Addis Ababa University

College of Business and Economics

Department of Public Administration and Development Management

Determinants of Infrastructure Project Delays and Cost Escalations. The Case of Road and Rail Construction Projects in Ethiopia

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This is to certify that the thesis prepared by Yenealem Fentahun Kassa entitled "Determinants of Infrastructure Project Delays and Cost Escalations: the Cases of Federal road and Railway Construction Projects in Ethiopia", which is submitted in partial fulfillment of the requirements for the Degree of Masters in Public Management and Policy (MPMP), complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Declaration

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

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Abstracts

Construction of road and rail projects to enhance social and economic activities of the country. The number of road and rail construction projects in the country increasing time to time. These construction projects achieve or failure of objectives measured by whether successfully completed on time and cost or not. However, most of federal road and rail construction projects in the country exposed to time and cost overruns. It becomes difficult to complete projects on schedule and allocated budget. To fill the gap, the study on causes of time and cost overrun was conducted. Questionnaire surveys together with project completion report were used. A total of 73 questionnaires from owner, consultants and contractors were collected and secondary data of 30 (25 roads and 5 rails) construction projects completed since 2014 in federal road and rail agencies were investigated. From the analysis it was found that 88% of road and 100% rail construction projects suffered time performance, and 80% of road and 100% of rail projects also cost overruns. The key time and cost overrun determinants ranked by respondents conducted through questionnaire and interview managers and engineers who have experience of delay construction projects from clients, contractors and consultants in purposive sampling method. From these identified and ranked 38 determinants five top extension of time and 4 escalation of cost are selected for discussion. Factors which affected time performance were: incomplete study prior to project approval, poor project management and coordination, right of way issues, inaccurate forecasting of schedule, overconfidence and interest of project stakeholders. Whereas the extremely significant factors affecting cost performance were; inflation of material cost, scope change with change order, incomplete study project approval, poor bill of quantity and design, and poor project performance monitoring. Cost and time overruns of Federal road and rail projects have affected key stakeholders in particularly and on the economy of the country generally. Time and cost overrun added in estimated time and cost over and above initial agreed upon on set, this damages client and contractor reputation, loss of profit and investment opportunities, inability to deliver value of money and inefficient use of time, disposing business activities and create burden for taxpayers. This paper finally came up with solutions towards reducing the impact of delays and cost overruns on federal road and rail projects in Ethiopia.

Key Words: *Time and cost overruns, determinants, road and rail construction projects, planned date and cost, actual completion date and cost, and project stakeholders.*

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List of Acronym:

ERA- Ethiopian Road Authority

ERC- Ethiopian Railway Corporation

USD- United State Dollar

ETB- Ethiopian Birr

SPSS- Statistical Package for Social Science

ToDOT- Texas Department of Transport

RII- Relative Importance Index

AfDB- Africa Development Bank

GDP-Gross Domestic Product

GTP- Growth and Transformation Plan

CHAPTER ONE

INTRODUCTION

1.1. Background

The role of infrastructure construction encourages economic growth and development of the country successfully (Calderon Cesar, and Serven Luis 2008).The World Bank estimates that a 10 percent rise in infrastructure assets directly increases GDP by up to 1 percentage point. McKinsey & Company (2013) investigated that infrastructure projects are high on governments' agendas, and the infrastructure-development and investment pipeline is huge. The current global project pipeline is estimated at $9 trillion, one-third of it in Asia and one tenth in Africa. In contrary, insufficient or underdeveloped infrastructure presents one of the biggest obstacles for economic growth and social development worldwide (McKinsey & Company 2013). Some studies argue that the poor state of infrastructure is one of the major obstacles preventing economies in Sub-Saharan Africa from their current economic status into modern industrial economies stated by (Calderon; Yepes, Pierce, and Foster 2008). For instance, (Escribano, Guasch, and Pena 2008) observed that the state of infrastructure in Sub-Saharan Africa lag the global average by 30% due to deplorable condition and massive backlogs across different countries and sectors thereby leading to loss in economic growth by 2 basis points annually. Addressing this huge infrastructural deficit would require huge capital outlay estimated to be around US$ 93billion and lengthy construction periods. The rapid increase in population growth in SSA and the growing demand for better utility services has made the investments in infrastructure even more imperative.

According to (Stephanie Riegg Cellini; Fernando Ferreira; and Jesse Rothstein 2010), generally agreed that public sector construction projects are seen as an economic and social engine for sustainable rural community development that promotes the well-being of rural residents. Government purpose to spend money on public infrastructure projects to enhancing social and economic activities (Yates A., 2014). In the construction industry, achievement of the three project objectives of time, cost, and quality is used to measure whether the execution of a project is successful or not (Majid 2006; Olawale and Sun 2013). However, the most significant project success criteria

are not only meeting time, cost, and quality objectives of the projects but also the standard of meeting the community needs (Jaman I. Alzahrani, and Margaret W. Emsley 2013). This success cannot be achieved easily, as the industry is unique and complex, and it has been quite common to have problems related to low quality, cost overruns, and schedule delays. Delays are considered one of the most frequently recurring problems in the infrastructure construction industry (Mahamid et al. 2012).

The structuring and delivering of modern infrastructure projects is extremely complex. The long-term character of such projects requires a strategy that appropriately reflects the uncertainty and huge variety of risks they are exposed to over their life cycles. Infrastructure projects also involve a large number of different stakeholders entering the project life cycle at different stages with different roles, responsibilities, risk-management capabilities and risk-bearing capacities, and often conflicting interests. During the implementation of the infrastructures, particularly in road projects, one of the main problems observed for the construction parties is the problem of the cost overrun and schedule delay (Panagiotis Ch. Anastasopoulos, Abhishek Bhargava, and Kumares C. Sinha 2010).

The project cost overrun is considered as a challenge due to the reasons of leading to wasteful allocation of resources, and further cost overruns; it destabilizes policy, plan, implementation, and operations of projects; lastly for the bigger project the problem is bigger which destabilize the finances of a whole country (Bent Flyvbjerg, Mette K. Skamris Holm, and Soren L. Buhl 2004). Therefore, procurement problems on large infrastructure projects are a global epidemic. They affect projects conducted by national governments, and private sector organizations. For instance, megaprojects are by their very nature chaotic and unpredictable, (Standish Group 2004, and Flyvbjerg et al 2002). Similarly, special projects with high technical complexity in terms of meeting the performance specifications such as nuclear reactors, aeronautical space projects, oil and gas projects as well as geo-thermal and hydro electrical projects are prone to high frequency and magnitude of overruns (Sovacool, Gilbert, and Nugent 2014).

In similar condition project cost overruns and schedule delays is a widespread challenge affecting infrastructure procurement world over across time, project size and type (Flyvbjerg, Holm, and Buhl 2003; and Flyvbjerg 2005). Flyvbjerg et. al. (2003) in their extensive study on project cost

overruns and schedule delay observed over the course of 70 years that the study considered, the incidence of cost escalation had not decline and concluded that it appears no learning seemed to have taken place. Similarly (Ahiaga-Dagbui, Smith, Love and Ackermann 2015) the vast attention given to cost overruns and project time delay in literature and practice, not much progress appears to have been made in terms of the reliability of initial project cost estimate and predictability of final actual cost over the years.

International research shows that most infrastructure megaprojects experience cost escalations, but the overruns depend on project type and size. In the transportation sector (Flyvbjerg Bent , Nils Bruzelius, and Rothengatter 2003) conducted the largest and most robust study of cost overruns on a sample of 258 major roads, tunnels, bridges, urban transit, and rail projects in 20 countries on five continents. Each megaproject cost $100 million or more and most the biggest, highest-profile, and most complex transportation projects were conducted in the jurisdiction at the time. The study concluded that nine out of ten megaprojects experienced a cost overrun, and the average cost escalation was 28 percent. Rail projects in the sample experienced the largest cost escalations with the average overrun being 45 percent. Fixed-link bridges and tunnels on average had a cost overrun of 34 percent, and the average cost overrun on surface roads was 20 percent. This pattern of cost escalation was common across all countries in the study and was unchanged over the 70 years for which data was available (Flyvbjerg Bent, Bruzelius Nils, and Rothengatter Werner 2003).

The finding that transportation megaprojects routinely experience large cost overruns is consistent with the results of the other studies of transportation megaprojects (Joseph Berechman, and Qing Wu 2006). For instance, the Boston's Central Artery/Tunnel Project faces the technical and logistic challenges that increase the project costs from $2.5 Billion to $14.63 billion; nearly the project cost overrun is 485% (Ray R. Venkataraman, and Jeffrey K. Pinto 2008).

According to (Odeck 2004; Love, Edwards and Irani 2012) also argued that cost and time overruns could sometimes average 70% and 183% over the initial stipulated estimate respectively. In another related study (Ernst & Young 2014) also reported that 64% of the infrastructures in the oil and gas industry recorded cost overruns in varying categories and in one particular instance cost overrun were as high as 59% representing cost escalation of US$500 billion. In the energy sector, a

2013 study by Flyvbjerg Bent, and Atif Ansar found that of 245 large hydro dam projects in 65 countries the cost escalated on average by 90 percent between the final approved budget and the completed project. There was no improvement in budget accuracy over the 70 years of data that the study covered (Atif Ansar, Alexander Budzier, Flyvbjerg Bent, and Daniel Lunn 2014).

In the case of major global sporting events Flyvbjerg Bent and Allison Stewart found in a 2012 report that for every Olympic Games between 1962 and 2012 final costs were higher than anticipated at the time that the bid was submitted. The average cost overrun in real terms was 179 percent for Olympic Games host cities, higher than for other types of megaprojects. In the same way for instance, the British Parliamentary Committee criticized the escalating costs of the 2012 London Olympic infrastructure costs. As the Olympics Minister said infrastructure cost had risen by $6.5 billion from $4.7 billion number mentioned in the bid. Also the Boston's Central Artery/Tunnel Project faces the technical and logistic challenges that increase the project costs from $2.5 Billion to $14.63 billion (Hemanta Doloi, 2013).

Cost overruns are also a persistent problem on megaprojects in other sectors. Large information and technology projects that cost hundreds of millions or even billions of dollars, such as new enterprise software, management support systems, or digital customer recordkeeping, are notorious for cost escalations. A 2011 study published by Flyvbjerg Bent and Alexander Budzier in the Harvard Business Review found that out of a sample of 1,471 IT megaprojects in the United States and Europe, the average cost overrun was 27%. And fully 1 in 6 IT projects had a cost overrun of 200%, which added hundreds of millions of dollars to the initial budget. There was no difference in performance between Europe and the United States or between projects undertaken by public /or private sector organizations; they each experienced cost overruns equally.

A study on cost and time overrun in Malaysia indicated that the Malaysian construction industry is characterized by poor performance leading to failure in achieving effective time and cost performance. The findings of this study revealed that 92% of construction projects were overrun and only 8% of project could achieve completion within contract duration. In this study also in terms of cost performance only 11% of respondents mentioned that normally their projects are finished within budgeted cost while 89% of respondents agreed that their projects were facing the problem of time and cost overrun in the range of 5-10% of contract (Ade Asmi Abdul Azi, Ismail Abdul

Rahman, Aftab Hameed Memon, Sasitharan Nagapan, Qadir Bux Alias Imran Lati, and 2012). Another study in Malaysia on the other hand concluded that only 46.8% and 37.2% of public sector and private sector projects respectively are completed within the budget (Akintola Akintoye, Intan Rohani Endut, and John Kell 2005).

The study also contends the same idea 9 out of 10 transportation infrastructure projects costs are underestimated and that for all project types, the actual costs are on average 28% higher than estimated costs in European Countries (Gerard De Jong , Hugh Gunn, & Warren Walker 2004). The situation seems to be worse in India where studies on construction projects, found that more than 60% of projects experienced up to 200% time overrun and 750% cost overrun (David A. Mfinanga, and Eradius E. Rwakarehe 2014).

On the other side of studies, more routine construction and maintenance projects in the roadways projects show that cost estimates for this type of work tend to be more accurate. As three recent studies in the transportation sector found, only about half of all small road projects experienced a cost overrun, and the average escalation ranged from 4% to 9.5% (Ralph Ellis, Jae-Ho Pyeon, Zohar Herbsman, Edward Minchin, and Keith Molenaar 2007).

A 2006 study of cost overruns on Canadian transportation projects conducted by Joseph Berechman and Qing Wu examined 163 routine highways, bridge, and tunnel projects on Vancouver Island, and found that eight out of ten had cost overruns. The average cost overrun was 5.5%, while a considerable share of the projects had far larger cost escalations (Joseph Berechman, and Qing Wu (2006).It appears that while overruns still occur, cost estimates tend to be more accurate for smaller and simpler projects that can be completed over a shorter period than for megaprojects, and for projects that involve fewer sub-contractors. These routine projects are also less likely to get involve in politicized decision-making processes that can surround a high-profile megaproject.

1.1.1. Infrastructure Construction Projects in Sub-Saharan Africa

The high rate and magnitude of project cost overruns and schedule delays in Sub-Saharan Africa remain persistent and create further difficulties the poor infrastructural condition of the region

(Flyvbjerg et. al., 2003). A study on Nigeria transport infrastructure project reported project overrun of averaging 14% cost escalation and time schedule delay of 188% investigated by Omoregie and Radford (2006). Likewise in Ghana, 75% of ground water drilling projects have been reported to have exceeded cost and time overruns, investigated by (Frimpong, Oluwoye, and Crawford, 2003). In Kenya, a reported on range of projects under the Constituency Development Fund indicated a 48% cost overrun and 87% time overrun studies taken by (Ngacho, and Das, 2013). This study also classified the projects across different sectors and found that Agricultural market projects experienced an average of 71% project overrun while industrial estate projects witnessed project overrun of 68.3% of cost and time escalation.

Africa Development Bank 2013, the Africa infrastructure development is inadequate cited as the third most serious constraint to doing business in the continent, after access to finance and corruption. It also Sub–Regional analyzed report by (AfDB, 2010). East Africa Region has maintained its bottom positions in continental infrastructure development. Infrastructure project procurement performance in Sub-Saharan Africa was found to be severely constrained by weak institutions, inadequate project management capability, and poor project design as well as a high degree of uncertainty regarding the operations and maintenance of the new facilities by the host government or community (Paul, Terna Gbahabo and Oluseye, Samuel Ajuwon 2017).

A study also conducted (Atif Ansar, Flyvbjerg Bent, Alexander Budzie, and Daniel Lun, 2013) that another reason developing countries such as those in Sub-Saharan Africa are more prone to a greater frequency and magnitude of project overrun is inflation and currency exchange, arguing that foreign currency exchange volatility which is so prevalent in developing countries can severely impact project cost due to the high dependence on foreign goods for project materials. Indeed, inflationary pressures and its concomitant impact on local currency devaluation is a common theme in infrastructure procurement overruns in Sub-Saharan Africa. For instance, the Tanzam Highway Rehabilitation project in Tazania which experienced cost overrun of 54% and a schedule overrun of 50 months attributed the cause of the overrun to a number factors including depreciation of local currency due to a spike in inflation as well as delay in cash disbursement (AfDB's OPEV, 2004).

Further compounding the issue of foreign currency dependence is the extensive use of foreign labour and expatriates as project consultants as well as the award of the contracts to foreign engineering procurement and construction companies due to comparative lack of experienced local project management team, thereby potentially increasing the cost of labour due to the high cost of foreign labourers. This position has been verified by (Meredith, 2005). The study observed that across the region there was an almost precarious dependence on foreign expertise up to a point where Nigeria Airlines was essentially managed by KLM and Nigerian Railways run by Rail India. The other example in Ethiopia Railways projects (Addis Ababa Light Transit Railway and Ethio-Djibouti Railway Share Company), and Ethiopian Grant Renaissance Damp which is hydroelectric power technical and managerial positions have leaded by foreign technical professional and their payment in foreign currencies due to lack of skill and experienced local experts. Lack of technical experts locally and devaluation of Ethiopian birr rapidly increases cost of projects.

In addition to above challenges the researcher observed in many African developing countries such as Nigeria, Kenya, Ghana, Uganda, and Tanzania. In Tanzania found out that total cost and time overrun rates on average to be 44% and 26% respectively by considering seven projects. Further identified that among other factors the average contribution of inadequate design to be 26% and 32% respectively and the extent to which inadequate design contributes, as a percentage, to cost and time overruns was 61% and 85% respectively (Eradius E. Rwakarehe, and David, A. Mfinanga 2014).

The case in Ghanaian construction industry performance in most respects, such as cost, time, quality, safety and health of its workers, the durability of its products and the satisfaction of its stakeholders is inadequate (G.Ofori 2012). In other side, Ali, A. S., Smith A., Pitt, M., Choon, C. H., (2010), the most fundamental ones contributing to delay of road construction projects in Ghana are: material shortages or scarcity, contractor or client financial problems, labour availability or shortage, plant or equipment shortage, and site control and management (Azlan Shah Ali, Andrew Smith, Chan Hong Choo, and Michael Pitt 2010).The Nigerian construction industry is also still struggling with a lot of intrinsic challenges, ranging from inadequate technical and managerial know-how to insufficient financial, material and equipment capital base (Isa R., Jimoh, R. and Achuenu E. 2013).

A study on evaluation of management challenges facing the Nigerian construction industry also revealed that time, cost, quality, and safety remain the top management challenges facing construction managers in Nigeria (Okoye P. U., Ngwu C., and Ugochukwu S. 2015).The industry in Kenya is facing lots of challenges such as the expenditure exceeding the budget, delay to complete the project on time, the building defects and over-reliance on foreign workers. Most construction projects especially road infrastructure in Kenya are exposed to extreme cost escalation to the extent that it calls not only for extra funding but also specialized expertise hence leading to technical and project managerial conflicts between project's parties (Abednego Oswald Gwaya, Sylvester Munguti Masu, and Githae Wanyona 2014).

In Botswana on the other hand investigated that seven out of ten public projects had reported cost overruns and the factors that influence cost overruns have been identified and ranked in order of significance, accordingly variations, re-measurement of provisional works, contractual claims and fluctuations in the cost of labor and materials, with variations being the most significant (Chimwaso D. K. 2000).

1.1.2. Infrastructure Construction Projects in Ethiopia

The cases in Ethiopia are not different with other Sub-Saharan African countries. In the country there are many infrastructure megaprojects constructed, under constructing and plan to be constructed. But a very common problem which is affecting almost all infrastructure construction projects in the country is the failure to meet the initial scheduled and estimated budget.

The study on Southern District of Ethiopia shows that only 8.25% construction projects have been completed on schedule. The remaining 91.75% delayed up to 352% of its contractual agreement (Werku Koshe, and Jha, K.N. 2016). The magnitude of cost overrun among selected road project extended from 4.16% to 83.2%, the average magnitude of cost overrun was nearly 21.52%.

Fekadu Takele, & Abera Legesse in 2016 studies 10 completed building construction projects in Ethiopia (Oromia industry and urban development). From the investigated it was found that 100% of the building construction projects suffered both time and cost performance. The actual rate of cost performance ranges from a minimum of 12% to the maximum of 60% of the contract amount and the actual time performance ranges from a minimum of 7% to the maximum of 170% of the

contract time. On the other researchers (Tsegay Gebrehiwet & Hanbin Luo 2017) investigated that more than 91% of construction industries in Ethiopia time overruns. Most of constructed projects in the country suffered time and cost overrun, (Fetene Nega, 2008).

Integrated housing programme had set major targets to construct about 396,000 condominium units during the first growth and transformation plan period (2010/11-2014/15) in the major cities and towns across the country. However, the government constructed and transferred at the end of 2016 almost 231,540 houses in major cities in the country (UN-Habitant 2011; Dolicho E. 2006; Ethiopian GTP I-2015 report). The significant factors affecting time and cost performance in housing development sector in Ethiopia; weak performance capacity of project key stakeholders, low commitment of government to implement the program, corruption, right- of- way problem, design changes, lack of cost-effective and integrated designs, shortages of quality materials and inflation of materials costs, and shortages of foreign currency to import major materials and equipments, and local contractors limited capacities and abilities, (Ethiopian Growth and Transformation Plan I, 2011:Tsegay Gebrehiwet & Hanbin Luo 2017:Werku Koshe 2016: Robel assefa 2015: and CMUD-GTPI 2011)

The government of Ethiopia has invested huge finance to constructing 5 new sugar factories across the country, and also upgrading capacities of existing plants to reach the country's goal of becoming one of the ten largest global sugar producers by 2023. However, most of new sugar processing facilities lack behind the initial planned schedules and large areas of planted sugarcane that are going unused due to facilities are not operational/or not available to production. The major contributor factors of sugar project schedule delays and cost overruns are; lack of commitments of governments, sever corruption, lack of basic infrastructure, funding shortfalls, lack of skilled and technical experts, delay of right-of–way acquisition, inaccurate forecasting of cost and schedule time (published in Addis Fortune News April 2016 posted in all africa.com; and Global Agricultural Information Network, 2016).

Yayu fertilizer project one of big agricultural sector project started construction in 2008 the total initial cost of 730 million USD that expect to increase Ethiopian agricultural product and productivity to alleviate millions of poorer people from poverty, and also planned to save million dollars of foreign currencies exchanges directly import of fertilizers. The project was expected finalized at

the end of the first Growth and Transformation Plan (GTP1) 2014/15), but currently the accomplishment of project is almost reached 43.66% after 10 years, and the cost of project likely go up every time from planned budget.

The major factors contributing project planned failure of fertilizer projects are; shortage of hard currency to import equipments, lack of competition based procurement process to select best contractors and consultants, lack of skilled professionals in the sector, poor monitoring and evaluation systems of client and contractor, design and specification error, & change, and inaccurate forecasting of cost and schedule time (published Ethiopian Herald May 18, 2015 posted to all Africa.com: published Capital News, and HPRs of Ethiopia reported on Nov15, 2017).

Ethiopia planned to generate 17,208 MW, and increase access of electricity for citizens 90% at the end of Growth and Transformation Plan two (GTP II) in 2019/20 from hydroelectric, wind, geothermals and other renewable sources. However, current the country generates only 4,500 MW electric powers and the accesses for citizens only 27.2%, about 72.8% of Ethiopian or three-quarters of population lack access of electricity (World Bank 2018). Most of constructed and under constructing projects have missed initially planned schedule and budget. For instance, Gibe III hydroelectric project began construction in 2006, but actual construction of project completed in December 2016, after lags initial schedules of 4 years. The other hydroelectric megaproject is Grant Renaissance Dam (GRD) construction has started in March 2011 and which was expected to complete July 2017, but at the beginning of 2018 project accomplishment reaches only 62% has taken full planned construction time.

The major limitation of power megaprojects includes extension of time and escalation of costs were; several times design change; inadequate capacities of stakeholders, internal and external pressures; difficulty of site condition, selection and placement; currency shortages and fluctuation; material price inflation; shortages of skill managerial and professionals in the sector: inadequate materials locally (like cement, steel bar): lack of basic infrastructures, inaccurate forecasting of cost and schedule time: and bad weather condition were the major causes of schedule delays and cost escalation of power projects, stated in(Omo-Turkana Research Networking 2016, Xinhua.net and Construction Proxy.com 2017, and GRD website 2018).

The construction of Ribb Irrigation Dam in South Gonder, in the Amhara Regional State, was projected to cost 1.3 billion Birr upon completion two years ago. A redesign work carried out in October 2007 led to price escalation that nearly doubled the cost, which the Ministry of Water, Energy & Irrigation (MoWEI) hopes would develop 20,000ha of farm land. The project was 62% complete in June 2014, still construction on going. This cause because of design change, machinery and human resource shortages, contactor performance inefficiencies, client poor project management and coordination, and shortage of finance and materials (Dawit Endeshaw, 2014).The researcher understands from above projects most of constructed and under constructing projects missed initial deadlines and estimated budgets, this impacts on economic and social activities of the country.

Poorly executed public works can burden governments with hundreds of millions of dollars in unexpected expenses, put the financial feasibility of projects at risk, and worse construction-related disruptions for residents and businesses. International evidence suggests that the bigger the project, the more likely it will go over budget and misses its deadlines. The outcomes include government budget deficits, a loss of public confidence that the government can meet its commitments, and social and economic impacts on the residences. The problem of delays of infrastructure project is a global phenomenon, and most extremely affects developing countries those which having low skilled professionals, and lack of clear and integrated infrastructure development policy to manage infrastructure projects.

Tsegay Gebrehiwet, and Hanbin Luo in 2017 studies in Ethiopia critical effects of infrastructure project delay investigated cost overruns, time overrun, termination of contract, arbitration litigation, and economic impacts of community's. Cost overruns and schedule delays on infrastructure megaprojects are a common news story in the media and parliaments, in Ethiopia. Millions of dollars here, months or years of delay there, and operating inefficiencies cost Ethiopia's infrastructure sectors $451 million a year /or 3.4 percent of GDP (Vivien Foster, and Elvira Morella 2010 in World Bank Report). Operating inefficiency impacted on performance of clients, contractors, communities, and entirely social and economical problems of the country.

The growing rate of delays is adversely affecting timely delivery of infrastructure project and cost escalation throughout the construction periods. International research on infrastructure project

cost and time overruns have identified a lack of systematic tracking across government departments of how project cost and schedule estimates at the time of project approval compare with the outcome (Siemiatycki, Matti 2009). The researcher reviewed different infrastructure projects delay and cost overrun issues in worldwide, Sub-Saharan Africa and Ethiopia level. From these review different researchers in different countries studied show that most of the infrastructure projects overrun patterns almost similar conditions, but difference of delay and cost overrun reasons across the countries.

The purpose of this study mainly to identify potential problems behind the road and rail construction projects cost and time overruns and to develop strategic approaches to minimize problems through scientific method. And also the study should close the policy gaps and help the government and decision makers to aware factors which influence schedule delay and cost escalation of mega infrastructure projects specially road and rail projects, and also to inform advance measures.

To address the problems the researcher uses the following approaches; First, extensive international academic literature is reviewed to show how pervasive cost overruns and schedule delays on large infrastructure projects. Second, identify the major influential factors contributing project delivery delay and cost overruns. Third, summarize actually completed projects to identify magnitude of time and cost overruns of road and rail construction projects. Fourth, develop strategies to minimize cost overruns and schedule delays on large infrastructure projects, in particularly road and rail projects.

1.2.Statement of the Problem

Construction sectors particularly road and rail construction are a very important for the development and economic growth of any developing countries (M.Haseeb, 2011). It facilitates mobility of goods and services, and business activities of vicinities areas. Saudi A. et al., (2006) researcher investigates, completing projects on time and budget is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of stakeholders, resources availability, uncertainty conditions, contractual relationships, and required sophisticated technology and technical experts. By these cases it is difficult to see a project is completed within the specified time and budget. The

delay of completion of construction projects is a worldwide problem (M. Haseeb, & Xinhai, 2011).

The contribution made by infrastructure is a vital element in the development of rural areas and the growth of rural economy. However, most of the public sector projects in developing countries experience extensive delays and thereby exceed initial time (Mahamid I., Bruland A., Dmaidi N. 2012). According to researchers (Prajyot Gandhak, & Syed Sabihuddin 2014) reviewed delay in completion of public infrastructure projects effects completion on time, cost, and quality. This negatively impacts social and economical activities of the country.

Most of infrastructure projects constructed and under constructing in Ethiopia that causes extensively time and cost overruns. Since, the causes could be anticipated and controlled; however, one might expected that budgeting and scheduling would improve over time as those who manage megaprojects rather than to gain more experience from past. To guide these infrastructure projects of the country's an integrated and organized infrastructure development policy and strategy need to complete project constructions on time, with budget, according to the specifications, and stakeholder satisfaction.

The researcher refers different infrastructure policies and guidelines of the country. However, there is no clear and integrated infrastructure guideline of the country's to solve those factors influencing cost escalation and schedule delays of projects. For instance, right-of-way acquisition, utility accommodation, resources management, Federal or state legislation and regulatory, workforce guideline, and other policies which are not clearly stated, coordinated and integrated each others. Some polices in introduction stages and there is no clearly direction; the other polices not at all developed and did not implemented effectively.

Road and rail construction projects in Ethiopia have carried out without taking into account some factors that are considered trivial and it is causing a variety of problems during a project management and lead to the delay in completion of project in given period and budget. The delay and cost overruns have different reasons as for the project various from project sizes, locations and the scope of the projects. Some of the project happens to be late for few days and some could be delayed for years from the estimated time. Delay and cost overrun also occurring during the various

stages of a project, typically affecting different stakeholders (the state, the contractor and the public) in different ways. During each stages of a project, numerous events can cause project delays and cost overruns. These numerous causes of schedule delay and cost overrun of infrastructure projects in this study can be grouped into time extension and cost escalation factors.

Many researchers have studied and discussed for decades but the delays and cost overruns still happens in almost every construction projects. Most of the previous studies have been conducted research in technical determinants of project cost and time overruns. If cost and time overruns were merely caused by technical problems with project delivery, then the size and frequency of cost and time overruns would decline over time as forecasting and project delivery methods improved. However, data from thousands of projects show that time and cost overruns are a consistent feature of large infrastructure project delivery, suggesting that other factors are at play. They were ignored political and psychological interest and bias which also mainly influencing time and cost overruns construction projects. This research is to conduct combination of technical, psychological, and political interest and bias causes of time and cost overruns of road and rail projects. Generally, this study tried to identify the most common and frequent factors of delay and cost overrun for road and rail construction projects in Ethiopia.

1.2. Objectives of Study

The objective of this study is findings of the major determinants of rail and road project delays and cost overruns, and strategies to minimize influential factors by taking into consideration recent international and domestic trends. In turn, this problem enforced for a subsequent assessment of the gaps in current understanding of road and rail project delayed factors, and clarify the impact of road and rail investment project delay. The ultimate goal of the overall and specific objectives as follows:

1.3.1.General Objective

This research is aimed at determine factors influenced time and cost overrun in Federal road and rail projects in Ethiopia.

1.3.2. Specific Objectives

a. To identify major determinants of time extension and cost escalation of road and rail construction projects in Ethiopia.
b. To analysis selected road and rail projects extent of actual cost and time overruns their construction completed since 2014.
c. To conduct comparative statistical analysis dataset among projects and between road and rail projects in actual time and cost with initial planned agreement.
d. Forward strategies to minimize determinants of road and railway project schedule delay and cost escalation beyond initial completion date.

1.4.Research Questions

The research questions ultimately to be addressed by the study of the available literatures and observation of actual situation of projects. This paper answers the following five questions:

a) What are the major reasons behind cost and time overruns of road and rail construction projects?
b) In what extent of actual cost and time overruns of selected road and rail projects their construction completed after 2014?
c) Which construction projects (compare road and rail projects) overtake more time & cost beyond initial schedule and estimated budget?
d) What are the strategies to address major determinants of road and rail projects delay and cost escalation?

1.5.Significance of the Study

This study identifies key factors causing Federal roads and rail construction projects completion and to understand whether cost and time overruns or not in selected construction completed projects. It helps in application of theoretical skills to policy makers to address practical problems in the road and railway sectors, and to provide insights today's and the future managers on the importance of properly manage road and rail construction projects to complete initially specified schedule and budget. The study also encourage initial basement further researchers on the area and

benefit scholars who wish to undertake the research on factors that affecting time and cost over-runs in roads and rails construction projects.

1.6. Scope and Limitations of the Study

1.6.1. Scope of Study

This research examines recent road and rail project that meet the following requirements:

a) Both sectors construction projects include new construction and reconstruction - roadways only include asphalt concrete and DBST.
b) Existing project data reviewed construction completed since fiscal year (FY) 2014 and reported in ERA and ERC.
c) Completed projects have sufficient data requirements in order to be analyzed cost and time overruns according to research collection format.
d) Delay and cost overrun occurred because of the project missed one or more letting milestones according to the project schedule dates established and allocated fund by the project engineer and the respective agency (ERA & ERC), contractors and consultants.
e) Consultants and contractors who have involved in construction of Federal road and rail projects currently based on Addis Ababa city.

The following types of projects are excluded from this analysis:

a) Gravel and maintenance projects
b) Locally let and other non-state let projects that were not reported within the ERA and ERC data provided.
c) Roadway and railway projects with a total project investment of less than 150 million Ethiopian Birr.

1.6.2. Limitation of Study

This study was faced the shortages of time to organize the research proposal according to schedule and to collect expected reliable and valid data. In secondary data collection it is difficult to get organized and centralized data system in one place of administrated agencies and the access of data the researcher wants. Roadway data collected from each regional division departments of each

project administrating experts in the head office. Especially, cost overruns were hidden for stakeholders and public except a few experts to administrate the projects. This task takes longer period of time beyond data collection planned.

1.7. Organization of Study

This research report is organized in five chapters. Chapter one, introduction which includes the background of the study, statement of the problem, purpose of the study, objectives of the study and research questions, statement of the problem and study limitation. Chapter two, the study consists of basic assumptions and the definition of significant terms, and the literature review with information from other articles which are relevant to the researcher. Chapter three entails the methodology to be used in the research. Chapter four has given the insights of data analysis, the findings and discussions of the study. Then lastly in chapter, the study has given a summary of findings, discussions, conclusions and recommendations.

CHAPTER TWO

LITRETURE REVIEW

2.1. Introduction

This chapter deals about different literatures' which was conducted on the area of both project time and cost overruns. Most of the literatures' discussed here under conducted on different countries and situations to ascertain the fact that delay and cost overrun factors could be different in different countries and situations. The purpose of this chapter is to refer it and integrate with the finding of this study.

2.2. Operational Terminologies

The common definition of an overrun in most studies is a change in cost or schedule relative to the final estimate provided when the approval or "go decision" was made until construction is completed and the facility is operational (Matti Siemiatycki, 2015). This definition means that a road and a rail projects are not necessarily considered and built on contracted price and set schedule. In other definition, project delay means estimating the difference between in planned and actual project completion date, this research assumes that the construction completion date is the date from the notice to proceed plus the number of days/or months or years allowed for construction. The actual completion date is when the project is open for public use (Curtis Beaty, David Ellis, Jon Epps, Brianne Glover, Nicolas Norboge, and Bill Stockton 2011).

A project is considered on time and on budget only if it is built to the final estimate at the time when the project was approved, which is typically before a construction contract is signed. Conventionally, cost overrun is often defined as the actual turnout of costs measured as a ratio of estimated costs (Flyvbjerg et. al.., 2003). However, cost overrun is defined by another school of thought as the difference between actual project cost at completion and budgeted estimate at project approval after adjusting for expenditures due to cost escalation (Merrow, 2011; Love, Ahiaga-Dagbui and Irani, 2016). The implementation schedule commences from the date of project approval by the main financiers and the key decision makers, to when the project comes to full commercial operation (Ansar, Flyvbjerg, Budzier and Lunn, 2013).

According to (W. Turkey 2011) the road construction sector is one of the most important contributors for the political, economic, social and technological development of a country. Existing facts show that about 50% of the Federal capital budget of Ethiopia is routed to the development of physical infrastructure, from this nearly 33% were for the roadway projects. Moreover, the involvement of the private sector as the partners in the capital investment is very low, government create conducive environment to increase capital investment in the field, as well as, promote more advanced technologies and materials. Mostly, Ethiopian road projects are financed by the government alone and it is sensitive to the unpredictable costs and schedule delay. Concurrent delay is however, an amalgamation of two or more isolated causes happening at the same time (Mubarak, S. 2005). It can be defined as separate delays to the critical path that occur at the same time (Trauner J. T., Manginelli W. A., Lowe J. S., Nagata M. F., and Furniss, B. J. 2009). This type of delay can be created by either the client or the contractor (Levy, S. M., 2006). Both parties to the contract assume responsibility for such delay and cannot retrieve damages.

2.3. Factors Contributing Project Delay and Cost Escalation

A very strong impetus has recently been given to infrastructure investments in Sub-Saharan Africa. In 2009, the World Bank committed more than $7 billion in Sub-Saharan Africa (with almost $1.5 billion in roads). Among competing infrastructure priorities, roads and railways are considered most important to reducing poverty. There is a widely accepted consensus that transport infrastructure has a significant, positive and substantial impact on economic growth and poverty alleviation as it enhances the connectivity of isolated and remote areas (World Bank, 2009: performance, 2006). Aid to Africa is planned to double in the near future of which investments in infrastructure, and roads in particular, are likely to be the bulk of it. However, most of infrastructure projects particularly road and rail construction projects not completed with initially approved budget and schedule. The authors revealed and addressed two strands of literature. The first considers terminologies; the second explicitly examines the causes of road and rail project delays, and third actual cost time and overrun trends in roadway and railway projects.

Infrastructures, particularly road and rail construction are a very important for the development and economic growth of any developing countries (M.Haseeb, 2011). It facilitates mobility of

goods and services, and business activities of vicinities areas. However, due to different factors the project work is not completed within bounded time, estimated costs and required quality. There are a number of factors that account for delays on road and rail construction projects. According to (M. J. Kamanga, and Prof Wynand Steyn 2013), the top ten causes of delay in road construction in Malawi are: shortage of fuel, insufficient contractor cash-flow, shortage of foreign currency for importation of materials and equipment, slow payment procedures adopted by the client in making progress payments, insufficient equipment, delay in relocating utilities, shortage of construction materials, delay in paying compensation to land owners, shortage of technical personnel, and delay in site mobilization (Kamanga, M. J. and Wynand Steyn). Patil, Gupta, Desai and Sajane (2013) investigated on the causes of delay in Indian transportation infrastructure projects were: delay right-of-way acquisition, uncertainty events, financial closure; change designs by client, and poor site management and supervision.

The causes where ranked and recommendations to reduce time overrun in road construction where given to the government, owners, contractors, and consultants (Divya.R. and S.Ramya 2015). Finally, the literature concluded with determining top five severe causes of delay as seen from the combined view of contractors and consultants; political situation, segmentation, award project to lowest bid price, progress payments delay by owner; and shortage of equipments (Divya.R. and S.Ramya). Cost overruns are a major concern because large amounts of funding are involved and litigation expenditures have been shown to increase at a steady rate (Pena-Mora et al., 2003). Cost overruns are common in road construction, with many projects experiencing overruns of 50 to 100%, (Hackney 1991 and Flyvbjerg et al. 2004). Many of these cost overruns can be attributed to claims that originate from diverse sources, including cost items and delay claims.

Causes of schedule overruns are factors that lead to construction projects not being finished according to the planned scheduled time at the inception of project. Ade-ojo and Babalola (2013) states that there are 6 major causes that would lead to schedule overruns, the identified causes were ranked as follows: design error, poor site condition, delay in payment, financial incapability of client, financial incapability of contractor and non-availability of subcontractor and supplier. Further, (Akinsiku and Akinsulire 2012) show that financial or cash flow difficulties, frequent change order and design, failure to pay for completed works, shortages of resources, considerable additional work, escalations of material prices, increases in the scope of work, delay in design

work and late delivery of materials are the top causes of schedule overruns on construction projects (Akinsiku, O. E and Akinsulire 2012).

According to (Siraw Yenesew, 2014) 80% of the road projects under Addis Ababa City Administration suffered time overrun. The most important causes of time overrun were found to be slow cite clearance, contractors' financial problems, inflation, progress payments delay by owner, inaccurate cost estimation, and delay in commencement. In similarly, (Ashebir Shiferaw, Wubishet Jekale , and Murad Mohammed 2017) analyzed and ranked 40 influential cost overrun factors road construction project in Southern District of Ethiopia. The top one includes material inflation, cost underestimation, delay supply of materials and equipment, inadequate review and contract document, lack of coordination at design phase, poor project reporting and performance monitoring, lack of skilled professionals in the field of construction management.

External factors play an important role in delaying any construction project in Nigeria (Sambasivan, M. and Soon, Y.W. 2007). Further, they define the external factors as weather changes, change in rules and regulations, problem with neighbors and unforeseen site conditions. In (Haseeb, et al., 2011) reported that in Pakistan's construction industry, the most important and highly ranked factors are natural disasters, unexpected site conditions, organizational changes, changes in rules and regulations, conflicts and problems with neighbors. In the same line (Assaf and Al-Hejji, 2006) investigated that the main external factors which are responsible delay in Saudi construction industry were weather condition, regulatory changes problem with neighbors unforeseen site condition. In other studies taken by (Ayman Ahmed, and Ezzat Othman 2013) classified the above identified challenges into four categories: engineering challenges, human development challenges, managerial and political challenges and sustainability challenges. But the other researchers studied shows that the most influential contributing to delay of road construction projects in Ethiopian and other developing and developed countries classified as follows.

Specifically road and rail project delay and cost escalation determinants classified in to three categories; technical challenges, overconfidence issues, and self-interest issues.

2.3.1. Technical Challenges

Technical issues account for the most common explanations for project cost overruns and schedule delays. The technical explanation for project overrun comprise inaccurate forecasting of time and cost estimation due to insufficient data and experience, design changes, geotechnical challenges, shortage of construction materials and equipment, inflation, etc. as well as the general inability to predicting the future (Siemiatycki, 2015).

A. Incomplete Studies Prior to Project Approval

Incomplete studies prior to project approval includes; late design, scope change, change order, unforeseen events. According to Virginia Department of Transportation highway report (2001), project schedule delays can result faulty of project designs. The actual earth material and rock scoured quantity was much more than predicted, and inaccurate planning and insufficient investigation of the project during pre-construction phase of the projects the major causes of cost overruns road project in Ethiopia (Belachew A. S., Mengesha W. J. and Mohammed M. 2016). These researchers investigated that design output incompetence resultant extra completion project time and cost in Ethiopian road construction projects. In similar manner studied by (Benjamin Boahene Akomah, and Emmanuel Nana Jackson 2016) the views of contractors working in the Western Region on the relative importance of the factors causing delays in road construction projects revealed that: bad weather conditions, and unfavorable site conditions.

Poor design and delays in design documents are a common problem that occurs in construction projects of Malaysia. Knowledge and well experience of the designer to all materials, equipment and project specifications is an important attribute for developing a comprehensive design documents system. Besides that, time limitation given to designers during design phase occasionally force the designer to wrap up the necessary design works at a lower quality. If inadequate time is given, the design cannot be developed in a proper manner (Nashwan Al-Emad 2016).

The causes of delay in Indian transportation infrastructure projects and the results showed that change orders by the client (Patil, Gupta, Desai and Sajane 2013). According to (Benjamin Boahene Akomah, and Emmanuel Nana Jackson 2016) viewed consultant initiated variations /or de-

sign change factor contributing delay of road construction project in Western Region. Late design and design document was identified as the most significant cause of project delay in the Iranian and Ghanaian construction project (Allahnejad, M.H. 2013; and Amoatey, C. T., Y. A., Ameyaw, E. Adaku, and Famiyeh S. 2015).

B. Inaccurate Forecasting of Project Cost and Time

Improper planning and scheduling of the project was indicated as one of the significant factor causing construction delay. In Malaysian industry survey ranked ineffective planning and scheduling of the project as the 5th significant cause of construction delay (Nashwan Al-Emad 2016). Since large road and rail construction projects are complex and take place in a context of uncertainty, accurately forecasting final project costs and time can be difficult. Forecasting problems include the use of inappropriate methods or inaccurate underlying assumptions because, of poor-quality or incomplete data, and unforeseen, dramatic shifts in external conditions. According to (Flyvbjerg 2005) project cost underestimation at the planning stage arising from poor forecasting techniques often misleads decision makers to buy-in on inferior projects with high overruns and low benefit thereby leading to allocate inefficiency. It also (Siraw Yenesew 2014) study shows one of the impacted factors time overrun were found inaccurate cost estimation, and delay in commencement in Addis Ababa City Administration road projects.

The other researchers have been also determined ineffective planning and scheduling of projects by contractors as one of the most important causes of project delay (Sambasivan Murali, and Yau Wen Soon 2007; and Assaf S.A. & Al-Hejji S. 2006). This improper planning at the initial stages of a project manifests throughout the project and causes delays at various stages.

C. Insufficient Work Efforts

Insufficient work efforts in this literature review listed; shortage of skilled, semi-skilled & un-skilled workforces, shortage of equipment and materials, inefficient time usages in construction site, material price inflation, and shortages of foreign currencies to import construction materials and equipments.

Material shortages on site or in short supply can create a lot of problems on road and rail construction projects. Materials which are of high demand are likely to become scarce at a point in time on the market. This inadequacy in supply can create a lot of inconveniences for contractors which may eventually delay the project. Consistent supply of materials is imperative to the success of every project (Dada M., Petruzzi N. C., and Schwarz L. B. 2007). Missed or late deliveries can negatively impact on productivity and lead to project delay (Ruiz-Torres, A. J., and Farzad, M. 2006). Previous studies have been identified slow delivery of materials as a major cause of project delay which identified (Fallahnejad, M.H 2013; Kaliba C., M. Muya, and K. Mumba 2009: Dnan, Enshassi AlNajjar Jomah, and Kumaraswamy Mohan 2009: Zou Patrick X. W., Guomin Zhang, and Jiayuan Wang 2007).

The reason for this factor was due to transportation problem to the remote construction sites with little or no transport infrastructure and complicated purchasing process; especially when most of the materials required importing from overseas. The ability of a supplier to deliver promptly should be one of the major criteria for selecting a supplier (Van der Rhee B., Verma R., Plaschka G. 2009). Study (Dada et al 2007: Ruiz-Torres, Farzad Aibinu and Odeyinka 2006: and Van der Rhee et al 2009) also shows that unreliable suppliers can also be a factor in material shortages, and suppliers' failure to deliver on time can lead to disruption in operations and cause delay.

The initial capital injection makes it extremely difficult for contractors to venture into owning one (Chang C. L., Ogunlana S. and Saeed K. 1991). Mahamid and Kamanga and Steyn (2013) researched on the causes of time overruns in road construction projects in Palestine and Malawi found out that lack of efficient equipment and plant. The use of own plant or equipment helps to sustain progress because plant or equipment will always be available for use. According to (Nwanyanwu, L. A. 2012) construction equipment and plants for leasing or hiring are inadequate to meet the demand of contractors. Contractors who may not have the financial muscle to hire plant or equipment would suffer from equipment shortage which can impede progress.

Mustapha (2013) and A. S. Belachew, W. J. Mengesha, and M. Mohammed (2016) studied on the factors of delays in road project delivery in Ghana and Southern district of Ethiopia found out that construction material inflations, and inadequate and delay of resources (supply of cement, skilled labor and machineries and breakdown of machineries) have been a major bottleneck in road

projects under this case study. Without enough equipment, finance and materials road and rail construction projects to complete construction in stated date and budget impossible. The completion date ends up being extended by several months and the contractor submits a delay claim. The longer the expected construction period, the more account will need to be taken of expected inflationary price increases over time.

Every construction project needs a certain level of technical professionals, skilled, semi-skilled and unskilled labours. The need for such forces is imperative for the success of construction projects. But it is often difficult finding resources with the requisite skill (D. Bruce, and A. Dulipovici 2001). Workforce shortage is a key component of project delay. The location of some projects makes it difficult to attract some skilled manpower. For instance, labourers prefer living in places where living standards are low (Nesan, L. J. 2006). Demand for labour higher standard living place in the construction industry far outweighs supply (O. A. Ejohwomu 2007). Wang (2010), Sweis et al (2008), and Sambasivan and Yau (2007) investigated shortage of manpower including skilled, semi-skilled and unskilled labour causes delay in construction projects.

In other study (PMI-KPMG, 2012) shows that non-availability of highly-skilled professionals can have an adverse impact on the project delivery and cost Asian countries. By this study 2022 infrastructure sector is expected to have a shortage of around three million project professionals including project manager's, civil engineers, planner's, surveyor's, safety professional's etc. Hence it is imperative to increase investment in training and mentoring to develop the requisite skill set in the professionals deployed across various departments.

Low productivity of labour is certainly affecting the activities duration and consequently the total project duration. This factor ranked as the 7^{th} significant factor causing construction delay in Malaysia. Low productivity of the labours could be due to several factors including non-availability of materials, tools and equipment, unskilled manpower hired, also labours are not receiving their salaries on time, and inefficient time usages. This has an adverse impact on the project progress (Nashwan Al-Emad , Ismail Abdul Rahman , Sasitharan Nagapan, and Yaser Gamil 2016). The researchers described as, it is a continuing process during construction and needs to match with the resources and time to develop the work to avoid cost overrun and disputes.

D. Financial Difficulties

The financial state of a contractor can be really bad and impact adversely on a project (Ali A. S., Smith A. Pitt, M. and Choon C. H. 2010). Causes of delay in road construction projects in Palestine, Malawi, and Indian respectively were difficulties financing projects by contractor or clients. The problem of the contractor can be self in flinching or client related (Mahamid, Steyn, Patil, Gupta, Desai & Sajane 2013). A crippling financial state of a contractor means there is insufficient funds to continue construction works. The Researcher (Fugar and Agyakwah-Baah 2010; and Siraw Yenesew 2014) pointed out delay in honoring payment by the client, low profit margins and insufficient capital or excessive debt as the causes of financial difficulties among contractors (Ali, A. S., Smith A., Pitt, M., Choon, C. H.2010). Difficulty in financing project by contractor is considered as the most significant contributor to construction delay in (Makkah city in Malaysia Nashwan Al-Emad 2016). Contractor's financial difficulties are sometimes due to poor financial control and management (Liu, Z. 2010). Difficulty in accessing bank credit are the most critical factors causing delay in road project in contractors working in Western Region road construction Projects (Benjamin Boahene Akomah, and Emmanuel Nana Jackson 2016).

Failure to provide steady monthly progress payment by owner will cause work progress delay because there is inadequate cash flow to support construction expenses especially for those contractors who are not financially sound. The client's delay of progressive fund/ payment is one of the most important causes of project delay in the Ethiopian and Malaysian construction Project (Mahamid, I., A. Bruland, and N. Dmaidi 2012), and (Nashwan Al-Emad, Ismail Abdul Rahman, Sasitharan Nagapan, and Yaser Gamil, 2016). A study recommends that the client needs to release payment on time unless contractors impairs ability to finance the work (Assaf, S.A. and Al-Hejji, S. 2006).

E. Late Third Parties Issues

Late third parties issue includes; right-of-way acquisition, mandatory reviews, utility accommodation like water, power, telecommunication, and others related factors. Patil, Gupta, Desai and Sajane (2013) researched on the causes of delay in Indian transportation infrastructure projects and the results showed that delay land acquisition and environmental related with issues the major

causes of project delayed. According to Virginia Department of Transportation highway report 2001, project schedule delays can result right-of-way complications. PMI-KPMG (2012) study shows that delay in subsequent land acquisition and inadequacy in project planning considering the impact of deferred land acquisition is possibly the single largest factor causing project delays in Asian countries highway projects. This fact is also complemented by the survey results where 82 percent of the respondents agree that land/site handover is the main reason for project delays. The right of way acquirement is a fundamental component of the overall planning and implementation of road construction projects.

The case study also shows that the problem of right of way acquirement and lack of attention for the utility (due to the failed pipe structure, constructing an access road, retaining wall at cut sides, paved ditch along box cut sections) resulting major variation in quantities, leading to project schedule and cost overrun of road construction in Southern District of Ethiopia (Belachew A. S., Mengesha W. J., and Mohammed M. 2016). It also the most important and highly ranked factor in Pakistan was changes in rules and regulations (Haseeb, M., A. Bibi, and W. Rabbani 2011).

F. Poor Management, Coordination, and Communication Issues

Construction of roadway projects needs a lot of coordination from all players and passed in all project stages. A lack of coordination and communication of stockholders through project stage can be detrimental to project success. All stakeholders have a responsibility in project delivery and that is to ensure that projects are completed and handed over to clients on time. On the contrary, effective site control and management is a challenge to contractors, clients and consultants. This problem persists because most stakeholders lack the requisite experience and managerial skill to manage the project team (Kadir, Lee, Jaafar, Sapuan, and Ali 2005). Patil, Gupta, Desai and Sajane (2013) researched on the causes of delay in Indian transportation infrastructure projects and the result shows that poor site management and supervision by contractor. A poorly managed site affects operations and contributing factor to project delay and also affect the overall team resulting in eventual outcome of project delay (Arshi & Sameh 2006, Arditi et al 2005, and Faridi & El-Sayegh 2006).

Communications problems are often at the root of troubled projects. There may be lack of communications between the top executives and the project management team, and communications also may break down between the owner's project management team and the designers and contractors. According to Virginia Department of Transportation highway report 2001, project schedule delays can result complications or disagreements with the designer, contractor/or builder, and inspectors. The project manager may warn that a project is running over budget and behind schedule, but the message may not reach the C-suite and board before problems get out of hand. The communications failure sometimes results from fear of being the messenger of bad news.

Each project has faces challenges. These can be various and their influence can be varied depending on the scope of the project. Project management might support to identify the unrealistic nature of the project, and specify that it should be corrected or improved. According to (PWC 2013), the three key elements of the control environment are proper transparency of controls, clear accountability with responsibilities, and a meaningful audit trail of information to make sure people are performing their required roles effectively. An effective risk management process is also critical. It enables project managers to monitor risks and identify when they need to put a mitigation plan in place to actively manage them. Another factor in troubled projects is slow decision making. If the authorized executive fails to sign off on a routine decision, a project can languish. Or sometimes if a decision is not forth coming from the owner's team, a contractor may move ahead with an inappropriate and costly solution to a problem studied by (PWC 2013). Delaying decisions can be especially costly in the long run for process plants or transport projects that produce a large revenue stream as soon as they're up and running.

Inadequate project management causes the failure of resources to achieve the project goal, either in terms of cost or time or both, which is overruns (Jhn & Iyer 2006). Poor site management and performance can cause not only delays, but also defects, disputes, and cost overruns in Malaysian Construction industries (Sambasivan, and Yau Wen 2007, Abdul-Rahman, Berawi, Berawi, Mohamed, Othman, and Yahya 2006) . Nashwan Al-Emad (2016) poor contract management was ranked one of the 10th factors causing road construction delay in Malaysia. Inadequate contract management is usually caused by lack of management skills and shortage of professional experts

among the project practitioners. As a result of poor contractual skills, the project could experience negative effects to duration of project.

The study was conducted (PMI-KPMG 2012) 86 percent of Asian respondents agree that Project Management Office (PMO) could be an effective way of monitoring projects helps in ensuring successful implementation of projects through deployment of project management best practices. PMO also helps in proactive risk identification and provides adequate guidance and information for timely decision-making, and also recommended by different scholars poor site management and performance overcome by recruiting qualified site managers, allocating an optimal number of supervisors, and integration of knowledge management processes.

2.3.2. Stakeholders Overconfidence Bias Issues

The problem of estimation bias stemming from being overly optimistic about the prospect of a project in terms of cost and time is one of the major factors causing cost over-runs and schedule delays in infrastructure procurement. Flyvbjerg (2005) suggested that political and psychological issues which affects cost and time overruns of project delay more than technical challenges. Arguing that political, psychological and competitive pressures on projects incentivize by project promoters, developers, politicians, and other stakeholders by deemphasize costs and risks while overemphasizing project prospects (benefits) leads to project failure. The concept optimism bias in project cost and time estimation was inspired from the seminal work on decision-making under uncertainty (Kahneman and Tversky, 1979). They stressed that most people often suffer from planning fallacy and optimism bias in that they tend to be delusional about their prospects and thus over exaggerate the outcome in an investment or project, while underestimating the cost and time schedule.

Over optimism biases in road and rail project planning, it simply implies the tendency to overestimate project stakeholder in their skills, capacities, and recourses to take personal credit for positive outcomes run, while underestimating the project costs, time schedule, and risks of the project, this leads project to unexpected internal and external events (Matti Siemiatycki 2015). This is especially true for public sector construction which has gained notoriety for large over-runs. According to (Flyvbjerg 2005), over-optimism often arises from cognitive biases in the information processing mechanism of the human mind thereby leading to poor project forecasts and wrong es-

timates stemming from technical inefficiencies and systematic misrepresentation. Poor estimation and forecasting techniques as well as incomplete and unreliable data are main causes of biased estimate. Better understanding of the technicalities as well as social and political dimensions of infrastructure procurement could provide a reality check, thus reducing the incidence of optimism bias.

According to (PWC 2013) investigation optimism bias is another leading cause of troubled projects. When project stakeholders embark on big projects, they often put on rose-colored glasses, underestimating the complexity of the task at hand and simply assuming things are going to proceed smoothly. In their need to get approval and funding for projects, overconfident project managers fail to address potential risks early enough in the process.

2.3.3. Stakeholders Self-interest Issues

Systematic deception and misrepresentation has been set forth by scholars and policymakers as one of the leading causative factors of project cost overruns and schedule slippage (Holm, and Buhl, 2002). Systematic deception and misrepresentation speaks to the possibility that project cost overruns and schedule delay may stem from a deliberate misrepresentation of facts and realities of project by project stakeholders with the sole intent to deceive (Matti Siemiatycki 2015). This means strong incentives for proponents to strategically misrepresent initial budgets to get a project approved, funded, and started, knowing that once work began, a few projects are ever halted (Altshuler, A., and Luberoff, D. 2003) .The notion of systematic misrepresentation as one of the factors causing project overruns can be traced to two theories; agency theory and the theory of strategic deception.

Not only project misrepresentation issues faced planning and development stages affects project delay and cost overruns, but also ambiguity in contract terms and conditions can also derail projects. To provide transparency and accountability, contract provisions should clearly delineate the roles and responsibilities of the various parties and identify the governance structure, including the execution, oversight, and assurance roles (PWC 2013).

2.4. Effects of Road and Rail Construction Projects Delay and Cost Overrun

2.4.1. Cost Overruns

The two most important data variables in this research are the estimated and actual costs. Cost overrun is measured as actual out-turn costs minus estimated costs expressed as a percentage of the estimated costs. Actual costs are defined as real, accounted construction costs determined at the time of project completion. Estimated costs are defined as budgeted or forecasted construction costs determined at the Time of formal Decision to build (Flyvbjerg et al., 2003a).

Effects are the consequences that will be encountered when cost overruns occur on a construction project. Cost overruns have obvious effects for the key stakeholders in particular, and on the construction industry in general (Nega 2008). To the client, cost overrun implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental or lease costs or prices. To the professionals, cost overrun implies inability to deliver value for money and could well tarnish their reputations and result in loss of confidence reposed in them by clients. To the contractor, it implies loss of profit for non-completion, and damaging the reputation that could jeopardize his or her chances of winning further jobs, if at fault. To the industry as a whole, cost overruns could bring about project disposing of business activities before mature, bad reputation, and inability to secure project finance or securing it at higher costs due to added risks.

Study's (Eshofonie 2008) identifies four effects of cost overruns as follows: company or firm liability to insolvency and liability of the companies or firms to bad debt, under-utilization of manpower resources, plants and equipment, increased project cost due to extension of time: Longer project duration means that more resources will need to be allocated to the project, which then increases the project costs and leave project implementation behind.

A comparative analysis of cost overruns between different projects or districts are interesting trends, it is useful for comparison of the magnitude of costs among the projects. As the different study described majority of projects experience cost overruns and the cost overrun amounts vary among the projects (Jennifer S. Shane 2009, and Baccarini & Collins A. 2001). The extents of cost

overrun were dependent on the volume of contract and the range was varying between the projects. In different countries the road projects are owned State and it includes different stake-holders. However, in different road construction projects what observed was all team of the projects were not participating actively at the beginning stages (Worku Koshe, 2016). This leads the projects to the possibility of un-expected cost. The study shows that the problem of project cost overrun is also a problem in developing country including Ethiopia (Rosenfeld Y. 2013, and Thillai A. Rajan, 2011). It was significant in the Ethiopian road project – the study conducted by (Turkey W. 2011) shows that 80% of the projects were experiencing the cost overrun. This implies that eight out of ten projects were exposed with the problem of project cost overrun (Turkey W. 2011). Ashebir Shiferaw, Wubishet Jekale, and Murad Mohammed (2016) also investigated cost overrun factors of road construction projects in southern district of Ethiopia. The magnitude of cost overrun among selected project extended from 4.16% to 83.2%.

The researcher identified sample distribution of 95 (74 roads and 21 rail) transport projects in China (1984–2008), worth US$52 billion, 75 per cent of transport projects suffered a cost overrun in constant local currency terms. Actual costs were on average 30.6 per cent higher than estimated costs, with a median of 18.5 per cent indicating that the distribution of costs had a heavy skew to the right (i.e. going over budget). From this analysis seven out of 10 roads went over budget, whereas nine out of 10 rail projects went over budget (Ansar, Flyvbjerg, Budzier, and Lunn 2016).

Mahamid et al. (2011) conducted a study to investigate the time delay in road construction projects in the West Bank in Palestine; they found that all projects suffer from time overrun and that 70% of the projects experienced delays between 10% and 30% of the contracted duration. In similarly, the researcher also distributed questionnaires to 54 practitioners to evaluate the significance of the factors that causes the project cost overrun. The magnitude of cost overrun among selected project extended from 4.16% to 83.2%. While the average magnitude of cost overrun was nearly 21.52%, this is a significant amount when it compared with the number of projects. Road project delay factors, a total of 94 questionnaires from client, consultants and contractors were collected and a desk study of 10 completed road construction projects in Addis Ababa city were investigated. From the results it was found that 100% of the road construction projects cost overrun. The rate of cost overrun ranges from a 4.11% to 135.06% of the initial contract amount (Abubeker Jemal 2015).

2.4.2. Time Schedule Delay

Effects of schedule overruns are the consequences that will occur when the causes of these schedule overruns are not identified and worked on effectively. The study of (Pourrostam & Ismail 2011) identified and ranks the effects of construction delays as follows, time overrun, cost overrun, dispute, arbitration, litigation, and total abandonment of projects. These findings are in general agreement with other studies as carried out by (Aibinu & Jagboro 2012, and Motaleb & Kishk 2010). However, the study of (Baki 1999) brings in the aspect of claims as one of the effects of delays in construction projects.

Texas Department of Transport (TxDOT) investigated in 2011, 868 road projects of 424 projects delay concurred. The researcher also identified major cause of highway construction delay from the total delay of, 26.1 % occurred additional work desired by construction agencies, and 23.5% contractor's related issues and the reaming 50.4% caused by a combination of different factors. In total, these two categories of delay accounted for almost half of all time of delay. Syed M. & Bachan S., (2017) studies 10 road construction projects around the year 2010 to 2015 in the Malaysia state of Perak. From the study, the longest duration of delay is 100 days and the shortest duration for delay is 30 days. The total EOT obtained is 573 days. The cause of delays forwarded by contractors in the application of EOT are lack of materials, lack of workers, change of design, financial problems and lack of machinery. This shows Malaysian road construction project has better implementation of schedule than other developing countries.

Abubeker Jemal (2015) assessed road delay factors, a total of 94 questionnaires from client, consultants and contractors were collected and a desk study of 10 completed road construction projects in Addis Ababa city were investigated. From the results it was found that 100% of the road construction projects suffered time. The rate of time overrun ranges from 25% to 264.38% of the initial contract period. The researcher Siraw Yenesew (2014) investigated almost 80% of the Addis Ababa City Administration road projects were completed beyond their planned completion period out of the asphalt road construction projects which was completed from 2000 to 2005E.C. In both researchers result indicates that road construction projects in Addis Ababa city Administration severe time overrun with compared initial schedule.

CHAPTER THREE

RESEARCH APPROACH AND METHODOLOGY

3.1. Introduction

This chapter describes the various methodologies that will be used in the study. This includes the research design, the targets population, sampling technique, data collection instrument, data collection procedures, data processing and data analysis.

3.2. Research Approach

The research approach defined as the way in which collecting, organizing, analyzing, and interpretation of collected data to identify causes of project delays and cost overruns, identify extent of cost and time overruns, and develop strategic approach to take proactive actions. This research was applied an inductive approach as it initiated from the general observation of existing problems of delay and cost of road and rail construction projects to specific applicable one to find out new facts or assemble old facts by scientific ways for the purpose of developing existing theory or its application for real problems.

The research followed mixed approach (quantitative and qualitative) to achieve the objective mainly to focus on the primary data (questionnaire and interview), and secondary data (by literature review). The researcher used quantitative approach for structural questionnaires distributed to the project engineers, data measurements and variables play an important role. On the other hand, qualitative approach interview questionnaire was used to collect data measurements and variables do not carry much significant like feelings, believes, and perception of respondents. This research also categorized as applied and descriptive type. It is applied because the research is initiated from practical problems and finds whether there exists time and cost overrun or not. It is also descriptive because it tried to describe the actual rate of time and cost overrun, and the variables or factors of time and cost overrun in Federal road and rail projects in Ethiopia.

To conduct raw data from targeted population questionnaire and interview was designed to identify the common factors influence of delay and cost overrun of road and rail projects in generally and specifically. The questionnaire and interview was designed to apply primary data survey based on the determinants of road and rail construction project delays and cost overrun, and to develop strategic approaches for future directive. This data collected purposive sampling method from client, contractor, and consultant engineers present by physically in their offices and sites. Secondary data (document review) collected through developing tabular forms which was clearly shows facts or information's already available in ERA and ERC published and unpublished documents projects that constructed and completed since 2014.This was initiated from practical problems and finds whether there exists delay and cost overrun or not, and to find major reason of causes of delay and cost overrun.

Primary data analyzed and interpreted using SPSS (computer software version 20) and Relative Importance Index (RII) to identify frequency, rank and correlation of variables that affects project delay and cost overrun. Secondary data also analyzed using Microsoft Office Excel 2007 to rate actual cost and time overruns of selected project that completed since 2014. Both methods should analyze friendly and more appropriate attitudinal of responses.

Methods of communicating and displaying analyzed data using text, tables, and graphs helpful to examined more effectively.

3.3. Applicable variables

Variables are image, perception or concept that capable of measurement-hence capable of taking on different values. Variables can be measured directly or indirectly through appropriate indicators. This research was applied both directly measurable variables and indirectly measurable concepts (feelings and judgments) together to identify causes and effects of road and railway construction projects delay and cost overrun.

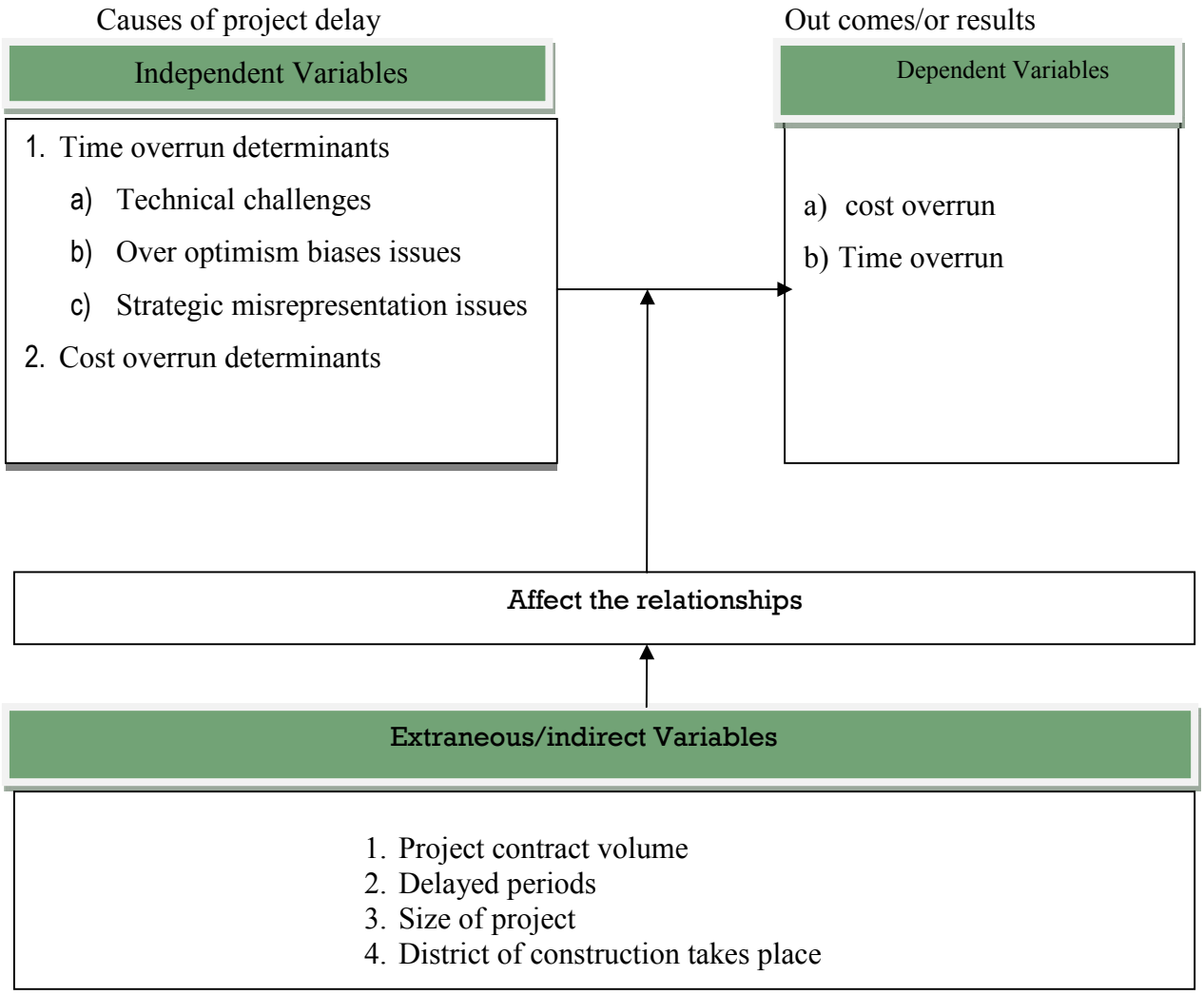
This research determinants of cost overruns and schedule delays of road and rail construction projects can be generally grouped into three broad category of time overrun and single category of cost overrun to collect and analyze data: (1), technical challenges includes: inaccurate forecasting of project cost and time: insufficient work effort or resources (workforce, time usage, equipment,

material, inflation, and foreign currencies):incomplete studies prior to project approval (late design, scope change, change order): unforeseen events (unfavorable weather, challengeable site condition, events); financial difficulties: late third party issues (right-of-way acquisition, mandatory review, utility accommodation and e.t.c.): and poor management, coordination, and communication issues, (2), stakeholders overconfidence bias challenges (over confidence of politicians, project developers, contractors, communities, project sponsors and consultants in their skills and capacities), (3), self-interest of stakeholder issues (interest of politicians, project planners, contractors, and project sponsors deliberately misleading of project facts and realties).

Key cost overrun determinants also includes: scope change, order change, incomplete study prior to approval, poor forecasting and specification, devolution of currencies, material inflation, financial problem, inadequate monitoring performance and evaluation results, third party issues, unforeseen project site, bad weather conditions, shortages of skilled professionals, national or regional legislation, and disputes and litigation. These are the major determinants of time and cost overrun which impacted road and rail construction projects accomplishments on time and allocated budget.

Technical, over optimism, strategic misrepresentation, and cost escalation determinates are causes/or independent variables, while project performance of time and cost overruns are effects/or dependent variables that increase or decrease based on degree of causes /or independent variables.

Figure 3.1 shows the causes and effects of applicable variables



This research was done based on view point of a casual relationship of variables. It has three sets of variable may operate; independent, dependent, and extraneous. To analysis this research the researcher uses these variables. Change variables are independent variables- causes of road and rail construction project time and cost overruns. Outcome /effect variables are also called dependent variables-the outcome or change brought about by introduction of an independent variable. Extraneous variable are project size, complexity, distract of construction takes places, and project completion estimated period may affect changes in the dependent variable. These factors, not measured in the study, may increase or decrease the magnitude or strength of the relationship between independent and dependent variables.

3.4. Research Instruments

To collect primary data causes of road and rail projects delay from targeted populations the sample units printed out a set of questions delivered and interviewed face to face senior management bodies, project engineers and operational engineers in their offices and site. Respondents requested to choose more than one answers from each question provided determinants and put their selected answers in rank from highest to lowest influential factor by writing determinates in given space or using numerical numbers /or alphabetical character in front of each selected choice (1,2,3, …/or a, b, c……). In first written determinant or numerical number's '1' or character's 'A' was the most influential factors causes of project delay and cost overrun, and the last written or the last ranked (R_n) determinant taken as least impacted of project delay and cost escalation. Participants filled the questionnaires in their own time without any assistance from the researcher.

Collected relevant and available data from recorded secondary sources of Ethiopian Road and Rail agencies by developed simple tabular forms disclose the fact of major road and rail constructions projects to analyze whether projects completed as per contract agreement or not, and identify the reason of time and cost overruns. Each project actual data filled by assigned experts of each region in ERA and ERC those projects which were completed construction since fiscal year of (FY) 2014 and reported to both agencies.

3.5. Target Population

This study targeted collection of data from project professional of Federal Road and Rail agencies, contractors, and consultants who have involved construction of projects. Ethiopian Road Authorities have constructed and administrated those selected federal road and railway projects. The contractors and consultants participated in this questionnaire only those who have involved construction of Federal road and railway projects and the head office is based on Addis Ababa city. The main aim of chosen this type of population was able to get current and past information from professionals who have participated in the implementation of roads and rail construction projects and those who experienced of delay and cost escalation challenges.

Projects completion summarized reports gathered from Federal Road and Railway Agencies Head Office (ERA and ERC). Project data collected from five Regions of ERA (North, South, East, West, and Central) in the Head Office, and ERC (Infrastructure Development Division). Both sectors project construction completed since 2014 fiscal year and completion of projects reported to these agencies.

3.6. Sampling Method

This research population it does not mean that all members (employees) of road and rail construction stakeholders are possible respondents for the questionnaire and interview. Rather the questionnaire and interview were distributed and interviewed to engineers and managers who are experience working stakeholders of construction projects (contractors, consultants, and owners). Contractors and consultant construction companies selected based on past experience involved in constructions of road and rail projects.

Judgmental or purposive sampling technique was applied to select primary respondents from Federal road and rail construction agencies, consultants, and contractors. Purposive and/or expert sampling was a useful method which allows a researcher to get information from a sample of the population that one thinks knows most about the subject matter which have experts working within the road and rail construction sectors/or projects.

In the case of secondary sources the researcher considered the asphalt concert road, and rail projects which have finalized construction since 2014. After the specified periods many road and a few rail projects has constructed across the country. The researcher uses the asphalt concrete new and upgrades road projects which have available necessary data and the amount of contracts more than 150 million local currency. Researcher selected new and upgrading roads, and higher contract volumes based on international trends and experiences, showed that larger volume of contract and more complicated the project, high opportunities of missing estimated cost and deadlines. In the cases of railway projects all available projects is sample size due to small number projects constructed.

3.7. Sample Size

The sample size described as (Ranjit Kumar 2011) in research methodology the number of participants who are going to select in sample to obtain required information, usually denoted by the letter 'n'. This study is primarily designed to find out a cause of road and rail projects delay and cost overrun. There are three different parties involved in each project which were the client, contractor and the consultant. So it was necessary to select the respondents form each party by purposive sampling techniques. The data collected from clients of ERA & ERC, contractors, and consultants who have involved Federal construction projects across the countries. In total of 98 participants (65 for two agencies, 23 for five contractors, and 10 for three consultants) chosen from all parties and involved for questionnaires (closed and open ended). Additionally 10 managers and senior engineers from clients and contractors also interviewed in face to face to gather supplementary data for questionnaire and to understand more detail project issues.

Interviewed again 8 management respondents from client, contractor and consultant after analyzed and ranked each determinant project delay and cost overrun to gather detail data of the most ranked determinants.

This study data distributed and collected more from government based clients, contractors and consultants due to they have involved frequently project constructions and more experienced delay and cost overrun factors.

The secondary data collected based on unit of scope mentioned in introduction part of road and rail projects and availability of complete data according to data collection tubers form. From the total 45 asphalt road, and 5 railway construction projects constructed across the country in the last five years, the researcher included in sample size 25 roads projects in five regions and all rail projects. Because of 5 road projects less than scope limitation (less than 150 million Birr) and 10 road projects also there is no complete access of necessary data according to researcher collection format. Road and railway project construction trends showed that the bigger and more complex the project, difficult to complete project construction on schedule and allocated budget. These road and rail construction projects built by Federal Road and Rail Agencies and currently administrated by them.

3.8. Source of Data

To undertake this research, both primary and secondary data was used in relation to the topic under discussion. Primary data used to determine the cause of project delay, cost overrun, and develop strategic approaches for future direction. The data collected directly from stakeholders of construction project professionals of client, contractor, and consultant who are actively involved and sufficient experienced in the field of road and rail construction projects delay and cost overrun.

Secondary data collected from ERA and ERC Head Office which completed construction since 2014.

3.9. Data Analysis and Findings

According to Ranjit Kumar (2011) data analysis is a process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusion, and supporting decision making. The collected data analyzed through combination of Statistical Package of Social since (SPSS), Relative Importance Index (RII), and Microsoft Window Excel 2007.This analyzed data communicating and display in the form of text, graph, chart, and table.

3.9.1. To Test Reliability of Data

Reliability refers to the consistence, stability, or dependability of the data. Whenever an investigator wants to measures reliability of a variable to be sure that the measurement provides dependable and consistent results (Cooper & Schindler, 2003). A reliable measurement is one that if repeated a second time gives the same results as it did the first time. If the results are different, then the measurement is unreliable (Mugenda & Mugenda, 2003).

Cronbach's Alpha (α) is the most common measure of reliability of data in advance. Cohen and Sayag (2010), states that Cronbach's Alpha (α) greater than 0.70 or Akintoye & Fitzgerald (2000) alpha ranges from 0.50 to 0.60 are acceptable for analysis.

3.9.2. Ranking of Major Determinants of Time and Cost Overruns

SPSS and RII were favorable models for analyzed frequency of respondents and index of determinants. It is used to rank determinants based on frequency and importance index which is derived from view of respondents. The determinants which has highest relative index are the most influential factors, while those with smallest importance index are the least influential factors of time and cost overrun of road and rail projects.

The weight assigned in each question based on number of determinants in each question. The larger the number of determinants in the question, the weight also proportional to each determinant (i.e. larger), while smaller number of determinant in the specified question, weight also assigned in determinants proportionally which is smaller. The highest ranked (R_1) in the determinant assigned highest weight (W_n), while the lowest ranked (R_n) in the determinant assigned the lowest weight (W_{n-i}).

$$RII = \frac{\sum(F_{i*}W_i)}{\sum F^* W_n} = \frac{R_1 (F_{1*}W_n) \ldots + R_2 (F_{2*}W_{n-1}) \ldots + R_3 (F_{3*}W_{n-2}) \ldots + R_n (F_{n*}W_{n-i}) \ldots (1)}{\sum F^* W_n}$$

Where:

i= response category index for i^{th} rank, i^{th} frequency and i^{th} weight (R_1, R_2, R_3……$R_{n,,}$ F_1,F_2,F_3……F_n and W_n, W_{n-1}, W_{n-2}, W_{n-3} ..... W_{n-i})

R= ranks given by respondents in each determinant (R_1= the highest rank and most influential factors, and R_n= the lowest rank and least influential factors for project delayed and cost overruns)

W=the weight assigned to the i^{th} rank, W_n, W_{n-1}, W_{n-2}, W_{n-3} ……W_{n-i} in the determinant (W_{n-i} = the lowest weighted assigned to rank determinant and W_n = the highest weighted assigned to rank determinant)

F= the frequency of respondents i^{th} rank (F_1, F_2, F_3……F_n) in the determinant

$\sum$**F**= Sum of frequency of respondents in the selected determinate

RII= Relative Importance Index

3.9.3. Relationships of Variables

Pearson correlation coefficient (r) used to assess the relationship/association between two categorized determinants; this research classified variables generally into two categories: Time overrun and cost overrun variables. Time overrun variables also classified in to three groups; technical issues, stakeholders overconfidence bias and self-interest of stakeholders. To analysis pears correlation coefficient uses at least two variables at the same time: time overrun categorized variables (technical with overconfidence, technical with self-interest, and over confidence with self-interest issues), and time overrun with cost overrun variables (technical with cost overrun, overconfidence bias with cost overrun, and self-interest of stakeholders with cost overrun). This analysis shows only the degree of association between two categorized variables.

Pearson's correlation coefficient (r) value lies between $-1 \leq r \leq +1$. The + and – signs are used for positive linear correlations and negative linear correlations, respectively. A perfect positive correlation the two variable in coefficient of +1, a perfect negative correlation in a coefficient of -1, and a total absence of correlation in a coefficient of 0. Intermediate value between +1 and 0 or -1 is interpreted by degree of correlation.

3.9.4. Secondary Data Review

Secondary data analyzed by Microsoft Office Excel 2007.This simple model software used to show the actual magnitude of cost escalation and schedule slippage of each road and rail construction projects completed since 2014. It also analysis comparisons of cost and time overruns of among projects and road and rail projects to show actual situation of projects on the ground.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. Introduction

This chapter describes the results and discussion of questionnaire survey, interview, and document review concerning cost and time factors affecting the performance of Federal road and rail construction projects in Ethiopia. Time and cost performance influencing factors categorized in to technical, stakeholder's overconfidence, and self-interest issues. Relevant data collected from projects professionals of ERA and ERC clients, contractors and consultants who have involved and experienced delay and cost overrun of road and rail construction projects. The completion report of the road and rail projects which are considered construction completed since 2014.

4.2. General Background of Respondents

The researcher surveyed general back grounds, and causes of road and rail projects related to respondent backgrounds before going to the detail analysis of the existing related causes and aspects. In addition to secondary data reviewed the researcher wants further understand situation in detail based on primary survey to determine major factors caused of project delay and cost overruns to determinants, to learn the relationships of caused factors, and to develop strategic approaches minimize the causes of project delay and cost overrun. The detail discussion consists of general backgrounds of respondents and major determinants of extension of time, and cost escalation in federal road and rail construction projects as follows.

4.2.1. Respondent Rate

Table 4.1 result shows questionnaire response rate

Respondents parties	Questionnaire			Percentage	
	Distributed	Returned	Valid	Returned from distributed	Valid From returned
Clients	65	55	52	85	94
Contractors	23	17	15	74	88
Consultants	10	6	6	60	100
Total	**98**	**78**	**73**	**80**	**94**

Source: filed survey (2018)

In this study, purposive sampling was used in selected respondents. 98 professionals in the road and rail construction projects were selected and distributed: 65 for clients, 23 for contractors and 10 for consultants. Based on the response obtained from Table 4.1 85 % of client, 74% of contractors, and 60% of consultants returned the questionnaires. In total 80% (78) of those distributed questionnaires were able to return. From the returned questionnaires 94% of clients, 88% of contractors, and 100% of consultants' responses were valid. In total of 94% of respondents were returned valid responses.

4.2.2. Respondent Educational Levels

Table 4.2 results of educational level of respondents

Qualifications	Frequency	Percentage
Degree holders	42	57.5
Master specializes	31	42.5
Total	73	100

Source; 2018 filed survey

Table 4.2 shows that 57.5 % (42) of the respondents are B.S.C /or Bachelor degree holders, and 42.5% (31) of the respondents are M.S.C /or Master degree specialized.

4.2.3. Respondents Professional Qualifications

Table 4.3 result of professional qualification of respondents

Professional qualification	Frequency	Percentage
Chief officers (dep't head)	6	8.2
Project Engineer	44	60.3
Office Engineer	5	6.8
Operational /technical engineer	18	24.7
Total	**73**	**100.0**

Source: field survey (2018)

Table 4.3 results show that professional qualification of current involving duties of respondents. From the results 8.2% (6) of respondents chief officers, 60.3% (44) of respondents project engineers (includes project designers, contract administrators, material engineers, and other engineers), 6.8% (5) of respondents office engineers, and 24.7 %% (18) of respondents operational/or technical engineers.

4.2.4. Respondents Current Involving Professional Duties

Table 4.4 result of current involving profession qualification of respondents

Degree of respondents	Frequency	Percentage
Yes completely based on graduation field	45	63.4
Yes partially based on graduation field	21	29.6
Yes slightly based on graduation field	4	5.6
Not at all related field of graduation	1	1.4
Total	**71**	**100**

Source: field survey (2018)

Table 4.4 shows the researcher asked the respondent whether or not current involving professional qualification duties based on field of specialization/ or graduation. The results 63.4% (45) respondents' working completely on field of specialization/or graduation, 29.6% (21) respondents working on partially similar duties, 5.6% (4) respondents working slightly similar duties, and 1.4 % (1) respondent current involving duty not at all related to field of graduation or specialization.

Therefore, from the above analysis 63.4% respondents are working in graduated field or specialization, and 36.6 % respondents working partially, less and not at all similar position of field of graduation/or specialization.

4.2.5. Respondents professional duties and field of graduation mismatched Whether or not impact on project performance

Table 4.5 results of dissimilarity current professional duties and filed of graduation contribute on project delay.

Degree of respondents	Frequency	Percentage
Yes, completely contributed to project delay	3	11.5
Yes, partially contributed to project delay	12	46.2
Yes, slightly contributed to project delay	5	19.2
Not, at all contributed to project delay	6	23.1
Total	**26**	**100.0**

Source: Field survey (2018)

Table 4.5 twenty six (26) respondents asked again those who answered in table 4.4 their current involving professional duties not completely based on field of graduation/or specialization, this dissimilarity whether or not contributed to road and rail project construction delayed. From the analysis 11.5 % (3) of respondents yes completely contributed, 46.2 % (12) respondents answered yes partially contributed, 19.2% (5) respondents yes slightly contributed, and 23.1% (6) of respondents not at all contributed to project delayed.

In generally from above analysis 57.7% of respondents believed mismatched of duty and educational qualification contributes construction project delay completely and partially, and 42.3 % of respondents' response mismatched of field of specialization and working duties slightly and not at all contributes project delays.

4.3. Magnitude of Time and Cost Overruns of Construction Completed Road and Rail Projects

A comparative analysis interesting and useful techniques to compare magnitudes of cost and time overruns among projects, and between road and rail projects. The extent of time and cost overrun of projects depends on: project size, contract amount, construction taken districts, technical capabilities of stakeholders, and unforeseen events. The magnitude of cost and time overrun of completed since 2014 road and rail projects in both sectors summarized in table 4.6

Table 4.6 result shows estimated and actual time and cost of asphalt road and rail construction projects completed since 2014.

Asphalt Road Construction Projects							
No	Name of the Project	Length in (km)	Date of commence mence-ment	Planned Completion Schedule	Actual comple-tion date	Initial planned cost in ETB	Actual comple-tion cost in ETB
1	Aposto-Irbamoda	94.1	Apr 28,2009	Apr 27,2012	Jun 29,2014	660,938,029.10	837,522,641.78
2	Sawla-Kako Lot 1	22.6	Sep 12,2011	Mar 14,2014	Oct 31,2016	163,067,816.45	189,205,163.25
3	Dessie-Kutber	67.5	May 20,2014	May 5,2017	May 19,2018	1,545,557,747	1,877,782,018.19
4	Sanja-Keraker	49.2	Mar 17,2014	Sep 14,2016	May23,2017	786,796,666.46	848,256,431.96
5	Abiadi-Hawzen-Fireweyni	100.9	Feb 23,2012	Feb 23,2015	May 9,2016	874,321,450.10	995,767,290.60
6	Tegede Jun- Ke-tema Nigus	22.83	Nov 30,2012	Nov 29,2014	Jun 6,2016	516,442,158.68	473,717,943.53
7	Dansha - Abrafi – Maykadra	118.75	Dec 24,2013	Dec 24,2016	Dec 24,2016	1,607,687,055.79	1,762,084,263.14
8	Mekelle - Seret Village	64.56	Apr 28,2009	Apr 17,2014	Mar 2,2016	482,679,383.60	658,041,659.26
9	Zagora-Gassay	44.5	Jun 25,2014	Jun 24,2016	May28,2017	485,177,003.27	492,026,476.27
10	Turmi-Omorutie	91	May29,2013	May 28,2016	Dec 7,2016	794,855,085.00	770,218,600.00
11	Otolo-Sawla	59.62	Sep 1,2011	Sep 7,2014	Nov 252016	358,972,228.46	765,602,420.01
12	Agremariam-Yabelo	94.5	May 11,2011	Nov 21,2015	Mar 4,2016	740,685,321.21	850,597,255.17
13	Maga-Moyale	109.3	Sep 1,2013	Aug 16,2016	Jan 30,2018	1,146,905,005.89	1,631,337,357.34
14	Mazoria-Hadero	36	Aug 25,2015	Aug 24,2016	July 28,2017	288,252,845.07	400,446,579.64
15	Jimma-Bonga	110	Apr 21,2008	Feb 20,2011	Feb 28,2014	742,938,243.00	1,052,507,574.00
16	Bonga-Mizan	119	Apr23,2008	Feb 22,2011	Feb 28,2016	686,102,036.00	925,107,589.00
17	Mekenajo-Ayra	52.06	Apr7,2011	Apr 4,2014	Mar 31,2016	633,534,840.56	656,801,471.56

18	Ayra-Chanka	70.55	Apr7,2011	Apr 4,2014	Dec 15,2015	669,143,993.96	805,369,526.05
19	Chanka-Dembidolo	65.5	Apr7,2011	Apr 4,2014	Jul 28,2016	648,548,842.21	702,162,129.67
20	Addis -Adama Experess	84	Apr 1,2010	Apr 21,2014	Apr 20,2014	8,012,199,960	8,211,209,893.04
21	Kombolcha-Burka	60.03	Sep 5,2013	Sep 4,2016	Mar 10,2018	1,588,240,440.60	1,595,391,558.46
22	Burka-Mile	73.07	Sep 2,2013	Sept 1,2016	Mar 15,2018	1,285,666,666	1,297,718,902
23	Mile and logiya Twon	21.37	Jan 10,2013	Jan 11,2015	Jan11,2015	773,359,132.05	705,359,132.05
24	F2 - F1 - Hana	37.14	Nov 14,2013	Nov 13,2015	Dec 16,2016	651,111,223.66	651,111,223.66
25	Azezo -Goregora	52.7	Jan 23,2013	Aug 29,2015	Apr 13,2017	730,706,949.39	730,706,949.39

Railway construction projects completed construction since 2014

No	Name of the Project	Length in (km)	Date of commence-ment	Planned Completion Schedule	Actual com-pletion sche-dule	Initial planned cost in USD	Actual comple-tion cost in USD
1	A.A. L.R.T	34.2	Jun 1,2012	Jan 31,2015	Mar 31,2016	475,000,000.00	494,052,200
2	A.A to Meiso	339	Oct 25,2011	Apr 25,2015	Oct 29,2018	1,841,470,000	2,043,908,591
3	Meiso to Dwenle	317.25	Jun 1,2011	Dec 25,2015	Oct 29,2018	1,401,000,000	1,605,400,000

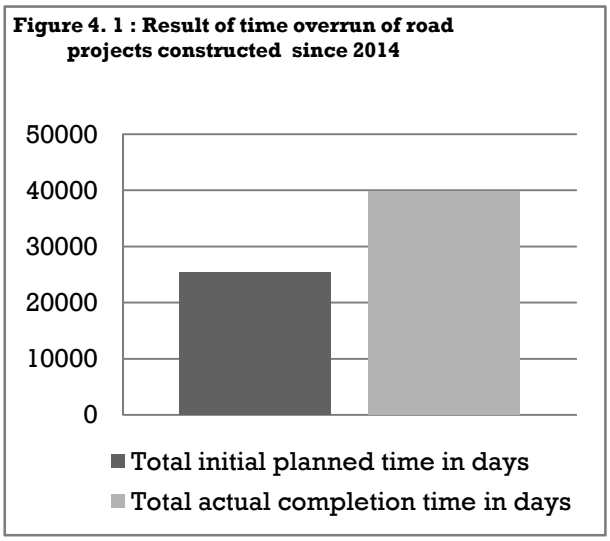
Source: ERA and ERC (2018).

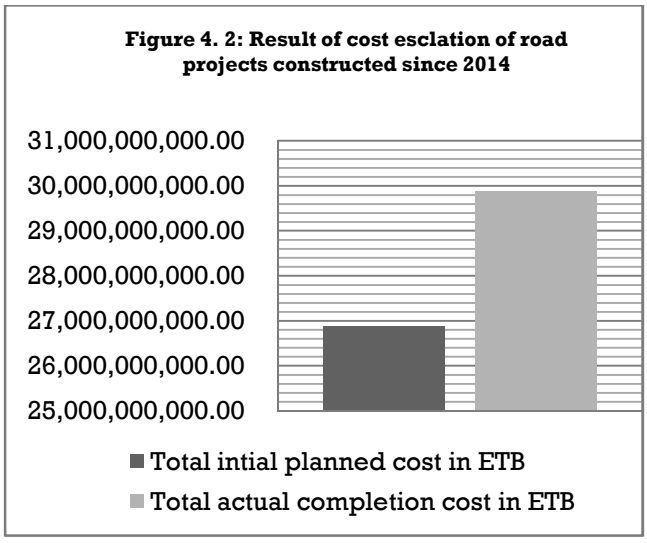
4.3.1. Roadway Construction Projects

The magnitude of planned and actual completion of time and cost of selected road projects shows below figure 4.1 and 4.2. Among these projects only 12% completed on schedule, and 88% completed beyond planned schedule time which extended from 6 % to 63 % (103 to 1831 days). While the average percentages rate of time overrun was nearly 38% higher than estimated schedule, this delayed both client and contractor schedule around 661 working days which was equivalent to 1 year and eight months. Almost two years delayed of each projects beyond initial schedule of construction result; loss of economy of return to investment, and negatively impacted business activities of vicinity areas.

Only 8% of these projects completed initial planned cost, 80% of projects completed beyond initial planned cost, and12% of projects completed below initial planned cost due to changed in designed and decreased estimated road size. The actual magnitude of cost overruns of these projects

between 0.45 % to 53% in amounts between 6.8 million to 485.4 million birr in local currencies, and while average cost overruns percentage rate was 15% higher than estimated costs, which expensed client more than 157 millions in Ethiopian Birr (ETB) for each project, which is significant amount compared with number of projects and the capacity of country's resources development. The added costs initially paid by agencies are ultimately born by public (directly passed to taxpayers). This creates burden for citizens, loss of business efficiencies (resulting higher costs and lower benefits) and loss of future development opportunities of different projects due to scarcity of resources. From selected road projects no any road projects construction completed expected date and costs at the same time (i.e. two projects completed expected date, but overrun costs from expected, and two projects also completed expected costs, but extension of time from expected one).





Sources: Field survey (2018)

4.3.2. Railway Construction Projects

In figure 4.3 and 4.4 below shows that the comparison between actual completion date and cost with initial schedule time and budget to understand whether the railway projects completed in initial planned or not. These projects were 100% completed beyond schedule time and planned budget. The extension of time among the projects extended from 29 % to 43 %. While the average percentage rate was 37 %, this extended the client and contractor scheduled time to 682 working days which is equivalent to one year and nine months. The magnitude of cost overrun among these projects extended 3.86 % to 12.73 % in amounts between 19 million to 204.4 million USD. The

average rate of cost overrun nearly 8.83% of total completion costs which was additional cost to client near 142 million US dollars each project.

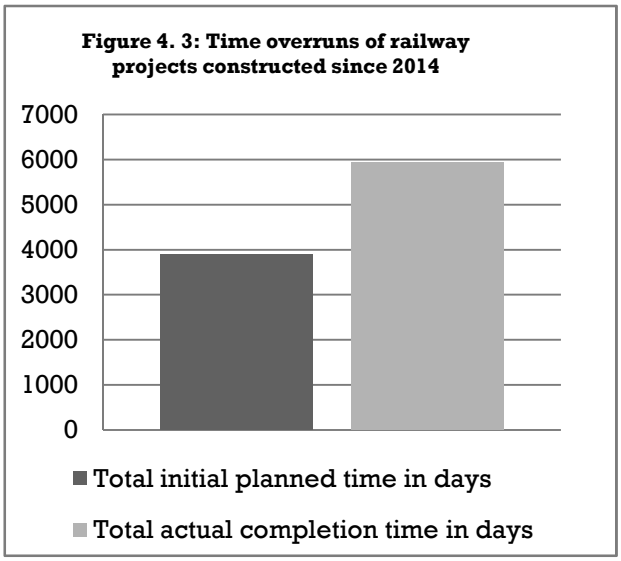


Figure 4. 3: Time overruns of railway projects constructed since 2014

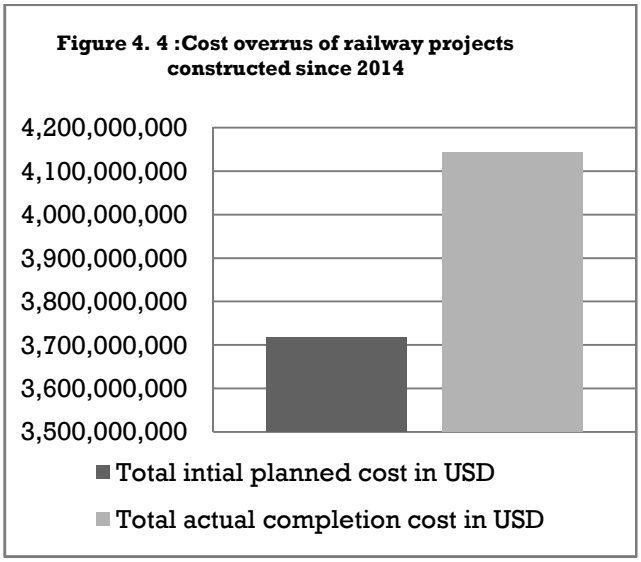
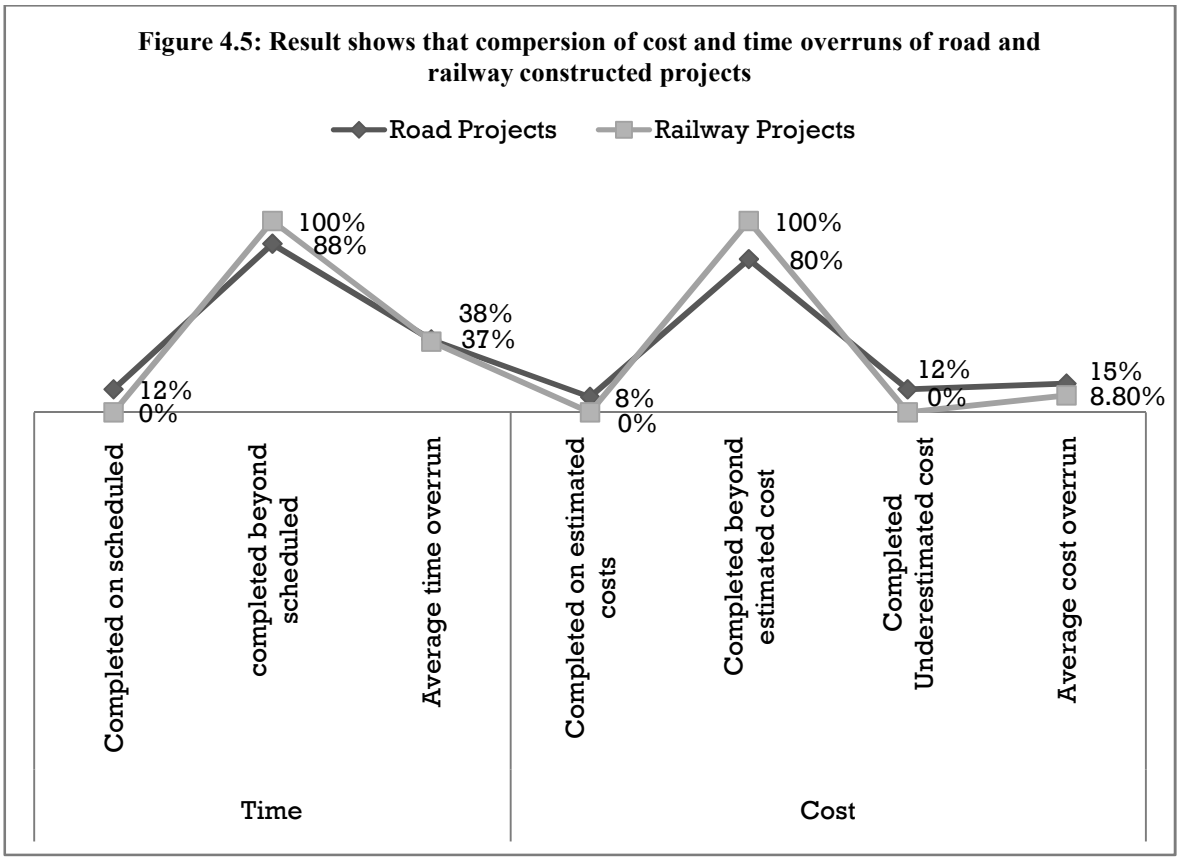


Figure 4. 4 :Cost overrus of railway projects constructed since 2014

4.3.3. Comparison Between Road and Rail Construction Projects

Comparison is necessary for the researcher to understand the situations of both projects for future direction. Figure 4.5 shows the result of comparisons between planned and actual completion time and cost of national road and rail constructed projects. Road construction projects better completion on time and estimated cost than rail projects, the percentage rate which was 12% and 8% respectively, but railway construction projects 100% cost and time overruns. The average time and cost overruns of road projects higher than rail projects which were 38% and 15% road projects, and 37% and 8.8% rail projects respectively. The extent/structural flows of time and cost overruns of both projects almost similar structures/or patterns. In other side, 12% of road construction projects completed underestimated cost, but not in railway projects.



Sources: field survey (2018)

4.3.4. The Effects of Time and Cost Overruns of Road and Rail Construction Projects

The consequence of cost and time overruns have obvious effects key stakeholders in particularly, and on the economy of country generally. To the clients, time and cost overruns added estimated schedule time and cost over and above initial agreed upon set, resulting less return to investment. To the contractors, it implies loss of profit for non-completion damaging the reputation that could jeopardize his or her chances of winning further jobs, if at fault. To the professionals, cost and time overrun implies inability to deliver value for money and inefficient uses of time, and could well tarnish their reputations and result in loss of confidence reposed in them by clients and citizens. To the industry as a whole, cost and time overruns could bring about project disposing of business activities before mature, bad reputation, and inability to secure project finance or securing it at higher costs due to added risks. To the end user, the added costs are passed on taxpayers create burdens and loss of business of construction takes place, and road and rail project users.

4.4. Determinants of Time and Cost Overruns of Road and Rail Construction Projects

This part of the paper consists of results and discussion of factors for schedule delayed and cost escalation in road and rail projects. Project construction determinants in this research classified in to time overrun, and cost overrun determinants. Time overrun determinants also general grouped in to technical, over optimism, and strategic misrepresentation determinants. In each categorized determinant have two questions; (1) asked the respondents choose more than one answers from key determinants that influencing cost and time overruns of projects in the given question and; (2) ranked the chosen determinants based on influence of cost and time overruns. The researcher analyzed frequency of each ranked and Relative importance index of each determinate. The numbers of weight and rank depends on choices of sub-determinants in each question of the categories and the analysis model and interpretation was the same for all question of research. The ranked determinants were analyzed using SPSS packages and Relative importance Index (RII) models to test reliability of data, to indentify frequency in each ranked determinant, rank determinants based on result of delay and cost escalation, and correlate each categorized determinants to understand relationships.

4.4.1. Reliability Test

Reliability test to confirm data collected is reliable for analysis or not. Cronbach's alpha (α) was used to analyze by SPSS packages categorized determinants. Overall value of determinants measured in cronnbach's alpha test was 0.784, which higher than value compared to acceptable 0.50 to 0.60 stated by Manerikar V. & Manerikar S. (2015) and Akintoye & Fitzegerald, (2000) cutoff. Below table 4.7 shows the value of each category determinants ranges from 0.711 to 0.807; this is higher than cutoff values. Therefore, collected data are reliable and analyzable.

Table 4.7 results show reliability test of time and cost overrun determinants

Categories of determinates	Cronbach's alpha (α)
Technical determinants	0.807
Over optimism issues	0.759
Strategic misrepresentation issues	0.711
Cost overrun determinants	0.784
Overall	**0.784**

Source: Field survey (2018)

4.4.2. Time Overrun Determinants

Schedule delay of road and rail construction projects are one of the challenges of projects successful completion across the country. According to secondary data were analyzed in this research article 4.3 (sub article from 4.3.1 to 4.3.3), the road and rail projects time overruns 88% and 100% respectively. Time overrun determinates in this research categorized in to technical, over optimism bias and strategic misrepresentation. The following sub-determinants chosen and ranked by respondent's response in each categorized issue. Those top determinants ranked in each question again asked the top managers the reason for the above determinants caused project delayed. SPSS and Relative Importance Index (RII) used for analysis, and the RII ranges between 0 and 1, (0 not inclusive).

4.4.2.1. Technical Determinants

Table 4.8 results show that relative importance index of technical determinants and their ranks.

Technical determinants	∑F	∑(W*F)	W_n	RII	Rank
Incomplete studies prior to project approval	52	525	12	0.8413	1st
Poor project management and coordination	56	559	12	0.8318	2nd
Right- of-Way acquisition issues	62	606	12	0.8145	3rd
Inaccurate forecasting of project schedule	48	463	12	0.8038	4th
Shortage of equipment and materials	47	450	12	0.7979	5th
Financial difficulties	32	267	12	0.6953	6th
Utility accommodation issues	25	202	12	0.6733	7th
Shortage of skilled professionals.	23	170	12	0.6159	8th
Bad weather conditions	29	212	12	0.6092	9th
Difficult site conditions	41	294	12	0.5976	10th
Mandatory reviews of federal or state legislation	17	93	12	0.4559	11th
National/or state events and holidays	12	46	12	0.3194	12th
Overall average of determinants				**0.6713**	

Source: Field survey (2018)

Table 4.8 shows the result of causes of project delayed in the view of technical prospective. All determinants result laid on relative importance index range 0 and 1, (0 not inclusive) and the average index of determinants 0.6713 which is above the half of maximum importance index result and third ranked influential categorized determinant of project construction delay. From twelve factors ranked, five most significant factors caused construction project delayed and its reason discussed in detail below:

Respondents ranked incomplete studies prior to project approval as the most influential factor of road and rail project delay which is the relative importance index (RII) of 0.8413. This problem caused by government official often speed up the progress of approvals to get urged projects

started quickly, or to make project announcement to meet program funding deadlines or before election timelines to response public interest started projects without enough resources, capacities and detail studies. Incomplete studies before project to approval leads to project design change during construction period, and create confusion in scope of work to project stakeholders. This leads extension of time beyond planned schedule to complete construction of projects.

Inefficient project management and coordination ranked second determinant of project construction delayed which is relative importance index (RII) of 0.8318. Poor project management and coordination were the administrative failure of all levels management of project stakeholders. These occurred due to a lack of planning and coordination of activities, slow decision making/or unable to give solution the problem timely, inadequate communication between member of project team and project sponsor, failure to identify problems and institute necessary design and program changes, and weak accountabilities of all levels of officials involving project construction were the major causes of poor project management and failure of project management objectives (performance quality, time and cost).

Delayed right-of-way acquisition and clearance of construction site is the third determinant of project construction delay with relative importance index (RII) of 0.8145. Most of the rail and road projects in the country started construction before completely clearance of the right of way of the property owners and other third party issues. The project owner speedy up project construction started without consideration to time taken to clear third party issues. Sometimes raised legal issues due to lack of clear compensation policy property owners across the government levels. The amount of compensation that actually paid sometimes not agreed until the end of the project, especially if the property owner appeals against the original valuation. The owner may have the right to appeal and it is up to a Court to agree a fair price for the property. In many cases this disagreement has taken longer periods than the original forecasted deadline.

The fourth determinant is inaccurate forecasting of project schedule the relative importance index (RII) of 0.8038. Since large projects are complex and take place in a context of uncertainty, accurately forecasting final project schedule can be difficult. Forecasting problems include the use of inappropriate methods or inaccurate underlying assumptions because of poor-quality or incomplete data, and unforeseen, dramatic shifts in external conditions.

The fifth determinant of project delayed is shortage of equipment and material (RII=0.7979). Material and equipment shortage commonly faced problems in Ethiopian road and rail constructions projects. When there are many construction projects in the country, the equipment are in short supply and are poorly maintained. This occurs because of shortages of construction material locally, weak financial capacities of contractors timely purchase necessary construction material and equipment, shortages of foreign currency to import material and equipment which was not locally available. Failure of supply of material and equipment were caused project delayed.

The above five technical determinants highly contributes national road and rail project delayed from the initialed planned. Clients, contractors, consultants and other project stakeholders will give more attention to these factors to complete projects on time.

4.4.2.2. Overconfidence Bias Issues

Project stakeholders' overconfidence bias issues is another leading cause of project delay due to human behavior has found that people are prone to planning fallacy. When people to start on big projects, they often put on rose-colored glasses, underestimating the complexity of the task at hand and simply assuming things are going to proceed smoothly without risks faced. By this case most of project stakeholders tend to reflect overconfidence in their own abilities, talents and skills to complete project on schedule. They are quickly taking personal credits for positive outcomes, at the same time attributing failures to unexpected internal and external events.

This problem occurs due to project developers to get approval and funding from the government, and politicians exaggerated/or amplified degree of control of situations to take attention of communities for future votes. Personal or group overconfidence of project sponsors, contractors, and communities are the other influential factors to start without considering internal and external situations. In the table 4.9 respondents ranked over overconfidence determinants based on their experiences.

The relative importance index of overconfidence of politicians, project developer/owners, contractors, communities, project sponsors and consultants are 0.816, 0.7716, 0.7500, 0.6265, 0.6260 and 0.2222 ranked first, second, third, fourth, fifth and sixth respectively. The result of analysis shows that determinants of overconfidence bias relative importance index falls between 0 and 1, this

agreed with what was expected at the beginning, and the average index of all determinates (RII=0.6354) which is above the half of maximum index result. This technical categorized determinant is second ranked influential of project construction delay.

Table 4.9 results show that relative importance index of project stakeholders' overconfidence determinants and their ranks.

Stakeholders overconfidence bias determinants	**∑F**	**∑W*F**	**W_n**	**RII**	**Rank**
Overconfidence of politicians	58	284	6	0.8161	1st
Project planners highly optimistic in the outcomes	54	250	6	0.7716	2nd
Contractors overconfidence	48	216	6	0.7500	3rd
Influence of communities on project stakeholders	54	203	6	0.6265	4th
Interest of project sponsors	41	154	6	0.6260	5th
Consultant overconfidence	12	16	6	0.2222	6th
Overall average of determinants				**0.6354**	

Source: Field survey (2018)

4.4.2.3. Self-Interest Issues

Project stakeholders' self-interest speaks to the possibility that project schedule delay may stem from a deliberately misleading of facts and realties of projects by planners, promoters, politicians and financial sponsors due to their personal interest. It occurs between the principal and agent due to a number of reasons including the presence of information asymmetry, divergent self-interest, and differences in risk preferences. The implication of strategic misrepresentation is underestimate costs, overestimate project benefits, unacceptable construction schedule (over or under), missing of facts or realities of projects. The following four major determinants of stakeholders self-interest issues ranked based on influence of project delay.

Self-interest of project stakeholders determinants caused by initial budgets to get a project approved, funded, and started, knowing that once work begins, difficult to continuity of construction in initial budget and time, it needs revision of the project activities.

Project developers/or planners deliberately misleading of realities and facts of projects by underestimate schedule time of their projects to make more attractive to project financial sponsors. Pol-

iticians and project promoters have an incentive to underestimate the costs and time of their preferred road and rail project plans to make them acceptable to voters. And contractors competitively bidding for projects may strategically underestimate costs, knowing that once they win the job, they can drive up the price through change orders. Sometimes project developer, politicians, project sponsors overestimated time schedule to success their interests.

The researcher asked the respondents to rank factor which affects deliberately time overruns of national road and rail projects. By this case self-interest of politicians ranked in most influential factor which is the RII of 0.7818. The second determents followed politicians interest is project planner/developers interest, the relative importance of index of 0.7541.The third determinate is self-interest of contractors the relative importance index of 0.6900, and the last determinate is interest of financial sponsors (RII=0.4847).

Range of relative importance index of stakeholder self-interest determinates lie relative important index range of 0 and 1, and overall average index is 0.6777 which is above the half of maximum index result. From the analysis of self-interest of stakeholders is the highest average relative importance index compared to technical and overconfidence bias determinants, which is the most influential of project construction delay. The following table 4.10 shows the relative importance index results of self-interest of project stakeholder determinants and their ranks.

Table 4.10 results show of relative importance index of stakeholder self-interest determinants and their ranks.

Stakeholders Self-interest determinants	**∑F**	**∑W*F**	**W_n**	**RII**	**Rank**
Self-interest of politicians	55	172	4	0.7818	1st
Interest of project planners/or developers	61	184	4	0.7541	2nd
Self-interest of contractors	50	138	4	0.6900	3rd
Interest of project sponsors	49	95	4	0.4847	4th
Overall average of determinants				**0.6777**	

Source: Field survey (2018)

4.4.3. Cost Escalation Determinants

Cost overruns are one of the challenges of projects successful completion of road and rail construction projects in Ethiopia. According to secondary data were analyzed in this research article 4.3 (sub article from 4.3.1 to 4.3.4), the road and rail project cost overruns 80% and 100% respectively. To identify major determinants of cost escalation factors across national road and rail projects, the following 15 cost escalation determinants ranked by respondents based on influence.

Table 4.11 results show that relative importance index of cost overrun determinants and their ranks.

Cost escalation determinants	**∑F**	**∑(W*F)**	**W_n**	**RII**	**Rank**
Inflation of material cost	57	741	15	0.8667	1st
Scope change with change order	53	653	15	0.8214	2nd
Incomplete study to before project approval	45	527	15	0.7807	3rd
Poor specification/or bill of quantity and design	46	516	15	0.7478	4th
Poor project performance monitoring	43	469	15	0.7271	5th
Shortages of currency to import construction inputs	41	439	15	0.7138	6th
Devolution of value of Ethiopian Birr	54	573	15	0.7074	7th
Shortages of financial resource	36	383	15	0.7074	7th
Late clearance /or dispute for third party issues	35	340	15	0.6476	8th
Unforeseen project sites	45	425	15	0.6296	9th
Incompetent bidding process	26	221	15	0.5667	10th
Faulty contract administration	35	268	15	0.5105	11th
Unfavorable weather condition	29	217	15	0.4989	12th
Shortages of skilled professionals in the sector	27	186	15	0.4593	13th
Litigation/or contractual agreement problems	24	120	15	0.3333	14th
Overall average of determinants				**0.6479**	

Sources: Field survey

Range of relative importance index of cost escalation determinant lie between 0 and 1, which standard and overall average relative importance index is 0.6479 which is more than half of maximum results of index. This determinant result shows strongly influenced cost escalation of projects beyond initial planned budget. From the above table 4.11 fifteen ranked factors, five most significant factors caused construction project cost escalation and its reason discussed in detail below:

The first rank identified by respondents is inflation of materials cost the relative importance index of (RII=0.8667). International trend showed that having inadequate trading system in the country and many mega infrastructure projects have under construction, then the key construction material dramatically increasing price from time to time. The longer the expected construction periods, the more account will need to be taken of expected inflationary price increases over time. This is particularly important where a public authority's expenditure program is involved. Initial cost estimates need to allow for the value that will be paid at the time the project actually goes ahead. The cost which was escalates over the course of the project; this tends to be cost overruns on road and rail projects.

In second ranked determinant is scope change with change order the relative importance index of 0.8214. The specifications of the project are changed following the "go decision," leading to escalating costs. Scope changes include major alterations to a road and rail projects. Politicians often initiate these significant changes to ensure that their constituents benefit from a project, or that the harm to adjacent communities is mitigated. Change orders may take the form of contractor-initiated variations to the approved design to correct errors and make the road and rail construction, or minor variations to change finishing materials or facility layouts to meet the evolving desires of the client. On large, complex projects, hundreds of change order requests may be instigated by the various stakeholders, all of which have to be negotiated and approved between the client and the contractor. This can be a costly and sometimes contentious process.

Respondents ranked incomplete studies prior to project approval is the third most influential factor of road and rail construction projects cost overruns which was the relative importance index (RII) of 0.7807. Project approval and construction of road and railway projects often proceed before all technical feasibility and engineering studies are completed, leading to escalating costs as more de-

tails about the project are confirmed. This problem caused by government often speed up the progress of approvals to get urged projects started quickly, or to make project announcement to meet program funding deadlines. Incomplete studies before project to approval leads to project design change during construction period. This also leads escalation of cost beyond initial allocated budget to complete construction of projects.

The forth determinant ranked in cost overrun is inadequate specification/or bill of quantity of projects the relative importance index of 0.7478. Inadequate specification of road and rail project negatively affects contractor's competition in procurement process. Without detail bill of quantity and designed precede procurement process created obstacles on competition of business to provide fair price, invited to involve unethical behaviors and negatively impacts implementation of projects at the time efficient contractor win the contractors. This leads to unfair competition in business and sometimes interrupts first procurement process and forced again rebidding process. This increases cost of constructions.

The fifth ranked determinant caused of cost escalation in road and rail projects is poor project performance monitoring and evaluation with the relative importance index 0.7271. Governments may not have the decision-support systems in place to track contractor performance as the job progresses or to select contractors who have a strong record of delivering quality projects on budget and on schedule. It is perhaps to be expected that technical reasons for cost overruns are most often cited by stakeholders involved in the delivery of a project, as this explanation minimizes their level of responsibility for the problem. Monitoring the activities of projects and evaluation of results in project phases are the most important inst instruments helped take decisions promptly on time to success the objectives.

Project stakeholders give more attention pre-construction and construction time for those mentioned key cost overrun determinates which affects negatively road and rail projects implementation on allocated budget.

4.4.4. Correlation Analysis of Variables

Pearson's correlation coefficient (r) is the most widely used correlation statistical to measure the degree of the relationship between two variables. All of the variables are measured in a nominal and ordinal scale. A Pearson's correlation coefficient (r) parametric statistical analysis was used

rather than a Spearman rho type because most of the correlations of the variables in the analysis have a linear relationship.

Different studies shows that the correlation coefficient of two variable greater than 0.8 is generally described as strong, whereas correlation less than 0.5 generally described as weak. On the other side, the P-value is less than the specified significance level, $P<0.05$ or $P<0.01$ which indicates there is a strong significant relationship between, but the P-value greater than $P>0.05$ or $P>0.01$ weak significant relationship between categorized variables.

When $P < 0.01$ or $P<0.05$ level means there is 1% or 5% from in a 100% chance of there no relationship in variables, but the difference is P-value less than 0.01 stronger than P-value less than 0.05 using single- tailed probability values. The following table shows correlation between categorized variables.

Table 4.12 result of correlation coefficient and P-values time and cost categorized variables

Time and Cost Overrun Categorized Variables		Technical determinant	Cost overrun determinant	Stakeholders overconfidence bias issues	Stakeholders self- interest issues
Time overrun determinant	Pearson Correlation	1	.970**	.978**	.957*
	Sig. (1-tailed)		.000	.000	.022
	N	12	12	6	4
Cost overrun determinant	Pearson Correlation	.970**	1	.958**	.978*
	Sig. (1-tailed)	.000		.001	.011
	N	12	15	6	4
Stakeholders overconfidence bias issues	Pearson Correlation	.978**	.958**	1	.975*
	Sig. (1-tailed)	.000	.001		.013
	N	6	6	6	4
Stakeholders self- interest issues	Pearson Correlation	.957*	.978*	.975*	1
	Sig. (1-tailed)	.022	.011	.013	
	N	4	4	4	4

**. Correlation is significant at the 0.01 level (1-tailed) –statistically highly significant

*. Correlation is significant at the 0.05 level (1-tailed)- statistically significant

4.4.4.1. Correlation Between Cost and Time Overrun Categorized Variables

The correlation coefficient(r) of technical and overconfidence bias is 0.978, then the P-value is 0.000 which less than specified standard ($p<0.01$) statistically highly significant and strong correlation between variables. When technical and overconfidence bias, and self-interest and overconfidence bias the correlation coefficient 0.975 and 0.957, then the p-value also 0.013 and 0.022 respectively, which is less than specified standard ($P<0.05$) study was significant and the relationship between variables really exists.

From the above time correlation determinants, one determinates of time variables directly affects (positive result) of the other time variables in the projects. Thus, it can be stated that there is an association between schedule variations. Because of the reason correlation is positive; the more variation in the schedule of one category variable, the more schedule variation added in the other category variable a project.

4.4.4.2. Correlation Between Cost and Time Overrun Categorized Variables

The correlation coefficient(r) of cost and technical, and cost and overconfidence bias are 0.970 and 0.958, then the P-value both 0.000 and 0.001 respectively, which less than specified standard ($p<0.01$), the result shows statistically highly significant and strong correlation between variables. When cost and self-interest determinants the correlation coefficient 0.978, then the p-value also 0.011 which is less than specified standard ($P<0.05$) study indicates significant and the relationship between variables really exists.

Thus, it can be stated that there is an association between budget variation and schedule variation. Because of the reason correlation is positive; the more variation in the schedule, the more budget variation in a project.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary of research findings, conclusions, recommendations and suggestions for further research.

5.2. Conclusion

Based on the results of the analysis of secondary data and primary data conclusions are drawn. Time and cost overruns have extreme challenges for Federal road and rail construction projects in the country. Secondary data were analyzed selected Federal 25 asphalt roads and 5 railway projects since construction completed 2014. The result shows 88% of the road and 100% of railway construction projects time overruns beyond their planned completion periods. The average time overrun of road projects were and rail projects 38% and 37% respectively. Almost 80% of the road and 100% of railway construction projects also cost overruns beyond their planned completion period. Almost 80% of the road and 100% of railway construction projects also cost overruns beyond their planned completion period. The average cost overruns of road and rail construction projects were 15% (157 million birr) and 8.83% (142 million USD) respectively. The analysis showed that the magnitude rate of railway construction projects consumed more time and cost than road projects. This shows that both Federal road and rail projects time and cost overruns are common phenomenon across the country.

Time and cost overruns not only the result of technical challenges associated with delivery of road and railway projects, but also deep psychological and political economy factors contributes the persistent the phenomenon. Political and psychological interest and overconfidence are hidden factors which highly affects project time and cost overruns beyond initial planned. The major contributors of project delay and cost escalation factors identified based on past trends and experiences of respondents to select key determinants' that influenced project delay and cost escalation.

Twenty two (22) influencing project delay determinants incorporated into the three questions technical, overconfidence bias, and self-interest of stakeholders. The top most important determinants of time escalation highlighted and discuss were: incomplete study to project approval, poor project management and coordination, right of way acquisition issue, inaccurate forecasting, project stakeholders over confidence and self- interest, and inefficiency capacities of contractors.

Fifteen (15) cost overrun determinants also incorporated in single question in the form of choices. The top five determinates of rail and road project cost overrun were selected and ranked by respondents were discussed; Inflation of material cost, scope change with change order, incomplete study before project approval, poor specification and bill of quantity, and poor project performance monitoring and evaluation among top factors. The result shows that cost overruns federal road and rail projects due to delay adversely completion of projects and impacts on clients, contractors, professionals, construction industries and socio-economy of the country.

The consequences of cost and time overrun have obvious effects on project stakeholders and the economy of country. The time and cost overruns added estimated schedule time and cost over and above initial agreed upon set resulting less return to investment, damaging the reputation, inability to deliver value for money and inefficient uses of time, created burdens for taxpayers, and loss of other investment opportunities.

5.3. Recommendation

As has been verified, time and cost overrun on road and rail construction projects are continuous problem due to varieties of complex in technical, psychological and political-economy factors. In response, action are required that together address the different factors of schedule delay and project cost overruns. The following are six approaches to minimize challenges drawn from respondents' response:

Weak project management by the national road and rail sectors has been identified common causes of time and cost overruns. The first approach is enhancing project management capabilities of staff is important to manage competitive tender processes, to select firms based on best value rather than lowest bid, to draft enforceable contracts that clearly transfer the risk if budget and time expectations are not met or change orders are requested by the contractor or government, to use

conflict resolution approaches when tensions between partners arise, and to develop effective risk management tools to address the key issues facing all parties involved in a project phases. Good practices in upgrading staff capacities, and develop risk management tools can radically improve outcomes in big infrastructure projects.

Enhance performance monitoring and information sharing in project implementation process is the second strategic approaches to minimize cost and time overruns. Data collection should be coordinated a central department and conducted through single software application. Project managers of agencies in road and rail sectors should be required to input schedule and cost details of each project in the software program when it is initially approved and at the substantial completed. These data used for to learn previous experience and to develop predication modals to estimate time schedule and cost overruns to avoid similar causes in future and to identify early warring of projects. These computer aided estimators range from a simple spread sheets software to sophisticated collaborative online platforms for project construction designs, simulation models, as well as cost and time monitoring and control models.

The third approaches should be control project schedule delayed and cost escalation is reward good performance contractors. Long term and sustained improvements of performance of project incentive reward individuals or firms achieved what their expected, while panelize those that fail to meet performance expectations. One approach that has gained international interest is the implementation of formal prequalification system, which gives firms or individuals good track records an improved chance of obtaining future contracts. Such system should be used to drive up quality of road and rail project procurement. The ranking of each firm is based on results from numerous previous projects implementation, since time and cost overruns on any single project can be caused by factors that may or may not be within the control of the contractor. The strength and legitimacy of the prequalification system is predicated on the development of a data collection regime that is rigorous in capturing both the size and causes of cost overruns as well as construction quality.

Inaccurate forecasting of project construction schedule and budget is one of challenges in federal road and railways construction sectors in Ethiopia. Inaccurate forecasting time schedule and budget top ranked issues in construction projects in both sectors. To minimize this problem need to use

numerous innovative project cost and time forecasting techniques and tools either in order to be develop themselves based on past experiences /or using available software on market. These forecasting tools standardize part of construction process and enhanced data collection on cost and time overruns can be used to develop dynamic registries of reference classes and project benchmarks as comparators in the assessment of future projects. And a common set of instructions, procedures, and assumptions for estimating the time and costs of projects can be developed.

The objectives of road and railways project construction in the country is very huge and increasing complexity. But the status of the road and rail project construction compared with objectives is very low due to government inefficiencies of construction sectors; this causes project schedule slippage, and cost escalation. To increase construction competency and minimize these problems make selective Public-Private-Partnerships (PPPs). PPPs have two main features develop incentive system on-time and on-budget project delivery. First, they combine multiple aspects of project delivery, such as design, construction, operations, and maintenance into a single contract. This creates a level of integration within integration of common purpose and related activities like designers, contractors, and operators of the project right from the planning stages of the project. There is a direct line of responsibility within the consortium for any design flaws or challenges during handovers between subcontractors on the job. Second, PPPs function as pay-for-performance contracts in which the private-sector institutions finances all or a portion of the initial construction costs of the project. The private-sector partner is repaid its initial investment in the project by government or through user fees over the entire life of long-term operating periods.

Unqualified contractors have involved the contract agreement is the other major challenges of road and rail construction projects delays and cost overruns. To minimize challenges; government, nongovernmental organizations, and other project stakeholders should give more attention for upgrade local contractor's capacities should be prepared on the job and off the job training to share good internal and external experiences, and field observation of best implemented projects. It also link between construction industries with higher educational institutions, and research and development centers to change professional knowledge in to actual skills, and to identify key industry problems and to develop best strategies for future solution in the sector.

These six key strategic approaches developed based on current challenges of Ethiopian road and rail projects. The project stakeholders and policy makers should give more attention to use these strategies to control extreme time extension and cost escalation of national road and rail construction projects.

5.4. **Suggestion for Future Research**

Future research can be carried out to determine the economic impacts of road and rail construction project delay which are not identified in the present study. Any interested researcher can include road and rail construction projects in country level to identify economical implication of road and railway users, project stakeholders, vicinity area of business communities, and entirely economy of the country.

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Sample questionnaire distributed to respondents of road/or rail project engineer of clients, contractor and consultant who have experience of delayed and cost overrun.

Thank you for your willingness to participate in this study as respondent. This questionnaire used to collect data for masters research entitled. "**Determinants of Infrastructure Project Delays and Cost Escalations: The Case of Road and Rail Projects in Ethiopia".** The researcher assures you that the information you provide used only for academic research purposes and anonymity of the respondents throughout the research process. All information provided will be treated in the strictest of confidence.

Questions will fill by Federal road and rail engineers, contractors and consultants who have involved construction and familiar with determinants of project delay and cost overruns. The answers should be selected based on your experience and perception of each stakeholder in Ethiopia level. Thank you for your collaboration to respond the questionnaires.

Please respond to the following details questions from **part I to III** by choosing /or filling the concise answers from provided each question.

PART I: General back ground of respondents

1. Questions related to the respondent's educational backgrounds and professional experiences.

1.1. What is your level of Education?

Please specify…….....

1.2. What is your educational field of specialization or qualification?

Please specify……

1.3. What is your current involving position?

Please specify……..

1.4. Is your current involving position has the same as field of specialization?

☐Yes, completely the same ☐ Yes, partially the same ☐Yes, slightly the same ☐ not at all the same

1.5. If your answers 1.4 other than yes completely the same, do you have expected field of specialization and working position mismatched contributes to project delayed?

☐Yes, completely contributes ☐ yes, partially contributes ☐ yes, slightly contributes

☐ Not at all contributes.

PART II: **Project time and cost overrun factors**

2.1.Factors influencing project time overruns

One of the major challenges of road/or rail project construction in Ethiopia is time overruns beyond initial planned. For this study the major determinates of project delay are classified broadly into technical, over-optimization bias, and strategic misrepresentation issues.

2.1.1. Technical determinants/or factors

Technical determinants of project delay have created by shortage of skills and experiences, unavailability of resources, lack of coordination and communication, and unforeseen external factors.

The detail of each question will fill based on your perception and choose more than one answers in each question and put in rank selected answers in right side of provided space.

A. Why do you think you project delayed initial planned schedule? Choose more than one answer by ticking box.	B. Which technical determinants are key factors for your project delayed? Please put your choice selected in question 'A' rank from most to less influential factors simply using numerical numbers or letters in front of each factors (1,2,3,…or A,B,C…..), 1 or A is the most influential factor.
☐ Incomplete studies prior to project approval	
☐ Inaccurate forecasting of project schedule	
☐Shortage of equipment and materials	
☐ Shortage of skilled professional	
☐Right- of-way acquisition	
☐Mandatory reviews of federal or state legislation, environmental and wildlife	

☐ Utility accommodation issues	
☐ Financial problems	
☐ Poor project management, coordination, and Communication	
☐ Difficult site condition	
☐ Bad weather condition	
☐ National/or state events and holidays	
☐ If others, please specify……	

2.1.2. Stakeholder Overconfidence biases determinants

Optimism bias means people tend to display overconfidence in their own abilities, talents and skills, and underestimate potential difficulties of projects. They are quickly taking personal credits for positive outcomes, while attributing failures to unexpected internal and external events.

Planning fallacy also as the tendency of people to underestimate task-completion times and costs even when they know that the vast majority of similar tasks have run late or gone over budget.

A. Why do you think your project lead to over-optimism bias? Choose more than one answers by ticking box.	B. Which over-optimism determinants are key factors for your project delayed? Please put your choice selected in question 'A' rank from most to less influential factors simply using numerical numbers or letters (1,2,3,…or A,B,C…..), 1 or A is the most influential factor.
☐ Project planners/or developers highly optimistic in the outcomes	
☐ Contractors and consultants over confidence their capacities	
☐ Over confidence of politicians	
☐ Influence of project sponsors	
☐ Influence of Communities	
Others	

2.1.3.Self-interest of stakeholders

Systematic deception and misrepresentation speaks to the possibility that project cost overruns schedule delay may stem from a deliberately misrepresentation of facts by project planners, promoters, and politicians. It occurs between the principal and agent due to a number of reasons including the presence of information asymmetry, divergent self-interest, and differences in risk preferences. The implication of strategic misrepresentation is underestimate costs, and over estimate project benefits, unacceptable construction periods, missing of facts or realities to win bid contract award over other competitors.

A. Why do you think your project lead to strategic misrepresentation? Choose more than one answers by ticking box.	B. Which strategic misrepresentation determinants are key factors for your project delayed? Please put your choice selected in question 'A' rank from most to less influential factors using numerical numbers or letters in front of each factor (1,2,3,…or A,B,C…..), 1 or A is the most influential factor.
☐ Project planners and/or government officials strategically misrepresentation project facts and realities	
☐ Self interest of contractors deliberately missed information facts to win bid	
☐ Self interest of politicians misrepresentation of realties to acceptable voters	
☐ Interest of project sponsors /or influence of financial sponsors	
Others ----------	

PART III; Project cost overrun/or escalation factors

Cost overruns are one of the challenges of project successful completion. This research to indentify major determinants of cost escalation factors across federal road/or rail projects.

A. Why do you think your project cost escalation initial planned? Choose more than one answers by ticking box.	B. Which determinants are key factors for your project escalation? Please put your choice selected in question 'A' rank from most to less cost escalation factors using simply numerical numbers or letters in front of each factor (1,2,3,…or A,B,C…..), 1 or A is the most influential factor.
☐ Scope change with change order	
☐ Hand over problems/or dispute between stakeholders or utility owners	
☐ Incomplete study to before project approval	
☐ Inflation of material cost	
☐ Poor project performance monitoring	
☐ Poor specification/or bill of quantity and Design	
☐ Incompetent bidding process	
☐ Shortages of financial resources	
☐ Shortages of currencies	
☐ Devolution of value of Ethiopian Birr	
☐ Shortages of skilled professionals in the sector	
☐ Unforeseen project events	
☐ Unfavorable weather condition	
☐ Faulty contract administration	
☐ Litigation/ or contractual disputes	
☐ Others, please specify……	

Annex 2:

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Structural interview/or questionnaire distribute to respondents of road/or rail project engineer of client, contractor and consultant who have experience of delays and cost overruns.

The structural interview/or questionnaire will gather from road /or rail project manager, office manager, and other professionals of client, contractor and consultant to collect supplementary data for closed ended questions and give chance for respondents freely provide their opinions.

This research title is "**Determinants of Infrastructure Project delays and Cost Escalations. The Case of Road and Rail Construction Projects in Ethiopia**"

The research assures you that the information you provide used only for academic research purposes and anonymity of the respondents maintained throughout the process. Thank you for willingness to participate in this interview. Please the following information:

Educational level, and qualification ……

Current working organization name ……

Current working position ……..

Types of business (client, contractor or consultant)……

1. How do you evaluate the status of road /or rail project constructions against objectives?

   ……

   ……

   ……

   ……

2. What are the major influential factors do you observe that affects of road /or rail project delayed?

   ……
   ……
   ……
   ……

3. What are the major influential factors do you observe that affects cost escalation in road /or rail projects?

   ……
   ……
   ……
   ……
   ……

4. What is your opinion about procurement process of road /or rail mega projects to select competent and reliable contractor and consultant?

   ……
   ……
   ……
   ……

5. How do you see the coordination and communication of project stakeholders (client, contractor, and consultant)?

   ……
   ……
   ……
   ……

6. Do you think that the only government can achieve the provision of road /or rail projects constructions compared to higher demand?

   ……
   ……
   ……

……
……

7. What are the strategies to minimize schedule delayed and cost overruns of road /or rail projects?

   ……
   ……
   ……
   ……
   ……..

8. Do you have believe enough knowledge's, skills and experience transferring in road /or rail projects sectors for long term benefiting the country?

   ……
   ……
   ……
   ……

9. What other major constraints do you observe during road /or rail project construction?

   ……
   ……
   ……
   ……
   ……..