ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

Assessment of factors causing project delay : The case of Ethio Telecom's ODN projects.

A Project Work Submitted to Addis Ababa University College of Business and Economics, School of Commerce in Partial Fulfillment of the Requirement for the Degree of Master of Arts in Project Management

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June 2022

Addis Ababa, Ethiopia

Assessment of factors causing project delay : The case of Ethio Telecom's ODN projects.

Declaration

I, Adem Abera, declare that this research paper is my own original work and has not been submitted earlier to any university or institution for the award of any degree, diploma, or prize to the best of my knowledge.

……..

Adem Abera

LETTER OF CERTIFICATION

This is to certify that the project work presented in in this report, entitled "Assessment of factors causing project delay : The case of Ethio Telecom's ODN projects " is conducted by Adem Abera under my supervision and guidance. This work is original in nature and, in my opinion, suitable for submission in partial fulfillment of the requirement for the award of Master of Arts Degree in Project Management.

Advisor : Zegeye Muluye (PhD)

Signature: _____

Date: _____

Addis Ababa University

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Assessment of factors causing project delay : The case of Ethio Telecom's ODN projects.

By: Adem Abera

Approved By Board of Examiners

Advisor Zegye Muluye (PhD) Signature----------Date ----------

Internal Examiner ----------Signature ----------Date----------

External Examiner----------Signature---------- Date----------

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Table of Contents

List of Tables and Figures

Acronyms/ Abbreviations

3G	Third Generation
4G	Fourth Generation
5G	Fifth Generation
EEP	Ethiopian Electric Power
ODN	Optical Distribution Network
PMBOK	Project Management Body of Knowledge
IoT	Internet of things
PMI	Project Management Institute
RII	Relative Importance Index
ROW	Right of way problem
SPSS	Statistical Package For Social Science

Abstract

The objective of this study is to identify the main causes of delay in Ethio Telecom's ODN projects. Project delay can be defined as the difference between planned and actual project completion date (Curtis et al, 2011) . It is possible to control or minimize project delays once their causes are assessed and identified. A total of 39 ODN project delay factors were identified through literature review and were further categorized in to 4 groups: Design related delay factors, owner related delay factors, contractor related delay factors, and external related delay factors. 118 ODN project professionals from both the owner and contractors responded to an online questionnaire through google forms. Quantitative approach was employed to gather and analyze the numerical data obtained from the respondents. SPSS and Microsoft Excel software was used to analyze and rank the delay factors based on RII (Relative importance index) value. The study revealed that design related delay factors to have the highest RII value of 0.640 followed by the owner related delay factors (RII = 0.611) , then external related delay factors (RII=0.576) , and contractor related delay factors (RII=0.566).

The researcher recommends that the owner and the contractors have to secure all the project materials, tools and instruments required by the projects before commencing the ODN projects and the owner should reengineer its contract amendment and payment process and also the skill and knowledge of the design team should be continuously upgraded so that delays of ODN projects will be minimized or avoided.

Key words: Project delay factors, Effects of Project delay , ODN projects , Relative importance index, Ethiopia , Ethio Telecom,

Chapter 1

Introduction

In this chapter background of the study, statement of the problem, the research questions, research objectives, significance of the study, scope of the study and limitation of the study will be discussed. How the study is organized will also be explained and finally key terms will be defined.

1.1 Background of the study

Project delays are one of the most common project problems globally. In one survey, less than 50 percent of companies said they complete projects on time. In another survey, nearly half of project managers (46 percent) responded that meeting project deadlines was among their biggest challenges. Project delays seem to occur more often than not (kissflow,2022).

Even though project delay is a common case worldwide, it is a very serious problem in developing countries and impairs the economic growth of a country.

In today's world it is difficult to live without telecommunication services . Telecom operators are helping human beings live better life by providing various telecom services in sectors such as education, business , medicine, military, transportation, agriculture…. and are creating impact on all spheres of life. Telecommunication is one of the industries that has huge contribution for development and growth of a country. Economic development of a country is almost impossible without telecommunication services.

One of the main important services that telecom operators are currently providing is Broadband internet services . Telecommunication services such as video streaming, video chat, file sharing, tele medicine , teleworking, E-Government, E-Commerce, and interactive media as well as various ways to share and access information are facilitated by broadband connectivity. Internet of things (IoT) and interactive computations such as cloud computing are also results of broadband internet connections (AREDO, 2017)

Telecommunication companies provide Broadband internet services to their customers through employing Optical Distribution Network (ODN) . In ODN , optical fiber cable and optical devices that distribute signals to customers are deployed. The Optical Distribution Network (ODN) is a key segment of fiber-based networks which connects the central office to a terminal user. Some of the advantages of using Optical Distribution Network (ODN) rather than copper network are higher reliability, higher speed, and higher internet bandwidth . ODN plays a great role in providing Broadband services by connecting each household through fiber cable technology.

Telecom service was introduced in Ethiopia by Emperor Menelik II in 1894 through the installation of telephone land line from Harar to Addis Ababa. After undertaking many organizational reforms , Ethio Telecom was established on November 29 , 2010 with the ambition of supporting the steady growth of Ethiopia. Currently it is the leading telecom service provider in the country providing 5G, 4G and 3G mobile and fixed broadband internet services to its customers. It has a mission of providing reliable communications and digital financial services to simplify life and accelerate digital transformation of Ethiopia (Ethio Telecom, 2022).

Ethio telecom has started deploying ODN projects before two years with the intension of reaching each home and office through optical fiber. Currently, the company has more than 500,000 fixed broadband subscribers through both ODN and copper networks and has a plan of implementing ODN projects that can accommodate 200,000 subscribers in this budget year. It is also replacing its existing old copper networks with ODN as the copper network has quality and limited bandwidth problems.

The company has the ambition of completing its ODN project on time so that it can be able to serve its waiting and potential broadband customers without delay. However, there is delay in implementing these ODN projects due to many factors. The main purpose of this study is to assess those factors causing delays in its ODN projects.

1.2 Statement of the problem.

Some of the criteria for a project to be successful are to be completed on time, on budget , within the desired quality and should satisfy the customer.

However, Ethio Telcom's ODN projects are currently getting delayed due to various factors and these project delays are causing Ethio Telecom to lose money due to material and labor cost inflation and also resulting in dissatisfaction of waiting customers, increasing time to market, decreasing in market share and in loosing potential revenue.

Therefore, the purpose of this study is to identify and assess those factors that cause delays in Ethio Telcom's ODN projects and give recommendations so that the ODN project delays can be minimized or avoided .

1.3 Research questions

1. What are the factors causing the delay of Ethio Telecom's ODN projects?
2. What are the top factors that cause delay to Ethio Telecom's ODN projects?

1.4 Research objectives

1.4.1 General objective

The general objective of this study is to assess and investigate the factors causing delay in Ethio Telecom's ODN projects.

1.4.2 Specific objectives

The study has the following specific objectives :

1. To know the factors that cause delay of Ethio Telecom's ODN projects.
2. To find out the top factors that cause ODN project delays and to rank them.

1.5 Significance of the study

The study will help the owner, the contractors and practicing ODN project professionals to be aware of the ODN project delay factors and take in advance mitigation actions so that ODN project delays can be controlled and minimized and ODN projects can be completed on time or even before the planned completion date.

The study will also benefit researchers who want to conduct studies on similar topics by providing information on ODN project delay factors and helps to fill the knowledge gap in

ODN project delay factors . The result of the study can also serve as input for the development of process and procedures that help in reducing time and cost overruns of ODN projects.

1.6 Scope of the study

The scope of the study is limited only to ODN projects that are being implemented in Addis Ababa city through the supervision of Ethio Telecom's Head office . ODN projects in other cities which are supervised by the regional Ethio Telecom's offices are not included in this study.

The study focused only on the assessment of the 39 ODN project delay factors that cause delays in Ethio Telcom's ODN projects. Other factors that can cause ODN project delays are not considered in the study. In addition, only quantitative approach is used to gather and anylze the data obtained from the respondents and the study used only descriptive research design. Finally, only the owner and contractors are participated in the study, other various ODN project stakeholders are not participated in the study.

1.7 Limitations of the study

The limitations of this study are :

- The unavailability of previous studies conducted on Ethio Telecom's ODN projects that can strengthen the findings of this study.
- The unavailability of documented information on ODN projects
- The use of only one type of data collection instrument (questionnaire) .
- The scope of the study is limited only to ODN projects found in Addis Ababa city .

The above-mentioned limitations may have some negative impacts on the quality of the results obtained by the study and the findings of the research may not be generalized for regional ODN projects that are being implemented out of Addis Ababa city.

1.8 Organization of the study

This paper has five chapters. The first chapter discusses about the background of study, statement of the problem, research questions, general and specific objectives of the study, significance of the research, scope of the study, limitation of the study, organization of the paper , and definition of key terms .

The second chapter deals with review of related literature comprising both conceptual and empirical reviews, and conceptual framework of the study.

The third chapter describes about the research design, variables of the study, study area and target population, sampling techniques and methods, data collection, data analysis, reliability and validity analysis, and ethical considerations.

The fourth chapter presents data analysis and interpretation and finally the fifth chapter provides summary of findings, conclusion, and recommendations.

1.9 Definition of key terms

The below mentioned terms are used in this study and their definition is as follows:

Optical Distribution Network (ODN) is a network that comprises the physical optical fiber cable and optical devices that distribute signals to users in telecommunications (Wikipedia, 2022) .

Optical fiber cable is a cable containing a number of glass fibers that transmit information as light pulses (Jennifer, 2021) .

Broadband internet refers to high-speed Internet access that is faster than the traditional dial-up access (Federal Communications Commission, 2014).

Project Time management is controlling the project time by applying project management tools techniques and systems which help to complete a project on schedule .

Project Delay is draw back in project time performance because of different factors.

Effects of Project delay : The consequences that will happen due to project delay.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 Introduction

In this chapter, literature related to this study topic is reviewed. The chapter consists of the conceptual review, empirical review , research gap, and conceptual framework of the study. The conceptual review section of the chapter examines: the meaning of project delay, the importance of project time management, sources of project delay, causes of project delay, and effects of project delay. The empirical review part of the chapter examines the top causes of project delays in various projects. Finally, the chapter presents the research gap and conceptual framework of the study .

2.2 Conceptual review

2.2.1 Meaning of project delay

Project is a temporary endeavor undertaken to produce a unique product or provide a service. Any project must have a starting point and an ending point, and also it must have a product or service as a deliverable (Mubarak, 2015). Ethio Telecom's ODN projects are projects financed by Ethio Telecom with the aim of increasing the number of broadband customers , increasing the revenue of the company, and contributing to the growth and development of the country.

A delay is an action or condition that results in completing a project later than the time stipulated in the contract (Flyvbjerg et al., 2003). Project delay is the difference between planned and actual project completion date (Curtis et al, 2011)

2.2.2 Importance of project time management

Project time management is one of the ten project management areas mentioned in the Project Management Body of Knowledge (PMBOK) Guide (Project Management Institute (PMI), 2008) . In order to complete projects on time, efficiently and effectively we have to practice and apply properly during the life cycle of our projects the following project time management processes defined in the PMBOK Guide: Plan Schedule Management, Define Activities, Sequence Activities, Estimate Activity Resources, Estimate Activity Durations, Develop Schedule and finally Control Schedule .

2.2.3 Sources of project delay

Sources of project delays can be classified in to internal and external sources . Internal sources are those parties involved in the project contract who cause the project delay . The project is said to be delayed by external sources when the cause of the delay is from circumstances outside the parties' control such as natural disasters, government decisions…(Ahmed et al. , 2002).

Sources of delay can also be categorized into three categories: delays originated by the client, delays stemmed from the contractor and delays caused by external factors (Scott , 1993).

Theodore (2009) divided project delays into critical delays and non-critical delays . Critical delays are those delays that have an impact on the completion of the project or on a milestone date. Noncritical delays are those that do not have an impact on the project's completion or a milestone date.

2.2.4 Causes of project delay

There are different factors that cause project delay. Different authors in different countries have grouped those factors into different categories such as design related, owner related contractor related , external related , equipment related, labor related, material related, project related, engineer related, finance related and human behavior related factors (Muhwezi et al, 2014). However, this research regroups and assesses those project delay factors by categorizing them into the following four classes: design related, owner related, contractor related, and external related delay factors.

2.2.4.1 Design related delay factors

The party responsible for design task of a project can cause the project to delay in many ways. Muhwezi et al (2014) identified the following design related factors that cause project delay on building construction projects in Uganda : Design errors made by designers ,inadequate site investigation , unclear and inadequate details in drawings ,delay in reviewing and approving design changes, lack of experience of designers , insufficient data collection and survey before design, Poor communication and coordination of designers with other parties , insufficient estimation of original contract duration , poor use of advanced designing software.

In a separate research , El-Razek et al (2008) mentioned that design changes during construction, design errors made by designers and changes in material types and specifications during construction as design related factors that contribute to project delay in building construction projects in Egypt . Slow approval of drawings, incomplete drawings, incomplete specifications and change in drawings are some of the factors of design related project delays identified by Faridi

and El-Sayegh (2006) in their research on significant factors causing delay in the UAE construction industry .

Zidane & Andersen (2018) in their study on causes of delay in major Norwegian projects mentioned that design related project delay factors as : late/slow/incomplete/improper design, poor/incomplete documentation (designs, engineering documents), missing or error in documentations during construction, error in engineering causing changes, poor quality in designs and materials causing changes.

Dula (2021) in his study mentioned that change in initial design, complexity of the project, error in estimating durations, error in estimating cost, poor communication by designers, unfinished designs, mistakes in preliminary site investigations, late design approval, delay in issuing work orders as factors that cause project delay in large irrigation projects in Ethiopia.

Getahune (2021) in his study on factors causing construction delay in Addis Ababa housing development corporation projects identified the following design related project delay factors: frequent design change, vague specification /unclear specification, incomplete design, inadequate experience, unrealistic contract duration, inaccurate estimates of cost, poor supervision, and delay approval of drawing and variation orders.

2.2.4.2 Owner related delay factors

Many authors have identified client related delay factors to cause project schedule delays. Some of them are mentioned below.

Assaf and Al-Hejji (2006) in their study on causes of delay in large construction projects in Saudi Arabia identified the owner related delay factors as: delay in progress payments by owner, delay to furnish and deliver the site to the contractor by the owner, change orders by owner during construction, late in revising and approving design documents by owner, delay in approving shop drawings and sample materials, poor communication and coordination by owner and other parties, slowness in decision making process by owner, conflicts between joint-ownership of the project, unavailability of incentives for contractor for finishing ahead of schedule and suspension of work by owner. Muhwezi et al (2014) described the following client related factors as causing delay : corruption tendencies , delay in payments, design changes by owner during project implementation, poor communication and coordination with other parties, slowness in decision making, delay in site delivery, lack of incentives for contractor to finish ahead of schedule, delay in performing inspection and testing of completed projects.

Daba & Pitroda (2018) in their study entitled "A Critical Literature Review on Main Cause of Delay in Construction Projects" identified that the owner related project delay factors to be : corruption , intermittent termination of variation while project is ongoing, less on-time payment for developers, variation of specifications and material type during construction work, delay in checking contract document, variation of project scope, poor coordination with other stakeholders, slow decision-making ,inadequate information during project feasibility study , delay in site delivery, lack of motivations for contractor to finish ahead of schedule, ineffective representative, poor experience, interference during actual project work, joint-owners disagreement, improper feasibility study, poor coordination and communication, interruption of work, slow document

approval, nature of bidding and award, impractical contract duration , and unrealistic delay penalties.

2.2.4.3 Contractor related delay factors

Contractors also contribute for delay of a project due to many reasons. Some of the contractor related project delay factors that are mentioned in various related literature which are relevant to this study are presented as follows.

Fashina et al (2021) identified in their study that the contractor related delay factors in Somaliland projects to be : difficulties in project financing , errors during construction, improper planning and preparation during construction project, poor site management and coordination, delays in sub-contractor's work ,underestimation or overestimation of the project cost, conflicts between contractor and other parties, delays in the mobilization of workers, regular change of sub-contractor's technical staff, conflicts in sub-contractor's schedule in execution of project, underestimation of the project duration .

Muhwezi et al (2014) mentioned that some of the contractor related project delaying factors in Uganda projects as : financial indiscipline/dishonesty, inadequate contractor experience , incompetent project team , Poor site management and supervision , absenteeism, ineffective project planning and scheduling, rework due to errors, poor communication and coordination with other parties , unqualified / inadequate experienced labor , low motivation and morale of labor, improper equipment, tools and instruments, shortage of equipment, shortage of labor, damage of materials, personal conflicts among labor, and financial problem of the contractor.

El-Razek et al (2008) described the following contractor related project delay factors in Egypt: difficulties in financing project by contractor , poor site management and supervision, ineffective planning and scheduling of project, rework due to errors during construction, delays in sub-contractor's work, inadequate contractor experience, delay in site mobilization, delay in preparation of shop drawings and material samples .

Muluneh (2018) who conducted research to assess the causes of a substation construction project delay at Ethiopian Electric Power (EEP) identified that the contractor related project delay factors as difficulties in financing project by contractor, conflicts in sub-contractors' schedule in execution of project , conflicts between contractor and other parties (consultant and owner), ineffective planning and scheduling of project , delays in sub-contractors work, inadequate contractor's work , frequent change of sub-contractors, poor qualification of the contractor's technical staff, delays in site mobilization.

2.2.4.4 External related delay factors

External related factors also play a huge role in causing project delays. Marzouk & El-Rasas (2014) mentioned in their research that the external related delay factors that cause delay to construction projects in Egypt are: weather effect (hot, rain, etc.), environmental restrictions, changes in government regulations and laws, slow permit by government/municipality, delay in performing final inspection and certification by a third party, lack of communication between the parties, fluctuations in cost/ currency, and force Majeure as war, revolution, riot, strike, and earthquake, etc

Daba & Pitroda (2018) after critically reviewing literature on main causes of project delay globally identified the following external related project delay factors : claim, unexpected natural disasters, accidents at the site, social and environmental factors, escalation of local material prices and global economic rise, price rise on the international market ,unreliable suppliers, public enemy, war, and conflict, delay in obtaining permits from local authority, geopolitical stability, variation in government regulations , late access to the site (like electricity, road , water) , neighbors problems, delay by traffic restriction and control, corruption, social factors, cultures, government policy and its commitment, late certification from 3rd party, lack of communication, thieves, international economic crisis, time delay by traffic restriction at the place of work, and raw materials unavailability.

Muhwezi et al (2014) mentioned the external related factors as : unfavorable weather conditions legal disputes between project participants , shortage of project materials , unexpected surface & subsurface conditions (such as soil, high water table) , accidents during project execution , environmental , social, and cultural factors , delay in obtaining permits from local authority, and changes in government regulations and laws.

In their research on causes of delay in road construction projects across 25 developing countries , Rivera et al. (2020) identified the following external related project delay factors : inflation, political situation, force majeure, lack of proper IT management, disruption of traffic movement, obstruction of economic and urban development, shortage of fuel, shortage of overseas currency (import of materials and equipment), effects of unexpected subsurface and changing ground condition, environmental claims, economic hardships, slow decision making and administration in

the non-client organization, road right of way, peace and order, government change of regulations and bureaucracy, economic conditions, accident during the construction.

According to Getahune (2021) the external related delay factors in Addis Ababa housing development corporation projects are : effect of site condition, delay of permission from government body, weather condition, unavailability of utility, social and cultural factor, change in regulation by government, and restrictions and controls from government body.

2.2.5 Effects of project delay

Project delay may result in dispute, clash, claims, lawsuit, total desertion, litigation, and abandonment of the project with the general consequences of loss of wealth, time and capacity, increased project cost due to inflation, low quality deliverable, customer dissatisfaction and slows the economic growth and development of a country. Specifically for the client a project delay causes the loss of income and unavailability of facilities . For the contractor, the project delay will result in the loss of money due to extra spending on equipment and materials and hiring labor and loss of time (Haseeb et al, 2011).

2.3 Review of Empirical Studies

There are so many studies which are conducted globally on factors that cause project delays, the findings of some of the studies are presented below.

Mwanaumo et.al (2021) have identified in their research 34 factors causing delays in telecommunication projects in Zambia and finally their study revealed that the top eight ranked factors as: (1) Unclear project scope and deliverables at initiation; (2) Poor stakeholder

identification and involvement; (3) Under-estimation of activity duration; (4) Over-optimistic estimates; (5) Lack of project surveys or feasibility studies; (6) Lack of dedicated project teams; (7) Procurement approval process; and (8) Late delivery of project materials by suppliers.

Fashina et al (2021) carried out an exploratory study on the significant factors that influence delays in construction projects in Hargeisa , Somaliland. Their study shows that the top ten project delay factors are:

(1) delay in honoring payment progressively

(2) underestimation or overestimation of the project cost

(3) delay in the approval of major changes in the work scope

(4) change orders during construction by owner and increase/fluctuation in the prices of materials

(5) errors in design and contract documents

(6) delays in sub-contractor's work

(7) poor communication and coordination with contracting parties , shortage/ lack of equipment.

(8) underestimation of the project durations, lack/shortage of labors, materials procurement difficulties (lateness), and unfavorable site conditions

(9) shortage/lack of materials in the marketplace

(10) lack of significant experience of consultant .

In their research on cost escalation and schedule delays in road construction projects in Zambia , Kaliba et al (2008) found the following causes as the major factors that cause delay in the Zambian road construction industry : delayed payment , protracted financial processes in client organizations , financial difficulties that accompany the delayed release of funds by client organizations, contract modification , economic hardships, material procurement and changes in drawings , staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site and changes in specifications , and finally labor disputes .

When we come to our country, we will find many studies caried out on factors that cause project delays in different types of projects . The findings of some of the studies related to this research are presented below.

Tolossa (2019) in his study has concluded that the most common factors that lead to late completion of road construction projects under Defense Construction Enterprise to be improper project planning practices, poor project monitoring practices, poor leadership skills, ineffective procurement process, poor top management support, financial problems, economic, political, and social factors, and frequent request for design changes .

Muluneh (2018) who conducted research to assess the causes of a substation construction project delay at Ethiopian Electric Power (EEP) has identified the below mentioned top ten main causes from the initially identified forty-six factors.

1. Poor and unorganized procurement
2. Delays in sub-contractor’s work
3. Poor management of the contract by the consultant

4. Difficulty to run the project due to poor cash flow of the contractor

5. Inadequate experience of consultant

6. Poor management and supervision of the project by the contractor

7. Lack of appropriate machineries in the work site

8. Poor planning and scheduling of project

9. Late procurement of electromechanical equipment

10. Design error that led to wrong construction and rework

In a study conducted at Addis Ababa road construction projects under the supervision of Addis Ababa city road authority , Godifey (2017) has identified 32 causes of time overrun. The conclusion of his study shows that the common causes of time overrun to be delay of delivering the project site (Right of way problem), financial problems of contractors, improper planning, and site management.

According to Emiru (2019) , who carried out a research on determinant factors affecting schedule delay on water supply and sewerage construction projects in Addis Ababa, the top ten determinant factors that affect schedule delay of those projects are bureaucracy in Government agencies, Government tendering system of choosing the lowest bidder, late delivery of materials, escalation of local material prices, ineffective project planning and scheduling, insufficient estimation of original contract duration, design errors made by designers, slowness in decision making, delay in site delivery, and unexpected surface and subsurface conditions.

MIRESSA (2019) who conducted a case study on two very much delayed road projects at Addis Ababa city found that out of the identified 74 factors related to project time delay , the following top ten (10) factors to be significant contributors to road construction project time delay in the city .

1. Slow land expropriation due to resistance from occupants / Slow site clearance which is termed as Right of way problem (ROW).
2. Delays in contractors' progress payment by owner.
3. Shortage of materials/Equipment on site.
4. Difficulties in financing the project by contractor.
5. Delay to deliver the site.
6. Wrong or improper (poor) design.
7. Shortage (non-availability) of construction materials.
8. Ineffective resources management by contractor.
9. Type of project bidding and award (negotiation, lowest bidder).
10. Late delivery of construction materials

2.4 Research Gaps

The researcher would like to mention that even though there are so many studies carried out to assess factors causing delays on different types of projects, there are only few studies done on causes of delay of telecommunication projects and especially the researcher could not get study done on causes of delay of ODN projects.

2.5 Conceptual framework of the study

Figure 1 below shows the conceptual framework which was developed based on the literature reviewed . The conceptual framework shows that there is a relationship between ODN project delay factors and ODN project delay.

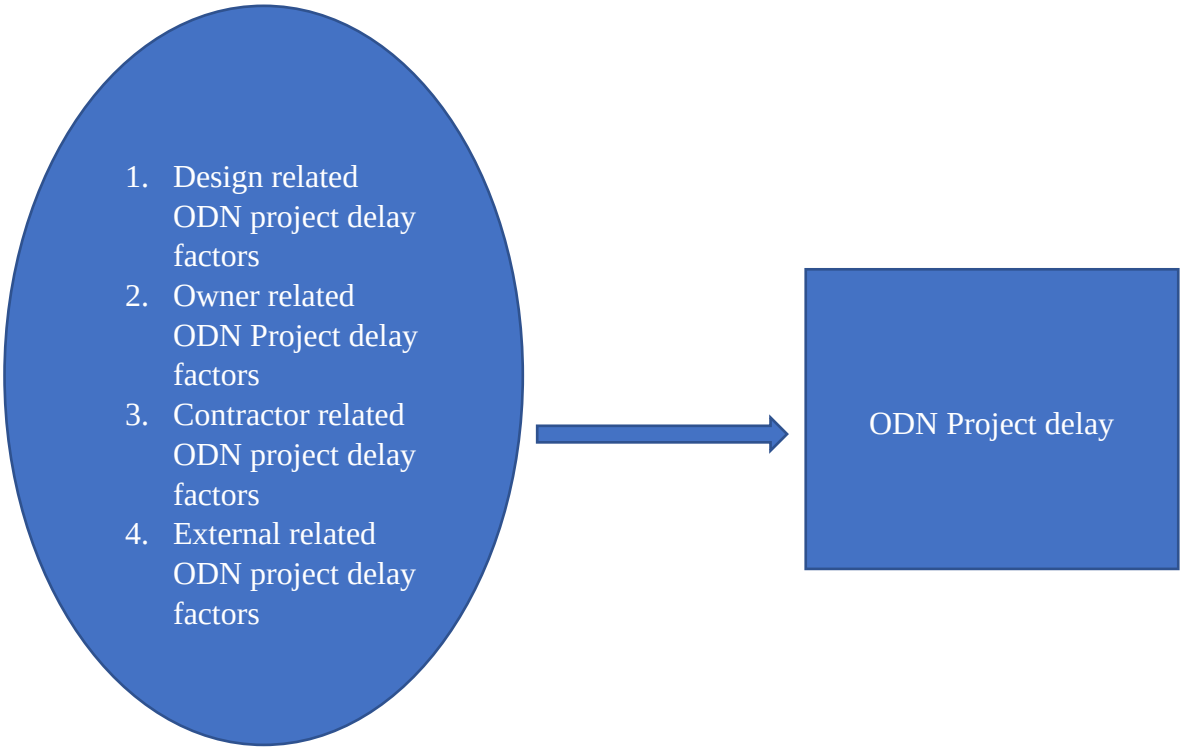

Figure 1: Conceptual Model of the Study

CHAPTER 3: RESEARCH METHODOLOGIES

Introduction

This chapter discusses about the research design, study variables, study area and target population, sampling technique, sample size, data collection, data analysis, reliability and validity analysis, and finally about ethical considerations.

3.1 Research design

This study is non-experimental research and uses descriptive research design to describe the factors of Ethio Telecom's ODN project delays and to rank them. In this research **quantitative approach** is employed where numerical data about the factors of ODN project delay is gathered through structured questionnaire from respondents using five -point Likert scale and then the collected data is analyzed using SPSS and Excel statistical software to know and then rank the main factors that cause ODN project delay.

3.2 Description of study variables

After conducting thorough literature review on factors that cause delays on related projects domestically and globally and then getting additional opinion on causes of delay from Ethio Telecom's ODN project experts, the researcher gathered various factors that cause ODN project delays and grouped them under the following main four categories which are used as independent variables of this research .

1. Design related project delay factors

2. Owner related project delay factors
3. Contractor related project delay factors
4. External related project delay factors

The dependent variable of this study is ODN project delay.

3.3 Description of study area and target population

Ethio Telecom's Fixed network Division which undertakes various fixed network projects is the study area of this research. The Division has three departments which are directly involved in ODN projects.

The target population is composed of the following elements:

1. Ethio Telecom's Fixed Network Division's 61 staff who directly involve in ODN projects by managing, administrating, controlling, and designing ODN projects, comprising directors, managers , supervisors, project specialists, project performance analysts and project site supervisors.
2. The 57 contractors that implement ODN projects by signing fixed price contract with Ethio telecom. These contractors have been trained by Ethio Telecom so that they can execute ODN projects easily.

   Hence, the target population consists of 118 project professionals from both the owner and the contractors.

3.4 Sampling technique and sample size

As the number of the target population is small (118) and to get the best results, the researcher decided to use census and collect data from the whole of the target population.

Hence, in this study data is collected from 61staff of Ethio Telecom's Fixed Network Division and also from 57 contractors, totally the researcher collected data from 118 project professionals from both the project owner and contractors.

The researcher used as a unit of analysis Ethio Telecom's ODN projects that are implemented and are under implementation from July 7, 2021 G.C up to July 6, 2023.

3.5 Data collection – source, types, instruments.

The study used survey as data collection method through structured questionnaire . Primary data is gathered through structured questionnaire .

The research used the questionnaire employed by Muhwezi et al (2014) to assess the factors causing delays on building construction projects in Uganda. Their questionnaire is also adopted by Bekele (2018) and other researchers who conducted studies in similar subjects . The questionnaire is divided into two parts. The first part is designed to gather demographic data from each respondent. The second part enables respondents to rate the possible factors that cause ODN project delay based on the below mentioned five -point Likert scale . Same scale was also used by Getahune (2021), Dula (2021) and Tolossa (2019) to assess project delay factors.

1 = Not significant

2 = Slightly significant

3 = Moderately significant

4 = Very significant

5 = Extremely significant

3.6 Data analysis – techniques, software

In this study Relative Importance Index (RII) Technique is used to determine the relative importance and significance of the various causes of ODN project delays.

RII is calculated using the following formula (Rajgor, 2016) .

$RII = \Sigma W / (A*N)$

Where :

W is the weighting given to each factor by the respondents (ranging from 1 to 5),

A is the highest weight (i.e., 5 in this study),

and N is the total number of respondents (118, in this case).

It is to be noted that the higher the value of RII, the more significant the cause of project delays.

SPSS software is used to find the RII of each factor causing project delays. Then the factors of the project delay are ranked as per their value of RII.

3.7 Reliability analysis

Reliability measures the internal consistency of the items in a scale and indicates that the extent to which the items in a questionnaire are related to each other. (Middleton, 2023) .

The reliability of the questionnaire of this research was ensured by the researcher by taking the following measures.

1. The questions are carefully and precisely worded.
2. The questionnaire was checked by the research advisor.
3. The questionnaire was checked and reviewed by ODN project professionals before data collection.
4. A pilot survey was conducted using the research questionnaire and its workability is checked.
5. Data is collected from the whole of the target population.
6. Reliability analysis is conducted using SPSS software to test the internal consistency of the data. Cronbach's alpha value for all variables was found to be more than 0.7, as shown in table 3.1 below, which indicates that the internal consistency of the data is acceptable.

Variables	Number of items	Cronbach's Alpha value
Design related ODN project delay factors	8	0.865
Owner related ODN project delay factors	10	0.848
Contractor related ODN project delay factors	12	0.932
External related ODN project delay factors	9	0.843

Table 3. 1 Reliability statistics

3.8 Ethical Consideration

During this research the following ethical consideration and measures are taken by the researcher.

1. Explicit consent was requested from the respondents.
2. The confidentiality of the information they provided is maintained.
3. Awareness was given to the respondents about the objectives of the research and the big role their contribution will play in the completion of this research.
4. The respondents are treated with respect and courtesy .

5. The researcher conducted the study with honesty by avoiding data distortions and misleading manipulation.
6. The analysis of data and interpretation of the results of data analysis were limited to what the data actually tells.
7. The researcher arrived at conclusions based on objective inferences that are purely guided by the data collected.

CHAPTER 4: DATA ANALYSIS AND INTERPRETATION

Introduction

This chapter deals with analysis, presentation and interpretation of the data collected through online questionnaire using Google forms. One hundred eighteen (118) project professionals from both the project owner and contractors were requested to fill the online questionnaire comprising 39 possible ODN project delay factors grouped under design, owner, contractor and external related ODN project delay factors. Accordingly, all participants responded to the questionnaire and all the responses are found valid , hence the response rate of the survey was 100% . Statistical Package for Social Sciences (SPSS) version 25 and Microsoft Excel software is used for the analysis of the data collected. This chapter consists of two sections. The first section presents the demographic information of the respondents, and the second section deals with analysis of the data collected using descriptive statistics.

4.1 Demographic Information of the respondents

4.1.1 Company affiliation of the respondents.

Out of the total 118 respondents 57 (48.3 percent) are from contractors' side and the remaining 61 (51.7 percent) are from the owner (Ethio Telecom) side as shown in table 4.1 below.

Company affiliations	Frequency	Percent
Contractor	57	48.3
Owner (Ethio Telecom)	61	51.7
Total	**118**	**100.0**

Table 4. 1 Company affiliation of the respondents

4.1.2 Gender of the respondents

As shown in table 4.2 below out of the 118 respondents 11 participants (9.3%) are female and 107 participants (90.7%) are male. Hence, the majority of the respondents are male because ODN projects, by their nature , demand to work out of office and outdoors with so many hardships and sometimes these projects are field works which are not preferable by most females.

Gender	Frequency	Percent
Female	11	9.3
Male	107	90.7
Total	**118**	**100.0**

Table 4. 2 Gender of the respondents

4.1.3 Job position (status) of the respondents

The job position (status) of the respondents within their organization is shown in table 4.3 below. As can be seen in the table, 48 (40.7%) of the respondents are managers, 22 (18.6 %) are project specialists , 15 (12.7%) are site supervisors, 12 (10.2 %) are supervisors, 7 (5.9%) are directors, and finally 7 (5.9%) are engineers. In this research most of the respondents are found to be managers because most of the respondents from the contractor side are the managers of their respective company.

Job position/ status	Frequency	Percent
Director	7	5.9
Engineer	7	5.9
Expert	1	0.8
Manager	48	40.7
ODN project facilitator	1	0.8
Project specialist	22	18.6
Site supervisor	15	12.7
Supervisor	12	10.2
Technician	5	4.2
Total	**118**	**100.0**

Table 4. 3 Job position (status) of the respondents

4.1.4 Project work experience of the respondents

The number of years of experience of the respondents in ODN related project works is shown in the table 4.4 below. From the table we can see that 36 (30.5%) of the respondents have project work experience of more than 15 years, 22 (18.6%) of the respondents have project work experience between 10 to 15 years , 40 (33.9%) of the respondents have experience of 6 to 10 years. Hence, most of the respondents have enough experience on ODN related project works.

Number of years of experience	Frequency	Percent
0 to 5	20	16.9
6 to 10	40	33.9
10 to15	22	18.6
> 15	36	30.5
Total	**118**	**100.0**

Table 4. 4 project work experience of the respondents

4.1.5 Education level of the respondents

Table 4.5 below shows the education level of the respondents. As can be seen from the table 87 (73.7%) of the respondents have BA/ BSc, 19 (16.1 %) of the respondents have MA/ MSc. and 12 (10.2%) of them have diploma.

Education level	Frequency	Percent
Diploma	12	10.2
BA/ BSc.	87	73.7
MA/MSc	19	16.1
Total	**118**	**100.0**

Table 4. 5 Education level of the respondents

4.2 Descriptive Statistics

Respondents were asked through online questionnaire to rate a total of 39 potential ODN project delay factors which are categorized under design related, owner related , contractor related and external related project delay factors. Accordingly, the respondents rated those project delay factors using a 5-point Likert scale based on the significance of each factor to ODN project delay. The collected data is analyzed using descriptive statistics and the result is presented in the following sections.

4.2.1 Design related project delay factors

Table 4.6 below shows the ranking of design related project delay factors. From the table we can see that the respondents rated as most important design related project delay factors to be insufficient data collection and survey before design (RII 0.686) , design errors made by designers (RII 0.683) , delay in reviewing and approving design changes (RII 0.676) , insufficient estimation of original contract duration (RII 0.647), and inadequate site investigation (RII 0.629).

This finding goes inline with the findings of Zewdie (2020) who found that the significant design related project delay factors in road construction projects in Oromiya region to be insufficient data collection and survey before design (RII=0.815) and design errors made by designers (RII=0.745).

The above-mentioned result of this study also agrees with the study conducted by Bekele (2020) who identified insufficient estimation of original contract duration, delay in reviewing and approving design changes, and inadequate site investigation as the most important design related causes of delay in road construction projects having the RII value of 0.798, 0.712,0.657 respectively.

Design related factors causing project delay	RII value	Rank
Insufficient data collection and survey before design	0.686	1
Design errors made by designers	0.683	2
Delay in reviewing and approving design changes	0.676	3
Insufficient estimation of original contract duration	0.647	4
Inadequate site investigation	0.629	5
Poor communication and coordination of designers with other parties	0.612	6
Unclear and inadequate details in drawings	0.597	7
Lack of experience of designers in ODN projects	0.588	8

Table 4. 6 ranking of design related project delay factors

4.2.2 Owner related project delay factors

Table 4.7 below shows the rank of owner related ODN projects delay factors. From the table we can see that the respondents ranked as most important owner related project delay factors to be delay of contract amendment (RII 0.710), delay in payments (RII 0.703), delay in site delivery (RII 0.656), delay in performing inspection and testing of completed projects (RII 0.656), design changes by the owner during project implementation (RII 0.607) and slowness in decision making (RII 0.603).

The above result is supported by the research conducted by Zewdie (2020) who found the main project delay factors from the owner side to be: delay in site delivery (RII=0.890), delay in progress payments (RII=0.825) and slowness in decision making (RII=0.795).

The above finding is also in line with the findings of Bekele (2020) who found that delay of payments by owner (RII=0.827), delay in decision making (RII 0.725), delay in site delivery to the contractor (RII=0.695), design changes by the owner (RII=0.642) as the most important causes for contributing to project delay from the owner side.

Slow decision making (RII 0.790) , delay in progress payment by owner (RII 0.758), and late delivering of the project site (RII 0.611) are also among the most contributing owner related causes of delay as mentioned in the study conducted by Muluneh (2018) which supports the findings of this study.

The researcher has noticed that the factor " delay in payments by the owner " is ranked as most important owner related project delay factor in many studies conducted on project delays. This also agrees with the finding of this research.

Table 4.7 below also shows that corruption tendencies (RII 0.461) have minimal contribution to ODN project delay. However, this is contrary to the findings of Muhwezi et al (2014) , Daba & Pitroda (2018) and other researchers who ranked corruption tendencies as most significant owner related project delay factor. A possible reason for this is that the contract type used in the ODN projects is fixed price contract which does not encourage to involve in high corruption tendencies.

Owner related project delay factors	**RII value**	**Rank**
Delay of contract amendment	0.710	1
Delay in payments	0.703	2
Delay in site delivery	0.656	3
Delay in performing inspection and testing of completed projects	0.656	4
Design changes by owner during project implementation	0.607	5
Slowness in decision making	0.603	6
Lack of incentives for contractor to finish ahead of schedule	0.595	7
Poor project supervision	0.569	8
Poor communication and coordination with other parties	0.546	9
Corruption tendencies	0.461	10

Table 4. 7 ranking of owner related project delay factors

4.2.3 Contractor related project delay factors

Table 4.8 below reveals the rank of contractor related ODN projects delay factors. From the table we can see that the respondents evaluated as most important contractor related project delay factors to be shortage of equipment , tools and instruments (RII 0.722), financial problem of the contractor (RII 0.614), ineffective project planning and scheduling (RII 0.588), inadequate contractor experience (RII 0.576), unqualified / inadequate experienced labor (RII 0.573) and poor site management and supervision (RII 0.569).

The above result is supported by the findings of Muhwezi et al (2014) who found that among the top contractor related factors that cause project delay to be: inadequate contractor's experience with RII (0.885), and poor site management and supervision with RII (0.835) .

The finding also goes in line with Getahune (2021) who mentioned that poor site management, unavailability of equipment and poor planning and scheduling to be one of the most significant causes of contractor related project delay having high RII values.

The result also agrees with the findings of Muluneh (2018) that difficulties in financing the project, poor management of the contract, poor planning and scheduling of the project, lack of appropriate machinery are the most contributing factors to project delay from the contractor side.

Table 4.8 below also shows that contractor related project delay factors such as financial indiscipline/dishonesty (RII 0.529), absenteeism (RII 0.524), poor communication and coordination of the contractors with other parties (RII 0.514), and damage of materials by the contractors (RII 0.481) have least influence on ODN project delay. This is contrary to the findings

of Muhwezi et al (2014), who mentioned that financial indiscipline/dishonesty of the contractor as most important project delay factor related to the contractor having RII value of 0.923.

Contractor related project delay factors	RII	Rank
Shortage of equipment , tools and instruments	0.722	1
Financial problem of the contractor	0.614	2
Ineffective project planning and scheduling	0.588	3
Inadequate contractor experience	0.576	4
Unqualified / inadequate experienced labor	0.573	5
Poor site management and supervision	0.569	6
Shortage of labor	0.556	7
Rework due to errors	0.551	8
Financial indiscipline/dishonesty	0.529	9
Absenteeism	0.524	10
Poor communication and coordination with other parties	0.514	11
Damage of materials	0.481	12

Table 4. 8 ranking of contractor related project delay factors

4.2.4 External related ODN project delay factors

Table 4.9 below reveals the rank of external related ODN projects delay factors. From the table we can see that the respondents assessed as most important external related project delay factors to be shortage of project materials (RII 0.754), lack of integration with other utility providers (RII

0.639) , delay in obtaining permits from local authority (RII 0.634), unexpected surface & subsurface conditions (such as soil, high water table) (RII 0.595), and unfavorable weather conditions (RII 0.568).

This study revealed that shortage of project materials (RII 0.754) as the most important external related ODN project delay factors that is because of the shortage of foreign currency to purchase ODN project materials from abroad.

The findings of this study agree with the findings of Sebsebie (2020) and Muhwezi et al (2014), who mentioned shortage of project materials as an important factor that cause project delay.

Table 4.9 below also shows that external related project delay factors such as environmental , social, and cultural factors (RII 0.532), legal disputes between project participants (RII 0.529), accidents during project execution (RII 0.469), changes in government regulations and laws (RII 0.461) have minimal effect on ODN project delay. This finding goes in tandem with the findings of Bekele (2018) , Muluneh (2018) , and Muhwezi et al (2014) who found that social and cultural factors, accidents during project execution, and changes in government regulations and laws to be least significant in causing project delays. However , in opposite to this study , Muhwezi et al (2014) found that legal disputes between project participants to have significant effect on project delay with RII value of 0.773.

External related project delay factors	RII	Rank
Shortage of project materials	0.754	1
Lack of integration with other utility providers	0.639	2
Delay in obtaining permits from local authority	0.634	3
Unexpected surface & subsurface conditions (such as soil, high water table)	0.595	4
Unfavorable weather conditions	0.568	5
Environmental , social, and cultural factors	0.532	6
Legal disputes between project participants	0.529	7
Accidents during project execution	0.469	8
Changes in government regulations and laws	0.461	9

Table 4. 9 ranking of external related project delay factors

4.2.5 Ranking of categories of ODN project delay factors

Table 4.10 below shows the ranking of the above-mentioned categories of ODN project delay factors. As shown in in the table design related ODN project delay factors (RII 0.640) are ranked first and owner related (RII 0.611) , external related (RII 0.576) and contractor related ODN project delay factors (0.566) are ranked second, third and fourth respectively.

The result shows that there are problems in the designing task of ODN projects that cause delay to ODN projects, and the company should do something to find solution for such design problems.

However, the above-mentioned result does not support the result found by Muluneh (2018) and Bekele (2020) who both found that the contractor related project delay factor to be the most important project delay factor.

Category of the ODN project delay factor	**RII value**	**Ranking**
Design related	0.640	1
Owner related	0.611	2
External related	0.576	3
Contractor related	0.566	4

Table 4. 10 Ranking of categories of ODN project delay factors

4.2.6 Top ten major factors of ODN project delay

Table 4.11 below shows the ranking of the totally identified 39 ODN project delay factors . From the table we can see that the top ten ODN projects delay factors are :

1. Shortage of project materials (RII 0.754),
2. Shortage of equipment , tools and instruments (RII 0.722),
3. Delay of contract amendment (RII 0.710),

4. Delay in payments by the owner (RII 0.703),
5. Insufficient data collection and survey before design (RII 0.686),
6. Design errors made by designers (RII 0.683),
7. Delay in reviewing and approving design changes (RII 0.676),
8. Delay in site delivery (RII 0.656), and delay in performing inspection and testing of completed projects(RII 0.656),
9. Insufficient estimation of original contract duration (RII 0.647), and finally
10. Lack of integration with other utility providers (RII 0.639).

The above finding agrees with the results of Bekele (2018) and Dula (2021) who found that delay in payments as one of top ten project delay factors . It is also inline with the results found by Muluneh (2018) and Muhwezi et al (2014) who mentioned that design errors made by designers is one of the top ten important project delay factors. Moreover, it also supports the result found by Bekele (2018) and Dula (2021) that insufficient estimation of original contract duration is one of the top ten contributing factors to project delay. The finding of this study is also supported by Muhwezi et al (2014) who mentioned that data collection and survey before design as one of the five most significant factors of construction project delay in Uganda.

However, the researcher did not find researchers that mentioned delay in contract amendment and lack of integration with other utility providers within the list of their top ten most important project delay factors.

Possible factors of ODN project delay	**Category of the factor of the delay**	**RII**	**Rank**
Shortage of project materials	external	0.754	1
Shortage of equipment , tools and instruments	contractor	0.722	2
Delay of contract amendment	Owner	0.710	3
Delay in payments	Owner	0.703	4
Insufficient data collection and survey before design	Design	0.686	5
Design errors made by designers	Design	0.683	6
Delay in reviewing and approving design changes	Design	0.676	7
Delay in site delivery	Owner	0.656	8
Delay in performing inspection and testing of completed projects	Owner	0.656	8
Insufficient estimation of original contract duration	Design	0.647	9
Lack of integration with other utility providers	external	0.639	10
Delay in obtaining permits from local authority	external	0.634	11

Inadequate site investigation	Design	0.629	12
Financial problem of the contractor	contractor	0.614	13
Poor communication and coordination of designers with other parties	Design	0.612	14
Design changes by owner during project implementation	Owner	0.607	15
Slowness in decision making	Owner	0.603	16
Unclear and inadequate details in drawings	Design	0.597	17
Lack of incentives for contractor to finish ahead of schedule	Owner	0.595	18
Unexpected surface & subsurface conditions (such as soil, high water table)	external	0.595	18
Lack of experience of designers in ODN projects	Design	0.588	19
Ineffective project planning and scheduling	contractor	0.588	19
Inadequate contractor experience	contractor	0.576	20
Unqualified / inadequate experienced labor	contractor	0.573	21
Poor project supervision	Owner	0.569	22
Poor site management and supervision	contractor	0.569	22
Unfavorable weather conditions	external	0.568	23
Shortage of labor	contractor	0.556	24

Rework due to errors	contractor	0.551	25
Poor communication and coordination with other parties	Owner	0.546	26
Environmental , social, and cultural factors	external	0.532	27
Financial indiscipline/dishonesty	contractor	0.529	28
Legal disputes between project participants	external	0.529	28
Absenteeism	contractor	0.524	29
Poor communication and coordination with other parties	contractor	0.514	30
Damage of materials	contractor	0.481	31
Accidents during project execution	external	0.469	32
Corruption tendencies	Owner	0.461	33
Changes in government regulations and laws	external	0.461	33

Table 4. 11 Ranking of ODN project delay factors

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents summary of the findings, conclusions and recommendations of the researcher that would help in avoiding or minimizing the occurrence of delay in Ethio Telecom's ODN projects.

5.1 Summary of findings

This research revealed that insufficient data collection and survey before design, design errors made by designers, delay in reviewing and approving design changes, insufficient estimation of original contract duration, and inadequate site investigation as the most significant design related ODN project delay factors . This finding of design related project delay factors agrees with the findings of Muhwezi et al (2014) . Moreover, delay in contract amendment, delay in payments , delay in site delivery , delay in performing inspection and testing of completed projects, design changes by the owner during project implementation, and slowness in decision making are ranked as major ODN project delay factors caused by the owner. In addition, shortage of equipment , tools and instruments, financial problem of the contractor, ineffective project planning and scheduling by the contractor, inadequate contractor experience ,unqualified / inadequate experienced labor , and poor site management and supervision of the contractor are found to be the most important ODN project delay factors originating from the contractor side.

The study also showed that shortage of project materials lack of integration with other utility providers, delay in obtaining permits from local authority, unexpected surface & subsurface

conditions (such as soil, high water table) , and unfavorable weather conditions to be the most highly contributing external related factors to ODN project delay.

Finally, the research revealed that the top ten most important ODN project delay factors to be shortage of project materials, shortage of equipment , tools and instruments , delay of contract amendment , delay in payments by the owner, insufficient data collection and survey before design, errors made by designers , delay in reviewing and approving design changes, delay in site delivery, delay in performing inspection and testing of completed projects, insufficient estimation of original contract duration, and finally lack of integration with other utility providers .

5.2. Conclusion

Assessing and knowing the factors of delay for ODN projects is advantageous, as it will be possible to minimize or avoid the delay of such projects when their causes are effectively identified and analyzed. The objective of this study was to identify, assess and investigate the factors causing delays in Ethio Telecom's ODN projects so that appropriate actions can be taken to avoid or minimize the bad effects of ODN project delays. After conducting a detail literature review, a total of 39 ODN project delay factors were identified and classified in to four categories : design related ODN project delay factors, owner related ODN project delay factors, contractor related ODN project delay factors, and external related ODN project delay factors. RII (relative importance index) was used to rank such ODN project delay factors so that the major contributing factors to the delay of ODN projects can be identified. Accordingly, after analyzing the evaluation and

assessment of the 118 ODN project stakeholders to the identified ODN Project delay factors , the top 10 most important ODN project delay factors were known as shown in table 4.10.

The result of this study mostly agrees with the findings of similar studies conducted in different sectors and countries with regard to the most important project delay factors identified. However, the corruption tendencies project delay factor which is ranked as least important project delay factor in this research is not supported by other studies.

Moreover, out of the top 10 most important ODN project delay factors identified in this research, 4 project delay factors are from design related project delay factors, 3 project delay factors are from owner related project delay factors , 2 project delay factors are from external related project delay factors, and finally 1 project delay factor is from contractor related project delay factors. This is contrary to the findings of other researchers who listed substantial number of contractor related project delay factors in their list of top 10 project delay factors. This may be due to the fact that in Ethio Telecom's ODN projects contractors get special support in different areas such as training , technical support, and others from the owner so that they can complete ODN projects on time. Another reason is that as each project is different from other projects with respect to country, culture, industry sector and company, the findings obtained from each project can be different from others.

5.3 Recommendation

Based on the findings mentioned above , The researcher puts forward the following recommendations so that delays in Ethio Telecom's ODN projects can be controlled, minimized, or avoided and the ODN projects will be completed on time.

- The project materials required for ODN projects are procured locally as well as imported from abroad demanding foreign currency. The owner and the contractors should exert their maximum effort and ensure that all project materials are available before commencing any ODN project so that during implementation phase of the project, shortage of project materials will not happen.
- ODN projects require sensitive instruments which are used for splicing and testing optical fiber cables which are procured internationally through hard currency. Hence, the contractors should make available all the equipment, tools and instruments which are procured locally, and the owner should discuss with the concerned governmental financial institutions to secure the foreign currency required for the purchase of those instruments and help contractors by procuring and availing on-time such internationally procured instruments on loan or sale bases.
- The owner should revise its existing contract amendment process and procedures and take remedial action to execute contract amendment tasks within acceptable durations.
- The owner should investigate its existing process , procedures and organizational structure for effecting project payments and should find the bottlenecks that hinder on time

payments and take the necessary actions and measures so that contractors get their payments as per the agreed contract, on time.

- The design team should take enough time for data collection and survey tasks of ODN projects so that sufficient data is collected before issuing the final design. The supervisors of the design team should also check and ensure that the data collection and survey task is done properly.
- The design team should carefully prepare designs to minimize and avoid errors made by designers. The team also should use modern software applications for preparing the design and the final design should be subjected to peer review and finally to be checked by the design supervisors. Skill upgrading trainings should also be provided to the designers regularly.
- When design change is requested , the design team should give priority for the task by conducting on-time design review and by quickly approving appropriate and reasonable design change requests.
- The owner should deliver the project site to the contractors as quickly as possible after contract signature.
- The owner should also perform inspection and testing of completed ODN projects on-time. The handover and acceptance of the completed ODN projects should be done without delay.
- The planning and design team should appropriately estimate and provide a reasonable contract duration estimation for each ODN project according to the project's size and complexity.

- The owner has to work closely with other utility providers so that its ODN projects will get their support and not be hindered by their various actions.
- The owner should continue giving regular trainings to the contractors on technicalities of ODN projects and project management skills.

5.4 Suggestion for future research

As the scope of this research is limited only to the assessment of project delay factors in Ethio Telecom's ODN projects that are implemented and under implementation in only Addis Ababa city, the researcher suggests that similar studies be conducted on ODN projects that are implemented and are under implementation in regional areas.

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Appendix

Questionnaire

Dear Respondent,

This questionnaire has purely academic purpose as I am conducting a study at Addis Ababa University, College of Business and Economics for partial fulfillment of master's degree in project management. The questionnaire is designed to collect data for a research paper entitled "Assessment of factors causing project delay : The case of Ethio Telecom's ODN projects''.

I believe your experience and educational background will greatly contribute to the success of my research. Please try to answer all the questions openly and from the best of your knowledge, as your answers will have an influence on the outcome of the research.

Thank you in advance for your time and effort for responding to this questionnaire.

With regards,

Adem Abera.

Part I. General background of the respondent

Please put "✓ " mark for your choice in the blank space

1. Organization type : Owner (_____) Contractor (_____)
2. Gender : Male (_____) Female (_____)
3. What is Your Position/ Status in your Organization?

Director (_____) Manager (_____) Expert (_____) Supervisor (_____) Project specialist (_____) Site engineer (_____) Other (specify)----------

4. Number of years you have been working in projects

   0 to 5 (_____) 6 to 10 (_____) 10 to15 (_____) >15 (_____)

5. The highest level of education you have accomplished.

   Diploma (_____) BA/BSc. (_____) MA/MSc. (_____) PHD (_____)

Part 2: Please rate the below mentioned possible factors that cause ODN project delay by Putting " ✓ " mark under the appropriate box.

The values of the scale are:

1 = Not significant 2 = Slightly significant 3 = Moderately significant

4 = Very significant 5 = Extremely significant

No.	Possible factors causing project delay	1	2	3	4	5
	A. Design related project delay factors					
1	Design errors made by designers					
2	Inadequate site investigation					
3	Unclear and inadequate details in drawings					

4	Delay in reviewing and approving design changes					
5	Lack of experience of designers in ODN projects					
6	Insufficient data collection and survey before design					
7	Poor communication and coordination of designers with other parties					
8	Insufficient estimation of original contract duration					
	B. Owner related project delay factors					
9	Corruption tendencies					
10	Delay in payments					
11	Design changes by owner during project implementation					
12	Poor communication and coordination with other parties					
13	Slowness in decision making					
14	Delay in site delivery					
15	Lack of incentives for contractor to finish ahead of schedule					
16	Delay in performing inspection and testing of completed projects					
17	Delay of contract amendment					

18	Poor project supervision					
	C. Contractor related project delay factors					
19	Financial indiscipline/dishonesty					
20	Inadequate contractor experience					
21	Poor site management and supervision					
22	Absenteeism					
23	Ineffective project planning and scheduling					
24	Rework due to errors					
25	Poor communication and coordination with other parties					
26	Unqualified / inadequate experienced labor					
27	Shortage of equipment , tools and instruments					
28	Shortage of labor					
29	Damage of materials					
30	Financial problem of the contractor					
	D. External related project delay factors					

31	Unfavorable weather conditions					
32	Legal disputes between project participants					
33	Shortage of project materials					
34	Unexpected surface & subsurface conditions (such as soil, high water table)					
35	Accidents during project execution					
36	Environmental , social, and cultural factors					
37	Delay in obtaining permits from local authority					
38	Changes in government regulations and laws					
39	Lack of integration with other utility providers					