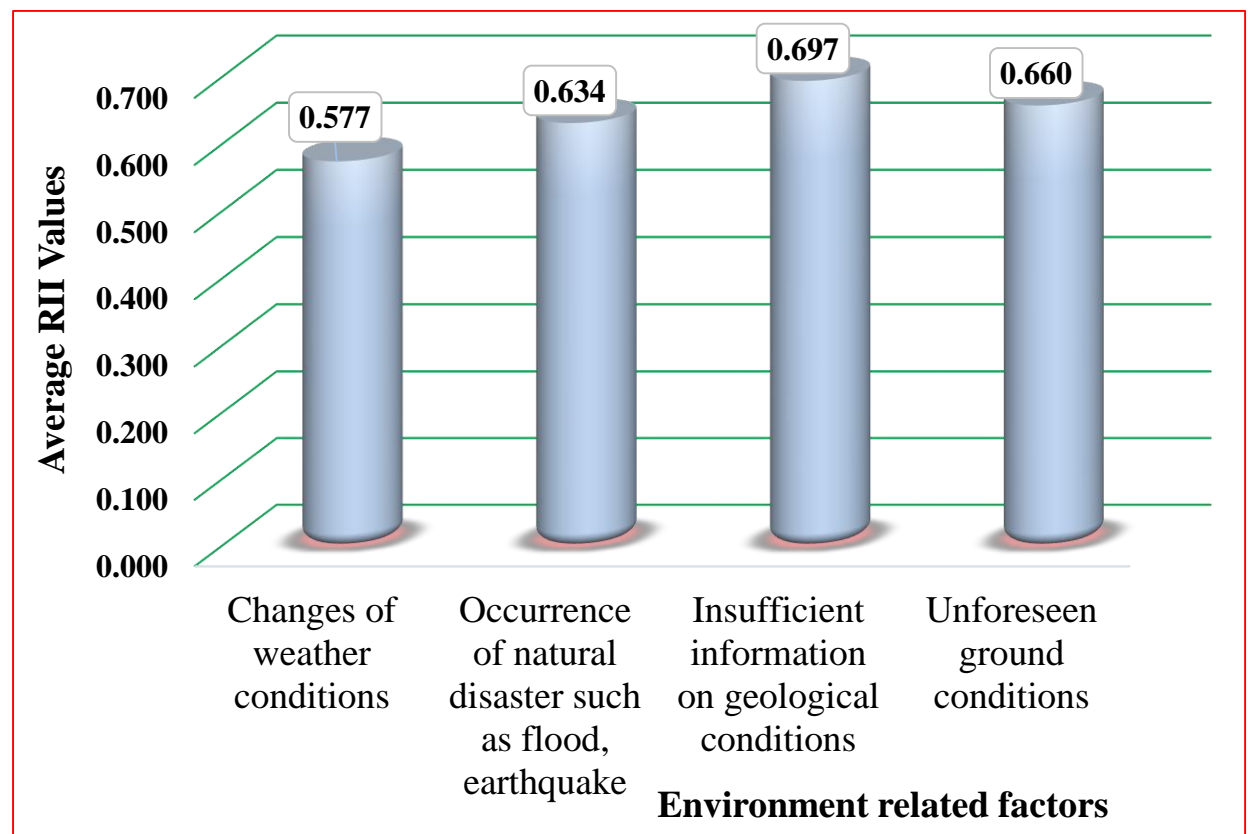


Figure 4. 9 Environment related factors

The calculated average RII value of the factors presented on Figure 4.9 indicates that, insufficient information on geological conditions, unforeseen ground condition and occurrence of natural disaster such as flood, earthquake with average RII values of 0.697, 0.660 and 0.634 were ranked as first, second and third position respectively by respondents(client, consultant and contractor). Hence, the RII values of these factors indicate that the severity of the factors on the performance of the project consultant is high

except change of weather condition with average RII value of 0.577 (medium impact). Also, it's not surprising that geological information is more important for designer/consultant during preliminary design stage and for contractors throughout the construction stage. This factor is essential for clients, consultants, and contractors as it has severe impact on building projects' design and supervision service. However, it's a general truth to understand that natural disasters (Act of God) are more important for client than others. Because impacts of this factors on project performance was goes to project owner as he/she is the initiators of the project. Similarly, changes of weather conditions with RII value of 0.577 was ranked fourth factors. Its RII value shows that the factor has medium impact on the performance of design and supervision consultant within building projects in Jimma Town. This finding confirms study conducted by Getu, et al., (2021) on factors Affecting Supervision Practice of Public Building Construction Projects in Dire Dawa Administration.

4.4 Relative importance index for group of factors affecting the performance of project consultants.

The data labeled in table 4.4 shows that Management related factor was ranked first with a weighted average RII value equal to 0.648. This indicates that management related a factor has a high impact on the performance of project consultants. Environmental related factors were also ranked second with weighted average of RII value equal to 0.642. Material related factors, political and economic related factors and design and supervision related factors were ranked third, fourth and fifth with weighted average of RII value equal to 0.640, 0.626 and 0.622 respectively. Hence the weighted average RII values of groups of factors listed in table 4.4 is ranging from 0.6 to 0.8 (high effect) except quality related factors and health and safety related factors with RII value ranging between 0.4 to 0.6 (medium effect). This implies that all the factors has medium to high impacts on the performance of project consultants working in public building projects in Jimma Town.

Table 4. 5 Relative importance index for group of factors

S. No	Group of Factors	Client		Consultant		Contractor		Average RII	Over all rank
		RII	R 1	RII	R 2	RII	R 3		
1	Management related factors	0.715	1	0.691	4	0.537	2	0.648	1 st

2	Design and supervision related factors	0.674	5	0.658	6	0.535	3	0.622	5 th
3	Time related factors	0.690	3	0.644	7	0.523	5	0.619	6 th
4	Cost related factors	0.660	7	0.639	8	0.499	7	0.599	7 th
5	Quality related factors	0.634	8	0.665	5	0.491	8	0.597	8 th
6	Material related factors	0.677	4	0.711	1	0.532	4	0.640	3 rd
7	Health and Safety related Factors	0.582	9	0.625	9	0.462	9	0.556	9 th
8	Political and economic related factors	0.673	6	0.704	2	0.500	6	0.626	4 th
9	Environmental related factors	0.692	2	0.692	3	0.543	1	0.642	2 nd

4.5 Reliability check using Cronbach's Alpha

Reliability is, the extent to which a measurement of a phenomenon provides stable and consist result. Hence, in this study used Cronbach's Alpha coefficient to check quality of Reliability Test. The formula that determines Cronbach's alpha is fairly simple and makes use of the number of variables or question items in the instrument (k) and the average correlation between pairs of items (r) Smith & Samantha,(2018).

$$\alpha = \frac{Kr}{1 + (K-1) * r}$$

However, the Alpha values in this study were 0.860 of good result. This implies that the five point scale values filled by the respondents were real to the real world. Also, the results are ranging between 0.8 to 0.9 values of good reliability. As a result, the closer the alpha value is to one, the stronger the internal consistency of the items in the instrument under consideration. The following statistical data shows Cronbach's alpha value of the respondents.

Table 4. 6 Reliability check/ Cronbach's alpha

Analysis of variance:

Source	DF	Sum of squares	Mean squares	F	Pr > F
Between subjects	27	142.889	5.292	7.143	< 0.0001
Within subjects	560	576.095	1.029		

Between measures	20	176.020	8.801	11.879	< 0.0001
Residual	540	400.075	0.741		
Total	587	718.985	1.225		

Computed against model $Y = \text{Mean}(Y)$

Cronbach's alpha statistics :

Cronbach's alpha	Standardized Cronbach's Alpha
0.860	0.838

Hence, the Cronbach's alpha value of 0.860 is the indicator of good reliability of the five point Likert scale values filled by respondents. Hence, the closer the alpha value is to one, the stronger the reliability of the items in the instrument under consideration.

4.6 Impacts of inadequate project consultant's performance on the success of public building projects.

Project success criteria are measurable factors that determine the success of the project. Project will be considered as success when it is completed on the scheduled time, within budgeted cost, specified quality and better safety criteria also. These criteria establish standards that stakeholders can use to evaluate the project and decide whether it meets the expected outcomes. If the construction project does not have a competent and knowledgeable consultant the consequences are significant losses for the project owners, such as cost overrun, project delay, poor project quality and disputes among the contracting parties. Hence the RII values labeled in table 4.6 shows the severity of impacts due to inadequate project design and supervision service on the project success in Jimma Town.

Table 4.7 Impacts of inadequate design and supervision constancy on building project success

S.No	Effects on project success	Client		Consultant		Contractor		Average RII	Over all Rank
		RII	R1	RII	R2	RII	R3		
1	Excess claim and disputes on contractors	0.862	1	0.877	1	0.740	3	0.826	1 st
2	Contract cancellation	0.708	6	0.708	8	0.740	3	0.718	7 th
3	Adversarial behavior and diminished reputations	0.708	6	0.754	4	0.700	9	0.721	5 th

Performance of Project Consultants in Public Building Construction Projects: In case of
Jimma Town

4	Delay of the projects	0.754	3	0.677	11	0.710	8	0.714	8 th
5	Increase in project cost	0.769	2	0.692	10	0.730	5	0.731	4 th
6	Wastage of materials	0.738	4	0.769	3	0.720	6	0.743	3 rd
7	Demolition, rework and extensions of time	0.662	9	0.815	2	0.760	2	0.746	2 nd
8	Productivity loses	0.631	10	0.708	8	0.720	6	0.686	10 th
9	Poor project quality	0.738	4	0.738	5	0.680	10	0.719	6 th
10	Deaths of workers due to unsafe structures	0.520	13	0.400	13	0.450	13	0.457	13 th
11	Increase in Overhead Expenses	0.708	6	0.738	5	0.640	11	0.695	9 th
12	Additional Money for Contractor	0.631	10	0.738	5	0.640	11	0.670	11 th
13	Delay in Payment	0.538	12	0.662	12	0.790	1	0.663	12 th

From the responses illustrated in table 4.5, it is simple to understand that, about 82.6 % (RII=0.826) of the respondents (client, consultant and contractors) strongly agree on the occurrence of excess claim and disputes on contractors with in study area and rank it first. Similarly, about 74.7 % (RII=0.76) and 74.3 % (RII=0.743) of the respondents agree on demolition, rework and extension of time and wastage of materials with in study area and ranked them second and third position respectively as a highest impacts occurring due to inadequate project consultants performance. Hence it is apparent to know that, all the impacts listed are important as agreed by respondents with decision of high occurrence of the factors except death of worker due to unsafe building structures with average RII=0.457, which indicates medium occurrence of this impact in the study area.

Furthermore, the researcher observed through interview, that adversarial behavior, delay of the project, increase in project cost, slow in payment, productivity loses and contract cancellation as the serious issues in the study area if they are not timely managed. This supports the RII values of the impacts labeled in in the table.

4.7 Measures to be taken for minimizing impacts due to inadequate project consultants' performance on project success.

Seventeen remedial methods to reduce impacts due to inadequate project consultants' performance on project success were identified and provided in the questionnaire form. However, determining the relative importance degree of each method was sought as it leads to the main objective of this survey. The following parts present and discuss the data collected regarding the relative importance use of the remedial methods in Jimma Town.

Table 4. 8 Remedial methods to be taken

S. No	Remedial Measures	Client		Consultant		Contractor		Average RII	Over all rank
		RII	R 1	RII	R 2	RII	R 3		
1	Working cooperatively together, sharing the same vision and objectives for the project.	0.877	1	0.754	4	0.690	5	0.774	2 nd
2	Communication between all parties with in the project in decision making processes, from project inception to completion	0.862	2	0.662	11	0.740	2	0.754	3 rd
3	Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone	0.800	4	0.631	14	0.710	3	0.714	6 th
4	Celebrating with employees after achieving milestones	0.569	14	0.538	17	0.660	9	0.589	17 th
5	Practicing consultancy performance appraisal	0.723	6	0.769	3	0.670	7	0.721	5 th
6	Taking consultancy responsibility and giving praises	0.569	14	0.677	9	0.640	14	0.629	15 th
7	Allowing room for innovation learning	0.646	11	0.708	7	0.570	17	0.641	13 th
8	Mission-focus/ priority-setting	0.708	9	0.677	9	0.750	1	0.712	7 th
9	Encouraging positivity	0.723	6	0.646	13	0.700	4	0.690	10 th

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

10	Continuing client and contractor involvement in the design and supervision management/ lean construction approach	0.862	2	0.785	2	0.680	6	0.775	1 st
11	Practicing good communication skills	0.646	11	0.708	7	0.600	16	0.651	12 th
12	Spend sufficient time and money in project planning, Design and supervision	0.723	6	0.815	1	0.660	9	0.733	4 th
13	Accepting challenges during execution of work	0.538	17	0.631	14	0.650	12	0.606	16 th
14	Training design and supervision personnel available across all disciplines to gain experience and competition	0.800	4	0.662	11	0.640	14	0.701	8 th
15	Delegation ability	0.569	14	0.754	4	0.650	12	0.658	11 th
16	Understand and encourage the role of technology in the delivery of projects by all stakeholders	0.600	13	0.631	14	0.660	9	0.630	14 th
17	Framing the contracting arrangement around goodwill and fair dealing in an open communication environment	0.708	9	0.723	6	0.670	7	0.700	9 th

Based on the overall calculated average weight index values illustrated in table 4.7, It is simple to understand that, there is a high agreement between all respondents (client, consultant and contractor) regarding the seventeen remedial methods being highly important. Because the average RII values of all methods was ranging between 0.6 to 0.8. This indicates the high importance of the remedial measure to minimize impacts due to inadequate project consultant's performance on project success. However, "Celebrating with employees after achieving milestones" it was ranked in the last position with average relative importance index of 0.589(58.9% medium agreement). This reflects that the client, consultant and contractor don't believe on celebrating with employees after achieving milestones and this return to the culture and adversarial attitudes towards their team work, communication and smooth relationship among the contracting parties as well as labour working in the project site. Also, this result refers to lack of interaction between client,

consultant and contractor and dealing with the employee is none of the concern of design and supervision consultants.

Continuing client and contractor involvement in the design and supervision management/ lean construction approach(RII=0.775), Working cooperatively together, sharing the same vision and objectives for the project(RII=0.774), Communication between all parties with in the project in decision making processes, from project inception to completion(RII=0.754), Spend sufficient time and money in project planning, Design and supervision(RII=0.733), Practicing consultancy performance appraisal(RII=0.721), Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone(RII=0.714), Mission-focus/ priority-setting(RII=0.712), Training design and supervision personnel available across all disciplines to gain experience and competition(RII=0.701) and Framing the contracting arrangement around goodwill and fair dealing in an open communication environment(RII=0.700) were ranked one to nine with RII of $0.700 \leq 0.800$. This indicates that the respondents are not fully aware of the importance these factors to improve the performance of consultant services within the study area. The serious issue forwarded from one of the interviewer is that” Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone (RII=0.714)” which means the selection on consultants is often driven more by price, friendship and corruptive practice during tendering process than the required level of profession, service and the required experience for successful accomplishment of the project.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The quality of the project design and supervision consultant's has a major influence on the overall success/performance and efficiency of construction projects. Declining the standard project consultancy service has contributed significantly to a similar decline of the successful completion of the primarily objectives of the project. The aim of this research was to assess the major factors affecting the performance of project consultants in public building construction projects in Jimma Town, their effects on project success and remedial measures.

- ✓ According to the review of literature and after interviewing experts who deal with design and supervision team, sixty eight factors were identified and listed under nine group of factors. These groups are Management related factors, Design and supervision related factors, Time related factors, Cost related factors, Quality related factors, Material related factors, Health and safety related factors, Political and economic related factors and Environment related factors. From these category of factors the study revealed that, management related factors and environment related factors followed by Material, Political and economic related factors, design and supervision related factors and time related factors were ranked as first, second, third, fourth, fifth and sixth respectively based on their calculated average relative importance index value and decided with severity of high impact on the performance of project consultants. Beside, cost related factors, quality related factors and health and safety related factors respectively were ranked as seventh, eighth and ninth with severity of medium impact on the performance of project consultants within public building projects in Jimma Town.
- ✓ The study also revealed that, occurrence of excess claim and disputes on contractors, demolition and rework, extension of time and wastage of construction materials respectively as the major effects of inadequate project design and supervision consultant's service. Furthermore, adversarial relationship among the contracting parties, increased project cost, delay of payment, productivity loses and contract cancellation were also determined as the serious issues occurring due to consultancy service problems in the study area.

- ✓ Respectively, the study naked that, continuing client and contractor involvement in the design and supervision management/ lean construction approach, working cooperatively together, sharing the same vision and objectives for the project, communication between all parties with in the project in decision making processes, from project inception to completion, spending sufficient time and money in project planning, practicing consultancy performance appraisal, Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone, mission-focus/priority-setting, training design and supervision personnel available across all disciplines to gain experience and competition and framing the contracting arrangement around goodwill and fair dealing in an open communication environment as remedial measure of minimizing consultancy related problems in building construction projects.

Generally, the study conclude that; there were still numerous factors affecting the performance of project consultants within a projects and this also influences time, cost and quality performance of public building construction projects in Jimma Town.

5.2 Recommendations

Based on the findings of the research results and detail review of the related literature, the following recommendations were forwarded for the intended parties:

1. Top managerial teams should have to create awareness for consulting team on the factors affecting the quality of project design and supervision consultants performance and their effects on project success
2. During selection of consultant, clients should recognize that insufficient fees and rash commitment of work will increase the probability of inadequate design supervision and significant contractual claims.
3. For the project execution process to work effectively, a collaborative working environment and high level of communication within the project team or stakeholder is needed.
4. Construction managers should have to organize capacity building trainings for their design and supervision consultants on the identified key impacts occurring due to inadequate consultancy service in this study.

5. Construction supervision consultants are expected to listen to subordinates, encourage teamwork during execution of work and quality performance of construction project.
6. Full-time involvement of consultants on project site to direct and encourage the contractor on every section of work to efficiently solve any design-related problems will enhance the project success.
7. Contractor should add professional experience on design and supervision practices to forward any design related errors and variation's before start the execution of the work.
8. Government bodies should have to include a strict legislation policy regarding market inflation of construction material cost.
9. Also, Ethiopian's construction industry legislative bodies should have to either split or clarify selection of one consultant both for the line share of design and supervision service to ensure the right counterpart.

Further study

1. Further study is needed on the drawbacks of assigning design and supervision service for consulting firm only (designer as a supervisor principle).
2. Study on the impacts of selecting the lowest bidder as a winner approach on the performance construction projects in Ethiopia.

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APPENDIX A1: QUESTIONNAIRES FOR CONSTRUCTION STAKEHOLDERS

Research Title: - “Assessment on Factors Affecting the Performance of Project Consultants in Public Building construction Projects: In Case of Jimma Town”.

Dear Respondents

The following questionnaires are prepared to collect data about the Factors Affecting the Performance of project Design and Supervision Consultants in Public Building construction Projects in Jimma Town. Therefore, the researcher uses your company information only for academic research purpose. Your genuine information is a critically supports or important to come a sound and meaningful conclusion and recommendations. I would like to thanks for your commitment of time, energy, effort kindly cooperation and returning back the questionaries’ on time.

Specific Objectives of the study are:

- ✓ To identify the major factors affecting the performance of project design and supervision consultants in public building construction projects in Jimma Town.
- ✓ To evaluate the impacts of inadequate project design and supervision consultants performance on the success of public building projects in Jimma Town.
- ✓ To determine the remedial measures of minimizing the impacts due to inadequate project design and supervision consultants’ service on the success of public building projects?

I. Respondents Profile

Please add (✓) as appropriate:

1. Your organization type:

Owner	Contractor	Consultant
-------	------------	------------

2. The respondent position:

Project Manager Facility Manager Site Engineer Office Engineer
Designer Others (specify) _____

3. Working experience of the respondent:

Less than 1 year from 1 to 5 years from 6 to 10years over
10 years

4. Number of completed building construction projects by your company:

Less than 5 from 5 to 10 From 10 to 15 More than 15

5. Does your company have past experience related to maintenance of public buildings?

Yes No

6. If your answer is 'yes' for question no. 5 tick or mark number of maintained or improved public building construction projects by your company within last ten years?

Less than 5 from 5 to 10 from 10 to 15 More than 15

Part II: Factors affecting the performance of Project design and supervision consultants in public building projects in Jimma Town

Depending on your experience, please express your opinion for the factors listed below on the rate of importance in building construction projects based on the representative numbers listed below. (Please tick the appropriate box).

1= Very low important

4= High important and

2= Low important

5= Very high important journey

3= Moderate important

Table 1: Factors identified for design and supervision consultants from the literatures

S. No	Factors affecting the performance of project design and supervision consultants	Rate of importance				
		1	2	3	4	5
1	Management related factors					
	Professional inability/inadequate background					
	Lack of cooperation/team work amongst the parties					
	Inadequate client's communication/relationship with design and supervision team members					
	Insufficient project documents and planning of workload					
	Inability to delegate authority					
	Lack of coordination among members with consultancy team					
	Allocation of staff to more than one project in the same time					
	Leaving design issues to be sorted out in the construction process					

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

	Lack of making rapid and precise decision when necessary					
	Selection of design consultants on the basis of lowest price selection strategy (Lowest bid approach)					
	Insufficient and missing input information from the client					
	Unstable client's requirements					
	Change in project requirements by stakeholders at later stages					
2	Design and supervision related factors	1	2	3	4	5
	Lack of time available for checking and correlating all the information on all design documents					
	The failure of a consultant to provide adequate and clear information in the tender documents; errors and omission of consultants					
	Unfamiliarity of the design consultants with the regulations, local conditions, construction permits and standard specifications					
	Lack of consultant's knowledge on available construction materials, equipment and techniques that will be used in the project site					
	Lack of consultant experience on similar projects					
	Lack of consultant full-time involvement on project site					
	Improper supervision of works executed by contractor					
	The presence of conflicts between contract documents					
	Unclear and inadequate details in drawings					
	Insufficient design reviews with relevant parties					
	Copying and modifying design and reports from previous work to minimize time and cost					
	Inadequate/ineffective use of new technology					
3	Time related factors	1	2	3	4	5
	Tight consultancy schedule or Inaccurate time estimates					
	Inappropriate planning and scheduling of work					
	Contractors' unrealistic construction's schedule					

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

	Timely submission of reports, payment certification, and claims					
	Contractor's change requests for easier operations, higher income, within the allowable limits for the project					
	Last minute change by client					
	Rectify construction mistakes					
4	Cost related factors	1	2	3	4	5
	The underestimate of the cost of the project					
	Inability to foresee and budget for potential inflation					
	Defensive approach to variations and claims for additional costs or time					
	Unwillingness of clients to pay fees commensurate with the design of high-quality services					
	Slow of payments' system for consultancy services					
	Lack of funds for staff job training					
	Increase of material price					
	Cost of re-work					
	Project cash flow					
5	Quality related factors	1	2	3	4	5
	Lack of qualified consultant's staff					
	Poor consultancy training and education system					
	Unclear statutory regulations, approvals and requirements					
	Increase in the overall complexity of projects					
	Adequate material test records					
	Excessive variation orders					
	Lack of advanced construction technology methods					
	Lack of ability to solve problems					
	Lack of motivation skill for innovations					
6	Material related factors	1	2	3	4	5
	Unavailability/shortage of construction material					
	Delay in material delivery					

	Increase in material price					
	Quality of construction materials					
	Affordability of materials					
7	Health and Safety related Factors	1	2	3	4	5
	Lack of awareness of safety equipment					
	Reportable accidents					
	Location of the project					
	Noise level					
	Wastes around the site					
8	Political and economic related factors	1	2	3	4	5
	The changes in policies and regulations					
	Economic instability/Inflation and price fluctuation					
	Change of market demand of the intended use of building					
	Political instability (Violence, not peaceful demonstration)					
9	Environmental related factors	1	2	3	4	5
	Changes of weather conditions					
	Occurrence of natural disaster such as flood, earthquake					
	Insufficient information on geological conditions					
	Unforeseen ground conditions					

Part III: Effects of inadequate project design and supervision consultant's service on the success of public building projects.

Below are the effects of inadequate design a supervision consultancy service on the success of public construction projects. From your experience, please express your opinion by ticking numbers provided for scale of agreement.

1= Very Low Effect, 2= Low Effect, 3= Moderate Effect, 4= High Effect and 5= Very High Effect

Table 2: Effects of inadequate design and supervision consultancy service on project success

S.No	Effects of inadequate design and supervision consultancy service on the success of construction project	Rate of effects				
		1	2	3	4	5
1	Excess claim and disputes on contractors					

2	Contract cancellation					
3	Adversarial behavior and diminished reputations					
4	Delay of the projects					
5	Increase in project cost					
6	Wastage of materials					
7	Demolition, rework and extensions of time					
8	Productivity loses					
9	Poor project quality					
10	Deaths of workers					
11	Increase in Overhead Expenses					
12	Additional Money for Contractor					
13	Delay in Payment					

Part IV: Remedial Measures could be taken to minimize the impacts of inadequate design consultancy and supervision service on the project success

Scale of Agreement

- 1= Very Low Effect
- 2= Low Effect
- 3= Moderate Effect
- 4= High Effect and
- 5= Very High Effect

Table 3: Measures to be taken to minimize the impacts related to inadequate design consultancy and supervision service of public building projects

S.No	Measures to be taken	Rate of effects				
		1	2	3	4	5
1	Working cooperatively together, sharing the same vision and objectives for the project.					
2	Communication between all parties with in the project in decision making processes, from project inception to completion					
3	Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone					
4	Celebrating with employees after achieving milestones					
5	Practicing consultancy performance appraisal					
6	Taking consultancy responsibility and giving praises					
7	Allowing room for innovation learning					
7	Mission-focus/ priority-setting					
8	Encouraging positivity					
11	Continuing client and contractor involvement in the design and supervision management/ applying lean principle					
12	Practicing good communication skills					
13	Spend sufficient time and money in project planning, Design and supervision					
14	Accepting challenges during execution of work					
15	Training design and supervision personnel available across all disciplines to gain experience and competition					
16	Delegation ability					
17	Understand and encourage the role of technology in the delivery of projects by all stakeholders					
18	Framing the contracting arrangement around goodwill and fair dealing in an open communication environment					

APPENDIX A2: Interview Questions

Name of the organization _____

Name of the Project: _____

Name of Respondent (optional): _____

Position/role: _____

Date and time: _____

Good morning/Good afternoon Mr. or Ms.: my name is **Mohammedsali Nuredin**. Before starting my question, I would like to say thank you for your voluntary participation in this interview. The interview has only one section and it will take approximately 30 minutes. This semi-structured interview, which is forwarded to the Clients, contractors, and consultants who are involved in the building construction project, is part of this academic research that aims **to assess factors affecting the Performance of project Design and Supervision Consultants in Public Building Projects: In case of Jimma Town**. With this survey, I would like to assess factors affecting the performance of design and supervision consultants, evaluating their effect on project success and determining remedial measure for minimizing the effects on public building projects in Jimma town. All information you provide will be kept in strict confidentiality and only used for academic research. Please feel free to answer the questions with what you know and what you think in your mind.

Part One. Interview Questions

1) What is your role in the organizations?

Project Manager Facility Manager Site Engineer Office Engineer

Consultant/Designer Others (specify) _____

2) Who is your employee?

Owner side Contractor side Consultant side

3) Does your company have a facility manager?

Yes No

4) In your experience; what are the common factors affecting the performance of design and supervision consultants with in construction

projects? _____

5) If your company hired consultant; what are his/her responsibility and advantage for the company?

6) If your company not hired a design and supervision consultant; what are disadvantage for the company?

7) Does your company plan a budget for consultancy service during project design stage?

Yes No

8) If 'no' why?

9) How do you plan and arrange design and supervision works to match construction needs? Is the designed amount in tune with construction needs?

10) How is the design review and construction supervision process executed? How is supervision lessons fed back to the constructor?

11) How much effects of not having project consultancy service on success/performance of the building project in degree?

Very Low Effect Low Effect Moderate Effect High Effect and Very High Effect

12) Do you think that lack of experienced consultant affects the goal of construction projects?

Yes No

13) Do you think lack of strict legislation of building law affect the performance consultants?

Yes No

14) How do you deal with the design and construction conflicts?

15) With your view of point what Measures should be taken to reduce the impacts of inadequate design and supervision consultants in building construction projects?

Thank you for your commitment!

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ANNEX B1: Factors affecting the performance of project design and supervision consultants.

Category of factors	Factors affecting the performance of project design and supervision consultants	Client		Consultant		Contractor		Average RII	Overall Rank
		RII	Rank	RII	Rank	RII	Rank		
		Management related factors	Professional inability/background	0.769	6	0.738	5		
Lack of cooperation/team work amongst the parties	0.800		4	0.738	5	0.550	7	0.696	4
Inadequate client's communication/relationship with design and supervision team members	0.815		3	0.831	2	0.740	1	0.795	1
Insufficient project documents and planning of workload	0.831		2	0.708	7	0.370	13	0.636	7
Inability to delegate authority	0.631		9	0.600	10	0.450	10	0.560	12
Lack of coordination among members with consultancy	0.692		8	0.785	3	0.400	11	0.626	9
Allocation of staff to more than one project in the same time	0.569		13	0.846	1	0.470	9	0.628	8
Leaving design issues to be sorted out in the construction process	0.615		10	0.600	10	0.590	5	0.602	10
Lack of making rapid and precise decision when necessary	0.785		5	0.677	8	0.560	6	0.674	6
Selection of design consultants on the basis of lowest price selection strategy (Lowest bid approach)	0.846		1	0.662	9	0.520	8	0.676	5
Insufficient and missing input information from the client	0.600		11	0.600	10	0.600	4	0.600	11
Unstable client's requirements	0.585		12	0.450	13	0.390	12	0.475	13
Change in project requirements by stakeholders at later stages	0.754		7	0.754	4	0.730	2	0.746	2
Design and supervision related	Lack of time available for checking and correlating all the information on all design documents		0.708	6	0.662	7	0.640	2	0.670

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

	The failure of a consultant to provide adequate and clear information in the tender documents; errors and omission of consultants	0.646	8	0.615	8	0.470	10	0.577	8
	Unfamiliarity of the design consultants with the regulations, local conditions, construction permits and standard specifications	0.754	4	0.723	3	0.570	5	0.682	4
	Lack of consultant's knowledge on available construction materials, equipment and techniques that will be used in the project site	0.769	3	0.723	3	0.600	3	0.697	3
	Lack of consultant experience on similar projects	0.560	10	0.615	8	0.480	8	0.552	10
	Lack of consultant full-time involvement on project site	0.738	5	0.815	1	0.600	3	0.718	1
	Improper supervision of works executed by contractor	0.554	11	0.600	10	0.390	11	0.515	12
	The presence of conflicts between contract documents	0.569	9	0.538	11	0.480	8	0.529	11
	Unclear and inadequate details in drawings	0.677	7	0.677	5	0.390	11	0.581	7
	Insufficient design reviews with relevant parties	0.431	12	0.477	12	0.750	1	0.553	9
	Copying and modifying design and reports from previous work to minimize time and cost	0.831	2	0.769	2	0.540	6	0.713	2
	Inadequate/ineffective use of new technology	0.846	1	0.677	5	0.510	7	0.678	5
Time related factors	Tight consultancy schedule or Inaccurate time estimates	0.846	1	0.800	1	0.460	6	0.702	2
	Inappropriate planning and scheduling of work	0.600	6	0.569	5	0.490	5	0.553	6
	Contractors' unrealistic construction's schedule	0.554	7	0.523	7	0.300	7	0.459	7
	Timely submission of reports, payment certification, and claims	0.754	3	0.538	6	0.570	3	0.621	4
	Contractor's change requests for easier operations, higher income, within the allowable limits for the project	0.662	4	0.692	3	0.620	2	0.658	3
	Last minute change by client	0.769	2	0.769	2	0.700	1	0.746	1
	Rectify construction mistakes	0.646	5	0.615	4	0.520	4	0.594	5

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

Cost related factors	The underestimate of the cost of the project	0.600	7	0.738	2	0.450	7	0.596	6
	Inability to foresee and budget for potential inflation	0.569	8	0.600	6	0.500	5	0.556	7
	Defensive approach to variations and claims for additional costs or time	0.769	1	0.723	3	0.620	1	0.704	1
	Unwillingness of clients to pay fees commensurate with the design of high-quality services	0.677	5	0.646	5	0.560	2	0.628	3
	Slow of payments' system for consultancy services	0.723	3	0.662	4	0.410	8	0.598	5
	Lack of funds for staff job training	0.738	2	0.769	1	0.500	5	0.669	2
	Increase of material price	0.646	6	0.600	6	0.380	9	0.542	8
	Cost of re-work	0.508	9	0.462	9	0.530	4	0.500	9
	Project cash flow	0.708	4	0.554	8	0.540	3	0.601	4
Quality related factors	Lack of qualified consultant's staff	0.631	5	0.708	3	0.470	5	0.603	4
	Poor consultancy training and education system	0.800	1	0.785	1	0.678	2	0.754	1
	Unclear statutory regulations, approvals and requirements	0.446	9	0.631	6	0.280	9	0.452	9
	Increase in the overall complexity of projects	0.554	8	0.585	7	0.390	7	0.509	8
	Adequate material test records	0.692	3	0.662	5	0.360	8	0.571	6
	Excessive variation orders	0.646	4	0.569	9	0.570	3	0.595	5
	Lack of advanced construction technology methods	0.785	2	0.785	1	0.540	4	0.703	2
	Lack of ability to solve problems	0.569	7	0.677	4	0.690	1	0.645	3
	Lack of motivation skill for innovations	0.585	6	0.585	7	0.440	6	0.536	7
Material related factors	Unavailability/shortage of construction material	0.646	4	0.800	1	0.470	4	0.639	3
	Delay in material delivery	0.677	3	0.754	3	0.470	4	0.634	4

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

	Increase in material price	0.738	1	0.631	4	0.620	1	0.663	1
	Quality of construction materials	0.615	5	0.800	1	0.540	3	0.652	2
	Affordability of materials	0.708	2	0.569	5	0.560	2	0.612	5
Health and Safety related Factors	Lack of awareness of safety equipment	0.354	5	0.523	5	0.340	4	0.406	5
	Reportable accidents	0.723	2	0.538	4	0.510	2	0.591	2
	Location of the project	0.815	1	0.692	2	0.730	1	0.746	1
	Noise level	0.554	3	0.769	1	0.400	3	0.574	3
	Wastes around the site	0.462	4	0.600	3	0.330	5	0.464	4
Political and economic related factors	The changes in policies and regulations	0.615	3	0.692	3	0.350	4	0.553	3
	Economic instability/Inflation and price fluctuation	0.738	2	0.815	2	0.570	2	0.708	2
	Change of market demand of the intended use of building	0.415	4	0.477	4	0.370	3	0.421	4
	Political instability (Violence, not peaceful demonstration)	0.923	1	0.831	1	0.710	1	0.821	1
Environmental related factors	Changes of weather conditions	0.662	3	0.600	4	0.470	4	0.577	4
	Occurrence of natural disaster such as flood, earthquake	0.633	4	0.769	1	0.500	3	0.634	3
	Insufficient information on geological conditions	0.738	1	0.692	3	0.660	1	0.697	1
	Unforeseen ground conditions	0.733	2	0.708	2	0.540	2	0.660	2

ANNEX B2: Impacts of Inadequate project design and supervision consultancy service on project success

S.No	Effects on project success	Client		Consultant		Contractor		Average RII	Overall Rank
		RII	R1	RII	R2	RII	R3		
1	Excess claim and disputes on contractors	0.862	1	0.877	1	0.740	3	0.826	1
2	Contract cancellation	0.708	6	0.708	8	0.740	3	0.718	7
3	Adversarial behavior and diminished reputations	0.708	6	0.754	4	0.700	9	0.721	5
4	Delay of the projects	0.754	3	0.677	11	0.710	8	0.714	8
5	Increase in project cost	0.769	2	0.692	10	0.730	5	0.731	4
6	Wastage of materials	0.738	4	0.769	3	0.720	6	0.743	3
7	Demolition, rework and extensions of time	0.662	9	0.815	2	0.760	2	0.746	2
8	Productivity loses	0.631	10	0.708	8	0.720	6	0.686	10
9	Poor project quality	0.738	4	0.738	5	0.680	10	0.719	6
10	Deaths of workers	0.520	13	0.400	13	0.450	13	0.457	13
11	Increase in Overhead Expenses	0.708	6	0.738	5	0.640	11	0.695	9
12	Additional Money for Contractor	0.631	10	0.738	5	0.640	11	0.670	11
13	Delay in Payment	0.538	12	0.662	12	0.790	1	0.663	12

ANNEX B3: Remedial measures of reducing impacts due to inadequate project design and supervision consultants on project success

S. No	Remedial Measures	Client		Consultant		Contractor		Average RII	Overall rank
		RII	R ₁	RII	R ₂	RII	R ₃		
1	Working cooperatively together, sharing the same vision and objectives for the project.	0.877	1	0.754	4	0.690	5	0.774	2
2	Communication between all parties with in the project in decision making processes, from project inception to completion	0.862	2	0.662	11	0.740	2	0.754	3
3	Selecting design and supervision consultancy service providers on the basis of value and competency not on the basis of lowest price alone	0.800	4	0.631	14	0.710	3	0.714	6
4	Celebrating with employees after achieving milestones	0.569	14	0.538	17	0.660	9	0.589	17
5	Practicing consultancy performance appraisal	0.723	6	0.769	3	0.670	7	0.721	5
6	Taking consultancy responsibility and giving praises	0.569	14	0.677	9	0.640	14	0.629	15
7	Allowing room for innovation learning	0.646	11	0.708	7	0.570	17	0.641	13
8	Mission-focus/ priority-setting	0.708	9	0.677	9	0.750	1	0.712	7
9	Encouraging positivity	0.723	6	0.646	13	0.700	4	0.690	10
10	Continuing client and contractor involvement in the design and supervision management/ applying lean construction approach	0.862	2	0.785	2	0.680	6	0.775	1
11	Practicing good communication skills	0.646	11	0.708	7	0.600	16	0.651	12
12	Spend sufficient time and money in project planning, Design and supervision	0.723	6	0.815	1	0.660	9	0.733	4
13	Accepting challenges during execution of work	0.538	17	0.631	14	0.650	12	0.606	16

Performance of Project Consultants in Public Building Construction Projects: In case of Jimma Town

14	Training design and supervision personnel available across all disciplines to gain experience and competition	0.800	4	0.662	11	0.640	14	0.701	8
15	Delegation ability	0.569	14	0.754	4	0.650	12	0.658	11
16	Understand and encourage the role of technology in the delivery of projects by all stakeholders	0.600	13	0.631	14	0.660	9	0.630	14
17	Framing the contracting arrangement around goodwill and fair dealing in an open communication environment	0.708	9	0.723	6	0.670	7	0.700	9

ANNEX C: Reliability check using Cronbach's alpha

Analysis of variance:

Source	DF	Sum of squares	Mean squares	F	Pr > F
Between subjects	27	142.889	5.292	7.143	< 0.0001
Within subjects	560	576.095	1.029		
Between measures	20	176.020	8.801	11.879	< 0.0001
Residual	540	400.075	0.741		
Total	587	718.985	1.225		

Computed against model $Y = \text{Mean}(Y)$

Cronbach's alpha statistics :

Cronbach's alpha	Standardized Cronbach's Alpha
0.860	0.838
0.819	0.886