

**ASSESSMENT OF FACTOR AFFECTING THE DELAY OF
ROAD CONSTRUCTION IN ETHIOPIA; THE CASE OF
OROMIA ROAD PROJECTS, JIMMA ZONE**

**A Research Paper Submitted to the School of Graduate Studies of Jimma
University in Partial Fulfillment of the requirements for Master's Degree
in Project Management and Finance**

BY:

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DEPARTMENT OF ACCOUNTING AND FINANCE

COLLEGE OF BUSINESS & ECONOMICS

JIMMA UNIVERSITY

OCTOBER, 2023

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And

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Declaration

I hereby declare that this paper entitled assessment of factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone”, has been carried out by me under the guidance and supervision of Dr. Tezera Selamu (Ass. Prof.) and Abebe Shentema (MSc).

This research paper is my original work and has not been submitted for the award of degree or qualification in any university or institution.

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CERTIFICATE

This is to certify that the research paper entitles assessment of factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone”, Submitted to Jimma University for the award of the Degree of Master of Project management and Finance and is a record of useful paper carried out by Mr. Negesse Getinet Daba, under our guidance and supervision.

Therefore, we hereby declare that no part of this research paper has been submitted to any other university or institutions for the award of any other degree or professional qualification.

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Abstract

Delays on the construction projects are the most common and frequent problem of the road construction. Many road construction projects have been undertaken throughout the Oromia Regional State as part of the government's regional development plans. However, a few road building projects in ORA that were proposed and financed by the Federal government have not been finished by the initial deadlines and pre-agreed sums of money. The main objective of this study was to identify the factors affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone. The survey data was carried out through a questionnaire. The sample size of the study is 158 respondents, professionals from 3 target population client, contractor and consultant in Jimma Zone Road Authority. 47 potential delay causes and 7 effects were selected from the reviewed literature and the causes were divided in to 5 as client related factors, consultant related factors, contractor related factors, material and equipment related factors and environmental related factors. The researcher used stratified simple random sampling techniques in order to assess the cause and effect of delay on road construction the case of Oromia road projects, Jimma zone. These factors was ranked using the Likert scale-type questionnaires are used as a data rating scale tool to measure employees' perceptions of the variables. The study used a primary data source and the data was quantitatively analyzed using the Social Science Statistics Package (SPSS). Finally, both descriptive and inferential statistics was used to analyze the data. Among the descriptive statistics frequency distributions, means, standard deviation and relative importance index method was used. Among the inferential statistics Pearson correlation and multiple linear regressions analysis was used to identify the effect of project delay of road construction. The Pearson correlation result showed that there is strong relationship between the independent variables and project delay. Consultant related factors, contractors related factors, and environmental related factors were identified as a statistical significant effect on the delay of road construction projects, but client related factor and material and equipment related factors do not have a statistical significant effect on the delay of road construction projects at 5% level of significance. The researcher recommends that clients should have a good coordination with the contractor and being realistic so as to avoid delays.

Key Words: Road Authority projects, Jimma Zone, delay on road construction

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Acronyms and Abbreviations

IHA	Imperial Highway Authority
RRD	Rural Roads Department
ERA	Ethiopian Road Authority
RSDP	Road Sector Development Program
RRD	Rural Roads Department
ORRA	Oromia Rural Roads Authority
ONRS	Oromia National Regional State
UN	United Nations
ISIC	International Standards Industrial Classification
RII	Relative Importance Index

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

The main purpose of roads is to provide accessibility and mobility for society. The expansion and connection of road networks is currently a top priority for developing nations all over the world. Given that a good road network aids in the growth of the economy and the country as a whole, road projects are listed as the main priority in their national budget. Without a sufficient infrastructure for transportation, the nations cannot provide their products and services (Enshassi; Al-Najjar and Kumaraswamy, 2009).

According to Enshassi et al. (2009), a number of performance indicators that can be related to a wide range of dimensions, including time, cost, quality, client satisfaction, business performance, health and safety, can be used to measure and evaluate how well construction projects performed in comparison to what was anticipated. However, the three main performance evaluation dimensions are time, cost, and quality, they continue to argue. King (2017) claimed that the use of good project management techniques gives project stakeholders the tools to achieve their goals, which are defined in terms of fulfilling the intended purpose, the level of quality, the timeframe, and the budget.

According to Assaf and Al-Hejji (2006), a delay in a construction project is a time overrun that occurs after the agreed-upon agreement date or after the date on which the parties agreed to transfer project results. There are several main categories of delays, including compensable (caused by the client) and non-excusable (induced by the contractor), critical and noncritical, and concurrent and non-concurrent. Understanding the different forms of delays makes it easier to understand their causes and to adopt mitigation strategies.

Therefore, in order to meet the immediate needs of stakeholders, road projects should be finished on time. A significant issue that contractors must deal with, sadly, is delays in road building projects caused by a variety of factors. According to research by (Ahmed; Azhar and Kappagantula, 2002) failure to complete projects on time and within the allotted budget is a problem everywhere. Despite the fact that the reasons for delays vary little amongst developing nations, there are a number of elements that are undoubtedly related to local businesses, socioeconomic conditions, cultural issues, and project characteristics including land disputes and issues with a road's right of way. Project staff is additionally burdened by

the numerous challenges that road construction projects currently cause the community, including excessive traffic and an increase in the likelihood of accidents on the roads, among others. Facing the significances of project failure, profit decrease, and loss of faith to the public in government-funded projects. Therefore, on-time completion of a road project is exceptionally fundamental.

Construction delays are a common phenomenon in most countries, mainly in the developing ones. Several studies have revealed that construction delays have negative effects on clients, contractors, and consultants (Ghaffari, 2013; Marzouk and El-Rasas, 2014). The causes and effects of these delay factors in the road construction industry differ from country to country, due to different environments and the techniques applied in the construction processes. For instance, in Ethiopia, where the government is the only client for road construction projects, a different set of circumstances are likely to affect delays than those that are typical in affluent nations, where the private sector is mainly responsible for road construction work. This makes it more challenging to generalize about the reasons behind project delays, their effects, and the approaches that should be used to reduce/prevalent in the road construction industry.

Any developing nation's growth and development depend heavily on the road construction industry in particular (M. Haseeb, 2011). Road transportation efficiency plays a significant role in driving economic development in underdeveloped nations like Ethiopia by facilitating market access for agricultural products, production outputs, and everyday consumption choices. The expansion of trade, social, and health services, educational institutions, and employment opportunities all benefit greatly from improved road infrastructure.

The building industry, which rules the domestic market, has also established itself as a major player internationally. According to Megaron (2014), the construction sector contributes about 8% of the global GDP. This highlights the importance of the construction industry to the world economy. Construction has always been a part of existence since the beginning of recorded history. Ethiopia's modernization and industrialization are now being led by the construction sector, which is also expected to raise living standards for individuals employed in the sector. The construction sector, which employs the majority of people in the country, fosters growth in other sectors as well as innovation and technology (Tekle Hagos et al. 2012).

Many academicians have assumed that efforts have been made to pinpoint the causes and effects of delay. For instance, Zinabu (2016) identified factors that lead to delays in road construction projects; of these, cash flow issues during construction, mismanagement by the contractor (financial, supplier support, sub-contractor), inadequate planning, slow decision-making, and late deliveries of materials and equipment were ranked as the top five factors. Adiam (2016), for instance, claims that solving the issue of time delay may lead to a number of additional issues, including challenges with cost overrun, resource overuse, mistrust, and conflicts among project stakeholders.

Ethiopian state-led road construction officially began in 1951 with the founding of the Imperial Highway Authority (IHA). The IHA launched a number of highway programs throughout the ensuing years to expand and upgrade Ethiopia's road system. Since its founding in 1951, the organization has been successful in carrying out a variety of physical and policy-related initiatives. There were six highway programs in a program for road building that began in 1951 with the founding of IHA (ERA, 2009).

The newly constituted independent authority was in charge of building, maintaining, and renovating highways as well as rural roads, and it was structurally under the Ministry of Transport and Communication. The Rural Roads Department (RRD), which is at the same structural level as the Highway Department, was established within the ERA in order to recognize the significance of rural roads (ETCA, 1986).

With a focus on enhancing accessibility and transportation to agricultural potentials, the program of rural road expansion was launched in 1970. Only 6,400 km of roads existed in total in 1951. In 2009, it increased to 46,812 kilometers (ERA, 2009). The emphasis placed on the sector is what caused the length of the road to increase. The Federal Democratic Republic of Ethiopia's current administration has given increased priority to enhancing the caliber and scope of the road infrastructure.

Rural road management responsibilities were gradually transferred to the newly created regions (ILO 2009). The regions were fundamentally given equipment and personnel from ERA, which made them "...responsible for the building and management of the rural roads in their particular area." (ERA 2009: ILO 2009) and mostly furnished with ERA's assets and personnel. The Rural Road Building and Maintenance Department, which was recognized within the Bureau of Works and Urban Development of the area in 1993/94, was initially tasked with managing the categorized country roads in Oromia. The Regional Government

formed the Oromia Rural Roads Authority (ORRA) in 1996 and gave it "the mandate to undertake the building and maintenance of rural roads in the region" (Oromia Today 2009). Before the Regional Government was established, the region's all-weather road compactness was 23/1000 km² (ORA RRNDS: 2012). In September 2008, the ORRA underwent reorganization and took a significant step toward establishing a public enterprise basis for regional road development.

By this system, the Oromia National Regional State (ONRS) has given a specific attention for the road development sector among its primary construction sectors (water, irrigation, etc.). Throughout the past 20 years, ORA have prepared substantial contributions to the region's road network expansion in accordance with its mission and mandate. The authority hasn't been able to fully achieve its planned goals, nevertheless, for a variety of reasons. Roads are still in high demand in the area.

As stated in the region's Growth and Transformation Plan I, in 2007 the region's road density, which was 36.7/1000 km² at the end of 2002, was expected to increase to 162.3/1000 km², while the density of roads, which was 0.45 per 1000 people, was expected to decrease to 0.40 per 1000 people. But according to the GTP I's final evaluation in 2007, the road and population densities that were actually achieved were 117 and 1.26 per 1000 km², respectively.

Among the various reasons that impede the expansion of road net in the region, delay in construction was acknowledged to be the major reason. Completion certificate of road projects or provisional acceptance certificate and letters of time extensions of ORA reveals that among road construction projects that are run by ORA, the amount of time that has already passed and the number of days that have been postponed vary from 3% to 259% (103-359%) of the original contract duration.

Yet, among the several road projects in ORA that have been completed or are currently being built, a number have frequently fallen behind schedule due to a variety of factors. The results of the past five years' GTP I reveal that the majority of the road projects' execution time exceeded expectations.

These facts, along with others that need to be addressed, prompt additional research and analysis of the causes and effects of road development projects in Oromia that are relevant to ORA road projects.

This study consequently attempts to investigate the major causes of road construction project delays specific to Jimma Zone, by identifying the different types of construction delays, their causes and effects from different perspectives, in order to determine the influence and the level of importance of the recognized delay factors in road construction projects in Jimma Zone.

1.2. Statements of the Problem

The performance of the road sector plays a vital role in growing the economy of every country irrespective of the level of development. In today's highly competitive economic environment, the need for completing road construction projects within the allocated budget, resources, time frame, and expected performance is highly important. So carefully managing these resources to the successful completion of the project is a crucial one. The essential for access to markets, health care, education and other facilities are the factors that affect roads projects. A very low road density and subsequent limited provision of services and infrastructure have been one of the difficult challenges for Ethiopia in its effort towards economic development and poverty reduction (Adiam, 2016). Recognizing these problems, and its role in supporting social and economic growth, the Ethiopian government has placed increased emphasis on road constructions projects. Hence, government always allocated large amount of capital on road construction projects. For example, in 2015/16, the government has invested birr 95 billion in road construction projects (National Bank of Ethiopia, 2016/17).

According to Shambel and Patel, (2018), the study conducted on 10 completed road construction projects in Addis Ababa, all the projects have suffered from time overrun ranging from a minimum of 25% to the maximum of 264.38%, (Werku, & Jha, 2016) concluded that only 8% projects were finished on the original targeted completion date in Ethiopia and the other 92% of the project delays beyond the planned completion date. Merid (2016) study on Defense Construction Enterprise concluded that 100% of the projects suffered with time and cost overruns in their execution and completion. For these construction projects, the actual time overruns ranges from 13% to 181% of the contract completion time.

In this regard, a few road building projects in ORA that was proposed and financed by the Federal government have not been finished by the initial deadlines and pre-agreed sums of money. A preliminary survey conducted by the researcher indicated that Jimma town-Agaro-Didessa (Jimma), which experienced a total delay of three years, and Jimma-Limmu- Nono

Benja Asphalt (Jimma), which saw a total delay of two years, are two examples of the projects that experienced delays in road construction.

The main issues that lead to failures to fulfill the region's development expectations in general and the road infrastructure in particular are the lapsed time that results in the delay of construction completion in some road projects. On the other hand, there are delays in payment, financial processes and difficulties of contractors and customers, contract changes, economic problems, material procurement, drafting changes, staff shortages, equipment deficiencies, lack of oversight, design flaws, inappropriate site customization. All the studies didn't consider the entire independent variables (client related factor, contractor related factor, consultant related factors, material and equipment related factors) on project delays and their effects on project success. Moreover, these studies conducted in different environmental factors and contextual setting (Chang, 2002). To the best of my knowledge there is no organized research has been carried out to record and carefully examine the issue. So, This study attempted to fill the research gap by examining factor affecting environmental related factors delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.

The study was identified the following basic questions:-

- What is a client related factors affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone?
- What is contractor related factors affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone?
- What is consultant related factors affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone?
- What is material and equipment related factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone?
- What is an environmental related factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone?

1.3. Research Objectives

1.3.1. General Objectives

The main objective of the research is to assessment of factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.

1.3.2. Specific Objectives

- ❖ To examine factor affecting client related delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.
- ❖ To examine factor affecting contractor related factors delay, of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.
- ❖ To examine factor affecting consultant related factors delay, of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.
- ❖ To examine factor affecting material and equipment related factors delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.
- ❖ To examine factor affecting environmental related factors delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.

1.4. Significance of the Study

This investigation is essential in determining the reasons behind and consequences of program delays in road construction projects. Time is a crucial component of construction project management and project success, recognizing and rating the delay causes and their consequences significantly reduce the delay issue and help the project succeeded. The study's conclusions ware raise value further by offering suggestions for mitigation measures that the management of Jimma Zone Roads Authority Road projects may use to take corrective action and make decisions that will help the project's effective implementation.

In addition, the study will also be important to the researcher as it will be contributing to add theoretical and practical knowledge on how to conduct research and it may be also useful to those researchers who require bases for more study in this area.

1.5. Scope of the Study

The scope of this study is limited to road construction projects regarding to title. An Oromia road project, Jimma Zone is selected as the context of this study and the period that the stud cover was from January 17/ 2023 up to November 1/2023. The study ware focused on the

analysis of the causes and effects of schedule delay from different perspectives. The groups of the respondents that were involved in the study are the client/owner, consultant, contractors and employees that are some of the main stakeholders in road construction in Ethiopia; the case of Oromia road projects, Jimma zone.

1.6. Limitations of the Study

The following are some of the limitations of the current study:

The study is subject to recall bias as the study participants may not remember the actual events for the problem under study.

These study findings may not be generalizable to all types of construction projects as the current study focuses on road construction projects.

These study findings are applicable to other regional areas that have similarity with Jimma Zone in lack of select material, non-seasonal rain and shortage of labor around working environment in Ethiopia.

1.7. Organization of the Paper

This study is organized in five subsequent chapters, and structured. The background of the study, a statement of the issue, some fundamental research issues, as well as the study's goals, significance, scope, and limitations, are all introduced in the first chapter. The second chapter covers a review of the literature along with profiles of several researchers who are interested in the subjects. The third chapters discuss the research methodology, design, data sources, target population, sampling method, sample size, instrument validity and reliability, and research ethics throughout the data collecting and analysis. The fourth chapter is about data analysis and interpretation then the final chapter is about summary, conclusion, and recommendation.

CHAPTER TWO

2. LITERATURE REVIEW

This chapter presents a literature review of the research work that was performed by various scholars in the field of timely completion of construction projects. This includes theoretical review, empirical review and conceptual framework.

2.1. Theoretical Review of Related Literature

2.1.1. An overview of construction projects

According to the Project Management Institute (2008), a project is a brief undertaking started with the intention of producing a special good, service, or outcome. All undertakings are dangerous, and Hillson D. (2009) identifies three distinct causes for this. The first reason is that all undertakings have similar traits that necessarily bring about unpredictability. Projects often require transition from a known present to an unknown future, are complex, involve assumptions and restrictions, are done by people, and have one-of-a-kind features. The second reason is that every project is started with the intention of achieving a particular goal. The last justification is that every project is impacted by the environment in which it is being carried out.

Simply said, a construction is the act of creating anything by hand for a specific purpose. It could be a street, a bridge, a dam, a home, an airport, a business, an office, etc. Construction, according to Wikipedia, is the process of constructing or putting together infrastructure. Construction is the acquisition and use of resources such as money, skilled labor, materials, and equipment on a particular site in accordance with plans, guidelines, and papers under a contract created to satisfy the needs of a customer.

In general, construction is defined by the UN's International Standards Industrial Classification (ISIC), Rev. 3, as an economic activity focused on the development, renovation, maintenance, or postponement of fixed assets such as buildings, manufacturing-oriented land developments, and other engineering constructions like roads, bridges, dams, and so forth. A collection of businesses involved in site preparation, building whole structures or portions of them, civil engineering, and building make up the industry.

Similar to any other project, building construction projects encounter a variety of dangers as they progress. This is caused by the distinctiveness of every project, the uncertainties imposed by the project stakeholders, statutory or regulatory protocols, and other intrinsic and

extrinsic limitations, according to Nafishah B., (2006). He goes on to talk about how risk might affect how quickly, cheaply, and effectively a project can fulfill its main goals. Failure to meet the project's goals will have a significant impact on all parties involved in its development. For the client, this may mean additional costs and a worse return on investment; for the consultants, it could mean that clients no longer have faith in them; for the contractor, it could mean a decrease in profits and a poor reputation; etc.

2.1.2. Effect of Delay on the Performance of the Project

Sambasivan and Soon's (2007) research identifies six ways that delays affect project success in Nigeria. Time and money overruns, disagreements, arbitration, lawsuit, and complete abandonment are some of these repercussions. Aibinu and G. Jagboro (2000) discovered the same impact of delays in Malaysia's building industry in a different study there. A study conducted in Pakistan by Haseeb et al. (2011) focused on the impact of delays in the construction sector. Their research showed that the development of the construction business was being slowed down by disputes, allegations, and complete abandonment. There are two different sorts of relationships between causes and consequences. These connections are both direct and indirect.

In the other study, conducted by Odeh and H. T. Battaineh (2002) in Jordan, they linked contract-related causes to disagreements and negotiations that took place between the project's stakeholders. The connections between different causes and performance-related items are incredibly numerous. It is possible to connect time and expense overruns to both material- and finance-related reasons. A connection between disputes and negotiation and labor or financial issues is possible. Times overrun and project abandonment is linked to factors related to finances, interpersonal relationships, and external situations.

2.2. Construction Sector

According to Aziz and Abdel-Hakam (2016), one of the most significant industries that can promote economic growth and stimulate development in other sectors is the construction industry. Rapid infrastructure development is essential for sustainable development because of population increase, rising urbanization, and globalization (Prasad et al. 2019). Construction projects, such as those for roads, water supply, hospitals, etc., play a crucial role since they are a requirement for creating jobs, reducing poverty, and fostering socioeconomic development, particularly in developing nations (Amoatey and Ankrah, 2017). However, a project must be completed within the allotted time, cost, and budget as well as meet the

expected standards in order to be considered successful. Project failures result in undesirable circumstances such late completion, cost overruns, and subpar quality (Association of Construction Development, 2014).

Globally, the construction industry encounters delays that pause many projects, in some cases even cause total abandonment, along with it are time and cost overruns, which comes with other consequences such as project failure, reduction of profit margin, and the loss of public confidence, particularly on government funded projects (Doraisamy et al. 2015; Zailani et al. 2016).

Excusable delays are those that happened for reasons that were not within the contractor's or any other party's control, could not have been anticipated sooner, and were not brought on by their fault or carelessness. However, a delay that is initiated by the contractor or any other party, such as a subcontractor, and is under the control of the contractor is referred to as a non-excusable delay. According to Doraisamy et al. (2015) and Anysz and Buczkowski (2018), concurrent delays happen when both the contractor and the owner are at fault.

A construction project could encounter delay in turning over the site, or when there are unanticipated ground conditions, extra works, modifications, suspensions of work, poor weather conditions etc. Based on their causes and effects, one can identify and take into account such delays (Keane and Caletka, 2008). They can also be divided into three categories based on who is responsible for them (Ekanayeka and Perera, 2016): Excusable Delays, Non-Excusable Delays, and Concurrent Delays.

2.3. Delay in Project Completion

Delay in project accomplishment is generally experienced in the construction projects and has always being a problem in the construction manufacturing and is being regularly reported in many countries (Oyegoke and Al Kiyumi, 2017; Budayan et al. 2018). Considering the potential benefit of construction projects to the economic improvement of any nation and the challenge of projects delay is gradually becoming a global occurrence, it is therefore of great consequence that causes of delay in construction projects be explored in depth, as an in-depth analysis of the concept could be what is needed to alleviate the distress and anxiety to all the parties involved in construction projects and making sure that projects are completed within the specified budgeted time and cost. Also, understanding of the main factors causing the construction projects delays can aid in evaluating the gaps and inadequacies in project implementation and can pave ways of improvement of project performance.

According to Marzouk and El-Rasas (2014), a construction delay is when the project is delivered later than the agreed-upon deadline or the date specified in the contract. The lengthening of the construction period as a result of disruptive events that impede the construction workflow might result in project delays in the road construction sector (Shebob et al., 2012). Additionally, these delays hurt both the contractors and the people who benefit from the finished projects.

In most nations, especially those that are developing, construction delays are a typical occurrence. According to numerous studies (Ghaffari, 2013; Marzouk and El-Rasas, 2014), clients, contractors, and consultants all suffer when construction projects are delayed. Due to varying surroundings and the methods used in the construction processes, the causes and effects of these delay factors in the road construction business vary from nation to country. For instance, in Ethiopia, where the government is the only client for projects involving the construction of roads, a different set of circumstances are likely to cause delays than those that frequently affect delays in industrialized nations where the private sector is primarily responsible for such projects. As a result, generalizations about the reasons for and consequences of project delays are more challenging.

This study therefore attempts to investigate the major causes and effects of road construction project delays specific to Jimma Zone, by identifying the different types of construction delays, their causes and effects from different perceptions, in order to determine the impact and the level of importance of the identified delay factors in road construction projects in Oromia regional State Jimma Zone.

2.4. Delay Factor Issues

Recent studies have sought to categorize and distinguish road construction project delays based on their context (Rosazuwad, 2010; Chai and Yusof, 2015; Elawi et al., 2015). Based on these investigations, three basic categories excusable delays with compensation, excusable delays without compensation, and non-excusable delays can be made for the causes of construction delays.

2.4.1. Excusable Delays with Compensation

These are delays that happen as a result of unavoidable circumstances beyond the control of the contractor or the subcontractor, frequently brought on by the client's actions or inactions. Contractors that experience this kind of delay are entitled to a time extension as well as financial compensation for the inconvenience. When a site owner refuses entry after issuing

the notice to proceed, that is an example of an excused delay with compensation. This kind of delay can occur unexpectedly but isn't the contractor's fault (Chai and Yusof, 2015; Elawi et al., 2015).

2.4.2. Excusable Delays without compensation

Such delays happen when neither the client nor the contractor is held accountable. Since there is no legal basis for damages when this kind of delay occurs, only a time extension will be justified. Due to the delay, the construction can now be completed with no further payment to the contractor. This type of delay is brought on by labor force protest, unforeseen weather circumstances that hinder or impair operations, unexpectedly delayed equipment delivery, and unexpectedly delayed material supply (Adam et al., 2015).

2.4.3. Non-excusable Delays

This occurs because the contractor disregarded clauses in the construction contract. If the contract agreement specifically mentions the client's loss, the client may assert it. Due to the client's infrequent review of the building project schedule, these delays must be discovered. This type of delay is typically caused by predictable weather-related delays, delays brought on by the subcontractor, ineffective project management by the contractor, poor financial management of the project, a lack of labor, failure to manage work in accordance with the contract schedule, and frequent but preventable mistakes or failure to meet owner specifications (Vasilyeva-Lyulina et al., 2015).

There are many different elements and connected problems that affect the delays in road construction projects. Cost overruns that hurt clients, contractors, and consultants are frequently associated with this problem. Delays cost the owner money and make their facilities unavailable. Contrarily, a delay costs the contractor money because it necessitates purchasing additional supplies and labor as well as additional equipment. All these unfavorable outcomes may lead to legal action, arbitration, difficulties with financial flow, and an overall apprehensive attitude toward one another. Because of this, the reasons for the delays varied for each party (Motaleb, 2014).

According to Al-Kharashi and Skitmore (2009), the causes of delays in road construction projects differ from nation to nation. For instance, it can be argued that in developing nations where governments are the only owners of road construction projects, the three key variables that significantly affect the growth of the road construction industry are national economic growth, government spending, and the level of community demand (Tang et al., 2003).

Different considerations would therefore inevitably affect delays in African nations like Ethiopia, where the government is the only owner of road development projects. Previously, Ye, G., Jin, Z., Xia, B., & Skitmore, M. (2015). Proposed that governments, particularly those of developing nations, were primarily focused on road construction. Thus, it may be concluded from research findings that the main reasons and effects of delays factors in the road construction industry vary from country to country, due to different environments and the techniques applied which affect the construction processes.

2.4.4. Environmental causing Delay

Environmental factors refer to both natural and human factors that surround us these conditions (such as natural resources, climate, political systems, Scott, (2014). Environmental factors are natural and socioeconomic conditions in which humans interact with each other. These conditions play a key role in shaping social institutions and relationships. Examples of environmental factors include climate, natural resources, political systems, population size, and more.

Pakistan and Sri Lanka encountering delays by financial issues together with the shortage of equipment and materials, and environmental calamities (El-Sayegh, 2016; M. Haseeb, Xinhai-Lu, A. Bibi, M-Dylian, 2011). Managerial issues, financial difficulties, shortages of resources like labor, materials, and equipment, along with contractors' inexperience are identified as the most influential factors for project delay in Malaysia (B. Honig, 2009; M. Haseeb, Xinhai-Lu, A. Bibi, M-Dylian, 2011). Managerial issues, financial difficulties, shortages of resources like labor, materials, and equipment, along with contractors' inexperience, delay in design and change orders during construction are identified as critical influential factors for construction project delay in Indonesian, Thailand, Afghanistan, and Vietnam.

2.5. Effects of Delays

Delays, a persistent issue in the road building sector, have been identified as having time and cost overruns as its primary effects. But other repercussions of delayed road development projects have been discovered by certain experts. For instance, Kikwasi (2013) highlighted cost and time overrun, compromised quality, arbitration, conflicts, litigation, low profit margin or financial loss, contract cancellation, and complete abandonment of the project as some of the consequences of delays. According to Salunkhe and Patil (2014), all of these delays have a detrimental impact on both the client and the building company.

Al-Khalil and Al-Ghafly (2015) looked at the connection between project circumstances, job scope, and timetable in the context of road construction. They noticed that any modifications to any of these three items could impact the amount of compensation and the turnaround time. It has been suggested that raising knowledge of the reasons behind project schedule delays, how frequently they occur, and how much they negatively impact project delivery is vital. According to Kaliba et al. (2009), construction project delays are a common occurrence, particularly in road construction projects, and their effects vary depending on the party involved. However, delays typically result in a loss of resources such as money, time, and capability.

The literature discussed in this section makes it clear that a systematic methodology must be implemented to combat delays and, as a result, lessen the effects of those delays in order to address the problem of delays in the construction sector. This may entail a number of strategies, such as ensuring that estimates are appropriately created by qualified experts and that clients submit a detailed brief of the work to be done. The budget team should be appointed early and be involved in the design process, and consultants should make sure that the design and specifications are within the approved budget. A project's risk and potential effects of less likely events must be considered by all partners. A closer coordination of consultants is necessary and utilization of an experienced consultant to produce a concluding design, working drawings, and contract drawings, should be done at the tender stage. In addition, preserving proper communication channels and certification is very important in terms of order management variations. Halwatura and Ranasinghe (2013) concluded in their study on the causes of delay in road construction projects that in order to minimize the effects of delays in construction projects, adequate planning in advance is required by all involved parties before commencement of work at the site.

2.6. Methods for Minimizing Delays in Road Construction Projects

In an effort to alleviate project delays in the field of road construction, various studies have in the past suggested various ways and techniques. Although there are some variations and differences in degree among all of these earlier techniques and approaches, an understanding of their weaknesses and strengths will aid this study in choosing a better strategy for dealing with these delay issues, particularly in the context of Ethiopia based on the various influential factors already identified during the course of this literature review.

The approach recommended by Abdul Rahman et al. (2013) assumed that financial matters should be given significant attention by making sure that there is an efficient procedure for making timely payments from the client to the contractor, from the contractor to the subcontractor, to suppliers, and to employees. Based on the significant influence equipment-related factors have on project execution, they also advised construction firms to invest heavily in the newest machinery, tools, and technology rather than obtaining them on a rental basis, and to have enough materials on hand to ensure a smooth supply throughout the project construction phase.

According to Memon et al. (2014), good time management may be improved with careful planning of the task, devoted leadership and management, and an efficient communication system. Indonesian road development projects in Padang and Pekanbaru were the subject of a framework designed by Harisaweni in 2007. All of these frameworks demonstrate that the cycling processes in each one are essentially the same and that they all serve the same function, which is to manage the project. Because it included thorough explanations of the potential activities and undertakings, the framework given by Bakhary et al. (2016) proposed a more succinct definition than others.

2.7. Review of Empirical Literature

Many articles have reported studies on the causes and effects of delay in road construction projects. The researcher assesses many studies for empirical studies.

In their study on the reasons behind delays in the Indian construction sector, Prakash and Joseph (2014) noted that seven categories were involved. These are the client, contractor, consultant, material, equipment, labor, and external element. The three main factors that led to the causes of delays were inadequate coordination and communication by the owner throughout construction, late revision and approval of design papers, and delays in the work of subcontractors. The most major category of delays was shown to be contractor-related, followed by client-related and consultant-related delays.

The researcher didn't study the environmental factors on causes and effects of delay road construction.

The frequency of occurrence, seriousness, and importance of each of the 55 causes of delay they found were determined by Drs. Ashraf Samarah and Ghanim A. Bekr (2016) in their investigation of the causes and impacts of delays in public construction projects in Jordan. The top 22 factors among the 55 causes were listed as the client's design changes, the

contractor's poor planning and management, the use of the lowest bid that resulted in poor performance, changes to the project's scope, a mistake in the design and contract documents, late payments from the client, rework because of construction flaws, and changes to the original design. They also noted low production, contractor technical issues, and improper building practices.

Accordingly, major causes and effects of construction project delays in Nigerian construction industries are identified as, Insufficient number of equipment, inaccurate time estimate, interim payment difficulties, change orders, inaccurate cost estimate, poor site management and supervision, inadequate modern equipment, shortage of construction materials, incompetent project team, improper project planning and scheduling and contractors' financial difficulties. (Obodoh D.A & Chikasi Obodoh, 2016)

After examining the causes of delays in road construction projects in Egypt, R.F. Aziz and A.A. Abdel-Hakam (2016) identified 15 groups of delay factors, including those related to equipment, design, contractors, materials, contracts, consultants, financing, sites, scheduling and controlling, owners, contractual relationships, labor, and projects.

According to the study conducted on, 'Factors Affecting Cost Overrun in Road Construction Projects in Saudi Arabia from contractors' viewpoint' by Abdullah Alhomidan, 41 factors considered in a survey indicates that the most severe factors affecting cost overrun in road construction projects are: internal administrative problems, payments delay, poor communication between construction parties, and delays in decision making. The results show that most of the critical factors are managerial factors that could be controlled and minimized by improving the managerial skills of the construction teams by conducting proper trainings and workshops.

Ashraf, S., & Ghanim A. B., (2016) identified 10 causes of delay in public construction projects in Jordan where among the top 10 factors causing delays on construction sites in Jordan, eight out of the ten are related to client and contractor (four for each). Only two factors are related to consultant the sixth and the ninth. The top ten delay causing factors are: inadequate management and supervision by the contractor, client's changes of the design, inadequate planning and control by the contractor, using lowest bid that lead to low performance, changes in the extent of the project, errors in design and contract documents, delay in progress payments by the client, rework due to mistakes during construction, changes in the original design, and low level productivity.

Study by Endale, M. (2016) on Major Causes to the delay in the construction of 40/60 Saving Houses Project in Addis Ababa have been identified ten top causes of delay. These include: shortage of labors, unqualified work-force, inadequate contractor's experience, difficulties in financing project by contractor, ineffective planning and scheduling of project by contractor, low productivity of labors, and delay in progress payments by owner. Similarly, Tsegay G. & H. Luo (2017) study on analysis of delay impact on construction project identified six critical factors of delay in the Ethiopian construction project most as from overall respondent's point of views. These are sequentially ranked as corruption, unavailability of utilities at site, inflation or price increases in materials, lack of quality materials, late design and design documents, slow delivery of materials, late in approving and receiving of complete project work, poor site management and performance, late release budget/ funds, and ineffective project planning and scheduling.

Study by (Shambel and Patel, 2018), on factors influencing time and cost overruns in road construction projects in Ethiopia identified six main sources of delay. They include financial problems, improper planning, land acquisition and construction delay, design changes, less materials and equipment supply by contractors, incomplete design. Merid (2016) concluded less emphasis to planning, poor contract management and Poor pre planning process has been ranked in the first, second and third position as the causes of time overruns at Defense Construction Enterprise in Ethiopia. Siraw (2015) concluded that slow cite clearance, contractor's financial problems, inflation, exchange rate fluctuation, supply of material, inadequate contractors experience, low productivity of labor, inaccurate cost estimation, poor resource management, and improper planning are the top ten client related construction delay.

Shewaferahu (2016) identified lack of funds to finance the project, changes in drawings, lack of effective communication among parties, lack of adequate information from consultants, slow decision making, unrealistic contract duration and variations, mistake and discrepancies in contract document, equipment availability and failure, mistakes during construction, bad weather, fluctuation in materials prices, ineffective planning and scheduling, low labor productivity as construction delay factors.

The analysis of the data revealed that excessive change orders, time-consuming decision processes taken by the owners, design error, time delay in approving design documents by the owner, error in contract documents, unrealistic schedule, delay in getting permission and acquisition, complexities and ambiguities of project design, poor communication and coordination of the owners with other parties and delay in providing the design documents by

the designer were the top ten main factors. As it can be seen in from the survey result, the role of the owner was significant as a top factor in causing delays, and change orders were identified as the primary cause of delay.

The delay and cost overrun are also key issues in the developed countries. For example, Shah (2016) published a report entitled 'Exploration of causes for delay and cost overrun in construction, projects in the case of Australia, Malaysia & Ghana' identified the critical factors for developed and developing countries. The study concluded that in Ghana the most critical factor and threat to the project delay is the delay in payment, which could have significant impact on the project progress and its performance in terms of quality and services followed by underestimation of the project cost and underestimation of complexity of the projects. These factors are common in the developing countries in the construction industry. In contrast, Australia and Malaysia share the most of critical factors are similar. For example, lack of planning & scheduling by contractors and poor site management & ineffective construction techniques are ranked as the first and second most influential factor for delaying the project.

Chan and Kumaraswamy, (2017) studied delay factors on projects in in Hong Kong construction projects and found out that site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client-initiated variations and necessary variations of works appear to be five significant sources of construction time overrun of projects. (Al Ahmadi and Nawab, 2016) investigated delay factors in construction projects in Saudi Arabia. The main causes of delay identified were slowness of owner decision making process, delay in contractor's payment by owner, delay in progress payment by owner, change orders by owner during construction and uncooperative owners.

2.8. Summary and Literature Gap

To summarize the literature reviews in this paper, the authors have reviewed various studies related to the causes and effects of delays in road construction projects. The literature review has identified five major categories of delay causing factors, including client-related factors, consultant-related factors, contractor-related factors, material and equipment-related factors, and external related factors. The authors have also reviewed the effects of delays, which include time overrun, cost overrun, financial loss, and poor quality of work, company's bad reputation, and loss of other facilities, disputes, loss of wealth and capacity, and breaches of

contract. The literature review has provided a comprehensive understanding of the causes and effects of delays in road construction projects, which will be used to identify the research gap and develop the research methodology. To the best of my knowledge there is no organized research has been carried out to record and carefully examine the issue.

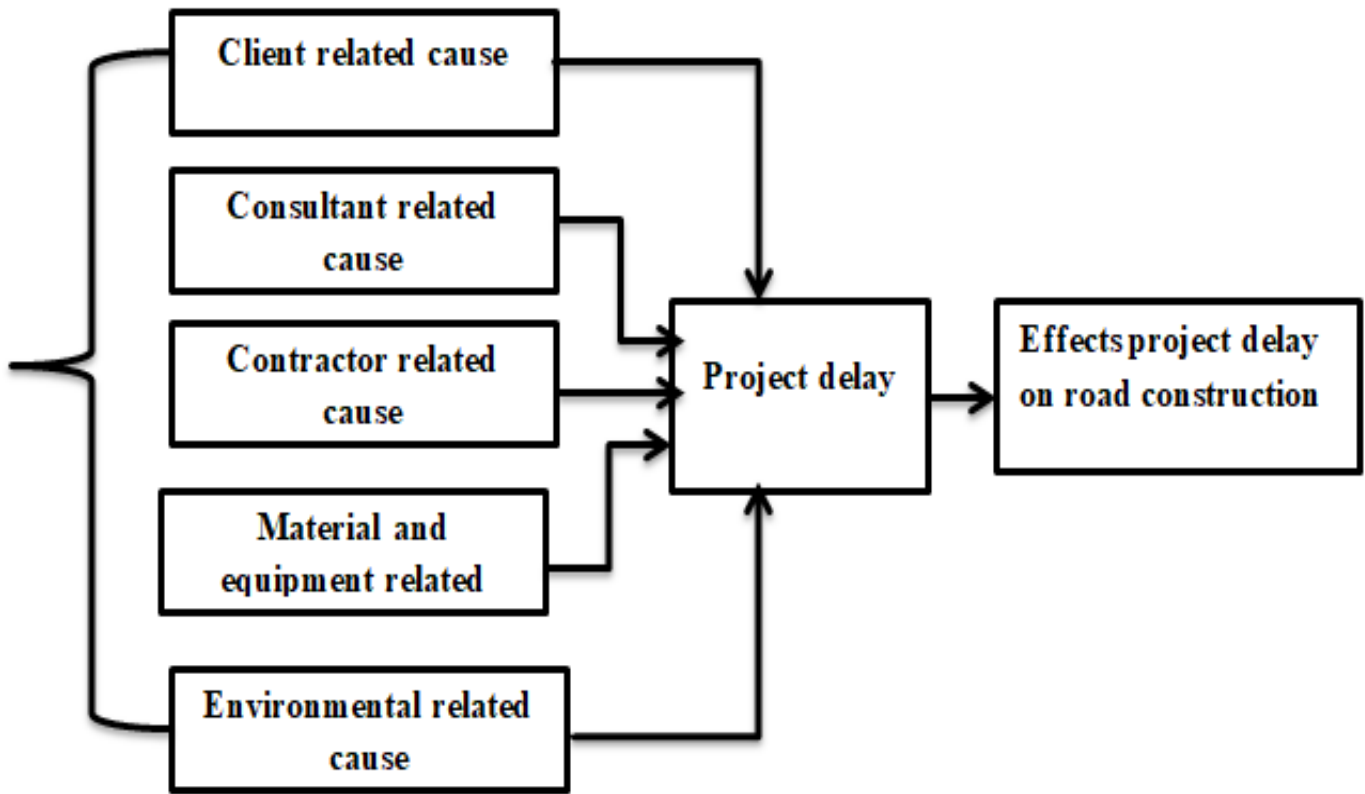
All the studies didn't consider the entire independent variables (client related factor, contractor related factor, consultant related factors, material and equipment related factors) on project delays and their effects on project success. Moreover, these studies conducted in different environmental and contextual setting, and the studies didn't consider the independent variable about environmental related factors. This is the other research gap that I have investigated.

Thus, this study will be conducted to produce scientific data that can assist policy makers in making decisions that may improve the performance the regional construction industry.

2.9. Conceptual Framework

This section's goal is to review the concepts from the previous works mentioned above and to highlight the contributions made to this field of study. Studies on the impacts of construction delays on roads have been done in a number of ways. 36 causes and 16 effects are determined from the reviewed literature. The factors that contribute to construction delays on roads are categorized by R.F. Aziz and A.A. Abdel-Hakam (2016) as follows: equipment related group, design related group, contractor related group, material related group, contract related group, consultant related group, financing related group, site related group, scheduling and controlling related group, owner related group, contractual relationship related group, labor related group, project related group, external related group, and rules and regulations related group. K.khair et.al (2016) summed up these groups in to contractor related, owner related, consultant related, government and external related factor. Therefore, this study re-clustered these factors in to 5 categories as client related, consultant related, contractor related, material and equipment related and external related factors.

According to the reviewed literature, the effects of road construction delays include cost overruns, time overruns, compromised quality, arbitration, disputes, negotiations, court cases, litigation, low profit margins or financial losses, contract revocation, complete project abandonment, loss of wealth and capacity, breaches of contract, subpar work, a bad reputation for the company, and loss of other facilities.



Source: Aziz & Khair, (2016)

Figure 1: Conceptual Frame work

CHAPTER THREE

3. RESEARCH METHODOLOGY

This chapter explains the technique and steps that would be taken to choose the manner and strategies for gathering information and data from the study population using administrative and field sources. Using the findings of all the evaluated research, the study categorized and ranked the variables that affect the length of the of road construction in Ethiopia; the case of Oromia road projects, Jimma zone road projects and their outcomes. This chapter covers the research's design, demographic, sample size and design, data collection techniques, instrument validity and reliability, methods of data analysis, and research ethics that was upheld throughout the study.

3.1. Research Design and Approach

3.1.1. Research Design

The study used both explanatory and descriptive approach through surveys to assess the causes and effects of delay on road construction: the case of Oromia road projects, Jimma zone.

The purpose of explanatory approach field study used to assess the extent of the relationships or correlations between the independent variables and dependent variables.

A correlation research study allows the researcher to describe in quantitative terms the degree to which two or more variables are related. Therefore, explanatory survey was designed to examine the causes and effect of all road project delays.

Descriptive studies present facts, existing conditions concerning the nurture of persons, a number of objectives or class of events and may entail procedures of enumeration and induction analysis, classification details and measurement (Creswell, 2014).

3.1.2. Research Approach

Quantitative approach was designed to investigate the problem under study; Quantitative research is a means for testing objective theories by examining the relationship among variables (Creswell, 2008). These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures. So, the researcher used these quantitative helps us to assessment of factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone.

3.2. Sources of Data

In regard to the subject at hand, a primary was utilized. A questionnaire survey was used as the primary sources of data. The data was gathered by using questionnaires to the respondents.

3.3. Data Collection Methods

To get primary data a structured questionnaire was developed by the researcher which helped to obtain direct information from the targeted population. Thus, five points Likert rating scale ranging from strongly disagree (1) to strongly agree (5) were used in the study which is shown in the table 3.1 and 3.2 below.

Table 3.1: Likert scale for frequency of occurrence of related delay causes

Category	Never	Rarely	Sometimes	often	Greatly often
Rating	1	2	3	4	5

Table 3.2: Likert scale for most influential effects of delay

category	Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree
Rating	1	2	3	4	5

3.4. Sample Size, Sampling Method, and Target Population

3.4.1. Target Population

A population is an entire group of individuals, events, or objects having common evident features. A target population is a population to which a researcher wants to take a broad view of the results of a study (Coolican, 2013). The target population of this study was among the client/owner, consultants, contractors, project managers, office engineers, site engineers, and supervisors with experience in the road construction industry and currently involved in Ethiopia; the case of Oromia road projects, Jimma zone road construction projects. There are 96 clients, 84 contractors, and 82 consultants giving a total of 262 study population.

3.4.2. Sample Size

Sampling is the process of systematically choosing a sub-set of the total population that the researchers are interested in surveying. Regarding to these Paula et al. (2001) noted that, sampling refers to drawing a sample or selecting a subset of elements from a population. The design of a sampling strategy is an important issue for a research study and it can be a powerful tool for accurately measuring opinions and characteristics of a population. The usual goal in sampling is to produce a representative sample.

As it is stated by Paula et al. (2001), a perfect representative sample would be a mirror image of the population from which it will be selected.

Depending up on Taro Yamane (1973) the sample size have been calculated as follows to represent the total population or universe 262, which is the total number of professional employees managed under the selected company found in Ethiopia; the case of Oromia road projects, Jimma zone at 95% confidence level.

It is calculated as follows:

$$n = \frac{N}{1+N(e)^2}$$
$$n = \frac{262}{1+262(0.05)^2}$$
$$n=\underline{158}$$

Where, n=Sample size, N= Population, e= standard error

Therefore the total sample size representing the population is 158 employees which have been used to assess the cause and effect of delay on road construction in Oromia Road Authority the case of Ethiopia; the case of Oromia road projects, Jimma zone.

For the convenience of the study the calculated 158 number of samples were collected from managerial and non-managerial employees working and managed under Oromia Road Authority the case of Ethiopia; the case of Oromia road projects, Jimma zone as follows in the following table.

Table 3.3: Sample size

Category	Number of Employees	Proportionate sample size from stratum $n_h = (N_h/N_s)n$
Clients	96	58
Contractors	84	51
Consultants	82	49
Total	262	158

Source: Own survey data, 2023

3.4.3. Sampling Technique

In this study used stratified simple random sampling techniques in order to assessment of the causes and effects of delay on road construction: the case of Oromia road projects, Jimma zone. Stratified simple random sampling technique greatly enhances the likelihood of the proper representation of strata in the sample.

Paula et al. (2001) noted that, under stratified random sampling the researcher can have more precise information inside the sub populations about the variables of the researcher's study. This leads the researcher to choose stratified random sampling for the current study.

3.5. Validity and Reliability of Instrument

According to Kothari (2004) validity is defined as the extent to which a test to measure what is the actual accuracy and precision of a measurement procedure. Validity of content is also mentioned to be the degree to which the content element of the questionnaire instrument covers the concept being evaluated. The validity of data collection instruments were checked against the available literatures. Moreover, to check the validity of the contents enclosed in the questionnaires, the advisor and other responsible parties were asked whether the issues in the questionnaire satisfactorily covered the crucial factors in determining how long road construction projects take to complete.

Reliability of the data collection instrument is the consistency of measurement and frequently assessed using a test-retest reliability method (Cooper and Schinder, 2014). Reliability enables the researcher to identify the ambiguities and inadequate items in the research instrument; where the instrument reliability is the dependability, consistency or trustworthiness of a test. The scores were tested using Cronbach's Alpha for the data to be reliable for those questionnaires raised by Likert scale. According to George & Mallery

(2003), it is recommended that if a Cronbach's coefficient of measurement scale exceeds 0.70 is acceptable as an internally consistent so that further analysis can be carried unless it is unacceptable. They indicated the alpha in the following rule of thumb concerning reliability coefficient: Alpha > 0.9 – Excellent, Alpha > 0.8 – Good, Alpha > 0.7 – Acceptable, Alpha > 0.6 – Questionable, Alpha > 0.5 – Poor and Alpha < 0.5 – Unacceptable. Cronbach's coefficient in table below shows that all the variables are found in the acceptable level.

No.	Variables	Cronbach's coefficient	No of items
1	Client related factors	.758	9
2	Consultant related factors	.827	8
3	Contractors related factors	.825	10
4	Material and Equipment related factors	.796	10
5	Environmental related factors	.789	10
6	Delay in Road Construction projects	.763	7
7	Overall	.935	54

3.6. Methods of Data Analysis

The collected data perception from Road construction related respondents was studied analyzed critically to determine the various causes and effects of actual delay in projects. The software tool used for the analysis was SPSS version 26. The collected data edited for completeness, homogeneity, and accuracy. Finally, both descriptive and inferential statistics was used to analyze the data. Among the descriptive statistics frequency distributions, means, standard deviation and relative importance index method was used. Relative importance index method was used to determine the relative importance of the various causes on project delay of road construction.

RIIs is calculated for each factor as follows: $RII = \frac{\sum W}{A*N}$

Where RII = Relative Importance Index

W = weights given to each factor by respondents (ranging from 1 to 5)

A = highest weight (i.e., 5 in this case) and

N = total number of respondents.

The RII value had a range of 0 to 1 (0 not inclusive); the higher the RII, the more important was the factor (Sambasivan and Soon, 2007). The RIIs was then ranked, and the results are shown in different tables at next chapter four.

Among the inferential statistics Pearson correlation and multiple linear regressions analysis were used to identify the effect of project delay of road construction.

3.7. Model Specification

The researcher was used ordinary least square (OLS) regression method to analyze the result. This regression analyses were conducted to know by how much the independent variable explains the dependent variable. The regression was conducted between causes of delay (independent variable) and delay of road construction (dependent variable) measured opinion of respondents for both financial and non-financial performances. The result of the regression analysis is presented as follows.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon_i$$

Where

Y is dependent variable which is explained by the independent variables

β_0 is constant

$\beta_1 \dots \beta_n$ are the coefficient of the independent variables X_1 to X_n .

ε_i is an error term

Specifically, model for this study can be expressed as follows;

$$D = \beta_0 + \beta_1 CL + \beta_2 CO + \beta_3 K + \beta_4 ME + \beta_5 E + \varepsilon_i$$

Where,

D=Delay of road construction

CL= Client related causes

CO= Consultant related causes

K= Contractor related causes

ME= Material and equipment related causes

E= Environmental related causes

3.8. Research Ethics

The researcher was followed ethically and morally acceptable processes throughout the research process. The data was collected with the full consent of the participants and they were aware about the purpose of the study. A document was reviewed from the organization remained confidential. The conclusions and outcomes of this study won't be applied to any other endeavor. During this study respondents were free to respond their own opinion from their experience, and their personal information such as name and detailed information was not mentioned.

CHAPTER FOUR

4. DATA ANALYSIS, INTERPRETATION AND PRESENTATION

4.1. Introduction

This chapter focuses on the analysis of the data collected from the field as well as the discussions of the findings. The results of the study are based on the general objective of the study which was to assess the causes and effects of delay in road construction the case Oromia Road projects, Jimma Zone. The results of the study are presented in both tabular and graphical formats. Once the primary data was collected, before the analysis, the questionnaire was reviewed and it was to certify that if questionnaires were filled appropriately.

Only 153 questionnaires were collected out of 158 distributed questioners to the selected respondents that make 96.8% response rate. To reduce the possible errors in the data administration, immediately after the collection of data, the researcher checked the outliers, missing values, and discrepancies. Hence, the data gathered were organized and analyzed in a manner that enables to answer the basic research questions raised at the beginning of the study by using SPSS version 26.

4.2. Demographic Characteristics of the Respondents

In order to have clear understanding about the result of the study, it is important to be familiar with demographic characteristics of the respondents in Jimma Zone Roads Authority. The demographic characteristic consists of sex, age, level of education, stakeholder, and work experience of the respondents. This aspect of the analysis deals with the personal data which was briefly described through tables and charts found below.

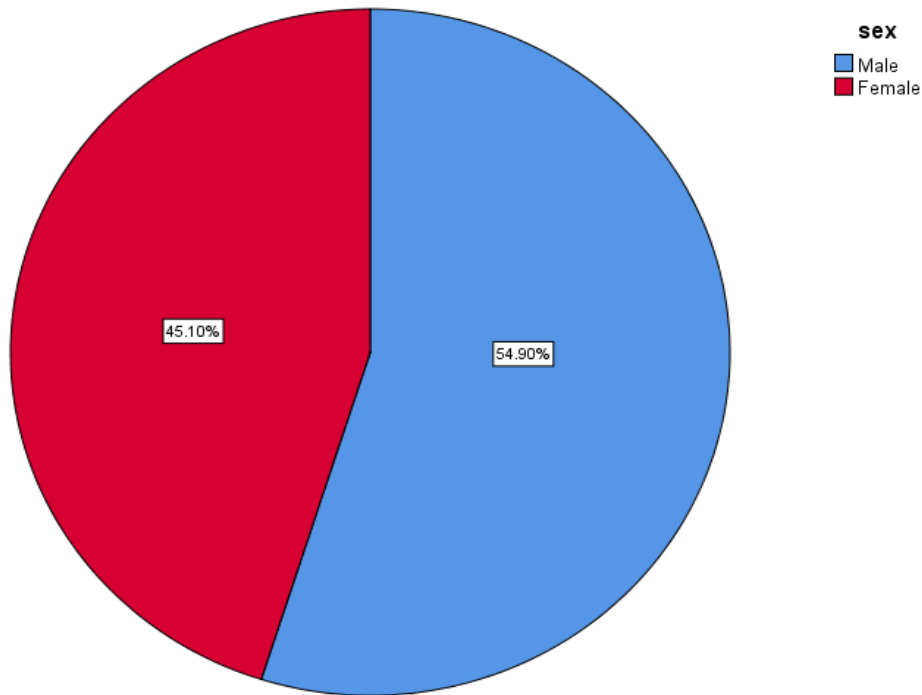


Figure 4.1: Sex of respondents

The above pie chart gives information on the composition of the respondents in terms of sex. The reason that the researcher included this part is to make sure that respondents are in an appropriate mix in terms of gender. The result showed that there were a balanced number of male and female respondents which accounts for 54.9% male and 45.1% female.

Table 4.1: Age of respondents

Age	Frequency	Percent
18-30 years	51	33.3
31-40 years	72	47.1
41-50 years	17	11.1
51-60 years	13	8.5
Total	153	100.0

Majority of the study respondents 72(47.1%) were in the age range of 31-40 years, hence in their prime productive and reproductive ages, followed by those in the age range of 18-30 years. Minority of the respondents were found in the age interval of above 50 years. The result indicated that most of the respondents are young. This shows the majority of respondents are between ages of 31 and 40 years in which they are active work force and

ready to act where there is comfortable situation is prepared for them because they are in adult age and have many responsibilities in the future. In addition, they are the age group expected to imitate and flexible according to the environment.

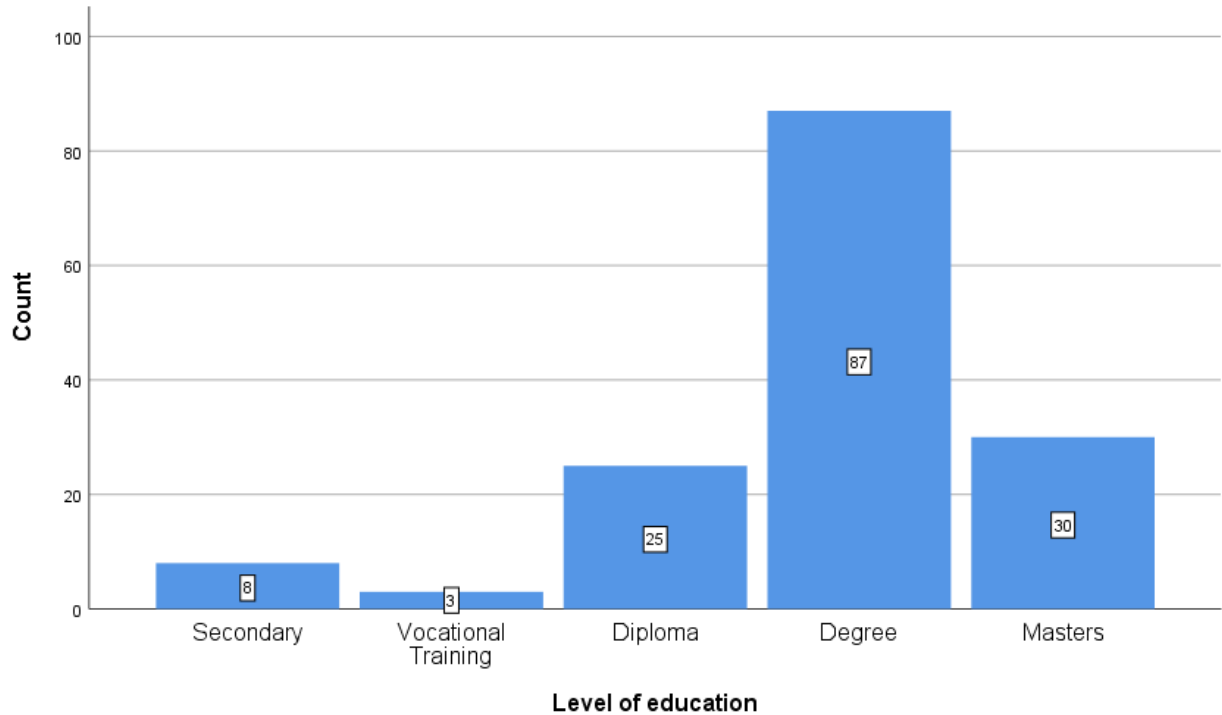


Figure 4.2: Educational level of respondents

More than half 87(56.9%) sample respondents were 1st degree holders, 30(19.6%) were 2nd degree holder, 25(16.3%) were college diploma holder and the remaining 8(5.2%) and 3(2%) of them grade 12 (secondary school) completed and Vocational Trained. Therefore, this result implies that the majority of the respondents were possessed a good level of education and have known - how/understanding about the causes and effects of delay in road construction.

Table 4.2: Experience in road construction

Experience	Frequency	Percent
1-5 years	67	43.8
5-10 years	51	33.3
11-15 years	27	17.6
16-20 years	8	5.2
Total	153	100.0

Taking into account the number of service years of experience, the respondents were asked to state the length of years of service. Accordingly, about 67(43.8%) of the respondents indicated that they had a working experience of 1-5 years. While, 33.5%, and 17.6% of them had 5 to 10, and 11-15 years of experience, respectively. The remaining 8(5.2%) of the respondents had an experience of above 15 years. Therefore, this result indicated that most of the respondents had a knowledge basis of causes and effects of delay in road construction the case Oromia Road projects in Jimma Zone.

Table 4.3: Stakeholders

Stakeholders	Frequency	Percent
Client	64	41.8
Contractor	60	39.2
Consultant	29	19.0
Total	153	100.0

Majority of respondents 64(41.8%) were clients followed by contractor, the remaining 29(19%) were consultant.

4.3. The Importance and Ranking of causes of delay

Delays in road construction projects happen due to various causes and factors. A total of 47 delay causing factors were identified and grouped in to 5 as client related factors, consultant related factors, contractor related factors, material and equipment related factors, and environmental related factors. Regarding to this respondents were asked to rank the delay causing factors based on the frequency of occurrence in road construction projects by using five points Likert scale.

4.3.1. Client related factors

The following table shows the results of the study analysis of factors of client ranking delay factors. Factors were ranked based on relative important index with mean value between group of respondent of contractor, client and consultant.

Table 4.4: Client related factors

Item	Mean	RII	Rank
Type of project bidding and award (selection based on least bidder)	3.56	0.712	1
Lack of coordination with the contractor and utility providers	3.33	0.665	2
Delay in progress payments	3.24	0.648	3
Poor communication & coordination of the owner with other parties	3.16	0.632	4
Slow decision making process	3.15	0.630	5
Delay in delivering construction site to the contractors	2.98	0.597	6
Unrealistic contract duration and requirements imposed	2.82	0.564	7
Lack of experience of owner	2.62	0.524	8
Change orders by owner during construction	2.39	0.477	9

Based on the Table 4.4, type of project bidding and award the major factor that causes delay in road construction projects with mean of 3.56 and RII=0.712. Followed by “Lack of coordination with the contractor and utility providers” as the second ranked factor which caused delays with mean of 3.33 and RII=0.665. The factors “Delay in progress payments” seem to be the third-ranked factors that cause delay in the road construction projects. Consequently, factors such as “Poor communication & coordination of the owner with other parties” and “Slow decision making process” were ranked fourth and fifth respectively. Lack of experience of owner and change orders by owner during construction were the least factor that causes delay in road construction projects.

4.3.2. Consultant related factors

Table 4.5 shows the mean and relative importance index of consultancy related causes of road construction projects in Jimma zone. Accordingly the most important and highly ranked consultant related factors was delay in design documents preparation by consultant with mean of 3.67 and 0.734 followed by lack of consultant’s site staff with mean value of 3.30 and RII=0.661. Poor communication and coordination of the consultant with other parties was the third ranked consultant related factors (RII=0.638) and mistakes in design documents and poor contract management were ranked as the fourth and fifth consultancy related causes of road construction projects. Inaccurate site investigation (RII=.562) and inadequate experience of consultant (RII=.557) were the least consultant related causes of road construction projects in Jimma zone.

Table 4.5: Consultant related factors

Items	Mean	RII	Rank
Delay in design documents preparation by consultant	3.67	0.734	1
Lack of consultant's site staff	3.30	0.661	2
Poor communication and coordination of the consultant with other parties	3.19	0.638	3
Mistakes and discrepancies in design documents	3.04	0.608	4
Poor contract management	2.88	0.576	5
Delay in inspection and testing by the consultant	2.87	0.574	6
Inaccurate site investigation	2.81	0.562	7
Inadequate experience of consultant;	2.78	0.557	8

4.3.3. Contractors related factors

According to Table 4.6 below the most important and highly ranked contractor related causes of road construction projects in Jimma zone were weak in follow up the planned work schedule by the contractor (RII=0.805) with mean value of 4.02, inadequate planning and scheduling of work by contractor (RII=0.759), shortage of contractors' materials on site (RII=0.729), and poor communication & coordination of owner with other parties (RII=0.715). Poor site management and supervision by contractors (RII=0.688), difficulties in financing the construction project by the contractor (RII=0.681), contractors inefficiency in handling resources (RII=0.668), and poor project manager skills (RII=0.667) were also contractor related factors that causes has road construction projects. Poor qualification of the contractor's technical staff (0.633) and rework due to error during construction (RII=0.617) were the least contractor related causes of road construction projects in Jimma zone.

Table 4.6: Contractors related factors

Items	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	4.02	0.805	1
Inadequate planning and scheduling of work by contractor	3.79	0.759	2
Shortage of contractors' materials on site	3.64	0.729	3
Poor communication & coordination of owner with other parties	3.57	0.715	4
Poor site management and supervision by contractors	3.43	0.688	5
Difficulties in financing the construction project by the contractor	3.40	0.681	6
Contractors inefficiency in handling resources	3.34	0.668	7
Poor project manager skills	3.33	0.667	8
Poor qualification of the contractor's technical staff	3.16	0.633	9
Rework due to error during construction	3.08	0.617	10

4.3.4. Material and Equipment related factors

According to Table 4.7 the most important and highly ranked material and equipment related causes of road construction projects in Jimma Zone were unavailability of equipment (RII=0.778) with mean of 3.89, shortage of material (RII=0.775), delay in equipment delivery (RII=0.731), materials not in right place when needed (RII=0.726), unavailability of equipment lists & related design data (RII=.722) and large or long lead-time equipment not received as requested (RII=0.720). Therefore, unavailability of equipment, shortage of material, delay in equipment delivery, materials not in right place when needed, unavailability of related design data, and non-receiving large or long lead-time equipment as requested are the top six material and equipment related delay factors of road construction projects in Jimma Zone.

Table 4.7: Material and equipment related factors

Items	N	RII	Rank
Unavailability of equipment.	3.89	0.778	1
Shortage of material.	3.87	0.775	2
Delay in equipment delivery	3.65	0.731	3
Materials not in right place when needed	3.63	0.726	4
Unavailability of equipment lists & related design data.	3.61	0.722	5
Large or long lead-time equipment not received as requested	3.60	0.720	6
Changes in quality of material.	3.42	0.685	7
Poor material management.	3.31	0.661	8
Shortage of recent technology equipment.	3.18	0.637	9

4.3.5. Environmental related factors

Table 4.8 below shows the most important and highly ranked environmental related causes of road construction project delay in Jimma Zone. Long distance on time completion of the projects (RII=0.835) with mean of 4.17, non-seasonal rain (RII=0.781), working culture (RII=0.740), land disputes (RII=0.739), and shortage of labor (RII=.710) were most important and highly ranked environmental related causes of road construction projects. Therefore, the data shows that long distance on time, non-seasonal rain, working culture, land disputes, and shortage of labor are the top five environmental related delay factors of road construction projects in Jimma Zone.

Table 4.8: Environmental related factors

Items	Mean	RII	Rank
Select material due to long distance on time completion of the projects	4.17	0.835	1
Non seasonal rain affects the road construction.	3.90	0.781	2
Working culture of the area effects on time completion of the projects	3.69	0.740	3
Land disputes and problems of the right of way for roads.	3.69	0.739	4
Shortage of labor effects on time completion of projects	3.55	0.710	5
unforeseen site conditions have also potential risk to road construction	3.26	0.652	6
The office cannot exactly compute risks related to environmental factors	3.22	0.644	7
Lack of selected materials around working environment	3.19	0.632	8
Adequate budget to mitigate environmental damage on the construction	3.13	0.626	9
Landslides effects on time completion project	2.39	0.478	10

4.4. Effect of Delay in Road Construction projects

Table 4.8 below shows Relative Importance Index (RII) of effects of road construction projects delay. Respondents selected the following seven major effects of delay in projects. Respondents identified cost overrun as the most critical effect of delay with a relative importance index of (0.876). The second most essential effect of delay was time overrun with a relative importance index of 0.843. This implies delay of road projects in Jimma zone led to extension of completion time from the initial planned period. The third effect of delay in road projects is litigation and court case with a relative importance index of 0.737 by respondents of the study. The fourth effect of delay in road projects is wastage and underutilization of resources with a relative importance index of 0.685 by respondents of the study. Abandonment of the project (RII=.674), dispute between parties involved (RII=639) and arbitration (RII=0.622) are among the least consequences of delay of completion of road projects construction in Jimma zone.

Table 4.9: Effect of Delay in Road Construction projects

Items	Mean	RII	Rank
Cost overrun	4.37	0.876	1
Time overrun	4.21	0.843	2
Litigation and court case	3.68	0.737	3
Wastage and underutilization of resources	3.42	0.685	4
Abandonment of the project	3.37	0.674	5
Dispute between parties involved	3.19	0.639	6
Arbitration	3.11	0.622	7

4.5. Pearson correlation analysis

After the descriptive analysis, the study conducted Pearson correlation analysis was used to indicate whether there is a relationship between dependent and independent variables. The Pearson correlation scale ranges from -1 to 1, any value greater than zero indicates a positive direct relationship between the two variables, which implies that every increase in the independent variable leads to an increase in the dependent variable, while any value less than zero indicate a negative indirect relationship between two variables, this means that every increase in the independent variable lead to the decrease on the dependent variable (Hafiz, 2007). Different authors suggest different interpretations; However, (Saunders *et.al*, 2009) suggests the strength of the relationship as $r = 0$ to 0.39 or 0 to -0.39 small(weak) relationship, $r = 0.4$ to 0.69 or -0.40 to -0.69 medium (moderate) relationship, and 0.70 to 1 or -0.70 to -1 large (strong) relationship.

The following Table shows the relationship between each variable.

Table 4.10: Correlation analysis

		Client related factors	Consultant related factors	Contractors related factors	Material and Equipment related factors	Environmental related factors	Delay in Road Construction
Client related factors	Pearson Correlation	1					
	Sig. (2-tailed)						
Consultant related factors	Pearson Correlation	.682**	1				
	Sig. (2-tailed)	.000					
Contractors related factors	Pearson Correlation	.562**	.682**	1			
	Sig. (2-tailed)	.000	.000				
Material and Equipment related factors	Pearson Correlation	.448**	.315**	.659**	1		
	Sig. (2-tailed)	.000	.000	.000			
Environmental related factors	Pearson Correlation	.533**	.306**	.581**	.829**	1	
	Sig. (2-tailed)	.000	.000	.000	.000		
Delay in Road Construction projects	Pearson Correlation	.570**	.668**	.747**	.618**	.677**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	

** . Correlation is significant at the 0.01 level (2-tailed).

As it can be seen from table 4.9 above it has been proved that contractors related factors ($r=0.747$, $p\text{-value} < 0.05$) have strong positive relation with delay in road construction projects. Client related factors ($r=0.570$, $p\text{-value} < 0.05$), consultant related factors ($r=0.668$, $p\text{-value} < 0.05$) material and equipment related factors ($r=0.618$, $p\text{-value} < 0.05$), and environmental related factors ($r=0.677$, $p\text{-value} < 0.05$) have a moderate positive relation with delay in road construction projects. Overall there is a direct relationship between delay in Road Construction projects and the independent variables.

4.6. Multiple Linear Regression Analysis

Testing assumption of multiple linear regression analysis models is very important before running regression analysis. So each assumption results were discussed in the following sub topics. In the previous section of this paper the descriptive and correlation analysis was carried out separately with the existence of association between delays in road construction

projects and independent variables. Therefore, the effect of each independent variable must be assessed and identified sequentially. The researcher used multiple linear regression models assumptions as follow.

4.6.1. Multi-collinearity Test between independent variables

According to Gujrati (2003) Multicollinearity tests helps identify the high correlation between independent variables and to avoid the double effect of independent variable from the model. When independent variables are multicollinearity there is overlap or sharing of predictive power. The predictor variable should be strongly related to the dependent variable but not strongly related to each other. This may lead to the paradoxical effect, whereby the regression model fits the data well but, none of the explanatory variables (individually has a significant impact in predicting the dependent variable. For this purpose, variance inflation factor (VIF) and tolerance test were used to check multi-collinearity for variables if the value of VIF is less than 10 there is no multi-collinearity and on the other hand if VIF is greater than or equal to 10 there is a serious Multicollinearity problem.

According to Gujarati, (2003) to avoid the serious problem of Multicollinearity by omitting the variable with 10 and more from the analysis, in addition, tolerance is an indicator of how much of the variability of the independent variable is not explained by the other independent variable in the model and is calculated using the formula $1 - R^2$ for each variable. If the value is very small (less than 0.1), it shows the multiple correlations with another variable are high.

Table 4.11: Multicollinearity Test between independent variables

Independent variables	Tolerance	VIF
Client related factors	.414	2.417
Consultant related factors	.344	2.911
Contractors related factors	.314	3.181
Material and Equipment related factors	.254	3.930
Environmental related factors	.271	3.690

Table 4.10 shows the division result that the value of VIF all variables were by far less than 10 and the value of tolerance statistics being above 0.1 they were accepted entered in to regression model for the estimation of variables. Therefore, this result shows there is no multicollinearity problem in the independent variables.

4.6.2. Normality Test

Normality assumption is around the mean of the residuals is zero and used to determine whether a data set is well modeled by a normal distribution or not and also to indicate un underlying random variable is to be normally distributed (Gujarati.2009). To test the normality assumption the histogram of residuals was used to check the extent to which the residuals are normally distributed. The residuals histogram in Figure 4.3 shows us fairly normal distribution for the variable. Thus, based on these results, the normality of residuals assumption is satisfied for the dependent variable delay in road construction projects.

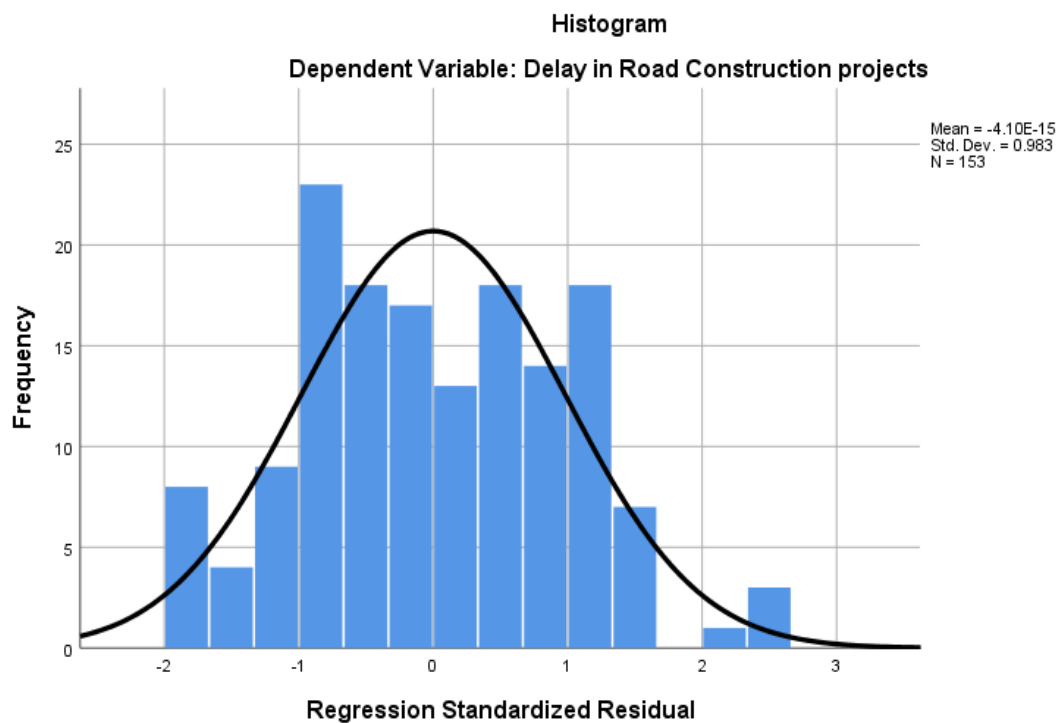


Figure 4.3: Histogram for Normality test

4.6.3. Linearity Assumption

To check the linearity assumption in multiple linear regressions the normal P-P plot was used, the plot shows all observed values somewhat spread along the straight diagonal line. Figure 4.4 in below shows us most of the observed values are spread very close to the straight line; there is high likelihood that the data are normally distributed and linear.

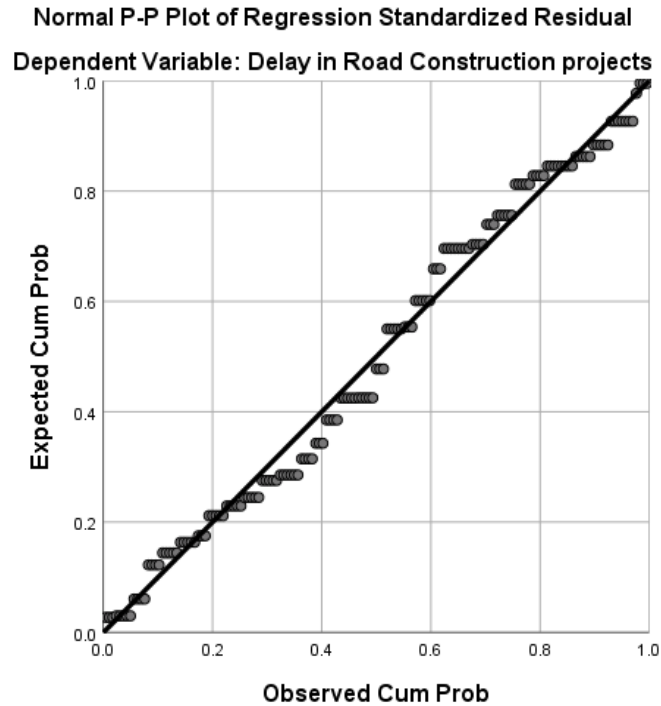


Figure 4.4: p-p plot: Linearity test results

4.6.4. Heteroscedasticity test

To check homogeneity assumption a scatter plot of the residuals against the predicted values was used to indicate whether the homogeneity of variance assumption is met. If it is met, there should be no pattern to the residuals plotted against the predicted values. In figure 4.5, a show there is no clear pattern, so the researchers assume that errors are spread out constantly between the variables. Heteroscedasticity problem exist when scatter plot is greater than 3.3 and less than -3.3. Therefore, as it was indicated in Figure which suggests homogeneity of variance assumption is met

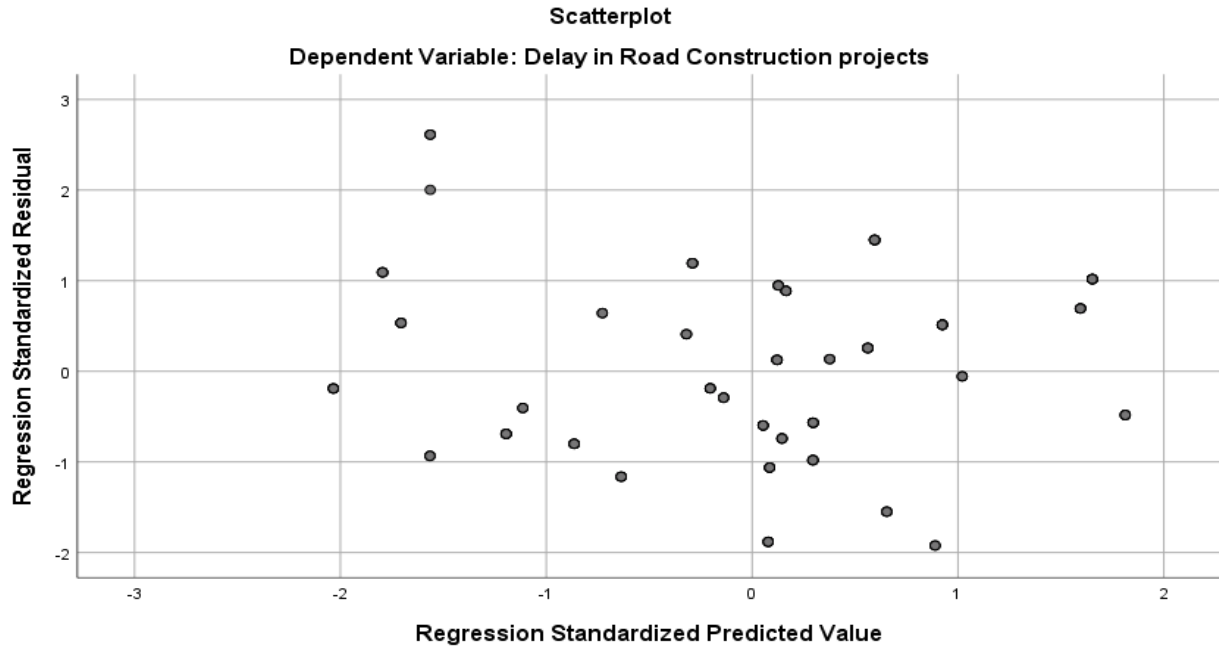


Figure 4.5: Scatter plot Heteroscedasticity test result

4.7. Result of Multiple Linear regression

Multiple regression analysis was then conducted to find out the effects of delay in road construction the case of Oromia road projects, Jimma zone. It gives more detailed analysis as it enabled the examination of the influence of each of the independent variables on dependent variables, controlling for all other factors. It also allowed the researcher to determine the combined effect of the variables (Gay, Mills, & Airasian, 2006).

Multiple linear regression analysis is a well-known statistical technique which fits a relationship between one dependent and more than one independent variable. Accordingly, model summary, an analysis of variance (ANOVA) and regression coefficient for the dependent variables were discussed under this sub-section.

In this subsequent section on regression results, the coefficient of determination (R square) was used as a measure of the explanatory power to show how the independent variables explain the dependent variable. The F statistics (ANOVA) was used as a measure of the model goodness of fit. Pearson correlation and the regression coefficient summary were used to explain the nature of the relationship between the dependent and independent variables. The significance levels of the regression results were also taken into account for proper interpretations. After the model assumption was checked presentation and interpretation of the analysis output is mandatory.

Table 4.12: Model Summary

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.850 ^a	.723	.713	.34411	1.544

As it can be observed from Table 4.11 above there is strong relationship between the independent variables and project delay, as indicated by R=0.850 rated to be strong positive relation. In addition to this the R-Square results showed that the sum total effect of these factors on project delay accounts 72.3% showing that these factors together have this much influence on delay in road construction projects in Jimma zone.

Table 4.13: ANOVA Analysis

Model		Sum of Squares	D f	Mean Square	F	Sig.
1	Regression	45.336	5	9.067	76.573	.000 ^b
	Residual	17.407	147	.118		
	Total	62.743	152			

The ANOVA Table 4.12 above is all about the model fitness test for measuring the effect of these independent variables on project delay. As such, the significance level .000 shows that the F test is large enough to prove that the model is adequate to measure the effect of these factors on delay in road construction projects.

Table 4.14 Standardize and unstandardized coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.312	.225		-1.38	.168
	Client related factors	-.145	.088	-.111	-1.65	.102
	Consultant related factors	.391	.067	.429	5.787	.000*
	Contractors related factors	.281	.083	.262	3.384	.001*
	Material and Equipment related factors	-.058	.103	-.049	-.563	.574
	Environmental related factors	.683	.116	.493	5.907	.000*

a. Dependent Variable: Delay in Road Construction projects

*indicates significance at 5% level

In this study, three independent variables such as consultant, contractors, and environmental related factors were identified as a statistical significant effect on the delay of road construction projects at 5% level of significance.

The estimated regression model was $\text{Project delay} = -0.312 + 0.391 \text{ Consultant related factors} + 0.281 \text{ Contractors related factors} + 0.683 \text{ environmental related factor}$. From the coefficients Table 4.13 above, it can be observed that consultant related factors, contractors' related factors, and environmental related factors had a positive significant effect on road construction projects in Jimma zone. But, client related factors and material and equipment related factors do not have a statistical significant effect on road construction projects. Here we can see from the standardized coefficients that environmental related factors is the most influential factor with the highest 68.3% possible effect on project delay. This shows that an environmental related factor has 68.3% effect on project delay in Jimma zone. It indicates that an increase in environmental related factor leads to increase in project delay.

The other significant effect comes from consultant related factors. It is the other influential factor with the 39.1% possible effect on delay in road construction projects, showing that a one percent increase in consultant related factors lead to increase in project delay by 39.1%.

Contractors' related a factor is the other factor that leads to increase the delay in road construction projects. The standardized coefficients of contractors' related a factor is 0.281; showing that contractors' related a factor has 28.1% effect on project delay in Jimma zone. It indicates that an increase in contractors' related factor leads to increase in project delay by 28.1%.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section takes the final point of view about the topic and suggests solutions to the problem. First, summary of the study presented and secondly conclusion remarks are provided based on important topics discussed in this thesis. Afterwards, recommendations for the problems are given. Finally, limitations of the study presented in detail.

5.1. Summary

The main objective of this study was to assess the causes and effects of delay in road construction the case Oromia Road projects in Jimma Zone. The research approach that was selected for this study was both explanatory and descriptive approach with questionnaire survey as a method for data collection. Descriptive research approach was used to explain perceived causes of road construction project delay in Jimma Zone. Explanatory approach field study was used to assess the extent of the relationships or correlations between the independent variables and dependent variables. Questionnaire surveys were used to obtain information on the problem.

- ✓ The result of the study reveals that the first five major client related factors that cause road construction projects delay are first “Type of project bidding and award”, second “, lack of coordination with the contractor and utility providers”, third “delay in progress payments, fourth “poor communication & coordination of the owner with other parties” and fifth “slow decision making process,” are the first five major causes with RII value 0.712, 0.665, 0.648, 0.632 and 0.630, respectively.
- ✓ Regarding to consultant related factors delay in design documents preparation by consultant, lack of consultant’s site staff, poor communication and coordination of the consultant with other parties, mistakes and discrepancies in design documents, poor contract management first five major consultancy related factors that cause road construction projects delay.
- ✓ Concerning Contractors related factors weak in follow up the planned work schedule by the contractor, inadequate planning and scheduling of work by contractor, shortage of contractors’ materials on site, poor communication & coordination of owner with other parties and poor site management and supervision by contractors were identified as first five major contractors related factors that cause road construction projects delay in Jimma Zone.

- ✓ Unavailability of equipment, shortage of material, delay in equipment delivery, materials not in right place when needed, and unavailability of equipment lists & related design data were identified as the first five major material and equipment related factors that cause road construction projects delay in Jimma Zone.
- ✓ With regarding to environmental related factors, select material due to long distance on time completion of the projects, non-seasonal rain, working culture of the area, land disputes and problems of the right of way for roads, shortage of labor were identified as the first five major environmental related factors that cause road construction projects delay in Jimma Zone .
- ✓ The study also found that the following five major effects of delay, these are; cost overruns, time overrun litigation and court case, Wastage and underutilization of resources and abandonment of the project.
- ✓ The Pearson correlation result showed that there is strong relationship between the independent variables and project delay with overall correlation $R=0.850$. R-Square results showed that the sum total effect of these factors on project delay accounts 72.3% showing that these factors together have this much influence on delay in road construction projects in Jimma zone .
- ✓ Multiple linear regression result showed that consultant, contractors, and environmental related factors were identified as a statistical significant effect on the delay of road construction projects at 5% level of significance.
- ✓ Environmental related factor has 68.3% effect on project delay in Jimma zone. The other significant effect comes from consultant related factors. It is the other influential factor with the 39.1% possible effect on delay in road construction projects, showing that a one percent increase in consultant related factors lead to increase in project delay by 39.1%.
- ✓ Contractors' related a factor is the other factor that leads to increase the delay in road construction projects. The standardized coefficients of contractors' related a factor is 0.281. This indicates that an increase in contractors' related factor leads to increase in project delay by 28.1%.

5.2. Conclusions

It was found from the study that the five most influential causes of road project completion delay were: Weak in follow up the planned work schedule by the contractor (RII=.805), Inadequate planning and scheduling of work by contractor (RII=.759), Unavailability of equipment. (RII=.778), Select material due to long distance (RII= .835), and non-seasonal rain (.781) are the five most influential causes of road project completion delay in Jimma zone.

The study identified cost overruns, time overrun, litigation and court case, wastage and underutilization of resources and abandonment of the project as the major effects of road project delays. These five effects are the consequences or the results of delay of completion of road projects construction in Jimma zone.

Consultant related factors, contractors related factors, and environmental related factors were identified as a statistical significant effect on the delay of road construction projects, but client related factor and material and equipment related factors do not have a statistical significant effect on the delay of road construction projects at 5% level of significance

An environmental related factor is the most influential factor with the highest 68.3% possible effect on project delay followed by consultant related factors. This shows that an environmental related factor has 68.3% effect on project delay in Jimma zone.

Consultant related factors has 39.1% possible effect on delay in road construction projects, showing that a one percent increase in consultant related factors lead to increase in project delay by 39.1%.

Contractors' related a factor is the other factor that leads to increase the delay in road construction projects. The standardized coefficients of contractors' related a factor is 0.281; showing that contractors' related a factor has 28.1% effect on project delay in Jimma zone. It indicates that an increase in contractors' related factor leads to increase in project delay by 28.1%.

5.3. Recommendations

The following suggestions and recommendations are proposed. These recommendations have been established based on the results and findings of the study through survey questionnaires on causes and effects of delay on road construction projects.

- ✓ Type of project bidding and award, lack of coordination with the contractor and utility providers and delay in progress payments are ranked by contractors and consultants as the three most important client related delay factors. Therefore, clients should have a good coordination with the contractor and being realistic so as to avoid delays. And client should work closely with contractor so that bank or any finance institution will have released the payment on schedule.
- ✓ Consultant should work on design documents preparation carefully and on time and should have a good communication and coordination of the consultant with other parties to void delays in reviewing and approving design documents.
- ✓ Contractors should plan and schedule the works from start of project and during the work to match with the resources and time to avoid delays and improve site management and supervision to achieve completion of work within specified time.
- ✓ Jimma Zone Road Authority should follow up the proper implementation of project planning and scheduling technique in each project in order to avoid cost overruns. This can be achieved through properly functionalization of Monitoring and Evaluation team of the organization.
- ✓ Members of construction project team should implement the above identified measure for minimizing extension of time in road construction projects at all stages of a project to minimize delay in road construction projects.
- ✓ This study mainly focused on the current causes of road construction projects. Hence future studies on delay causing factors could be done constantly with their mitigation measures. Specific studies in specific projects that experienced significant delay could also be conducted using similar approaches used in the current study. Also studies based on project size and duration may result in remarkable findings.

References

- Abdul Rahman, I., Memon, A. H., Karim, A., & Tarmizi, A. (2013). Relationship between factors of construction resources affecting project cost. *Modern Applied Science*, 7(1).
- Adam, A., Josephson, P. E., & Lindahl, G. (2015). Implications of cost overruns and time delays on major public construction projects. In *Proceedings of the 19th International Symposium on Advancement of Construction Management and Real Estate* (pp. 747-758). Springer Berlin Heidelberg.
- Adiam A. (2016). Identification of Causes for Late Completion of Federal Road Projects in Ethiopia and Suggested Remedial Measures, Addis Ababa Institute of Technology, School of Graduate Studies. Addis Ababa.
- Aibinu, A. A., and Jagboro, G. O. (2002). The effects of construction delays on project delivery in Nigerian construction industry, *International Journal of Project Management*, 2002, 20(8): 593–599.
- Al-Khalil, M. I., & Al-Ghafly, M. A. (2015). Important causes of delay in public utility projects in Saudi Arabia. *Construction Management & Economics*, 17(5), 647-655.
- Amoatey, C. T., & Ankrah, A. N. O. (2017). Exploring critical road project delay factors in Ghana. *Journal of Facilities Management*.
- Assaf SA. & Al-Hejji S. (2006). Causes of delay in large construction project. *Int J Project Management*. 24 (4): 349-57.
- Association of Construction Development (2014), “Construction delays”, available at: www.associationofconstructiondevelopment.org.
- Aziz, R. F., & Abdel-Hakam, A. A. (2016). Exploring delay causes of road construction projects in Egypt. *Alexandria Engineering Journal*, 55(2), 1515-1539.
- Bakhary, N. A., Adnan, H., & Ibrahim, A. (2016). Developing a Frameworks for a Successful for Claim Management in Malaysian Construction Industry. In *ECRM2016- Proceedings of the 15th European Conference on Research Methodology for Business Management*: ECRM2016 (p. 361).
- Budayan, C., Dikmen, I., Birgonul, M. T., & Ghaziani, A. (2018). A computerized method for delay risk assessment based on fuzzy set theory using MS project™. *KSCE Journal of Civil Engineering*, 22(8), 2714-2725.
- Chai, C. S., & Yusof, A. M. (2015). SEM Approach: Reclassifying Housing Delay in Malaysian Housing Industry. *Journal of Economics, Business and Management*, 3(3), 364-369.
- Chan, D.W. and Kumaraswamy, M.M. (1997). A comparative study of causes of time overruns in Hong Kong construction projects. *Int J Project Manage*; 15(1):55–63.
- Chang, A. S. (2002). “Reasons for cost and schedule increase for engineering design projects.” *J. Manage. Eng.*, 18(1), 29–36.

- Doraisamy, S. V., Akasah, Z. A., & Yunus, R. (2015). An Overview on the Issue of Delay in the Construction Industry. In *In CIEC 2014* (pp. 313-319). Springer, Singapore.
- Dr. Ashraf Samarah & Dr.Ghanim A. Bekr. (2016) Causes and Effects of Delay in Public Construction Projects in Jordan. *American Journal of Engineering Research (AJER)* e-ISSN: 2320-0847 p-ISSN : 2320-0936 Volume-5, Issue-5, pp-87-94
- Ekanayeka, E. M. K., & Perera, B. A. K. S. (2016). Appropriate delay analysis techniques to analyse delays in road construction projects in Sri Lanka. *Built Environment Project and Asset Management*.
- Elawi, G. S. A., Algahtany, M., Kashiwagi, D., & Sullivan, K. (2015). Major Factors Causing Construction Delays in Mecca. *Journal for the Advancement of Performance Information & Value*, 7(1).
- Endale, M. D. (2016). Identification of the Major Causes to the Delay in the Construction of 40/60 Saving Houses Project in Addis Ababa. *AAU*. Addis Ababa.
- Enshassi, et al. (2009). 'Factors affecting the performance of construction projects in the Gaza Strip', *Journal of civil engineering and management*, 5(3): 269–280.
- A. Enshassi, J. Al-Najjar, and M. Kumaraswamy, (2009) "Delays and cost overruns in the construction projects in the Gaza Strip", *J Finan Manag Property Construc*, vol. 14, no. 2, pp. 126-151, 2009. [<http://dx.doi.org/10.1108/13664380910977592>]
- ERA (2009). Road Sector Development Program (RSDP) 19 Years Performance Assessment. Addis Ababa, Ethiopia
- Ghaffari, A. (2013). Developing a Model for Risk and Responsibility Management Share Amongst Stakeholders Consortium in Construction Projects. In *Advanced Materials Research* (Vol. 684, pp. 639-643). Trans Tech Publications.
- Halwatura, R. U., & Ranasinghe, N. P. N. P. (2013). Causes of Variation Orders in Road Construction Projects in SriLanka. *ISRN Construction Engineering*, 2013.
- Harisaweni, H. (2007). The framework for minimizing construction time and cost overruns in Padang and Pekanbaru, Indonesia (Doctoral dissertation, UniversitiTeknologi Malaysia, Faculty of Built Environment).
- J. Nunally, 2007, *Psychometric Theory*, 2nd Edition, New York: McGraw-Hill,
- Kaliba, C., Muya, M., & Mumba, K. (2009). Cost escalation and schedule delays in road construction projects in Zambia. *International Journal of Project Management*, 27(5), 522-531.
- Kothari, C.R., 2004, "Research Methodology", *Methods and Techniques* (2nd ed.), New Age International, Ltd., Publishers
- M. Haseeb, a, Xinhai-Lu, Aneesa Bibi, Maloof-ud-Dyian & Wahab Rabbani,(2011) Causes and Effects of Delays in Large Construction Projects of Pakistan, *Kuwait Chapter of Arabian Journal of Business and Management Review* Vol. 1, No.4; December 2011

- M. Haseeb. (2011). 'Problems of projects and effects of delays in the construction industry of Pakistan', *Australian journal of business and management research*, 1(5): 41-50
- Marzouk, M. M., & El-Rasas, T. I. (2014). Analyzing delay causes in Egyptian construction projects. *Journal of advanced research*, 5(1), 49-55.
- Memon, A. H., Rahman, I. A., Abdullah, M. R., & Azis, A. A. A. (2014). Factors affecting construction cost performance in project management projects: Case of MARA large projects. *International Journal of Civil Engineering and Built Environment*, 1(1).
- Merid, T. (2016). *Assessment of Time and Cost Overruns in Construction Projects: Case Study at Defence Construction Enterprise*. IGNOU-SMU, School of Management Studies.
- Motaleb, O. H. (2014). Development of a risk response model to handle delays of construction projects in the United Arab Emirates.
- Nafishah B., (2006). Developing a framework to minimize the occurrence of construction conflict and disputes in different procurement strategies.
- Obodoh D.A & Chikasi Obodoh. (2016) Causes and Effects of Construction Project Delays in Nigerian Construction Industry IJISSET - International Journal of Innovative Science, Engineering & Technology,(Vol. 3 Issue 5, pp65-84) www.ijiset.com
- Odeh, A.M.; Battaineh, H.T. (2002). Causes of construction delay: Traditional contracts. *International Journal of Project Management*. 20: 67–73.
- Oyegoke, A. S., & Al Kiyumi, N. (2017). The causes, impacts and mitigations of delay in megaprojects in the Sultanate of Oman. *Journal of Financial Management of Property and Construction*.
- Prakash Rao,B.& Joseph camron culas .(2014). Causes of delays in construction projects. *International Journal of Current Research Vol. 6, Issue, 06, pp.7219-7222, June, 2014*
- Prasad, K. V., Vasugi, V., Venkatesan, R., & Bhat, N. (2019). Analysis of causes of delay in Indian construction projects and mitigation measures. *Journal of Financial Management of Property and Construction*.
- Project Management Institute, Inc., (2008). *A Guide to the Project Management Body of Knowledge (PMBOK Guide) (4th Ed.)*. Newtown Square, PA: Author.
- Rosazuwad, M. (2010). *The factors and effect of delay in government construction project (case study in Kuantan) (Doctoral dissertation, Universiti Malaysia Pahang)*.
- Salunkhe, A. A., & Patil, R. S. (2014). Effect of construction delays on project time overrun: Indian scenario. *Int. J. Res. Eng. Technol*, 3, 543-547.
- Sambasivan and Soon, 2007. Causes and effects of delays in Malaysia construction industry *international journal of project management* 25(5): 517-526.
- Shah, R. K. (2016). *An Exploration of Causes for Delay and Cost Overrun in Construction Projects: A Case Study of Australia, Malaysia & Ghana*, *Journal of Advanced College of Engineering and Management*, Vol. 2, ISSN: 2392-4853

- Shambel G. T. & Dixit P. (2018). 'Factors influencing Time and Cost Overruns in Road Construction Projects: Addis Ababa, Ethiopian Scenario', *International Research Journal of Engineering and Technology*, (IRJET) 05 (01)
- Shebob, A., Dawood, N., Shah, R. K., & Xu, Q. (2012). Comparative study of delay factors in Libyan and the UK construction industry. *Engineering, Construction and Architectural Management*, 19(6), 688-712.
- Shewaferahu, T. (2016). Cause and Effects of Delay on Educational Building Projects in Addis Ababa University. Addis Ababa.
- Siraw, Y. T. (2013). 'Analysis of Factors Contributing to Time Overruns on Road Construction Projects under Addis Ababa City Administration', *International Journal of Science and Research (IJSR)*
- T. D. King, (2017). Assessment of problems associated with poor project management performance. Long International, Inc. Colorado. USA.
- Tang, S. L., Poon, S. W., Ahmed, S. M., & Wong, F. K. (2003). *Modern Construction Project Management: The Commercial Success and Political Controversies of Hong Kong's Railway (Vol. 2)*. Hong Kong University Press.
- Tayie, S. (2005) *Research Methods and Writing Research Proposals*. Centre for Advancement of Postgraduate studies and Research in Engineering Sciences, Cairo University
- M. Haseeb, Xinhai-Lu, A. Bibi, M-Dyian, and R. W. (2011). Problems of Projects and Effects of Delays in the Construction Industry of Pakistan. *Aust. J. Bus. Manag. Res.*, 1(5), 41–50.
- B. Honig. (2009). Identifying the Important Causes of Delays in Building Construction Projects. The 9th East Asia-Pacific Conference on Structural Engineering and Construction.
- M. Haseeb, Xinhai-Lu, A. Bibi, M-Dyian, and R. W. (2011). Problems of Projects and Effects of Delays in the Construction Industry of Pakistan. *Aust. J. Bus. Manag. Res.*, 1(5), 41–50.
- Tsegay, G. and H. Luo. (2017). Analysis of delay impact on construction project, creative construction conference, 19-22 June 2017, Primosten, Croatia
- UN, 1996. *International Standards Industrial Classification (ISIC), Rev. 3*.
- Vasilyeva-Lyulina, A., Onishi, M., & Kobayashi, K. (2015). Delay Analysis Methods for Construction Projects: Mathematical Modelling. *INTERNATIONAL JOURNAL OF TRANSPORTATION*, 3(1), 27-36.
- Werku Koshe & K. N. Jha. 2016. Investigating Causes of Construction Delay in Ethiopian Construction Industries. *Journal of Civil, Construction and Environmental Engineering*. Vol. 1, No. 1, pp. 18-29. doi: 10.11648/j.jccee.20160101.13

- Zailani, S., Ariffin, H. A. M., Iranmanesh, M., Moeinzadeh, S., & Iranmanesh, M. (2016). The moderating effect of project risk mitigation strategies on the relationship between delay factors and construction project performance. *Journal of Science and Technology Policy Management*.
- Ye, G., Jin, Z., Xia, B., & Skitmore, M. (2015). Analyzing causes for reworks in construction projects in China. *Journal of Management in Engineering*,

APPENDIX

JIMMA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ACCOUNTING AND FINANCE

Questionnaires for Respondents

Dear participant,

My name is Negesse Getinet Daba and I am a student undertaking a course at Master's Degree Level in Project Management and Finance at Jimma University. So as to fulfill the completion of this course, I am carrying out a study on the "assessment of factor affecting the delay of road construction in Ethiopia; the case of Oromia road projects, Jimma zone". I 'kindly request you to take part in this study by responding to the questionnaire that is enclosed. Please be as honest as you can if you decide to take part in this study. You do not need to include your name in order to guarantee that all the information will be confidential. The information will only be used for academic purposes.

Section I- respondent background

1. Gender: Male Female
2. Age: 18-30yrs 31-40yrs 41-50yrs 51-60yrs Over 60yrs
3. Level of education: Secondary Vocational Training Diploma
Degree Masters
4. Which of the stakeholder are you? (Please choose one).

Contractor <input type="checkbox"/>	Client <input type="checkbox"/>	Consultant <input type="checkbox"/>
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5. For how long have you worked in construction industry? (In Years)
1-5 6-10 11-15 16-20 21 above

Section II: Causes of Delay in Road Construction projects

6. Please tick the extent to which you believe that the following **Client related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority.

Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.

Client related factors	1	2	3	4	5
a. Delay in delivering construction site to the contractors					
b. Lack of experience of owner					
c. Delay in progress payments					
d. Slow decision making process					
e. Unrealistic contract duration and requirements imposed					
f. Poor communication & coordination of the owner with other parties					
g. Lack of coordination with the contractor and utility providers					
h. Change orders by owner during construction					
i. Type of project bidding and award (selection based on least bidder)					

7. Please tick the extent to which you believe that the following **Consultant related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.

Consultant related factors	1	2	3	4	5
a. Poor communication and coordination of the consultant with other parties					
b. Delay in inspection and testing by the consultant					
c. Lack of consultant's site staff					
d. Inadequate experience of consultant;					
e. Mistakes and discrepancies in design documents					
f. Poor contract management					
g. Delay in design documents preparation by consultant					
h. Inaccurate site investigation					

8. Please tick the extent to which you believe that the following **Contractors related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.

Contractors related factors	1	2	3	4	5
a. Poor qualification of the contractor's technical staff					
b. Shortage of contractors' materials on site					
c. Difficulties in financing the construction project by the contractor					
d. Inadequate planning and scheduling of work by contractor					
e. Poor site management and supervision by contractors					
f. Contractors inefficiency in handling resources					
g. Weak in follow up the planned work schedule by the contractor					
h. Rework due to error during construction					
i. Poor communication & coordination of owner with other parties					
j. Poor project manager skills					

9. Please tick the extent to which you believe that the following **Material and Equipment** related factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.

Material and Equipment related factors	1	2	3	4	5
a. Shortage of material.					
b. Changes in quality of material.					
c. Poor material management.					
d. Materials not in right place when needed					
e. Unavailability of equipment.					
f. Delay in equipment delivery					
g. Shortage of recent technology equipment.					
h. Large or long lead-time equipment not received as requested					
i. Unavailability of equipment lists & related design data.					
j. Large or long lead-time equipment not received as requested.					

10. Please tick the extent to which you believe that the following **Environmental related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.

Environmental related factors	1	2	3	4	5
a. Non seasonal rain affects the road construction.					
b. The office cannot exactly compute risks related to environmental factors					
c. Adequate budget to mitigate environmental damage on the construction					
d. Working culture of the area effects on time completion of the projects					
e. lack of selected materials around working environment					
f. shortage of labor effects on time completion of projects					
g. unforeseen site conditions have also potential risk to road construction					
h. select material doe to long distance on time completion of the projects					
i. Land disputes and problems of the right of way for roads.					
j. Landslides effects on time completion project					

Section III: Effects of Delay in Road Construction projects

11. Please rank effects of delay below in what you consider to be the most important effect of delay. 1= Strongly Disagree, 2= Disagree, 3= Slightly Disagree, 4= Agree, 5= Strongly Agree

Effects of Delay	1	2	3	4	5
1. Time overrun					
2. Cost overrun					
3. Dispute between parties involved					
4. Arbitration					
5. Litigation and court case					
6. Total abandonment of the project					
7. Wastage and underutilization of resources					

Thank you very much for your contribution to this study!