ASSESSING THE CAUSES & EFFECTS OF DELAYS OF CONSTRUCTION PROJECTS IN ETHIOPIA: THE CASE OF FEDERAL GOVERNMENT BUILDING CONSTRUCTION PROJECTS PERFORMED BY MINISTRY OF URBAN DEVELOPMENT & INFRASTRUCTURE

MSc THESIS

This thesis Submitted to Addis College in Partial fulfillment of the requirements for the Degree of Master of Science in Construction Technology and Management

FETENE GETAHUN

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Assessing the Causes & Effects of Delay of Construction Projects in Ethiopia: The case of Federal government buildings Construction Projects performed by Ministry of Urban Development and Infrastructure

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This thesis Submitted to Addis College in Partial fulfillment of the requirements for the Degree of Master of Science in Construction Technology and Management

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ADDIS ABABA, ETHIOPIA

DECLARATION

I the undersigned, declare that the study entitled "Assessing the Causes & Effects of Delay of Construction Projects in Ethiopia: The case of Federal government buildings Construction Projects performed by Ministry of Urban Development and Infrastructure*"* is the result of my own effort and study that all sources of materials used for the study have been acknowledged. I have conducted the study independently with the guidance and comments of the research advisor.

This study has not been submitted for any degree in any university. It is conducted for the partial fulfillment of the requirement for the Degree of Master of Science in Construction Technology and management.

_____ _____

Fetene Getahun Date

STATEMENT OF CERTIFICATION

This is to certify that the thesis entitled "Assessing the Cause & Effect of Delay of Construction Projects in Ethiopia: The case of Government buildings Construction Projects by Ministry of Urban Development and Infrastructure" submitted by Fetene Getahun to Addis College towards partial fulfillment of the requirements for the award of the degree of Master of Science in Construction Technology and management is a genuine record of the work carried out by him under my supervision and guidance.

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Dagnachew Adugna (PhD) Date

ADDIS COLLEGE

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SCHOOL OF POST GRADUATE STUDIES

THESIS APPROVAL FORM

This is to certify that the thesis entitled "Assessing the Cause & Effect of Delay of Construction Projects in Ethiopia: The case of Government buildings Construction Projects by Ministry of Urban Development and Infrastructure" is carried out by FETENE GETAHUN MSc student at Addis College, with ID No GSR/065/2012

Name of external Examiner	Signature	Date
Name of Internal Examiner	Signature	Date
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Name of school Dean	Signature	Date

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ABSTRACT

Construction delay is a common problem in construction projects in Ethiopia and occurring in every type and phase of a construction projects. Therefore, this study was carried out to identify the major causes of delay for 32 Federal government buildings projects. 56 project delay attributes were identified through detailed literature review and expert's support. The study adopts quantitative & qualitative methods with the help of primary and secondary data. Primary data was collected using self-administered questionnaires on 150 selected respondents from clients, consultants and contractor. Secondary data was collected through reviewing of Federal government buildings construction project office contract documents and project reports. This research categorized the causes of delay under eight main groups of clients related, consultant related, contractor related, contract related, material related, equipment related, labor related and external related and then assessed their impacts on delay using descriptive and inferential statistics as a basis for analysis. Statistical Package for Social Science was used to analyze the data. The result for all delay factors and group of categories was computed so as to rank the factors. The top three most influential causes of Federal Government Buildings construction project delays were identified as: contractor group of causes are the most contributing factors to project delay. The consultant related causes ranked second next to Contractor related causes. Followed by Client related causes. IN addition, the study focuses on identifying the effects of delay. According to the result obtained from the study the measure effects of delays are time overrun, disputes and cost overrun. The other issues consider in this research is delay mitigation methods, the major mitigation suggested by all respondent are Select the competent project manager, using appropriate construction methods and not awarding contract based on the lowest bid.

Key Words: Delay, Delay causes, effect of delay, mitigation of delay, Federal government buildings construction projects.

Acronyms and Abbreviations

GDP	Gross Development Plan
MoWUD	Ministry of Work and Urban Development
MUDI	Ministry of Urban Development and Infrastructure
FGB	Federal Government Buildings
FGBCPO	Federal Government Buildings Construction Project Office
GDCF	Gross Domestic Capital Formation
GC	General Contractor
BC	Building Contractor
CRF	Contractor Related Factors
MRF	Material Related Factors
LRF	Labor Related Factors
CoRF	Consultant Related Factors
ClRF	Client Related Factors
ERF	Equipment Related Factors
ExRF	External Related Factors

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LISTS OF APPENDIXES

CHAPTER ONE: Introduction

1.1 Background of the study

The Construction industry has a great influence on the economy of all countries. It is one of the parts that provide vital factors for the development of any economy. According to World Bank, the share of construction industry in developing countries is approximately between 6-9% of the GDP. (Unit, South Asia Sustainable Development, 2007). In Ethiopia the percentage of GDP amounts to 3%, considerably lower than the sub-Saharan average of 6% (MoWUD, 2006).

Construction Projects are sets of planned activities that are undertaken to create a unique engineering facility within a specified time and under constrained resources. The products uniqueness entails the difference in output from one project to the other in some distinct characteristics. The specific time of project in turn indicates projects have finite time span through which they are executed. Achieving project objectives within the specified time and with limited resources require project management that applies knowledge, skill, tool and techniques of the activities (Project Management Institute, (2004).

The Ethiopian Government has commissioned Ministry of Urban Development and Infrastructure (MUDI) as the implementing agent for its Federal Government institution office Building construction Programme (FGBP). This is a large-scale construction project that makes complex demands of the programme management. Acting as an internally appointed agent of the different Ministry, by Federal Government Building construction project office (FGBCPO) Is managing the design and construction of 30 public buildings located in Addis Ababa. The government has been covering 100 percent of the administrative costs; 90 percent for building capacities of local contractors; and another 10 percent for its services. Rita Van Deuren, et al. (2016)

Due to the creation of new jobs based on the growth of the first Growth and Transformation Plan (GTP) period, many institutions have expanded their structures and created the executive and the executive bodies of the Federal Democratic Republic of Ethiopia.

However, if most of the federal government institutions offices continue to be rented as they are now, office rent will continue to grow in square meters and the customer will be able to access the services at one center and save time, money and energy. They are changing the office and making it more

difficult for the customer to have a permanent place of service. In addition, the inability to organize rental buildings in a customer-friendly manner and, if possible, the relocation of the building after the establishment of the office and the IT infrastructure is causing significant losses to the government.

The government spends more than one billion birrs annually on government institutions office buildings rent, which is believed to be more successful if it is used for the construction of offices, diverting more buildings and turning rents into other development projects. Therefore, unless a quick fix is in place and a quick fix is in place, it will have a significant negative impact on the implementation of the Second Growth and Transformation Plan.

On the other hand, despite the lack of budget and the shortcomings of the short-term completion of construction, the construction of federal government buildings in each phase of the institution is very low compared to the demand. Therefore, by accelerating the completion of previously unfinished constructions and cluster construction, it is possible for the institution to be the owner of the facilities and to provide technology-enabled and improved services to the customers and to establish a sustainable system. You need to make sure the currency is up and running on time.

Therefore, a regulatory framework has been prepared to address the growing demand for the construction of government offices and various buildings in order to achieve the overall growth and Growth Transformation Plan (GTP).

The FGB was planned to complete the construction of 30 Buildings on September 2018, however, different constraints, including a shortage of construction materials, delayed it by the Ethiopian Government, which is also leading and financing the programme. So, completion date was projected for September 2020.Due to different reasons the project was not completed according to the revised schedule. Therefore, the MUDI and the concerned parties made an evaluation and its challenges in February 2020 that led to project 2021 for overall completion of the project

The extension of the project has affected Federal government institution’s office building plan, over 80 local contractors, sub-contractors that have been working on the project for the last six years. This research studies the causes of delay that results from different circumstance and practice of construction project in Ethiopia.

1.2. Statement of the problem

Delay in construction projects has been a major issue in Ethiopian construction industry over the past decades. The government spends huge amount of money in the construction sector in an attempt to carry out economic development. It's a normal tradition to allocate developmental funds in yearly budget. Majority of this fund is set aside for the construction of roads, railways, hospitals, schools, residential and nonresidential buildings and airports. If these projects are delayed, it will not only slow down economic growth in the country but it will also increase government expenditures. This will be due to procurement of materials at a higher price, and also due to change of contractors during contract termination. The result will be wastage of country's resources that could have been used to for other purposes. In addition, business organizations every year invest a lot of capital in construction of new facilities in an attempt to expand their businesses and generate more profits by increasing their sizes of operations and also to meet up with competition. When the problem of delay occurs, the companies turn to loss large amount of money that can sometimes render the company insolvent. Moreover, contractors are constantly losing contracts due to delay or incompletion of previous projects. Most often they are obliged to share the cost of the delay which is not necessarily caused by them. Delay has also led to a lot of disputes amongst stake holders in the construction industry. If these disputes cannot be resolved amicably to the satisfaction of every party, some parties will prefer litigation and arbitration. All this will go a long way to increase the cost of the overall project. (Msafiri, 2015).

Finally, delay results in negative perception of the country's construction industry. Investors will not be willing to carry out construction projects in the country. In addition, predominance of delay discredits the local construction companies, contractors, consultants and engineers. This results in the country's construction industry to be less competitive. (Alaghbari & Salim 2007)

The increase in project delays in the construction industry is hurting the economy because it results in wastage of resources, enhanced costs of projects and frustration among customers, yet construction is one of the principal sectors that can revitalize economic growth in Ethiopia. Investment in construction projects and related infrastructure and services has multiple direct and indirect effects. It triggers forward and backward linkages through additional investment in manufacturing of building material, transport and government. Unfortunately, delays in large construction projects particularly buildings, will continue to plague the construction industry in the foreseeable future unless strategic measures are taken by the industry. The government may lack sufficient mitigating measures to

address the problem. Although much has been done in identifying the factors that influence projects delay in large construction projects in Ethiopia, the industry still experiences delays (Alaghbari & Salim 2007). This is attributed to the fact that there is still lack of information for the effective mitigation of delay. This study therefore seeks to contribute to these attempts by others in identifying further the causes of delay and its effect also which of the stake holders should be held responsible for delay in large construction projects in Ethiopia and then come up with strategies to mitigate such delays.

It was noted that most of completed and under construction projects by the Ministry of Urban and Infrastructure were not being completed on contract time, budget and specified quality. In addition to delaying the implementation of development projects, the government is spending more than one billion birrs annually on office rent for federal government institutions offices. (Federal Government buildings construction project office Reports)

1.3 Objective of the study

1.3.1 General objective

The general objective of this stud is to investigate the major causes and effects of construction project delays performed in Ethiopia specially construction of Federal government Organization Office Buildings performed by the Ministry of Urban Development and Infrastructure.

1.3.2 Specific objectives

Therefore, the specific objectives of this study were as follows:

- To identify the cause and effects of federal government buildings construction delays.
- To investigate the economic impacts of federal government buildings construction projects delay.
- To suggest strategic tools to minimize federal government buildings construction projects delay.

1.4 Basic Research Questions

The researcher has developed the following questions

- What are the causes of delay in construction Projects?
- What are the effects of construction projects delay?
- How can delay in construction be mitigated?

1.5 Significance of the study

There are several valuable benefits expected by implementing this study. The significance of establishing the issues related to the construction project delays was to provide a greater insight and understanding on the causes of delays particularly among the main project players: client, contractors and consultants. This can be achieved by applying theoretical concepts discussed in many literatures into practice in real projects. It was hoped that these findings were guide efforts to improve the performance of the construction industry and will be useful to the construction players. Therefore, these findings might encourage the practitioner to focus on delay problem that might were existed in their present or future projects. Other than that, this study was expected to provide a better ways and methods in delivering construction projects by minimize the major causes of delays.

1.6 Scope of the study

The research study focuses only on the construction of federal government buildings performed by MUDI. Due to shortage of time and budget it concentrates specifically on the Government Office Building Constructions Projects. More attention was focus on projects where the main client is the government (Government Office building construction projects). This proposed study was conducted in 2022 G.C.

1.7 Limitation of the study

Due to shortage of time and financial support this research is its own limitation to include and the factors for delay and its consequence, but it opens door for another researcher to fill the gap.

CHAPTER TWO: Literature Review

2.1 General Concept of Construction Delay

Delay in Construction projects all around the world is a common phenomenon. It has been observed by various researchers that construction projects come with various types, causes and effects on both time and cost overruns on project delivery. This observation however relates to the peculiarities of each of the various projects in terms of magnitude, location, period of execution, type of procurement and type of client. A construction project is therefore termed successful when it is completed on time, within budget, in accordance with the specifications and to client's satisfaction. It's therefore imperative that general management keep track of the progress of the project to minimize any occurrence of delay or to identify it at an earlier stage.

Health and safety authority (2012) define construction work is a high-risk activity; it must be managed from procurement, through the design process to the end of construction stage. Everyone involved in a construction project, each party are important and must appreciated their role, from client, project supervisor, designer, contractor and employer

Construction project includes many unique features that can be distinguished from other projects such as time, nature and size etc. Construction project usually takes long period of time until it reaches the operation stage, its financial weight along with the size of the project and difficult working environment; needs a dynamic organization structure (Zou et al, 2007).

Takim, Akintoye (2002) and Majid (2006) have defined a construction project as a successful one when some characteristics are contained within it such as: good management completed on time within budget, conform to the specifications required, satisfy all parties and achieve the profitability for the contractor with absence of financial claims and litigations.

Project success defined as achieving goals and objectives as described in the project plan within budget, time schedule and performance required. To achieve success project must have an effective plan effective control and monitoring (Frimpong et al, 2003).

The construction industry shows a weak response when dealing with delay in construction project. This is done either by pretending that it does not happen, or by simply adding a fine (which is in most cases not sufficient to make contractors abide to present completion date), the result was that many of the major construction projects fail to complete on time. In the

construction industry time equals many and management in very important and critical (Duran, 2006; Luu, et al, 2009).

2.2 Delay Theories

Delay is a situation when the contractor and /or the project owner contribute jointly or separately in making the project, implementation fails to finish on time, by exceeding the planned period of implementation or exceed the stipulated period of contract (Aibinu and Jagboro, 2002).

Sambasivan and Soon (2007) defined delay as a situation in which a project due to some causes related to the contractor, consultant and client or other causes has not been finished in contractual or agreed period.

Construction delay was defined as "the time overrun either beyond completion date specified in a contract or beyond the date that the parties agreed upon for delivery of a project." (Assaf and Al-Hejii, 2006)

Delay also defined as an "act or event which extends required time to perform or complete work of the contract manifests itself as additional days of work". (Zack, 2003) Al-Najjar (2008) defined delay in the project caused by internal or external reasons surrounding the project, lead to increase the time of project beyond planned date.

The construction industry in Ethiopia, as in most developing countries, has made a significant contribution to the growth of the economy through infrastructure development and job creation. Public construction projects are parts of the country's development initiative; they share considerable amount of the country's scarce financial resources.

In Ethiopia in general and in Addis Ababa Administration in particular, the construction industry is the highest recipient of government budget in terms of government development programs. Consequently, public construction projects consume an average annual rate of nearly 60% of the government's capital budget as reported by Ministry of Works and Urban Development (MoWUD, 2006). Many public building construction projects in Ethiopia suffer delay, only 8.25% projects were finished on the original targeted completion date and the remaining 91.75% delayed 352% of its contractual time (Werku and Jha, 2016).

The time overrun in construction projects has become one of the most common problems in the industry that cause multitude of negative effects on the projects and its stakeholders. The consequences of these delays include; cost overruns, loss of profits, increased overheads, stress, and dispute between parties, litigation and loss of opportunities. Therefore, this aspect has been constantly investigated by researchers across the world with a great enthusiasm in order to identify the root causes of the delay to come up with corrective measures.

Building construction projects are exposed to many problems during construction phase that lead to the unnecessary delay and to meet the deadline of the project. It is common to people blame one party (the contractor, the consultant or the client), commonly the contractor, without giving due consideration to the stakeholders involved in the particular project. Therefore, to ensure that public building construction projects can run smoothly without any delay, knowledge and understanding of the problems encountered during the construction process to each stakeholder should be conducted thoroughly.

2.2.1 Types of delay

Delay in projects is almost inevitable. Some delay will take place at a particular period in the completion of an activity and some other ones may be capable of leeway in when they have their effects. According to Scott (1993), he identified three major types of delay namely: Employer's responsible delay; Contractor's responsible delay and "Neither" party responsible delay.

He described Employer's responsible delay as those that results into variation and failure to provide site information. Ekeokonkwo (1995) further elaborated that the delays emanated from the Employer are found in the areas of extension to time and escalation of costs due to inflation, delay in the payment of interim certificates; inability of the client or his representatives in taking quick decision, late handing over of site, delay in the supply of materials and inadequate planning.

The Contractor's responsible delays are caused by inability of the contractor to proceed with the project diligently and efficiently. Others are in the areas of insufficient labour/ plant provisions and insolvency of the contractor will definitely cause delay and disruptions. The onus is that the contractor is once awarded the contract to take all possible steps to ensure that necessary

resources and details are required of the contract be provided for and by him so as to avoid delays.

"Neither" party responsible delay (Extraneous conditions) exists in situations that are beyond the capacity of either the contractor or the client. Such extraneous circumstances are resultants from strikes, riot, exceptional adverse weather, force majeure and acts of God, loss and damage due to fire and storm, Inability of the contractor to reason beyond his control and which he could not reasonably have foreseen at the date of the contract to secure such resources and delays caused by nominated subcontractors or suppliers which the contractor has taken all possible steps to avoid or reduce (Ekeokonkwo 1995).

Ahmed et al. (1999) is of the opinion that delay could be Non-excusable; Excusable (with or without compensation) and Concurrent Delays. He further explained that non-excusable delays are either caused by the contractor, sub-contractor or other party but are within the control of the contractor. These non- excusable delays are as a result of equipment breakdown; inadequate scheduling or mismanagement; underestimation of productivity; construction mistakes; improper project planning; poor site management and supervision; unreliable subcontractors or suppliers and general staffing problems.

Consequently, this type of delay presents no entitlement to a time extension or delay damages for the contractor if the delay can be proved to have affected the whole project but thus entitled the client to claim for a liquidated damage. A typical example is when the contractor fails to provide sufficient manpower to complete his task on time.

Excusable delays on the other hand are caused by unforeseen factors beyond the contractor or any other party and are not attributed to their negligence or faults. It is however within the terms of contract that when excusable delays occur, both parties will have to share the risks involved. The contractor will not receive compensation for the cost of delays, but will be entitled to an additional time to complete his work and is relieved from any contractually imposed liquidated damages for the period of delays.

This type of delay can also have an impact on non-critical activities which need a more detailed analysis to determine whether an extension of time is warranted, or if the reduction of float time

can be justified. Excusable delays can therefore be further classified into excusable with compensation and excusable without compensation.

Excusable with compensation are caused by the client's actions or inactions. When contractors encounter this type of delay, they are entitled to an extension of time as well as monetary compensation due to the delays. An example of an excusable delay with compensation would be when an owner denies access to the site once the notice to proceed is given.

Excusable without compensation are delays where neither the client nor the contractor is deemed responsible. When this type of delay is encountered, only a time extension will be warranted since there are no grounds for damages. Some examples of excusable without compensation delays are unprovoked strikes, or any 'act of God'.

Concurrent delays according to Ahmed el al. (1999) and Scott (1993) are described as when two or more delays occur at the same time and both parties to the contract are responsible for the delay of which if the delay had occurred alone, would have affected the ultimate completion time. Generally, if the delays are inextricably intertwined, the contractor can be held responsible for the delay by either forced to accelerate or be charged liable for liquidated damages or allowed to recover the delay damages from the client. Scott (1993) further expatiated that when excusable with compensation and non-excusable delays are concurrent, a time extension can be issued or the delay can be apportioned between the owner and the contractor.

In analyzing concurrent delays, each delay is assessed separately and its impact on other activities and the project duration is calculated. The following guidelines for classifying these kinds of concurrent delays:

- If excusable and non-excusable delays occur concurrently, only a time extension is granted to the contractor;
- If excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to time extension, but not to damages; and
- If two excusable with compensation delays occur concurrently, the contractor is entitled to both time extension and damages.

The completion of the project is of the main goals and mission in the management of projects delayed projects has repercussions negative value of the contractor because the contract work

associated expensive elements such as employment equipment and financial funding, any delay to the project will be determined to both the owner and contractor (Jammaz, 2010).

Vidals and Najafi (2002), Alaghbari et al. (2007), (Al – Najjar, 2008) have shown that the delay in construction projects is divided into the following main types: -

- Excusable compensable delay
- Excusable non compensable delay
- In Excusable delays Non (Excusable delay)
- Concurrent delays
- Non concurrent delays
- Critical and non-critical delays

2.3 Causes of Construction Delay

When projects are delayed, they are not without some cost consequences. Delay in this context therefore means cost overruns either beyond the contract sum or beyond the sum that the parties have agreed upon for the delivery of the project. In both cases, a delay is usually a costly situation inevitably resulting in contractual claims and higher project costs (O'Brien 1976). Kumaraswamy and Chan (1998) however suggested that if the delay problem could be controlled, it would tend to improve productivity. Good practice is thus an essential tool during the planning and execution of the works and in operation of the contract.

To the client, a delay generally leads to social inconveniences and loss of revenue and cause great consequences on the national growth. To the contractor it leads to loss of productivity. Construction delay and overrun therefore is a critical function in construction of public projects as to achieve proper management of construction projects (Al -Momani, 2000).

Delays can be minimized only when their causes are identified. Knowing the cause of any particular delay in a construction project would help avoiding the same. However, it is recommended that the Buildings Permit Approval Process be streamlined as much as possible and changes in Laws and Regulations be made keeping in mind the negative impact it causes in terms of construction project cost. Design related issues such as changes in drawings, incomplete and faulty specifications and change orders have a very damaging effect on project completion

costs and invariably lead to cost escalations as well. These are issues that can be controlled with proper design process management and timely decision making (Ahmed et al, 1999).

It is a well-known fact that decisions made early in the life of a project have the most profound effect on the project's objectives of delivering a safe, quality project within the time and budget allocated.

The proneness of projects to delay has attracted the attention of researchers all over the world. Most of who tried to identify the immediate as well as the root causes of project delay. A common theme from these is that project uncertainty and complexity provide a major challenge to the cost management capabilities of both parties and their professional advisers as well. (Ndekugri, 2007) He further stated the delay on any project is inevitable. From the contractor's perspectives, delay can cause inefficiency in the carrying out of the works and/ or cost escalations. Inefficiency often arises from the contractor being compelled to abandon carefully designed work plan for less efficient work methods thereby incurring additional cost, thus reducing profitability.

Ndekugri (2007) observed that delay is equally a major financial risk to the employer. If the economic viability of the overall commercial venture depends generating an income stream from 14 a particular date, failure to complete the construction project by the date could turn a profitable venture into a loss making one. Even though the delay does not cause losses but it reduces profitability on account of delay in the inception of revenue generation.

Mansfield, Ugwu and Doran (1994) however opined that in developing countries, lack of proper phasing of construction projects can contribute to the economy becoming 'overheated'. This therefore gives rise to project – cost overruns, with consequential effects on inflation and decline inefficient activity in the industry.

Several academic researchers have carried out studies over the years to investigate the causes of construction projects delays. Amongst these studies were;

A study carried out by (Sweis et al, 2008) on the causes of delay of residential projects in Jordan found out that financial difficulties faced by contractors and too many changes made by the client were the leading causes of most delays. In another related research performed by (Abd El-

Razak, 2008) in Egypt discovered that the most important causes of delay were financing by contractors during construction, delay in contractors' payment by owners, frequent design changes by owners or his agent during construction, partial payments and non-utilization of professional construction and contractual management.

Furthermore, a study was conducted by (Assaf and Alhajji, 2006) on time performance of different types of construction projects in Saudi Arabia, in an attempt to investigate the causes of construction delay and their importance according to each project participant (owner, consultant and contractor). A total of 73 delay related factors were observed and the most common cause of delay identified by all three project participants was change on order. In a similar report on the causes delay in large building projects in Saudi Arabia and their relative importance, (Assaf et al, 1995) reported a total of 56 possible causes were revealed; the contractors, the owners, engineers all ranked the financing group delay factors as the highest cause of delay. According to the contractors, the most important delay factors were preparation and approval of shop drawings, delay in contractors' progress payment by owners, and design changes. To the engineers and architects, the most important causes of delay were cash flow problems during construction, relationship between different subcontractors, schedules in the execution of the project and the slowness of owners' decision-making process. On the other hand, the owners cited the main causes of construction projects delay to be design errors, excessive bureaucracy in project owner organization, labor shortages and lack of skillful personnel.

In Malaysia, a study of delay factors and their impacts on construction projects completion in the Malaysian construction industry was carried out by (Sambasvian and Soon, 2007). Their results showed a list of 28 different causes. Amongst these causes were; contractors improper planning, contractors poor site management, shortage of material, inadequate labor supply, equipment availability and failure, lack of communication amongst project participants and mistakes during the construction phase.

Previous review also indicated that the factors that leads to delay in construction projects are many and differ from country to country and from circumstances to circumstances. (Ogunlana et al, 1996) reported that there were distinct problems that caused delays in the construction industry of Nigeria. These factors were classified into 3 groups namely; firstly, problems of shortages or inadequacies in industry infrastructure which are mostly supply of resources,

secondly problems caused by clients and consultants and thirdly problems caused by contractors' incompetence or knowledge and experience deficiencies.

Also, research was also conducted in Ghana by (Frank and Adwoa, 2007) to determine the factors causing delay of building construction projects in the Ghana construction industry. They carry out a survey using a semi structured interview of 15 key players in the construction industry of Ghana. A total of 32 delay related factors were determined. The most important factors were found out to be; delay in honoring certificates, underestimation of the project cost, underestimation of project complexity, difficulty in accessing bank credit, poor supervision, underestimation of completion time of projects by contractors, shortage of materials, poor professional management, fluctuation of prices, rising cost of materials and poor site management.

Moreover, a study was conducted by (Ayman, 2000) in Jordan. He investigated the causes of delay of 130 public projects in Jordan. These projects were inclusive of residential buildings, offices, administrative buildings, medical centers and communication facilities. The results indicated that the main causes of delay of the public construction projects were related to designers, user changes, weather, site conditions, and late deliveries of materials, economic conditions and increase in quantity.

Table: 2:1 Major causes of delays as identified by previous researchers

R.No	Researcher	Country of Residence	Major causes of delay
1	Baldwin and Manthei (1977)	United States	1. Inclement weather 2. Subcontracting systems 3. Shortages of labour supply
2	Arditi, Akan and Gurdarmar (1985)	Turkey	1. Considerable additional work 2. Delay in design work 3. Financial difficulties faced by public agencies and contractors 4. Frequent change orders / design 5. Organizational deficiencies

			6. Shortages of resources
3	Okpala and Aniekwu (1988)	Nigeria	1. Failure to pay for completed works 2. Poor contract management 3. Shortages of materials
4	Dlakwa and Culpin (1990)	Nigeria	1. Delay in payment to contractors 2. Fluctuations in materials, labour and plant costs
5	Mansfield, Ugwu and Doran (1994)	Nigeria	1. Fluctuations in costs 2. Improper financial and payment arrangements 3. Inaccurate cost estimates 4. Poor contract management 5. Shortages of materials
6	Semple, Hartman and Jergeas (1994)	Canada	1. Increases in the scope of work 2. Inclement weather 3. Restricted access
7	Assaf, Al-Khalim and Al-Hazmi (1995)	Saudi- Arabia	1. Changes in design / design errors 2. Delay in payment to contractors 3. Poor workmanship 4. Shortages of labour supply 5. Slow preparation and approval of shop drawing
8	Chan and Kumaraswamy (1996)	Hong Kong	1. Client- initiated variation 2. Poor site management and supervision 3. Slow decision making by project team 4. Unforeseen site conditions
9	Ogunlana and Promkuntong (1996)	Thailand	1. Changes in design / design errors 2. Liaisons problems among the contracting parties 3. Shortages of materials
10	Odeyinka and Yusif (1997)	Nigeria	1. Variation in orders.

			2. Slow decision making. 3. Financial/Cash flow difficulties 4. Resources management problems 5. Planning and Scheduling problems 6. Inadequate site inspection 7. Inclement weather and acts of nature 8. Labour disputes and strikes
11	Mezhel and Tawil (1998)	Lebanon	1. Material shortages and changes in type and specification during construction 2. Skilled and Unskilled labour shortages and Poor productivity. 3. Shortages of equipment, Unskilled operators, slow maintenance and old equipment. 4. Cash flow during construction, Delay in contractors' progress payment by owners, contractor financing problems and varying material costs. 5. Design changes by owners, design errors by consultants, geographical problems and unexpected site conditions 6. Permits from municipals, permits for foreign expatriates, building codes, bureaucracy in government agencies and Urban planning permits. 7. Shop drawings, preparation of network scheduling, lack of personnel training and management support, poor judgment in estimating time and resources and poor initial site planning.
12	Al-Khali and Al-Ghaftly	Saudia Arabia	1. Cash flow problem / financial difficulties

	(1999)		2. Difficulties in obtaining permits " 3. Lowest bid wins" system
13	Al-Momami (2000)	Jordan	1. Change orders/ design 2. Inclement weather 3. Late delivery 4. Poor design 5. Unforeseen site conditions
14	Frimpong, Oluwoye and Crawford (2003)	Ghana	1. Monthly payment difficulties from agencies 2. Poor contractor management 3. Material procurement 4. Poor technical performance 5. Escalation of material prices
15	Lo, Fung and Tung (2006)	Hong Kong	1. Exceptionally low bid 2. Inadequate resources due to contractor/ lack of capital 3. Inexperienced contractors 4. Poor site management and supervision by consultants 5. Unforeseen ground conditions 6. Works in conflict with existing utilities

From many research papers for the purpose of this research, the cause of delay that has been established by Chan and Kumaraasamy (1996); Odeh and Battaineh (2002); Sambasivam and Soon (2006); Long et al. (2008) are used. Following are the classification, the sources of delays that arise from each of these factor categories were identified from literature. All of these will be used in designing the questionnaire as to achieve the objectives of this research.

2.3.1 Client-related factors

Several studies identified the factors of client related delays. Chan and Kumarasamy (1997) in their study have listed the client characteristic, project financing, client variation and interim

payment to contractor. Sambasivam and Soon (2006) identified the factor of interference, slow decision making and unrealistic contract duration. Aibinu and Odeyinka (2006) have added the factors of late contract award by client

2.3.2 Consultant-related factors

Previous researchers have used this group of factors in their study. Chan and Kumarasamy (1997) used the term of 'design team related factors. They elaborate the factors into three: inadequate experience, project complexity and mistake in design. Similarly, Ahmed S.M., *et al.* (2002) identified the factors of design development, change order, changes in drawing and specifications, and incomplete document as contributors to this group of delays. They grouped these factors into 'design related'.

Aibinu and Odeyinka (2006) separated the consultant related factors into each design team participant: architect, structural engineer, services engineer and quantity surveyor. They added the factors of late valuation work, late preparation of interim valuation, inadequate supervision, late issuance of instruction and delay work approval.

2.3.3 Contractor related Factors

Numerous researchers were identified the factors of contractor related delays as the main contributor to the causes of construction project delays. Delay caused by contractors' attributes most often were classified into five main items: failure to evaluate the site or design, management problem, inadequate resources, poor workmanship and subcontractor failures (Abdul-Rahman H. *et al.*, 2001). Odeh and Battaineh (2002) identified the factors of inadequate contractor experience, inappropriate construction methods, poor site management and supervision and unreliable subcontractor as contributors to causes of delays. Aibinu and Odeyinka (2006) elaborated this group cause into contractor financial difficulties, inadequate site supervision and planning and schedule problem.

2.3.4 Materials-related factors

For this group cause, Chan and Sambasivam (1997) established the root causes such as shortages, materials changes, delay in procurement and proportion of off-site prefabrication.

Other causes of delay are attributed to material-related factors include: poor quality, damages materials, late delivery and shortage (Abd. Majid, 1997; Sambasivam and Soon, 2006)

2.3.5 Labor-related factors

Several studies identified the factors of labor related delay. Sambasivam and Soon (2006) in their study combined the labor factors and equipment related factor. They identified the factors of labour supply, low productivity, equipment availability and equipment failure. Chan and Kumarasamy (1997) identified the factors of low skill level and weak motivation. Abd. Majid (1997) identified the factors of strike, poor labor planning, slow mobilization, absenteeism and low morale.

2.3.6 Contract relationship related factors

Sambasivam and Soon (2006) in their study established the contract relationship related delay. They identified the factors of dispute and negotiation, inappropriate organizational structure linking to the project and lack of communication. Not many previous studies have focused to this group of causes.

2.3.7 External factors

Delay that not caused by project participants are demarcated as external causes. Following are the identified factors that arise from the external factors, particularly from the work of Aibinu and Odeyinka (2006), Sambasivam and Soon (2006) and Chan and Kumarasamy (1997).

2.4 Construction delay in the case of Ethiopia

The construction industry in Ethiopia has been developing tremendously since 2001. Recent studies by (Zewdu & Aregaw 2015) indicated that the GDP contribution of the industry has been raised to 5.6% and approaches to the sub-Saharan average (6%). Meanwhile, the Gross Domestic Capital Formation (GDCF), which was about 60 percent in 1996/97, has reached nearly 75% in 2002/03. Beyond its contribution to the nation, the industry is also the 6th major contributor of the content infrastructure stock following South Africa, Egypt, Morocco, Algeria and Nigeria. Since then, the country has been implementing significant number of programs/projects, which include the Construction of Federal Government Building projects (FGBP), University Capacity

building program, the housing development program and the road sector programs among others. 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, and a failure to scope with project requirements and the inability to adopt best practices.

2.5 Effects of delay

Aibinu and Jagboro (2002) studied the effects of construction delays on project delivery in Nigerian construction industry. The six effects of delay that were identified includes: time overrun, cost overrun, dispute, arbitration, total abandonment and litigation. Koushki and Kartam (2004) concluded that time and cost overrun was the impact of the material selection time, their availability in the local market and the presence of the supervising engineer. It is important to improve the estimated activity duration according to the actual skills levels, unexpected events, efficiency of work time, mistakes and misunderstanding (Lock, 1996). Delays influence negatively on the contractor's performance and contribute to adverse impacts in construction. Projects such as contract disputes, low productivity and increase in construction costs that will also influence on the pre-determined of construction project objectives, from the comprehensive literature review, seven major effects of delay in the construction projects were identified as follows:

2.5.1 Time Overrun

Murali et al., (2007) argued that contractor related factors and client related factors such as inadequate contractor experience and owner interference have impact on time overrun. On the other hand, Aibinu and Jagboro (2002) studied the effects of construction delays on project delivery in Nigerian construction industry. They identified time overrun as one of the major effects of delay.

2.5.2 Cost Overrun

Regarding cost overrun Koushki et al., (2005) identified three main causes that were contractor related problems, material-related problems, and owners' financial constraints, whereas Wiguna and Scott (2005) identified the most critical factors included: high inflation/increased material

price; design change by client; defective design; weather conditions; delayed payment on contracts and defective construction work.

2.5.3 Disputes

Disputes are the effects of major causes of delays in construction projects such as causes of client related, contractor related, and consultant related and external related that may be arisen during the construction projects among the project parties. Lack of communication may also lead to misunderstandings, conflicts and disputes. Hence it necessitates the project managers to have effective communication skills which are one of the significant soft skills (People skills) with the project parties involving in construction projects. Based on Murali et al., (2007) the factors such as lack of communication between the various parties, problem with neighbors, unforeseen site conditions, delay in payments for completed work, improper construction method, delay caused by the subcontractor and discrepancies in contract documents will give rise to disputes between the various parties. Furthermore, if the disputes cannot be solved amicably or easily it can lead to arbitration or litigation.

2.5.4 Arbitration

According to Murali et al. (2007) the delays which are caused by the client relate factors and contractor related factors such as change in order, mistakes or discrepancies in contract document and lack of communication between various parties which may rise the disputes will be settled through arbitration process. For these circumstances, it is necessitate having a competent third party that can settle the disputes amicably or easily without going to court.

2.5.5 Litigation

Based on Murali et al. (2007) when the delays caused by client related, contract related, labor related, external related factors and contract relationship related factors such as delay in payment for completed works, problems with site conditions and less of labor supply where eventually rise the disputes to be settled by the litigation process. The parties involved in construction projects use litigation as a last alternative to settle the disputes.

2.5.6 Total Abandonment

The most critical adverse effect of delays in construction projects is abandonment that could be temporary or in worse condition for permanent duration. The major causes of client related, consultant related, contractor related and external related may lead to project abandonment that will lead to delays in construction projects. Aibinu and Jagboro (2002) studied the effects of construction delays on project delivery in Nigerian construction industry. They identified total abandonment as one of the major effects of delay.

2.5.7 Project Abandonment

Project abandonment can be referred to as putting a stop or an end to an ongoing project due to many difficulties and constraints or problems faced during the phases of the project life cycle such that it becomes impossible to continue at that time (Alusegun, 2011). Many constructions and non-construction projects have been abandoned at various stages of their life cycle thus causing significant amount of loses to the stakeholders. To the owner or client loses in terms of capital and other resources including time. To the contractors and consultants loses in terms of time and wastage of expertise. Usually, most projects abandoned as a result of too much prolonged delay. The contractors, consultants or owner can abandon the projects.

In Nigeria (Kotangora, 1993) reported that there were about 4000 uncompleted or abandoned projects belonging to the Nigerian government with an estimated value of 300 billion Naira. In addition (Yap, 2013) stated that in 2000, there were about 54 abandoned housing projects in the country with an estimated value of RM 7.5 billion. Project abandonment often results from inadequate planning, inadequate finance, inflation, delayed payments political factors, incompetent management, wrong estimates, design and inadequate cost control and above all dispute amongst stake holders.

2.6 Minimizing Construction Delays

The success of construction projects is critically significant for all project participants especially for clients as well as the country economy and in bigger picture it affects contributing to country development. Research by Abdelnaser et al. (2005) concluded that in order to avoid delays during construction stage, you should make proper planning. Nguyen et al. (2004) studied the project success factors in large construction projects in Vietnam. A questionnaire survey was

used to collect data from construction professionals. There were sixteen success factors that can be applied as a method in order to minimize construction delays whereas the five most significant methods were as follows: availability of resources; multidisciplinary/competent project team; competent project manager; accurate initial cost estimates and accurate initial time estimates. Aibinu and Jagboro (2002) in their research identified two methods to minimize or if possible, eliminate time overrun that were: acceleration of site activities and contingency allowance. According to Odeh and Battaineh (2002), improving the situation of construction project that the major method was: enforcing liquidated damage clauses and offering incentives for early completion. The significant minimization methods from Koushki et al. (2005) that was identified in their study for the minimization of time delays and cost overruns would require: ensure adequate and available source of finance until project completion; select of a competent consultant and a reliable contractor to carry out the work.

Table 2.2: Delays reduction measures as suggested by Assaf and Al-Hejji (2006)

R.No	Categories	Reduction measures suggested
	Client	▪ Pay progress payment to the contractor on time because it impairs the contractors' ability to finance the work. ▪ Minimize change orders during construction to avoid delays. ▪ Avoid delay in reviewing and approving of design documents than the anticipated. ▪ Check for resources and capabilities, before awarding the contract to the lowest bidder.
	Contractor	▪ Shortage and low productivity of labor: enough number of labors should be assigned and be motivated to improve productivity. ▪ Financial and cash flow problems: contractor should manage his financial resources and plan cash flow by utilizing progress payment ▪ Planning and scheduling: they are continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and disputes.

		▪ Site management and supervision: administrative and technical staff should be assigned as soon as project is awarded to make arrangements to achieve completion within specified time with the required quality, and estimated cost
	Consultants	▪ Reviewing and approving design documents: any delay caused by the consultant engineer in checking, reviewing and approving the design submittals prior to construction phase, could delay the progress of the work; ▪ Inflexibility: Consultants should be flexible in evaluating contractor works. Compromising between the cost and high quality should be considered. ▪ Producing design documents on time: A/E should set a schedule to complete design documents on time, otherwise result in a delay of work completion. ▪ Mistakes and discrepancies in design documents: They are common reasons for redoing designs and drawings and may take a long time to make necessary corrections.

Source: Adapted from Assaf and Al-Hejji (2006) with some modifications

Mansfield, Ugwu and Doran (1994) therefore concluded that greater attention should be paid to obtaining more accurate estimates from contractors. Clients and contractors must allow the various parties sufficient time and resources to produce these effectively. He further added that to reduce the incidence of poor contract management, greater training is however needed at the senior and middle management levels.

2.7 Delay Mitigation mechanisms

Lo, Fung and Tung (2006) further suggested various measures that should be in place to mitigate construction delay and improve the overall productivity of the construction industry. These are:

1. Good site / ground investigation and preparation are required before the commencement of any construction project as to reduce the impact of any unforeseen ground conditions.
2. Better communication and strong management teams underlines the need for effective site management and supervision by contractors.

3. Technical and Managerial manpower should have their own knowledge updated by continuous professional development scheme.
4. To help eliminate future disputes and variations between parties during the construction stage, it's essential that effective decisions on design specifications, project financing, contractual system, good practice planning and methods of construction are all taken at the right time.
5. To accelerate communication and decision making among all parties, appropriate overall organizational structures and communicating systems linking all the project teams should be developed thorough out the life of the project.
6. Comprehensive strategies need to be formulated to minimize variations, whether client – initiated or consultants- initiated wherever possible. A clear and thorough client brief is considered the most useful strategy for reducing variations. Contingency allowance may be incorporated for inevitable variations.
7. Cash flow problems and financial difficulties, difficulties in obtaining permits and insufficient resources by the contractor can be eliminated by a good practice contractor selecting process. It is therefore essential to take into account not only the lowest bidding price, but also the previous working experience and reputation of the contractors and subcontractor.

Assaf and Al-Hejji (2006) however recommend measures to all parties in order to minimize and control delays in construction projects: He classified them into Clients, Contractors and Consultants:

Table 2.3: *Major causes of delays and their corresponding mitigation measures as identified by CIRC Report (2001)*

R.No	Major causes of delay	Sources of delay	Corresponding mitigation measures
1	" Lowest bid wins" system	Project	Client to reject low bids which have not been taken proper account of the risk involved and make sure adequate provisions have been allowed for in the tender prices for the fulfillment of statutory and contractual responsibilities

3	Change orders/ design (Variation)	Client	Client to exercise robust change control with particular emphasis on comprehensive project planning and risk assessment at project onset
4	Delay in design work	Design	Clients to ensure appropriate allocation of responsibilities among project participants and to enforce a clear accountability structure within their own organization
5	Inaccurate cost estimates	Design	To introduce past performance as one of the quality criteria for prequalification and bid assessment for public works consultancies, and develop a quantitative means for measuring the past performance of consultants
6	Inclement weather	External	Nil
7	Inexperienced contractors	Contractor	Inexperienced contractors Contractor To improve the "Contractor system" for public projects and the Works Bureau to consider allowing those with consistently good performance to take part in the pre-qualification exercise for major public works projects
8	Late delivery	Project	Facilitate better integration in the delivery of construction project through wider option of alternative procurement approaches (e.g. design and build, prime contracting) in both the public and private sectors
9	Liaisons problems among the contracting parties	Contractor	To improve the "Contractor system" for public projects and the Works Bureau to consider allowing those with consistently good performance to take part in the pre-qualification exercise for major public works projects

10	Poor site/ contract management and supervision	Contractor / Consultants	Client to rigorously enforce acceptance standards and consider designated site supervision proposals as a critical criterion for tender evaluation. For consultants- managed projects, clients to require consultants to demonstrate that they have satisfactorily carried out their supervisory role in all project activities.
11	Poor workmanship	Contractor	Client organization to provide wider use of direct labour through contractual requirements
12	Restricted access	External	
13	Shortages of resources	Resources	To develop an effective disciplinary mechanism to tackle non-performance by sharing information among Clients on the performance of their consultants and contractors
14	Slow decision making by project team	Consultants	Client and project team to secure teamwork, good practice and commitment from all parties at a project level through a jointly developed project pact
15	Slow preparation and approval of shop drawing	Client/Consultant/ Contractor	Client to ensure more integrated input from different disciplines
16	Subcontracting systems	Contractor	Client to prohibit total sub-letting and exercise tighter control over the performance and management of sub-contractors
17	Unforeseen ground /site conditions	Project	To reconsider the recommendation of the consultancy study on the General Condition of Contract for Public Works Projects with the objective of achieving a more equitable allocation of risks between contracting parties.

Source: Tang (2001)

2.8 Conceptual Framework

The study is focus on assessing the cause and effect of construction project delay in the case of Federal Government Office Building Construction Projects. The research has both dependent and independent variables. Independent variables are delay of construction projects and effects caused by delay of projects. On the other hands dependent variables are factors that cause delay and the results of delay.

CHAPTER THREE: Research Methodology

3.1 Research Design

Research Design is a way to provide a guideline for researcher to achieve the aim and objectives of the study. This chapter shows the chronological of research methodology and discusses the methods of conducting research in order to achieve the objectives. It is essential to describe the methodologies used throughout this research to ensure all the data and information gathered is reliable and to show that it is systematically collected and analyzed. The raw data obtained from the respondent will be analyzed and studied in depth before deriving conclusion

3.2 Data Type

Both quantitative and qualitative data have been employed in this study. This data was collected from primary and secondary sources. Primary data has factual and original data whereas secondary data is just the analysis and interpretation of the primary data. While primary data were collected with an aim for getting solution to the problem at hand, secondary data was collected for supportive of primary data.

3.3 Data Sources

The present study has collected data both from primary and secondary sources this data was collected through interview, questionnaires and personal observation. Reliable data source is the main factor for the findings of this research. In this study, the researcher obtained a list of client consultants and contractors which participate in construction of Federal Government Office Projects, engineers directly or indirectly participate in the construction of projects, reports and contract documents used as a source of data.

3.4 Sampling Design

3.4.1 Sampling Techniques

A random sampling method have used to select the contractors and consultants the clients or owners and end user was selected using non-probability technique where elements are selected based on the researcher's convenience that is from friends, colleague's professional contacts or referral networks. This method is highly recommended in a situation where there is difficult to obtain data from random sampling.

3.4.2 Sample Population

The sources of population are current engineering staff member of contractors, consultants, clients and end users professionals. The preliminary survey undertaken by the researcher before the questionnaire distribution was taken the total number of engineering staffs participated in the government office construction projects. Work experience, Level of education and position was used in order to select samples from the existing engineering staffs of client, consultant contractors, and end users professionals.

3.4.3 Sample size

In this research, the population includes construction companies of different category and consulting offices that have a valid registration by Former Ministry of Urban Development and Construction (MUDC) in Addis Ababa which is participated in Government office buildings design and construction projects. There are 70 total numbers of contractors and sub-contractors and there are 32 Consultant companies directly participated on this project and 32 end users of the project.

The sample population was distributed between contracting companies: 46 of GC/BC 1 contractors, 10 GC/BC 2 contractors, 14 GC/BC 3 contractors, 32 G1 Consultant companies and 32 end users (Federal government Institutions). The population selected was based on the participation, capital over 120 million and experience in the construction industry especially in the Federal Government Building Projects (FGBP).

To Sample building construction sites in Addis Ababa, reconnaissance survey was made and projects were identified as project owners with project cost more than one hundred twenty million (120) birr during this research. Therefore, this research paper considers these owners as sample representative.

Therefore, the following equation is used to determine the sample size (Al-Moghany, 2006).

$$Ss = \frac{Z^2 * P*(1-P)}{C^2} \quad \text{---------- \{Equation 3.1\}}$$

Where SS = Sample size

Z = Z value (e.g., 1.96 for 95% confidence level)

P = percentage picking a choice, expressed as a decimal (0.50 used for sample size needed).

C = margin of error (9%)

$$Ss = \frac{(1.9*6)^2 * (0.05) * (1-0.05)}{0.09^2} = 118.57 \text{ which is } 119$$

3.5 Data collection techniques

The primary data were collected from primary source directly involved professionals. These data were collected through questioners and interviews will be prepared and disseminated to MUDI managers, experts/engineers and consultants. The questioner was structured to address time and cost overrun, cause of construction delays, effect/impacts, resolution and responsible parties for causes of time and cost overruns.

The questionnaires were divided into three main sections. The respondents were first asked about their personal and organization background in section A. Subsequently in section B, the respondents were asked to state the frequency and severity effects on delay causes, according to their local working experience in construction industry. Section C is about the methods that minimize construction project delays. Respondent were required to give their opinion regarding the effectiveness of minimizing delays method. In addition, respondents were also encouraged to cite additional causes thought to extend the construction duration project by overall. Field observations have been conducted to collect some primary data such as contractor's management style, material approval procedure and material purchasing processes. Secondary data has collected from literature, documents and reports.

3.6 Data analysis techniques

The primary data has collected through questionnaire and interview were analyzed by using descriptive statistics (SPSS software) such as mean frequency and percentage the data collected.

3.7 Data presentation

The primary data were collected through questionnaire and interview were analyzed by using SPSS software has been presented by using tables and pie charts depending on the nature of the data. In general, the researcher chooses those methodologies to deeply examine and give an appropriate conclusion, recommendations and relevant suggestions.

3.8 Data validation

To test the validity of the data Chronbach's Alpha was conducted. The resulting Alpha value from the instrument used in this study was within the acceptable range of validity. As stated Nunnaly (1978) the closer the validity coefficient to 1.00 is the better. In general validity less

than 0.06 are considered poor; those in the range of 0.06 to 0.80 are considered as good and acceptable.

CHAPTER FOUR: Result and Discussion

4.1 Respondents position and response rate

4.1.1 Respondents position

Table 4.1 shows that among 120 respondents 52 which is 43.33% was from contractor, 32.50% or 39 respondents was from consultant firms or designer, 17.50% or 21 respondents were working in client/owner professionals for the targeted Project office 8 respondents which was 6.7% were from end users or Federal government institutions (project beneficiary).

Table 4.1 Respondents position in the company

R.No	Reprentative/company	Position	Frequency	Percent
1	Contractor	1. General Manager	10	8.3
		2. Project manager	14	11.7
		3. Site Engineers	12	10.0
		4. Office Engineers	10	8.3
		5. Quantity Survoyers	6	5.0
		Total	**52**	
2	Consultant	1. General manager	5	4.2
		2. Technical Manager	8	6.7
		3. Office engineers	10	8.4
		4. Resident Engineers	16	13.4
		Total	**39**	
4	Owner/Client	1. Managers	4	3.3
		2. Project/Site engineers	8	6.6
		3. Contract Engineers	6	5.0
		4. Archtects	3	2.5
		Total	**21**	
5	Other/end user	1. end user representative (engineer)	8	6.6
		Total	**8**	
Grand Total			120	100.00

Source: Own survey, 2022

Table 4.2 Response rate

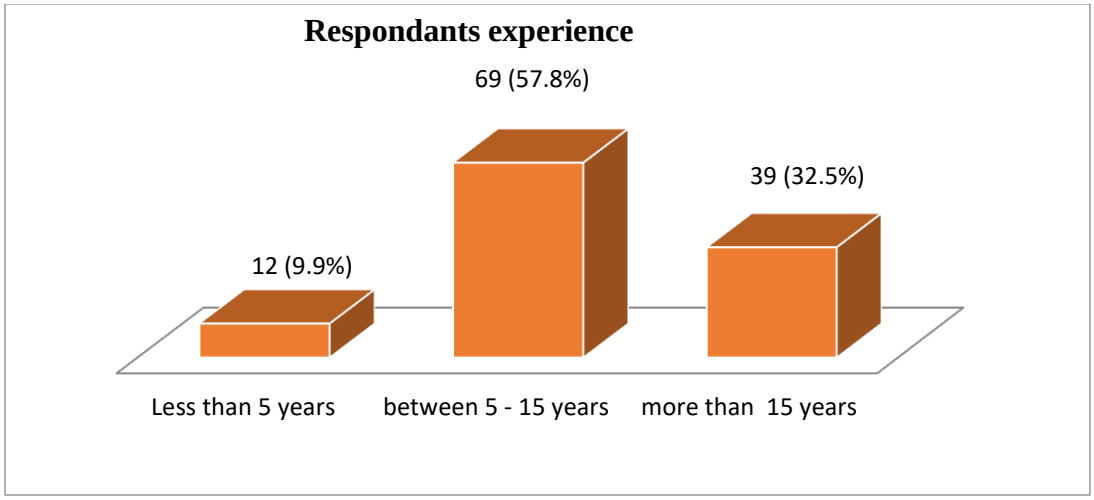
R.No	Respondent	Questionnaire distributed # (in number)	Questionnaire collected # (in number)		
			Incomplete	Complete/Valid	Total response (%)
1	Client	32	11	21	17.50%
2	contractor	64	12	52	43.33%
3	consultant	42	3	39	32.50%
4	Others	12	4	8	6.66%
	Total	**150**	**30**	**120**	**100.00%**

Source: Own survey, (2022)

4.1.3 Respondents General Experience

Among the respondents 9.9% or 12 respondents have less than 5 years' experience, 57.5% or 69 respondents have 5 to 10 years of experience, and 32.5% or 39 respondents have more than 15 years of experience in construction. Werku & Jha (2016), Aziz (2013), Owolabi J. D., et al (2014), and N. Jawal (2015) used similar groupings of respondent 's years of experience in their study as indicated below.

Figure 4.1: Respondent's experience



Source: survey data, 2022

4.1.4 Experience in Construction Industry

Regarding number of years involved in construction, 17.86 percent of respondents have less than 5 years, 57.14 percent of those have between 5 to 15 years and 25.0 percent of those have 15 years or more. The experience possess by the respondents may help in providing a better understanding of this matter and in better position in giving much precise answer required to the questionnaires form.

Table 4.3 Respondent staff experiences

Experience in years	Frequency	Percent
less than 5 years	22	18.2
5 -10 years	60	49.6
more than 15 years	38	31.4
Total	120	100.0

Source: Own survey data, 2022

4.1.5 Most Delayed Project

Table 4.4 represents the results for the most delayed project by respondents. The highest rate of 60% percent of the respondents having less than 12 months late, 20% percent of having more than 24 months late and 10.8 percent between 18 -24 month late and 9.2%between 12 -18 months late for the actual time spent for the most delayed project. This is important to ensure they are well qualified to offer reliable opinions on the questionnaire.

Table 4.4 Most delayed projects by respondent

Most delayed projects	Frequency	Percent
less than 12 months	72	59.5
18 - 24 months	13	10.7
12 - 18 months	11	9.1
more than 24 months	24	19.8
Total	120	100.0

Source: Own survey data, 2022

4.2 Delayed Federal Government Buildings projects

Based on desk study and visiting some projects, the researcher collected data and summarize the delays of selected Federal Government Buildings project on the above table 1.2 shows that almost all completed and under construction of Federal Government buildings projects were completed beyond their original completion date. The extent of project delay for completed projects ranges from 216.44% to 14.25% with the average delay equals to 94.79%. The causes of Federal Government Buildings Construction projects delay are varied project to project based on complexity and nature of the project, location of the projects, type of contract, capacity of contractual parties and communication between project stakeholders. Possible causes of delay identified and classified under eight major categories (clients, consultants, contractor, contract, material, equipment, labor and external related) which are used on survey questionnaire.

4.3 Results of Causes of delay in government office building construction projects

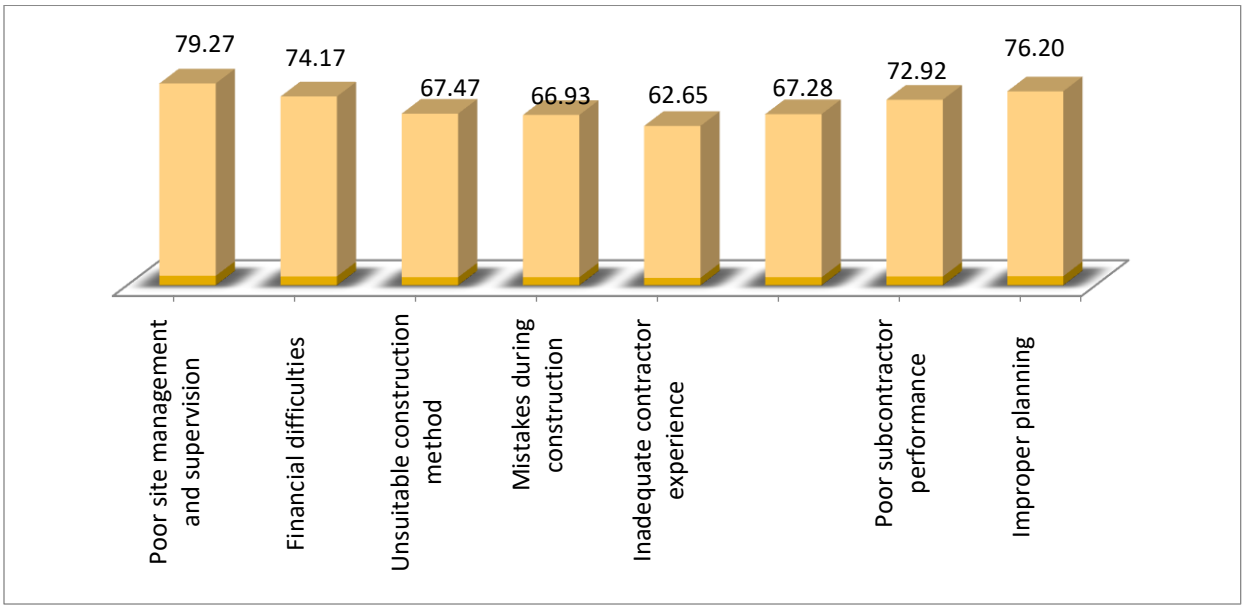
This part of the paper consists of results and discussion of causes of schedule delay in Federal Government office building construction projects. The causes of delay are discussed under eight groups, causes related to contractor, delay causes related to client, causes related to consultant, causes related to material, causes related to contract, causes related to equipment, causes related to labor and related to external factors. Each delay causes are assessed from the view point of clients, consultants and contractors. Each factor is evaluated and ranked based on their mean and likelihood of occurrence as perceived by respondents and the calculated mean are taken to rank the delay causes.

4.3.1 Contractor Related Factors

From the analysis depicted on Figure 4.2 below, we conclude that “Poor site management and supervision” is appeared to have very high impact on delays in construction projects with the value of 79.27%. The survey result shows that “Improper planning” considered as the most important causing delay in construction projects at the category of contractor related causes of delay with the value of 76.2%. Respondent’s survey results ranked “Financial difficulties 74.17% “on the third place and poor sub-contractor performance with the value of 72.92% on the fourth place.

Unsuitable construction method, defective works, Mistake during construction and mistake during construction with the value of 67.47%, 67.28%, 66.93% and 62.65% respectively ranked from five to eight among contractor related delay causes based on their order of importance.

Figure 4.2 Percentage value of contractor related factors



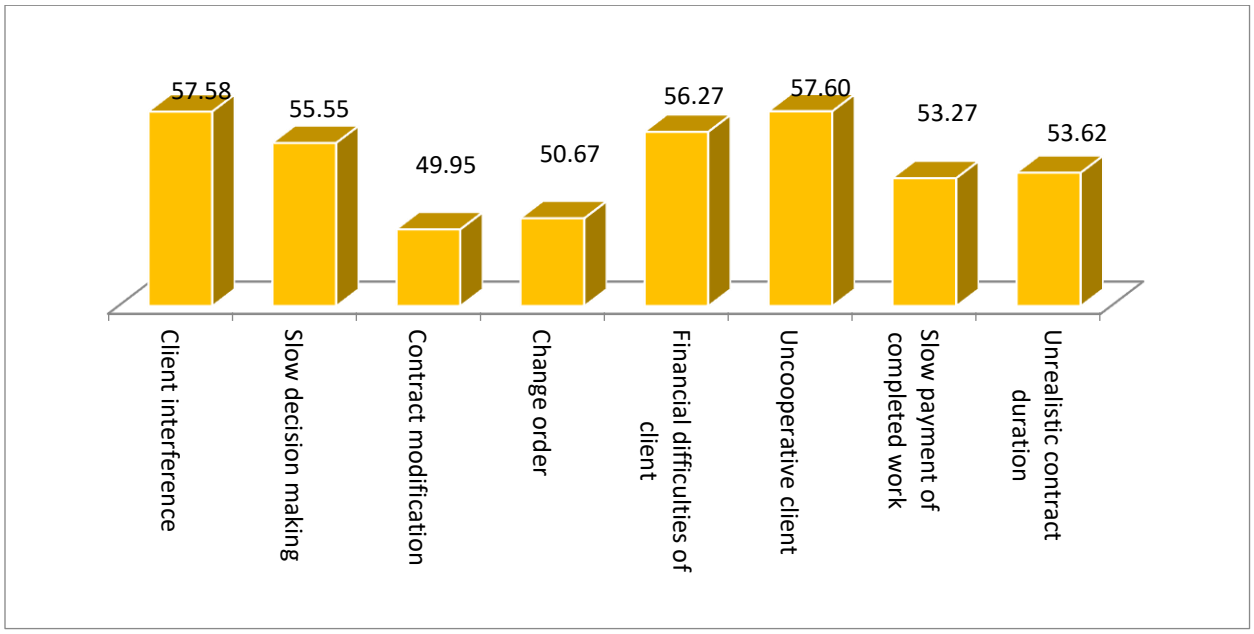
Source: survey data, 2022

4.3.2 Client Related Factors

The results presented in Figure 4.3 below show that from the eight delay causes related to the clients/ owner, uncooperative client ranked on the first place by all groups of respondents (clients, consultants and contractor) with the percentage value of 57.6%. The second most important client related cause of delay is client interference with personage value of 57.58% followed by financial difficulties of client with the value of 56.27%. slow discussion making (55.55%), unrealistic contract duration (53.62%), slow payment for completed activities (53.27%), change order (50.67%) and contract modification (49.95%) are the other factors causing delay.

From this group of categories (client ‘s related delay “uncooperative of client” the most influential causes of delay. L. Muhwezi et al (2014) categorized financial shortage under client related delay causes, so in this study too.

Figure 4.3 Percentage value of client related factors



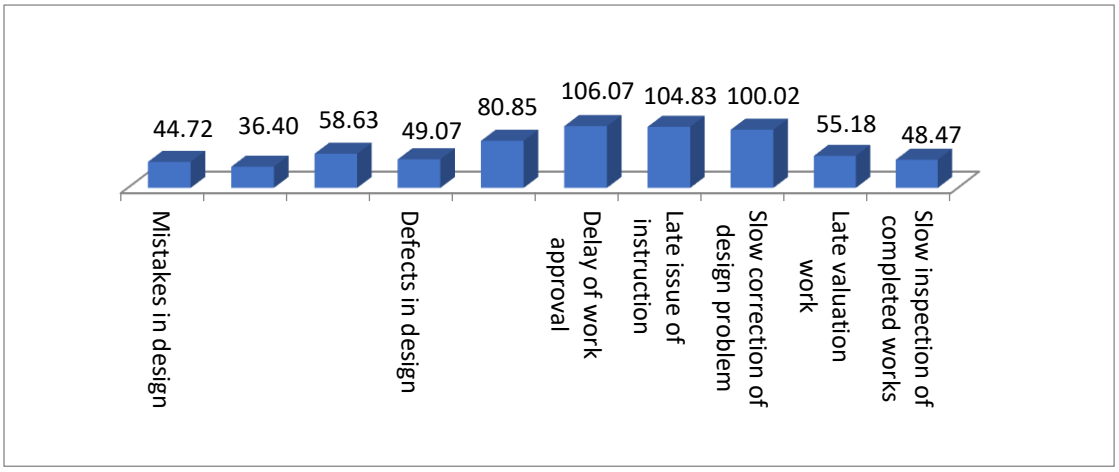
Source: survey data, 2022

4.3.3 Consultant related Factors

The respondent survey result of the eleven ten factors that are classified under the "Consultant related factors category" are shown in Figure 4.3 Delay of work approval identified as the most important causes of delay among the consultant related causes of delay and ranked on the first place by respondents from clients and consultants and contractor groups with the percentage value of (106.07%).late issue of instruction (104.83%) ranked as the second cause for delay under this category. According to the questionnaire survey result “slow correction of design problem (100.02%), inadequate supervision for contractor (80.85%) and incomplete documents (58.63%) are the other main factors for causing delay on the consultant side.

Late valuation work, defects in design, slow inspection of completed work and mistake in design with the value of 55.18%,49.07%,48.47% and 44.72% respectively are ranked from six to ten based on their order of parentage value given by respondents.

Figure 4.4 Percentage value of consultant related factors

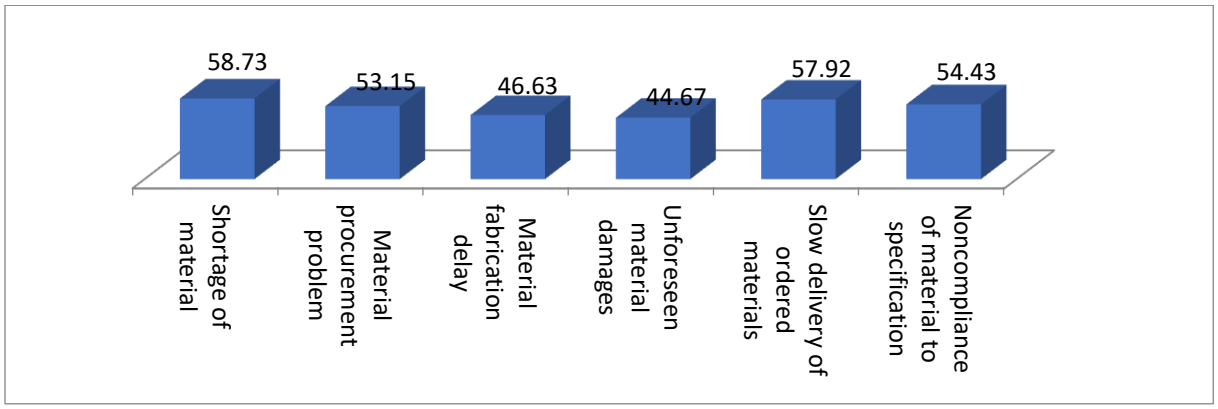


Source: survey data, 2022

4.3.4 Material Related Factors

In Figure 4.5 shows the results on causes of materials-related delays. The percentage value given was for material shortage (58.73%), followed by slow delivery of ordered materials (57.92%) had been ranked as the factors which give the most severe impact to the project delay. Similarly, noncompliance of material to specification (54.43%), material procurement problem (53.15%) material fabrication delay (46.63%) and unforeseen material damage (44.67%) are the other factors of delay in this category.

Figure 4.5 Percentage value of material related factors

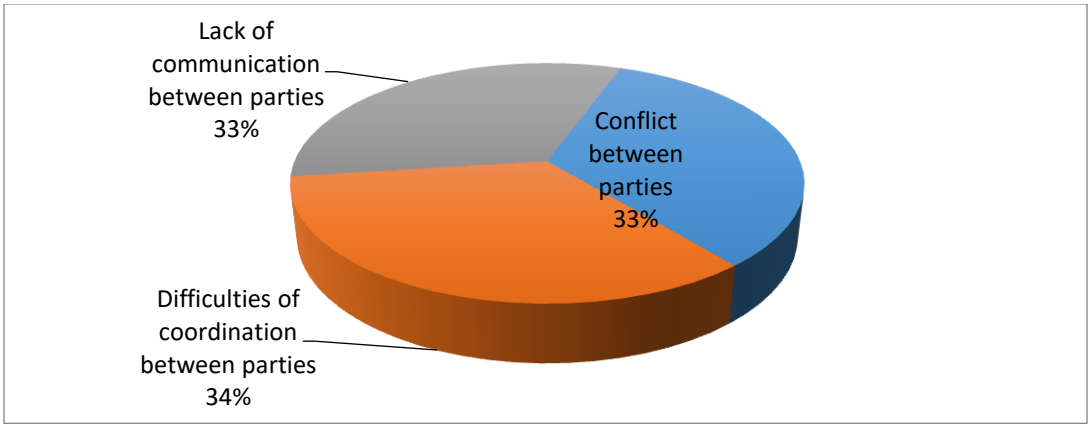


Source: survey data, 2022

4.3.5 Factors Related to Contract

Figure 4.6 presents the result of contract-relationship related delays. It can be seen that ‘difficulties of coordination between parties which is 34% is always happen in construction projects, followed by lack of communication between parties (33%) and conflict between parties (33%) all these factors are the causes of project delay in the category of contract related factors.

Figure 4.6 Percentage value of contract related factors



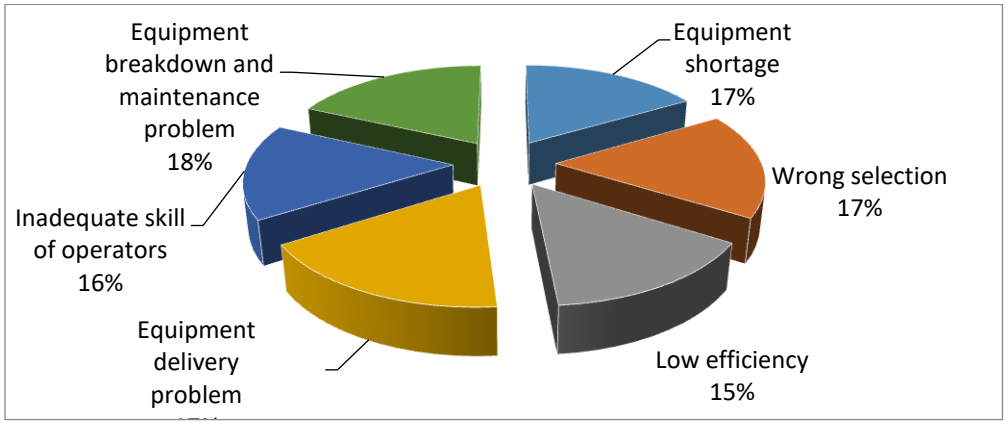
Source: Survey data, 2022

4.3.6 Equipment related Factors

Figure 4.7 highlights the responses of survey expressed in the mean percentage of combined effect of frequency and the severity indices for the plant/equipment related delays. According to survey result equipment breakdown and maintenance problem (18%) the most influential causes for delay under this group

The second factor is equipment shortage, wrong selection and equipment delivery problem are equally affecting the project which is (17%) followed by inadequate skill of operator (16%). The survey result shows that law efficiency (15%) is the factors causing delay regarding equipment factors.

Figure 4.7 Percentage values of equipment related factors

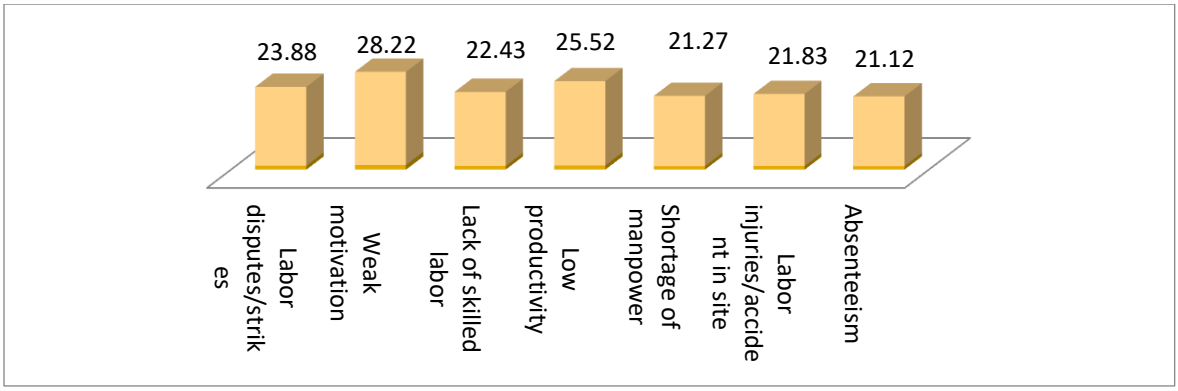


Source: Survey data, 2022

4.3.7 Labor Related Factor

Figure 4.8 shows the result of labor related delays in construction projects, it can be seen that the top in ranking was weak motivation (28%), followed by low productivity (25.52%) and labor dispute (23.88%), for the mean percentage of both frequency and severity index. The other factors are lack of skilled labor (22.43%), labor injuries (21.83%), shortage of man power (21.27%) and absenteeism (21.12%) are the causes of delay in labor factor side.

Figure 4.8 Percentage values of labor related factors

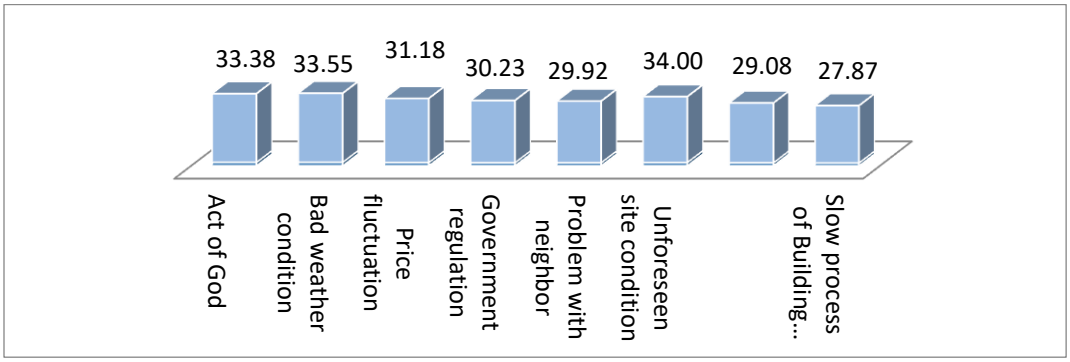


Source: Survey data, 2022

4.3.8 External Related Factors

There are eight factors of external related delays that contribute to construction project delays, have been ranked by the respondents as shown in Figure 4.9 unforeseen site condition was ranked as the most frequent and severe to the construction project by respondents with the value of 34.00%. The second factor is bad weather condition (33.55%), followed by act of God (33.38%) The causes that less happen in term of ranking was price fluctuation (31.18%), government regulation (30.23%), problem with neighbor (29.92%), civil destruction (29.08%) and slow process of building permit (27.87%).

Figure 4.9 Percentage values of external related factors



Source: Survey data, 2022

4.3.9 Combined Effect for Delay

Table 4.5 Variables combined effect for delay

Variable	Observation	Means	Std. Dev.	Min	Max
Contractor	120	3.64	0.84	2.14	4.85
Client	120	2.98	0.47	2.37	3.75
Consultant	120	3.49	0.23	3.21	3.8
Material	120	2.84	0.41	2.35	3.54
Contract	120	1.70	0.29	1.25	2.20
equipment	120	0.62	0.05	0.53	0.69
Labor	120	1.24	0.06	1.17	1.37
external	120	1.64	0.02	1.63	1.66

Source: Survey data, 2022

As shown in Table 4.6 the result of contractor related factors indicates the greatest source of delay (3.64%) for the respondents of the survey and is ranked first. Consultant related category (3.49%) delay can be considered as important source of delay for the three stake holders since it directly affects the performance of the project. According to Gwaya et al (2014) the consulting firm in construction industry significantly affects project delivery time. The results of table 4.6 shows that client related factors of delay (2.98%) and material related factors of delay (2.84%) are third and fourth causes for project delay in Ethiopia. A similar observation is suggested in the survey of Abdul-Rahman et al. (2006) conducted in Malaysia.

From the table 4.6 we can see that contract related factor (1.7%) and external related factor (1.64%) are the fifth and sixth influential factors for delay of government office building projects in Ethiopia. the same experiences were observed in Kenya Symon Antony (2016). Equipment related category of causes of delay is the least frequent and has been ranked in last position.

4.4 Reliability test result

To test the reliability of the instruments Chronbach's Alpha was conducted. The resulting Alpha value from the instrument used in this study was within the acceptable range of reliability. As stated Nunnaly (1978) the closer the reliability coefficient to 1.00 is the better. In general reliability less than 0.6 are considered poor; those in the range of 0.6 to 0.80 are considered as good and acceptable. In this study, all the variables, met the above requirement. The alpha value is as identified and summarized in table below are above 0.6. It indicates the reliability and consistency of the questioner to what was indented to measure in the research.

Table 4.6 Reliability test for model

	No of Items	Chronbach's Alpha
Overall satisfaction	9	0.6711

Source: test result

The SPSS result of Table 4.6 indicates that the entire variable has the expected impact regardless of their significant level. As the researcher discussed in the variable definition part contractor, client, consultant, contract, equipment, material, external factor and labor have positive impact on delay.

4.5 Causes of delay in each perspectives (factors)

4.5.1 Contractor Related Factors

Contractor related factors (con) are the one which contributes a positive impact on delay, also significance of contractor related factors affecting delay is acceptable and in line with all theoretical and empirical studies cited on this study the coefficient of contract related factors (cad) is 19.11%. The result of estimation showed that one percent increase in contractor related factor has resulted in 0.41 percent change in delay.

4.5.2 Consultant Related Factors

The result of this study revealed that consultant related factors (cons) have a positive impact on dely and its contribution for delay is 18.45%.This result is in line with the studies conducted by Dajang, (2009), Symon Antony (2016) and Jawad Nihal (2015).The reason for this is that the local consultants participated in government office building projects are selected by their grades and experiences, they are not selected by performance and practical experiences this causes the consultants have not sufficient experiences and stuffs for the construction of projects. As a result, one percent increase in consultant related factor has resulted in 0.23 percent change in delay.

4.5.3 Client Related Factor

From the above Table 4.6 we can observe that client related factors (cli) a positive impact on construction delay and contributes 14.64%. The result of this study similar with the study of Temesgen AAU, (2015) client financial shortage and poor management system is the main factor for delay in construction industry. According to this research one percent increase in client related factor has resulted in 0.23 percent change in delay.

4.5.4 Material Related Factor

14.18% of construction delay arises from material related factor (mat). The result is consistent with the empirical findings of by Dajang, (2009), Symon Antony (2016) and Jawad Nihal (2015) but it is similar to the argument given by Ausbildung von Bauzeichnern MOE (2010) which states that the correlation between material and construction delay has been medium level.

4.5.5 Contract Related Factors

As the estimated result of the above table showed, contract related factor (cad) has a positive impact on delay. Also, significance of contract related factors affecting delay is acceptable and in line with all theoretical and empirical studies cited on this study. The coefficient of contract related factors (cad) is 12.93%. This indicates that in the long run holding other things constant the contribution of contract related factors is 0.11 percent for a one percent change in delay.

4.5.6 Equipment Related Factors

Equipment related factor (equ) has positive impacts on delay. The findings of this research concerning positive impact of equipment related factor on delay is consistent with the study conducted by AfDB (2013) which argued that shortage of construction equipment is one of the most causes for project delay its contribution is 6.03%. As a result, one percent increase in equipment related factor has resulted in 0.03 percent change in delay.

4.5.7 Labor Related Factor

As indicated in Table 4.6 above labor (lab) has a positive impact on construction delay, and its contribution is 6.33%. This result is supported by research conducted in Kenya by Symon Antony (2015) “Labor has an inverse proportion with delay” that means when the number of labor increase delay decrease and vice versa. Finally, we can conclude that as a result one percent increase in labor related factor has resulted in 0.0.02 percent change in delay.

4.5.8 External Related Factor

The external related factor (ext) has a positive relationship with construction delay as shown in table 4.6 and its contribution for delay is 8.33%. The reason for is before the project is commenced detail investigation on environmental impact assessment, geographical location, nature of stack holder is not studied in detail.

4.6 Delay effects and its mitigation methods

4.6.1 Introduction

A completion of construction project within time was seen become a key criterion of project success. Delays in construction project can increase the time and cost allocated for executing the various project activities, resulting in project cost overruns and late completions. Causes of time and cost

extensions can result from all phases of projects, works, and circumstance; however, major troubles usually thrive during construction phases.

4.6.2 Effects of construction Delay

Delays in construction project completion seem to be a perennial problem. When projects are delayed, they are either accelerated or have their duration extended beyond the scheduled completion date. Delays are usually accompanied by cost increases. The subject of delay has been addressed by several researchers and they found that delay always led to the negative effects. Abd. Majid (1997) state that delay may lead to disputes, low productivity and increases in cost. Alkass et al. (1994) addressed that delay are costly and often result in prolonged litigation by the parties. Additionally, associated delay problems can also result in total abandonment of project (Aibinu and Jagboro, 2001).

The result of this study also support the above researcher's idea, According to this study the five main effects of construction delays are time overrun with the mean value of (4.42),disputes (4.33),cost overrun(4.32),negative social impact (4.14) and create stress on the stockholders (3.89).From the researcher observation in some Federal government building construction projects due to delay of projects the construction cost increases 20% to 30% and also there is disputes between client, consultant and contractors this disagreements causes a negative stress on the contractors. Due to this reason some contractors terminate the agreements.

Table 4.7 mean of delay effects

R.No	Delay Effects	N	Minimum	Maximum	Sum	Mean	Std. Deviation
1	Time Overrun	120	1	5	530	4.42	0.656
2	Disputes	120	3	5	520	4.33	0.665
3	Cost Overrun	120	1	5	519	4.32	0.65
4	Negative social impact	120	2	5	497	4.14	0.737
5	Create stress on the stakeholders	120	1	5	467	3.89	0.786
6	Bankruptcy	120	2	5	467	3.89	0.776
7	Litigation	120	2	5	463	3.86	0.813
8	Acceleration of Losses	120	1	5	457	3.81	0.781

Source: survey data, 2022

4.6.3 Suggestion Methods minimize delay from Survey Result

Project delays have been a topic of concern in the construction industry. Delays can be minimized only when their causes are identified. Knowing the cause of any particular delay in a construction project would help avoiding the effects. In Table 4.7 shows ranking of the top twenty-three effective methods of minimizing construction delays from the viewpoint of respondents in Federal Government office buildings construction projects.

These methods were ranked based on the Descriptive statistics as mention in previous chapter. There has a closer consensus between respondents of contractor, consultant and client sides. All are agreed that select the competent project manager (4.6), Use the appropriate construction methods (4.37), Not awarding contract based on the lowest bid (4.24), Increase productivity by working overtime, shift, etc. (4.22) and ensure the availability of resources (finance, Materials, equipment, workmen, etc. (are among top 5 effective methods to mitigate delays. All the respondents on the argued that the availability and competency of resources (money, workmen, materials, equipment, etc. (4.19) are very essential parts to ensure the construction projects run smoothly. A similar observation is suggested in the survey of Abdul-Rahman et al. (2006) conducted in Malaysia and also the research conducted in Keny by Neurol (2007) states that the cause of construction delay is coming from different directions but the major one is the effectiveness of project manager and the supply of resources according to the schedule. The respondents on the contractor side suggest the incentive for early project completion is the most effective methods since this is one type of motivation to the construction team as encouraging them to expedite works and complete project on time. On the other side respondents on the client and contractor side agreed that the better method to prevent delays is the competency of project manager. A competent project manager possibly can handle well his project from time overrun.

Table 4.8 Proposed method of mitigation delay

R.No	Proposed method	N	Min.	Max	Sum	Mean	Std. Deviation
1	Select the competent project manager	118	2	33	543	4.6	2.737
2	Use the appropriate construction methods	118	1	5	516	4.37	0.737
3	Not awarding contract based on the lowest bid	118	2	5	500	4.24	0.649
4	Increase productivity by working overtime, shift, etc.	118	2	5	498	4.22	0.753
5	Ensure the availability of resources (finance, Materials, equipment, workmen, etc.)	118	1	5	495	4.19	0.798
6	Hire experience personnel for project implementation	118	2	5	495	4.19	0.719
7	Promote team working among project participants	118	2	5	495	4.19	0.889
8	Offer incentive for early project completion	118	2	5	491	4.16	0.847
9	Accurate initial time estimation	118	1	5	490	4.15	0.939
10	Frequent site meeting with all functional parties	118	1	5	490	4.15	0.747
11	Thorough project feasibility study and site investigation	118	2	5	486	4.12	0.829
12	Absence of bureaucracy	118	2	5	485	4.11	0.885
13	Proper emphasis on past experience of project parties	118	2	5	484	4.1	0.937
14	Build a systematic project control and monitoring mechanism	118	2	5	483	4.09	0.827
15	Accurate initial project cost estimation	118	2	5	483	4.09	0.795
16	Developing human resources management (training, day Courses, etc.)	118	2	5	474	4.02	0.867
17	Execute delayed activities by subcontractors	118	1	5	473	4.01	0.929
18	Timely decision making by all functional group	118	2	5	473	4.01	0.862
19	Proper project planning and scheduling	118	2	5	472	4	0.867
20	Early in obtaining permit and approval from relevant authority	118	1	5	466	3.95	0.885
21	Utilization of the latest construction technology method	118	1	5	458	3.88	0.898
22	Ask for extension of time	118	1	5	450	3.81	1.132
23	Developing appropriate communication system linking to all functional group.	118	2	5	448	3.8	0.863

Source: survey data, 2022

4.7 Major findings

From overall results it was found Deficiencies in poor site management and supervision of projects was considered the first cause affecting delay in Federal Government office buildings construction projects. Generally respondents from the three major stakeholders agreed that out of a total of 56 delay attributes; Inflation and escalation of material prices, Delay of financing and payments by owners, Difficulties in financing the project by contractor, slow inspection of completed work, improper planning, Under estimation of cost of the project by contractor, Frequent equipment breakdown/equipment failure/, Delay in decision making, late issue of instructions, and shortage of construction materials are considered as the most prominent delay causes of Federal Government office building construction projects. The results presented in previous Table 4.6 above shows that contractor group of causes are the most contributing factors to project delay with the grand mean value equals to 3.64. The consultant related causes ranked second next to contractor related causes with the grand mean values of 3.49, followed by client related causes with the grand mean values equals to 2.98.

For the above delays the major mitigation suggested by all respondents are Select the competent Project manager with the mean value of 4.6 secondly using appropriate construction methods its mean value is 4.37 and thirdly not awarding contract based on the lowest bid with the mean value of 4.24.In addition to these the study covers the effects of construction delay, from the survey data we/I can generalize that the main three effects of construction delays are time overrun with the mean value of 4.42, disputes by mean value of 4.33 and cost overrun with mean value of 4.32.

CHAPTER FIVE: Conclusion and Recommendations

5.1 Conclusion

Project delay is still happening and will continue to happen in the construction for various reasons. Delays are inevitable; however, they can be avoided or minimized when their causes are effectively identified and analyzed

To identify/ study the causes of delays in term of degree of occurrence and severity of effects

A literature review and expert interviews were conducted to identify the causes of delay. A compiled list of 56 delay attributes were identified and categorized into eight groups of consultant related delay factors, contractor related delay factors, client related delay factors, contract related factors, material related factors, equipment related factors, labor related factors and external related delay factors and listed on the questionnaire for further quantitative evaluation in a questionnaire survey to confirm the causes and to identify the most important causes of Federal Government office building construction projects delay. The most important causes of delay identified by the survey through questionnaire and the results were analyzed for the overall view and for each of the three major parties in construction who participated in the questionnaire (clients/owner, consultants, and contractors) separately to make an overall view of the causes of delay in Federal Government office building construction projects. The above mentioned fifty-six (56) delay attributes were categorized into eight major groups (clients, consultants, contractors, contract, material, equipment, labor and external factors) and were ranked using descriptive statistics method. The results show that the average results of respondents from the three major groups indicated that the contractor group of delay factors was the most prominent delay factor. Consultant related factors were considered the second most influential causes of delay in Federal Government office building construction projects followed by client related causes of delay. For Federal Government office building projects, the results for the frequency of occurrence based on priority are: Contractor's Poor site management/supervision, financial difficulties, financial difficulties of client, slow payment of completed work and late issue of instruction. Subsequently, the causes with highest severity effect to construction project are: Client financial difficulties, late issue of instruction, improper planning, weak motivation and delay of work approval.

To compare the significant causes of delays in Federal Government Buildings construction projects

Comparison results between group factors for delay were made according to overall group causes. For the comparison of group causes, contractor related causes have higher grand mean form eight groups

of delay causes. The second and third delay factors are consultant related factors and client delay factors respectively.

To investigate the effects/impacts of construction projects delay.

The findings of this research shows that the top three effects of construction delay were time overrun, disputes and cost overrun. Late delivery of the project increase expenditure for all parties to the project, it brings lack of trust between parties this should be leading to the occurrence of disputes and conflict.

To suggest the methods of minimizing project delays

The third and last objective was achieved through questionnaire survey. A total of twenty-three methods of mitigation delays were identified. The most effective methods proposed by respondents are: selecting the competent project manager; to use appropriate construction methods for each project; not awarding contract based on the lowest bid, increase productivity by working overtime, shift etc. and ensure the availability of resource (finance, material, equipment and labor.

5.2 Recommendations

Federal Government office building construction projects will be successful when the construction project activities are done by proper planning and scheduling, within the allocated budget and specified quality, under specified time frame and by the satisfaction of the stakeholders. Delays are a part of the construction projects, however, they can be avoided or minimized when their causes are effectively identified and analyzed. Based on the above-mentioned results and findings of this study, the following points can be recommended as ways to minimized and control delay in Federal Government office building construction projects.

- During planning of the project, stakeholders (clients, consultants and contractors) must give considerations for unforeseen events which may lead to project delay.
- Clients must ensure that effective planning of project costs to determine adequate budget/ funds are available for the project in order to avoid intermittent stoppage of works as a result of finance/funding constraints and ensure interim payments are paid in time within the stipulated timeframe.
- Clients leave list bidders selection methods (must follow competitive bidders)
- Clients can make timely and prompt decisions

- Clients and consultants should also promptly respond to contractors enquires in revising and approving documents (design, drawings, submittals, sample materials etc.) without delay.
- Clients must ensure that the demand for design changes during construction have no adverse effects on the critical activities that leads to project delay.
- Clients and consultants can take in to account of proper estimate of the original cost and duration of the project pre-contract and bidding period.
- Consultant must undertake adequate site investigation and supervision and must assign competent and well experienced representative.
- Consultants shall ensure that the documents or design & specifications issued by consultants to contractors are free from mistakes or discrepancies and any design error must be rectified immediately to avoid delay in the progress of project works.
- Contractor shall ensure proper planning and scheduling of projects and proper Project management and supervision in order to run the project on specified time frame/ schedule.
- Contractors must also allocate adequate construction equipment's and ensure to avoid frequent equipment breakdown.

Finally, Commitment to project can be evident from all stakeholders; similar studies can also be conducted in this area and stakeholders in construction also take in to account such issues and utilize the findings of such studies. I also suggest that future studies can focus on the magnitude of effects of causes on projects.

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Appendix 1: Questionnaires

Questionnaires

Addis College Post Graduate Program

Questionnaire for Contractors, Consultants and Owner's Professionals

Dear: -

This questionnaire is prepared to conduct a study in the partial fulfillment of a Master's Degree in Construction Technology and Management (CoTM) program entitled with ***"Assessing the cause and effect of Delay of Construction projects in Ethiopia: The case of Government Buildings Construction Projects by Ministry of Urban Development and Infrastructure''***. Hence, you are kindly requested to give the necessary information for the research questions.

There is no need to write your name and address and the information that you provide will be kept confidential. The accuracy, honesty, and fairness of your response will have a great impact on the outcome of the research.

Objective of the questionnaire: This questionnaire is developed to assess the views of owners,

Consultants and contractors to identify important factors contributing for delay in the construction projects in Ethiopia in the case of MUDI, Federal Government Buildings Projects.

Thank you in advance for taking your precious time to fill this questionnaire. Please try to answer all the questions openly, as your answers will have an influence on the outcome of the research. Your 30 minutes or less will greatly contribute to the growth and advancement of knowledge in the construction industry.

If you have any questions or comments, please don't hesitate to contact me. You can reach me by;

E-mail: feteneget2002@gmail.com

With Regards

Fetene Getahun

SECTION A: RESPONDENT DETAILS

All the answers in this questionnaire will be treated with the strictest confidential. Please thick ▪ the box and fill in the blanks if you select others.

1. State the type of your organization or company (you are working in).

☐ Client (government or developer) ☐ Contractor

☐ Consultant ☐ Others: ……

2. State your position in the organization or company.

☐ Engineer/Designer ☐ Project Manager ☐ Others: ……

☐ Site Manager ☐ Owner professional/representative

3. State the number of years you involved in the construction industry.

☐ Less than 5 years ☐ 5 – 15 years ☐ More than 15 years

4. State the number of years your organization/company involved in the construction industry

☐ Less than 5 years ☐ 5 - 15 years ☐ More than 15 years

5. State the type of project that your organization/company has experienced with delay.

☐ Building and industrial ☐ Infrastructure

☐ Others ------- ☐ Never experienced on any delay project (Ignore for Question 6 & 7)

6. State the project duration based on contract document for your most delayed project.

☐ Less than 12 month ☐ 12 to 18 month

☐ More than 18 to 24 month ☐ More than 24

7. State the actual time spent for the most delayed project.

☐ Less than 3 month late ☐ 3 to 6 month late ☐ More than 6 months late

SECTION B: CAUSES AND EFFECTS OF DELAYS

Read through the list. For each option, please circle to show your answers based on the rating scale given below and fill in the blanks if you select others.

Question 1: What is the frequency of occurrence for the following related causes of delays associated with your project (s)?

Question 2: What is the severity of effects for following related causes of delays associated with your project(s)?

Rating Scale for Question 1	
Very Greatly occurred	5
Greatly occurred	4
Sometimes occurred	3
Rarely occurred	2
Not occurred	1

Rating Scale for Question 2	
Very great	5
Great	4
Sometimes	3
Rarely	2
Never	1

R.No.	**Contractor Related Delays**	**Frequency of Occurrences**					**Severity of effect**				
1	Poor site management and supervision	5	4	3	2	1	5	4	3	2	1
2	Financial difficulties	5	4	3	2	1	5	4	3	2	1
3	Unsuitable construction method	5	4	3	2	1	5	4	3	2	1
4	Mistakes during construction	5	4	3	2	1	5	4	3	2	1
5	Inadequate contractor experience	5	4	3	2	1	5	4	3	2	1
6	Defective works	5	4	3	2	1	5	4	3	2	1
7	Poor subcontractor performance	5	4	3	2	1	5	4	3	2	1
8	Improper planning	5	4	3	2	1	5	4	3	2	1
9	Others	5	4	3	2	1	5	4	3	2	1

R.No.	Client Related Delays	Frequency of Occurrences					Severity of effect				
1	Client interference	5	4	3	2	1	5	4	3	2	1
2	Slow decision making	5	4	3	2	1	5	4	3	2	1
3	Contract modification	5	4	3	2	1	5	4	3	2	1
4	Change order	5	4	3	2	1	5	4	3	2	1
5	Financial difficulties of client	5	4	3	2	1	5	4	3	2	1
6	Uncooperative client	5	4	3	2	1	5	4	3	2	1
7	Slow payment of completed work	5	4	3	2	1	5	4	3	2	1
8	Unrealistic contract duration	5	4	3	2	1	5	4	3	2	1
9	Others	5	4	3	2	1	5	4	3	2	1

R.No.	Consultant Related Delays	Frequency of Occurrences					Severity of effect				
1	Mistakes in design	5	4	3	2	1	5	4	3	2	1
2	Changes in drawings/specifications	5	4	3	2	1	5	4	3	2	1
3	Incomplete documents/drawing	5	4	3	2	1	5	4	3	2	1
4	Defects in design	5	4	3	2	1	5	4	3	2	1
5	Inadequate supervision to contractor	5	4	3	2	1	5	4	3	2	1
6	Delay of materials/work approval	5	4	3	2	1	5	4	3	2	1
7	Late issue of instruction	5	4	3	2	1	5	4	3	2	1
8	Slow correction of design problem	5	4	3	2	1	5	4	3	2	1
9	Late valuation work	5	4	3	2	1	5	4	3	2	1
10	Slow inspection of completed	5	4	3	2	1	5	4	3	2	1
11	Others	5	4	3	2	1	5	4	3	2	1

R.No.	Material Related Delays	Frequency of Occurrences					Severity of effect				
1	Shortage of material	5	4	3	2	1	5	4	3	2	1
2	Material procurement problem	5	4	3	2	1	5	4	3	2	1
3	Material fabrication delay	5	4	3	2	1	5	4	3	2	1
4	Unforeseen material damages	5	4	3	2	1	5	4	3	2	1
5	Slow delivery of ordered materials	5	4	3	2	1	5	4	3	2	1
6	Noncompliance of material to Specification	5	4	3	2	1	5	4	3	2	1
7	Others	5	4	3	2	1	5	4	3	2	1

R.No.	Contract-relationship Related	Frequency of Occurrences					Severity of effect				
1	Conflict between parties	5	4	3	2	1	5	4	3	2	1
2	Difficulties of coordination Between parties	5	4	3	2	1	5	4	3	2	1
3	Lack of communication between parties	5	4	3	2	1	5	4	3	2	1
4	Others	5	4	3	2	1	5	4	3	2	1

R.No.	Plant/Equipment Related	Frequency of Occurrences					Severity of effect				
1	Equipment shortage	5	4	3	2	1	5	4	3	2	1
2	Wrong selection	5	4	3	2	1	5	4	3	2	1
3	Low efficiency	5	4	3	2	1	5	4	3	2	1
4	Equipment delivery problem	5	4	3	2	1	5	4	3	2	1
5	Inadequate skill of operators	5	4	3	2	1	5	4	3	2	1
6	Equipment breakdown and maintenance problem	5	4	3	2	1	5	4	3	2	1
7	Others	5	4	3	2	1	5	4	3	2	1

R.No.	Labor Related Delays	Frequency of Occurrences					Severity of effect				
1	Labor disputes/strikes	5	4	3	2	1	5	4	3	2	1
2	Weak motivation	5	4	3	2	1	5	4	3	2	1
3	Lack of skilled labor	5	4	3	2	1	5	4	3	2	1
4	Low productivity	5	4	3	2	1	5	4	3	2	1
5	Shortage of manpower	5	4	3	2	1	5	4	3	2	1
6	Labor injuries/accident in site	5	4	3	2	1	5	4	3	2	1
7	Absenteeism	5	4	3	2	1	5	4	3	2	1
8	Others	5	4	3	2	1	5	4	3	2	1

R.No.	External Factors	Frequency of Occurrences					Severity of effect				
1	Act of God	5	4	3	2	1	5	4	3	2	1
2	Bad weather condition	5	4	3	2	1	5	4	3	2	1
3	Price fluctuation	5	4	3	2	1	5	4	3	2	1
4	Government regulation	5	4	3	2	1	5	4	3	2	1
5	Problem with neighbor	5	4	3	2	1	5	4	3	2	1
6	Unforeseen site condition	5	4	3	2	1	5	4	3	2	1
7	Civil disturbance/unrest	5	4	3	2	1	5	4	3	2	1
8	Slow process of Building permit	5	4	3	2	1	5	4	3	2	1
9	Others	5	4	3	2	1	5	4	3	2	1

SECTION C: METHODS OF MINIMIZING PROJECT DELAYS

Please, thick ☐ for your selected answer based on the rating scale given below and fill in the blanks if you select others.

Questions 3: How could the following proposed methods is effective to minimize Government Building construction projects delay?

Rating Scale for Question 3	
Very high effective	5
High effective	4
Moderate effective	3
Low effective	2
Not effective	1

R.No.	No Proposed Methods	1	2	3	4	5
1	Utilization of the latest construction technology method					
2	Frequent site meeting with all functional parties					
3	Not awarding contract based on the lowest bid					
4	Increase productivity by working overtime, shift, etc.					
5	Offer incentive for early project completion					
6	Ask for extension of time					
7	Execute delayed activities by subcontractors					
8	Promote team working among project participants					
9	Developing human resources management (training, day courses, etc.)					
10	Timely decision making by all functional group					
11	Proper project planning and scheduling					
12	Developing appropriate communication system linking to all functional group					
13	Early in obtaining permit and approval from relevant authority					
14	Thorough project feasibility study and site investigation					
15	Accurate initial project cost estimation					
16	Hire experience personnel for project implementation					
17	Build a systematic project control and monitoring mechanism					
18	Absence of bureaucracy					
19	Proper emphasis on past experience of project parties					
20	Accurate initial time estimation					
21	Ensure the availability of resources (finance, materials, equipment, workmen)					
22	Select the competent project manager					
23	Use the appropriate construction methods					
24	Others (please specify if any)					

SECTION D: EFFECTS OF PROJECT DELAY

Please, thick ☐ for your selected answer based on the rating scale given below and fill in the blanks if you select others.

Questions 4: How did the Delay of project affect the following?

Rating Scale for Question 4	
Very high effect	5
High effect	4
Moderate effect	3
Low effect	2
No effect	1

No	Proposed effects	1	2	3	4	5
1	Acceleration of Losses					
2	Cost Overrun					
3	Time Overrun					
4	Disputes					
5	Negative social impact					
6	Bankruptcy					
7	Litigation					
8	Create stress on the stakeholders					
9	Others (please specify if any)					

Thank you for completing this questionnaire

Appendix 2: *Projects List*

Completed and under construction of Federal government Building construction projects

R.No	Name of The Project	Number of Floors	Number of Buildings	Contract Time(Started Date)	Orginal Copletion date	Contract Duration in Date	Actual Copletion date	Total Dalay in day	Total Delay in %	Remarks
1	Ministry of Health Office Buildings	G+6	2	April 04,2007	Jan.04,2008	275	April 04,2009	455	165.45	
2	Ministry of Agriculture Office Buildings	G+6	3	April 04,2007	Jan.04,2008	275	April 12,2009	463	168.36	
3	Revenue and Customs Authority Number one	G+6	2	April 04,2007	Jan.04,2008	275	Feb. 12,2009	432	157.09	
4	Ministry of foreign affairs office building	G+6	1	Feb. 06,2008	Oct. 06,2008	270	May 21,2009	240	88.89	
5	Natinal Intelligence Service Office Building	G+6	1	Oct. 21,2009	Aug 21,2010	180	April 12,2011	365	202.78	
6	Revenue and Customs Authority Number two	G+6	2	April 12,2011	Jan 12,2012	300	April 12,2013	450	150.00	
7	Central Stastics Agency number one Office Building	G+6	1	April 12,2011	Jan 12,2012	300	June12,2013	540	180.00	
8	Ethiopian Press Agency Office Building	G+6	1	April 12,2011	Jan 12,2012	300	June 23,2013	515	171.67	
9	Ministry of Justice Office Building	G+6	1	Feb. 06,2008	Oct. 06,2008	270	July 12,2009	240	88.89	
10	Federal Prisons Administration Office Building	G+6	1	Feb. 21,2012	Oct. 21,2013	270	May 11,2014	180	66.67	
11	Ministry of Science and Technology Office Building	G+8	1	April 12,2012	April 12,2013	365	April 24,2013	377	103.29	
12	Ethiopian Road Autority Office Buildings	G+6	2	April 12,2011	April 12,2012	365	Sep 21,2013	189	51.78	
13	Ministry of Industry Office Building	G+10	1	May 20,2012	May 20,2013	365	Oct. 10,2013	170	46.58	
14	Federal Main Auditor Office Buildings	G+10	1	June 08,2012	June 08,2013	365	Feb.20, 2014	252	69.04	
15	Ministry of Civil Service Office Building	G+6	1	June 08,2012	June 08,2013	365	April 10,2014	302	82.74	
16	Central Stastics Agency Number two Office Building	1B+G+6	1	Dec 08,2013	Dec 08,2014	365	April 10,2015	122	33.42	
17	Federal Land Institute Office Buildings	2B+G+12	1	Aug. 11, 2014	Aug. 11, 2016	730	August 11,2016	On Time	0	
18	Government Higher Officials Residence	2B+G+2	6	April 12,2014	April 12,2015	365	April 12,2015	On Time	0	
19	Information Network Security Agency Head Office Building	3B+G+M+15	1	May 21,2015	Nov 21,2017	1,245	June 15,2020	1,185	95.18	
20	National Intelligence Services	G+1	2	March 24,2015	March 24,2016	365	Aug 12,2017	108	29.59	
21	Ministry of Foreign Affairs Conference Hall	1B+G+3	1	March 24,2011	Feb 24,2012	330	May 16,2013	447	135.45	
22	Ministry of Foreign Affairs Car Parking	2B+Slab	1	July 01,2014	July 01,2015	365	Sep 12,2015	52	14.25	
23	Government Communication Affairs Office Complex Buildings	2B+G+16	3	Aug. 12, 2016	Aug. 12, 2019	1095		880	80.37	not completed
24	Federal Juges Apartments	2B+G+18	4	Sep. 29, 2015	Sep. 29, 2017	730		1580	216.44	Parcially completed
25	Foreign Affairs Office Buildings	2B+G+18	1	Jan.12,2018	Jan.12,2021	1095		365	33.33	not completed
26	Foreign Affairs Residence Buildings	2B+G+11	1	Jan.12,2018	Jan.12,2021	1095		365	33.33	
27	Ethiopian National Theatere Building	2B+G+11	1	2019	2021					not completed
28	National Meteorology Agency Head Office Buildings Lot One	2B+G+9	2	March 11,2020	May 08,2022	788				*Under Construction (planned 50% Excuted 30.52%)*
29	National Meteorology Agency Head Office Buildings Lot Two	2B+G+10	1	Jan.19, 2021	Feb 18,2022	394				*Under Construction (planned 30% Excuted 25.25%)*
30	Ethiopian Civil Aviation Authority Office Building	2B+G+6	1	Dec. 20, 2018	Jan. 23, 2021	730				*Terminated at (planned 100% Excuted 28%)*
31	Federal document authentication and registration Agency Head Office Buildings	4B+G+21	1	Oct.12,2020	Oct.13,2024	1461				*Under Construction (planned 30% Excuted 25.25%)*
32	Leather Industry Development Office Buildings	2B+G+5,3	2	Jan.12,2021	Oct.12,2022	600				*Under Construction (planned 60% Excuted 31%)*
		Total Project	**51**							

Appendix 3: SPSS Results

Combined effect SPSS Result

Count	8
Sum	100
Mean (Average)	12.5
Median	13.555
Mode	All values appeared just once.
Largest	19.11
Smallest	6.03
Range	13.08
Geometric Mean	11.476378526726
Standard Deviation	4.7958341297422
Variance	23.000025
Sample Standard Deviation	5.1269623420836
Sample Variance	26.285742857143

Sorted data: 6.03, 6.33, 8.33, 12.93, 14.18, 14.64, 18.45, 19.11

Consultant related factors SPSS Result

Count	8
Sum	27.97
Mean (Average)	3.49625
Median	3.53
Mode	All values appeared just once.
Largest	3.80
Smallest	3.21
Range	0.59
Geometric Mean	3.4889109531093
Standard Deviation	0.22610492586408
Variance	0.0511234375
Sample Standard Deviation	0.2417163331558
Sample Variance	0.058426785714286

Sorted data: 3.21, 3.23, 3.27, 3.42, 3.64, 3.66, 3.74, 3.80

Contractor related factors SPSS Result

Count	10
Sum	36.39
Mean (Average)	3.639
Median	3.265
Mode	3.19, appeared 2 times
Largest	4.85
Smallest	2.14
Range	2.71
Geometric Mean	3.5383197371623
Standard Deviation	0.83702389452154
Variance	0.700609
Sample Standard Deviation	0.8823006542242
Sample Variance	0.77845444444444

Sorted data: 2.14, 3.09, 3.14, 3.19, 3.19, 3.34, 4.24, 4.50, 4.71, 4.85

Client related factors SPSS Result

Count	8
Sum	22.75
Mean (Average)	2.84375
Median	2.73
Mode	2.73, appeared 2 times
Largest	3.54
Smallest	2.35
Range	1.19
Geometric Mean	2.8149888902479
Standard Deviation	0.41490774577007
Variance	0.1721484375
Sample Standard Deviation	0.44355503765437
Sample Variance	0.19674107142857

Sorted data: 2.35, 2.44, 2.59, 2.73, 2.73, 2.90, 3.47, 3.54

Material related factors SPSS Result

Count	6
Sum	17.92
Mean (Average)	2.9866666666667
Median	2.92
Mode	All values appeared just once.
Largest	3.75
Smallest	2.37
Range	1.38
Geometric Mean	2.9508415704108
Standard Deviation	0.4663570401408
Variance	0.21748888888889
Sample Standard Deviation	0.51086854147292
Sample Variance	0.26098666666667

Sorted data: 2.37, 2.65, 2.68, 3.16, 3.31, 3.75

Contract related factors SPSS Result

Count	3
Sum	4.92
Mean (Average)	1.64
Median	1.63
Mode	1.63, appeared 2 times
Largest	1.66
Smallest	1.63
Range	0.03
Geometric Mean	1.6399392700097
Standard Deviation	0.014142135623731
Variance	0.0002
Sample Standard Deviation	0.017320508075689
Sample Variance	0.0003

Sorted data: 1.63, 1.63, 1.66

Equipment related factors SPSS Result

Count	6
Sum	10.2
Mean (Average)	1.7
Median	1.73
Mode	1.73, appeared 2 times
Largest	2.20
Smallest	1.25
Range	0.95
Geometric Mean	1.6738047947664
Standard Deviation	0.2968725877095
Variance	0.088133333333333
Sample Standard Deviation	0.32520762598685
Sample Variance	0.10576

Sorted data: 1.25, 1.46, 1.73, 1.73, 1.83, 2.20

Labor related factors SPSS Result

Count	7
Sum	4.35
Mean (Average)	0.62142857142857
Median	0.63
Mode	All values appeared just once.
Largest	0.69
Smallest	0.53
Range	0.16
Geometric Mean	0.61927591896052
Standard Deviation	0.050829848213306
Variance	0.0025836734693878
Sample Standard Deviation	0.054902511001645
Sample Variance	0.0030142857142857

Sorted data: 0.53, 0.57, 0.62, 0.63, 0.65, 0.66, 0.69

External related factors SPSS Result

Count	8
Sum	9.98
Mean (Average)	1.2475
Median	1.24
Mode	1.27, 1.21, each appeared 2 times
Largest	1.37
Smallest	1.17
Range	0.2
Geometric Mean	1.246270935798
Standard Deviation	0.056069153730015
Variance	0.00314375
Sample Standard Deviation	0.059940446635449
Sample Variance	0.0035928571428571

Sorted data: 1.17, 1.21, 1.21, 1.23, 1.25, 1.27, 1.27, 1.37