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## Challenges and Success Factors of Railway Megaprojects in Ethiopia

Alemu Asnakew<sup>1</sup>

### Abstract

*In this days project management knowledge and practices becomes very essential due to the fact that managing projects have been emerged complex and challenging from time to time. However, in Ethiopia, very little is studied about critical project success factors, measuring criteria, project management knowledge areas, tools and techniques. The aim of this study is to assess the critical success factors and challenges of the overall railway construction project success in Ethiopia. The study design was explanatory. Mixed approach was used and both primary and secondary data were collected using questionnaires. A sample of 79 respondents was selected from a population of 264. The study findings show that project success factors such as: leadership effectiveness, project team, Contractors. Competency, cost Management, communication management, time management, quality management, risk management, and stakeholder participation respectively are found to be critical factors to the project success. The study also concluded that the major challenging failure factors were: investment cost, skilled manpower in the sector, project integration and stakeholder management, contract administration, and land topography. Thus, it is recommended that participation of relevant stakeholders such as: a farmer on the road sides, people to be displaced and others that may be affected by the project is very essential for successful completion of projects. The Ethiopian Railway Corporation should give emphasis on improving contract administration practices, integration project activities, and improving the project quality management activities. In addition to this, Success factors that have significant effect on the overall success of the railway project should be managed selectively according to their effects.*

**Keywords:** Project success, Railway projects, Challenges and Ethiopia,

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## **Background of the Study**

In this days project management knowledge and practices becomes very essential due to the fact that managing projects have been emerged complex and challenging from time to time. The other fact is that many development and investments for the purpose of transformation or growth plans are intended to be passed through project activities. In particular, megaprojects are becoming very important and increasingly used as the preferred delivery model for goods and services of many businesses and development sectors across the globe.

According to World Bank (2008) more than 20 % of global economic activity takes place as projects, and in some emerging economies, it exceeds 30 %.For instance, in India it is 39 % and in China it is 43 %. This data shows, 22 % of the world's \$55 trillion gross domestic product (GDP) goes to capital formation, which is almost entirely project-based. Global megaprojects are spending to beat \$6 to 9 trillion per annum or 8% of global GDP (Accenture, 2012). Studies revealed that, 80% of all government policies are delivered through large-scale projects and programs (Research Excellence framework, 2014). Trends show that the volume of projects grows alarmingly year by year which needs highly organized project management practices.

Ethiopia is one of the developing countries having good economic annual growth. World Bank estimates show that public infrastructure spending of Ethiopia was approximately more than 19% of its total GDP in fiscal year 2011-2012 (The US Department of State, 2015).For instance, the Ethiopian government has been working hydroelectric infrastructure projects with an estimated amount of more than US\$ 11billion including those projects commenced recently (World Bank, 2008) and railway construction projects with more than US\$17 billion (Ethiopian Railway Corporation (ERC), 2017).

However, literature shows that 65% of megaprojects end up fail, either over budgeted and/or behind schedule to be completed (Taylor, 2015). Other Studies show us, more than 50% of time wasted during construction is attributable to poor management practices (Koskela, 2000). This concludes, delivery of megaprojects is an expensive, highly complex task that entails the combination of leading-edge technology and multiparty governance that demands high stakeholder commitment and multi- directional project

leadership skills (Naomi and Giorgio, 2015). In Ethiopian case, some known projects have been either delayed, have had cost overruns, poor in quality, poor user satisfaction or did not meet the initial objectives (Fetene, 2008; Tekalign, 2014).

According to Tekalign (2014), 79.1 % of the construction project fails to meet its objectives in Ethiopia and if completed it is with an average cost overrun of more than 26.2%. We must know that, Project failures have significant effect from economic as well as political points of view. If the project takes longer time, it requires additional resources, and budgets and this increases labor, material, machinery and equipment cost. This affects the budget of other projects and in general, it affects the economy of the country and results in dissatisfaction of the society at large. This means, Projects are required to be completed within the time frame, budgeted cost and required quality so that to achieve its objective and satisfy stakeholders and users as well. The study of critical success factors is a means of improving effectiveness and efficiency of projects (Makulwasawatudom et. al., 2003; Chanet et al., 2004).

Although, many researchers have been conducted on success factors of projects in many countries across the globe, very little has been done in Ethiopian context. In Ethiopian case, there are problems that result in delay, poor quality and overrun of projects. Some of these are absence of well trained and professionally qualified staff, offensive and poor attitude and behavior on project management works, inadequate facilities and equipment required, and others have been considered as constraints which make our situation is different from other developed countries in completing the project successfully. When we see research activities carried out in Ethiopian public sector projects, most of them focus on project monitoring and evaluation practice. Therefore, this study has focused to make assessment of success factors and challenges of railway megaproject construction management process in Ethiopian context through a survey study and finally contribute to the project management body of knowledge in megaproject management activities.

## **Objectives of the study**

The objectives of this study are:

1. To assess success factors contributing to the success of railway construction projects
2. To assess the major failure challenges of the railway projects in Ethiopia.
3. To identify the possible correlates and predictors of the railway project success.
4. To suggest the possible recommendations that can improve the performance of railway megaprojects across the country.

## **Significance of the Study**

Given their size and scale, mega-projects are important not only to the immediate project stakeholders, but also to the societies, economies, and environments affected by them. Conducting a study in these issues is very essential for the purpose of finding highly influencing factors to draw appropriate scientific solutions for the improvement of mega project outcomes. As a research, the primary merits of the study goes to the university academics. Since there are few studies in the area, it will give a comprehensive starting point for more studies in megaproject management performance improvement. Secondly, public (railway and others) organizations engaged in any types of megaprojects will get important concepts on project success that will create/develop/ awareness. Furthermore, it will also open for further studies in the area.

## **Scope of the Study**

This study mainly focuses on the Ethiopian railway megaproject construction practices such as: Addis Ababa Light Railway, Addis Ababa-Djibouti railway, and awash-weldia railway construction projects. The success criteria used to measure the overall success of the railway project in this study are: complete the project within time, complete the project within budget and complete the project with specified quality. The study has mainly focused on the perception of the project employees.

## **Study hypotheses**

**Hypothesis 1:** Project manager's leadership/Administrators effectiveness has significant positive effect on construction projects success.

**Hypothesis 2:** Contractor's competency has significant positive effect on construction projects success.

**Hypothesis 3:** Project team effectiveness has significant positive effect on construction projects success.

**Hypothesis 4:** Stakeholders Participation has significant positive effect on construction projects success.

**Hypothesis 5:** Risk management has significant positive effect on construction projects success.

**Hypothesis 6:** Communication management has significant positive effect on construction projects success.

## **Project and Project Management**

Kerzner (2013) described that to realize project management; one must start with the explanation of a project. Project is a unique set of co-ordinate activities, with defined starting and finishing points undertaken by individuals or organizations to meet specific objectives with in defined schedule, cost and performance parameter. The word unique points out that every project has its own authentic nature in the sense that there may not be a pre-existing blue print for the project's implementation and there may not be a need to repeat the project once accomplished. Its goal distinctiveness may be well perceive as achieving stated objectives or solve a particular problem, while its provisional nature signifies a discrete, definable commencement and conclusion. Project is series of activities and tasks that have Specific objectives, defined start and end dates, funding limits, and it also has characteristics of multifunctional i.e. cut across several functional lines (Kerzner, 2009).

**Mega project:** is an extremely large-scale investment project typically defined as costing more than \$1 billion and attracting a lot of public attention because of substantial impacts on communities, environment, and budgets ((Naomi and Giorgio, 2015).

**Project management:** is the process by which projects are defined, planned, monitored, controlled and delivered such that the agreed benefits are realized. Projects bring about change and project management is recognized as the most efficient way of managing such change. Project management involves project planning, monitoring and includes such items as: Project definition of work requirements, definition of quantity and quality of work, description of resources needed, project monitoring, tracking progress, comparing actual outcome to predicted outcome, analyzing impact and making adjustments. Successful project management can then be defined as having achieved the project Objectives (within time, within cost, at the desired performance/technology level keeping the desired quality) while utilizing the assigned resources successfully and efficiently, and accepted by the customer/owners (Kernzer, 2013). According to Project Management Institute (PMI, 2004), Project management is the application of knowledge, skills, tools, and techniques to a program in order to meet the program requirements and to obtain benefits and control not available by managing projects individually.

The full amount of all the project management activities consists of 42 processes, which are stretch across ten knowledge areas (PMI, 2013): such as:

***Project Integration Management:*** Project Integration Management includes the processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.

***Project Scope Management:*** Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It includes scope planning, scope definition, scope verification, create WBS and scope control of a project.

***Project Time Management:*** Project Time Management includes the processes required to manage the timely completion of the project. It includes activity definition, activity sequencing, activity resource estimation, activity duration estimation, schedule development and schedule control of a project.

***Project Cost Management:*** Project Cost Management includes the processes involved in cost planning, cost estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.

***Project Quality Management:*** Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.

***Project Human Resource Management:*** Project Human Resource Management includes the processes that organize, manage, and lead the project team and all other work forces of a project. It consists of human resource planning, acquire project team, develop project team and manage project teams.

***Project Communication Management:*** Project Communications Management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.

***Project Risk Management:*** Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, and monitoring and controlling of risk on a project.

***Project Procurement Management:*** Project Procurement Management includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team. It includes contract administration of the project.

***Project Stakeholders Management:*** Project Stakeholder Management includes the processes required to identify all people or organizations impacted by the project, analyzing stakeholder expectations and impact positively or negatively on the project, and developing appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

### **Project Success, Criteria and Factors**

***Project Success:*** is measured against the project's overall objectives and project management success that is measured against the iron triangle (time, cost and quality), customer satisfaction (Serrador & Turner, 2015). Recently, project management success has also been added that it is defined as meeting the customer's expectations. It is argued that successful Project management for construction project should align to the stakeholders' organizations goals.



Previous research conducted in South Africa found that success for a public construction project can be measured across six dimensions for infrastructure project success which include: economy, environment, society, resource. In Malaysia, public construction project success metrics include four perspectives, which are a financial perspective, a customer perspective, an internal perspective, and a learning and growth perspective. In Great Britain, successful road infrastructure projects must be achieved according to reliability, delivery on time, budget, safety, maintenance, environment, customer satisfaction and value added to national development. Furthermore, in Hong Kong, USA, Canada, Australia, Germany, and Korea, three dimensions of success measurement such as: predictability, process, and outcomes are identified in order to determine to what extent projects are delivered successfully (Toor and Ogunlana, 2009; Lin et al., 2011; Cha and Kim, 2011; Kaare and Koppel, 2012; and Ugwu and Haupt, 2007 cited by Abednego, 2015).

### **Project Success Perspectives**

Samset has explained that success can be viewed from three different perspectives; operational (the project outputs), tactical (the project goal) and strategic (the project purpose). According to him, the operational view is measured whether the project was completed on time, within costs and to the expected quality. These are the most commonly applied measures of success, as well as the most limited perspective which only gives an indication of the delivery of the project itself (Samset, 1998 cited by Elías, 2015).

Project success at operational perspective holds efficiency of the project (the cost, time and quality performance of the project/the iron triangle). Efficiency: is the delivery of the project in regard to time, cost and quality performance. This study is limited on the specific of project success at operational perspective.

**Success criteria:** Standards, rules, or tests on which a judgment or decision can be based, or by which a product, service, result, or process can be evaluated (Serrador& Turner, 2015). In this study, the success criteria (dependent variables) to be tested are: complete the project within time (time

performance), complete the project within budget (cost performance) and complete the project with specified quality (quality performance).

**Success factors:** The set of conditions, facts, or influences which contribute to the project outcomes (Serrador & Turner, 2015). Among many types of the critical success factors identified by different researchers, the project critical success factors considered in this study are described below:

### **Project Manager's Leadership / Administrators Effectiveness**

Leadership is the capability to establish vision and direction, to influence and align others towards a common purpose and to empower and inspire people to achieve project success. Saifur et al. (2014) concluded that, leadership competency has positive impact on the project success. Megaprojects generally are managed with two project leaders at the level of controlling: On one side, the owner-side megaproject leader represents the joint venture, company or government body that has commissioned the project. This leader's primary focus is on ensuring the project is delivered to specification and answers to the project owner's needs. On the other side, the contractor side megaproject leader, employed by the contractor engaged to carry out the project, which is responsible for the successful planning and building of the project.

Russell Reynolds Associates (2016) stated that 81% of megaproject leaders (surveyed from 31 world's leading megaproject leaders) were over the age of 50% and 19% were over 60 years of age. The majority of these leaders are male, with only five females in their sample. Maturity can be used here as a substitute for years of experience: Current megaproject leaders have spent an average of 25 years working their way up a focused career ladder. According to that study, megaproject leaders' most recent preceding in megaproject leading role shows project management (42%), operations management (25%), division head (7%), engineering (4%), general management (4%), strategy (4%) and corporate affairs (4%).

### **Contractors Competency**

Construction projects and their success are highly dependent on contractors (PMI, 2004). Appointment of the right contractor will not only ensure the overall quality of the project but also offer the opportunity of saving on costs.

Wong (2003) showed that contractors with adequate plant resources are an important and statistically significant factor affecting project success. The scheduling model reveals that the adequacy of plant resources factor is a statistically significant predictor of project success.

### **Project Team Effectiveness**

Team Effectiveness is defined as the project manager or leader's perception on team members' performance in task completion, goal achievement, empowerment, information sharing and team's ability to create and sustain good working environment (Bourgault et al., 2008). Team effectiveness refers to the extent to which a team has been successful in meeting the objectives of their project.

### **Stakeholder's Participation**

Stakeholders are those with a particularly significant interest in the project's outcome, including those providing funding or right of way for the project and property owners who are affected by the project. Or it is an individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project which have significant influence on project success (PMI, 2013). Stakeholders should not be considered simply as recipients of monitoring and evaluation reports. Rather, they have the right and responsibilities to know what is happening in the project, which aspect needs corrective action, what the results are, and which lessons can be learned and shared with one another (MoFED, 2008).

### **Project Risk Management**

Major risks anticipated in railway construction projects are: geological risk, stakeholder conflict, weather, economic, political, law, and physical site, scope of work, construction contract, designing, materials, and financial and human resource risks. Risk-response is a key component of risk management in tunnel construction. The major project risk management factors such as: identifying and documenting project risks, updating the risk response plan and strategy, using risk break down structure (RBS) in the identification or planning of risk, estimating the chance of occurrence of risks, accomplishing quantitative and qualitative risk analysis, preparing a detailed risk response plan for risks that warrant action, using risk register/log in the risk management process performing risk audit in a project, developing risk

response strategy, performing risk monitoring and control, and others are very critical of the project success or failures (PMI, 2004; Kernzer, 2013).

### **Project Communication Management**

By definition, project communication management refers to the set of activities concerned with the generation, collection, presentation, distribution, and secure storage of information within a project and its environment.. Project communication is the exchange of project-specific information with the emphasis on creating understanding between the sender and the receiver. Project communication management is thus the backbone to effective decision making during the lifecycle of a project. Effective communication is one of the most important factors contributing to the success of a project. Communication is the fuel that keeps the project running efficiently to complete in time, with budgeted cost and with specification according to planned quality (PMI, 2004). According to different scholars and practitioners, failure to communicate is often the greatest threat to the success of projects.

### **Project Cost Management**

According to PMI (2013), cost management is concerned with the process of planning and controlling the budget of a project or business. It includes activities such as planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget. Cost management covers the full life cycle of a project from the initial planning phase towards measuring the actual cost performance and project completion. To manage project costs effectively, there are three key processes we need to be able to perform: project cost estimating, project cost budgeting and project cost control. According to PMI (2013), control is comparing actual performance with planned performance, analyzing variances, assessing trends to effect process improvements, evaluating possible alternatives, and recommending appropriate corrective action as needed.

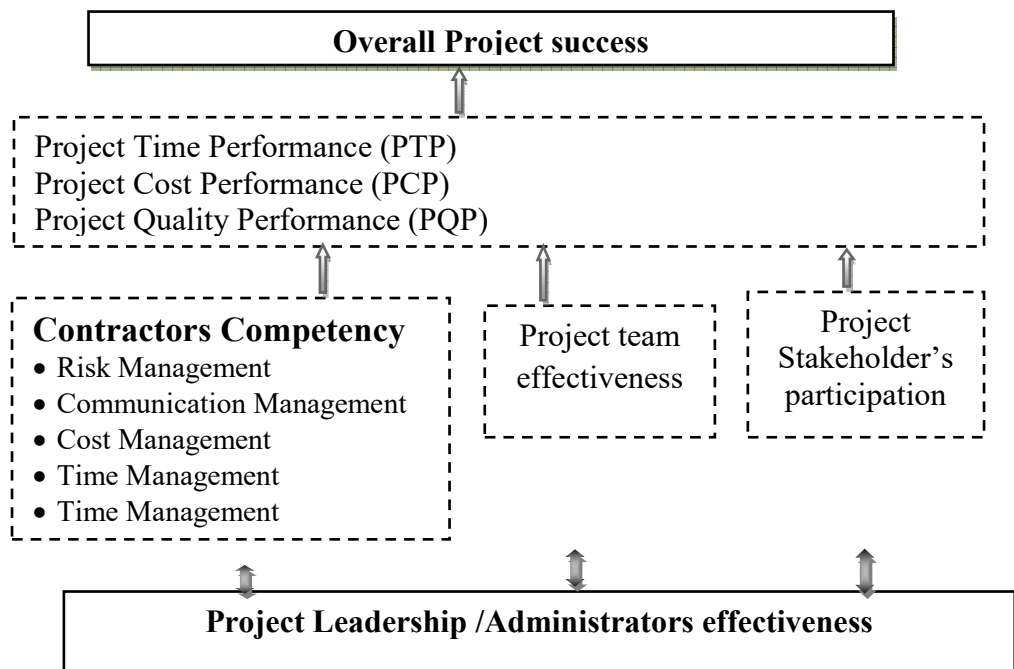
### **Project Time Management**

Project time management is the efficient use of time by means of good organization, efficient productivity, and proper planning. Project managers, who are tasked with overseeing projects from start to finish, utilize these time

management skills to complete their work in the most efficient, cost-effective ways possible. It is necessary because a team needs to be organized to meet deadlines and to streamline collaboration. The knowledge area of time management typically refers to the skills, tools, and techniques used to manage time when accomplishing specific tasks, projects and goals (Kerzner, 2013). Scheduling and sequencing of activities will usually use to manage the time to be used in the appropriate utilization of the project schedule time. Previous study revealed that the Contribution of time management for overall success of the project by descriptive analysis was 92% with the mean value of project time was 4.64 (Abednego, 2015).

### Project Quality Management

Project quality management is the discipline that is applied to ensure that both the outputs of the project and the processes by which the outputs are delivered meet the required needs of stakeholders. Quality is broadly defined as fitness for purpose or more narrowly as the degree of conformance of the outputs and process.



According to Jha & Iyer (2006), the critical success factors obtained was: project manager's competence; top management's support; monitoring and

feedback by project stakeholders; and administrators' competence. The factors that harmfully affected the quality performances of projects were: conflict among project stakeholders/participants; aggressive socio-economic environment; harsh climatic condition; project manager's ignorance and be deficient in of knowledge; defective project conceptualization; and aggressive competition during tendering. Therefore, the conceptual frame work of this research is presented below. The arrow indicates the direction of influence and success determinations.

## **Research Design and Methodology**

### **Study Area Description**

Railway becomes the most useful transport system in both developed and developing countries. Railways have a low impact on the environment, particularly in comparison with other transport modes and most notably, road. Overall, rail is one of the 'greenest' ways there is to provide mobility for goods and people. For instance, the total greenhouse gas (GHG) emissions in the EU are described as: rail transport 0.9%, domestic navigation 2.2%, domestic aviation 2.5%, road transport 93.4 % and other transport has only 1.0 %<sup>2</sup>. Ethiopia has experienced rail transport since the last ten decades. As the Ethio-Djibouti Railway deteriorated from lack of maintenance, Ethiopia lost railroad access to the sea. The existing meter gauge railway had been originally built by the French between 1894 and 1917.

This study was focused on the Ethiopian Railway projects currently constructed. In the new era of railway transport, the construction of the Addis Ababa light railway has been completed, which is 34 km length and has become one of the attractive transport systems in the city. The Addis Ababa Djibouti railway is about a total length is about 743.245 km and is the most feasible project and the 3<sup>rd</sup> project is the awash woldia railway construction. The projects were contracted to Chinese company. The contract type is EPC-turnkey contract agreement

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<sup>2</sup> Full information can be accessed from [www.railwaystrategies.co.uk](http://www.railwaystrategies.co.uk)

### **Research Design and Approach**

This research employed two types of designs such as descriptive and mainly explanatory methods. Descriptive design was used to describe the analysis of the collected data while explanatory design was concerned to test some objectives and the research hypothesis. In this study, mixed approach is used (Borrego et al., 2009).

### **Research Methods**

For this study, survey method has been chosen as the appropriate method to collect data in concerning project success factors concentrated on the scheduling, monitoring and controlling process of the railway megaproject. Furthermore, the survey method can cover interview, questionnaire method and document review of the railway project management process. Survey method provides with standardized answers allow easy comparison and generalization; and also researcher's control of the process and gives opportunity to increase the speed of data collection (Creswell, 2013).

### **Sample and Sampling Techniques**

The proposed sampling technique for this population is purposive sampling where the respondents were selected based on the criteria (Burns, 2000; Saunders & Thornhill, 2012). When the population is less than 1000, we can take a sample of 30% of the total population (Voorhis and Morgan, 2001). If the population is greater than 1000, a sample size of 10-20% can be a representative of the population (Gay and Airasian, 2003). The total population of this study were 264 project team members who have at least first degree and have been working in the construction of the railway projects. Therefore, sample size of this research was 79.

### **Data Sources and Collection tools**

This study has employed both primary and secondary data. Primary data was collected using structured questionnaire, interview and secondary data by reviewing of major project documents. For quantitative data collection, Likert rating scale was adapted to support producing the appropriate ratings. Except for demography questions, all variables (dependent and independent) identified were incorporated in the questionnaire properly for measurement purpose with a 5-point Likert scale rating of 1-5 points. The questionnaire were distributed to employees who have been directly working in the project

activities to fill it independently and returned for analysis. For the interview purpose a group was organized holding key persons who have been working in all project life cycles of the railway construction projects.

### Methods of Data Analysis

The data analysis procedures adopted were: statistical analysis of descriptive frequencies, means and multiple linear regressions to test the effect of success factors on the overall success of the railway projects. Analysis was done using SPSS for Windows, Version 20). Qualitative data was analyzed using content analysis based on the research question.

### RESULTS AND DISCUSSION

To collect important information, 79 questionnaires were distributed for selected respondents from this 76 were returned and analysed with a response rate of 96%. As indicated in table 1 below, the mean value of Project team effectiveness, Project manager's leadership effectiveness, Contractors competency and Project cost management were 4.04, 3.97, 3.96 and 3.91 respectively having rated better followed by project time management, and Communication management which have a mean value of 3.78, and 3.72 respectively. While project quality management, project risk management and stakeholders participation have the smallest mean of 3.54, 3.5, and 3.46 respectively.

Table 1. Descriptive Statistics of Variables (n=76)

Variables	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)	Mean
Project manager's Leadership/ Administrative Effectiveness	2(3)	9(12)	54(71)	11(15)	3.9737
Project Contractors Competency	-	13(17)	51(67)	12(16)	3.9605
Project Team Effectiveness	2(3)	7(9)	53(70)	14(18)	4.0395
Stakeholder Participation	4(5)	21(27)	47(62)	4(5)	3.4605
Project Risk Management	4(5)	17(22)	49(65)	6(8)	3.5000
Communication Management	-	13(17)	52(68)	11(15)	3.7237
Project Cost Management	-	13(17)	52(68)	11(15)	3.9079
Project Time Management	-	15(20)	48(63)	10(13)	3.7763
Project Quality Management	2(3)	19(25)	44(58)	11(15)	3.5395

Source: Own Survey



This result shows, most of the factors have mean value of greater than 3.5 which is nearly 4. It is evident that, respondents have agreed most of the project success factors were well practiced in the project management process. As item no.1 table 1 above showed, when agree and strongly agree are summed up, 86 % (66) of them have agreed that project managers/administrators have effective leadership ability and for project contractor's competency, 83% (63) of respondents have agreed there was relatively effective contractor for the success of the project. This study also shows 88% (67) of them have decided the railway construction project teams were effective to complete the project successfully where only 3% (2) of them were disagreed and 9% (7) of respondents have not decided (neutral). This result has demonstrated that the project team was the most important success factor of the project completion within time, budget and specification.

The result from table 1 item no. 4 has also revealed that the participation of stakeholders was agreed by 67% (51) of the total respondents. However, in this success factor 27% (21) were neutral and 5% (4) were disagreed. We can conclude that stakeholder participation was the least contributing factor which was not clearly decided by the mentioned respondents. The frequency distribution from table 1 demonstrated that non- human success factors such as: risk management 73% (55), communication management 83% (63) cost management 83% (63), time management 79% (58) and quality management 73% (55) of the respondents respectively have agreed that these success factors were also important in the project management process.

Table 2. Relevant Statistical tests for multiple Regression Analysis

Statistical tests	Test results	Decision
Linear relationship test	Both the Q-Q plot and scatter plot line of all the variables are linear	All independent variables have linear relationship with dependent variables
Reliability test	Cronbach's alpha is 0.92	It is More reliable
Test of Model fitness ( $R^2$ )	$R^2$ is between 0.58 to 0.62	Multiple regression model is fit for this study
Multicollinearity test	r is <0.50, tolerance= 0.77 to 0.87 and VIF = 1.15 to 1.301	No problem of multicollinearity

**Source:** Own survey

Based on the result of statistical tests, in table 2 above, the result of the test showed that, collected data were consistent, reliable and the regression model used was validated, and fit to this study.

**Table 3.** Model Summary of Time, Cost and Quality Performance Regressions

Model	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.61	0.57	0.29	2.32
2	0.62	0.59	0.25	1.85
3	0.58	0.55	0.33	2.46

**Note:** Model 1, dependent Variable: Completing the project within time; Model 2, dependent Variable: Completing the project within budget; and Model 3, dependent Variable: Completing the project with specification(specified quality)

The regression of project time performance (model 1) on the explanatory variables gives an  $R^2$  value of 0.61, as shown on table 3 above, Where  $0 < R^2 < 1$ . Here, 60.8% of the variability in the time performance of a railway project has been explained strongly by the six explanatory variables in combined and 39.2 % variability is explained by other external variables which are not considered in this study.

As we can see in the Model Summary of cost performance(model 2) at Table.3 above,  $R^2 = 0.62$  which indicates that 62.2% of the variance in the project success criteria which is called complete the project within budget (cost) can be explained by this regression model. On the other side, the rest 37.8 % variability is affected by other external factors which are not included in this test of relationship.

The regression (Model 3) Summary (table 3) offers  $R^2 = 0.58$  which indicates that 58.2% of the variance in the project success criteria which is called complete the project with specified quality can be explained by these six project management success factors where the rest 41.8% is affected by other external factors. So, it has to be done alongside other indicators.

The ANOVA generated from dependent variables demonstrated that, there is significant relationship between dependent and the six independent variables for the three models mentioned (Table 4. below).

Table 4. ANOVA Results for Model 1, Model 2, and Model 3 Regression functions

Model	Equations	Sum of Squares	df	Mean Square	F
1	Regression	9.38	6	1.56	17.87***
	Residual	6.03	69	0.09	
	Total	15.41	75		
2	Regression	6.94	6	1.16	18.95**
	Residual	4.21	69	0.06	
	Total	11.16	75		
3	Regression	10.32	6	1.72	16.0***
	Residual	7.42	69	0.11	
	Total	17.74	75		

\*\*\* Significant at  $p < 0.01$

The result of t- test presented in Table 5 at model 1, below illustrated, except contractor's competency and project team effectiveness; each other success factors has significant relationship with time Performance of the railway project.

The result of the test presented in Table 5 below at model 2, suggested that, except Stakeholders participation, each of other factors has significant relationship with Cost Performance of the railway project. The result of the multiple linear regression coefficient of t-tests presented in Table 5 at model 3 below, demonstrated, except contractor's competency and communication management factors each of other success factors has significant positive effect on quality Performance (project success criteria) of the railway project.

## Hypothesis Testing

### The Effect of success factors on time performance

The result of the multiple regression test presented in Table 4 above, model 1 suggested that, there was a significant relationship ( $F=17.87$ ,  $p < 0.05$ )

between the railway project success criteria such as completing the project within time and the six success factors in combined. In addition to this, the combined association was relatively strong ( $R^2=0.61$ ), which means that 60.8 % of the total variation in time performance was affected by the six success factors.

From the regression result in the table 5 below, it can be concluded that project managers leadership/administrative effectiveness ( $\beta=0.28$ ,  $t=4.43$ ,  $p<0.05$ ), stakeholders participation ( $\beta=0.12$ ,  $t=2.11$ ,  $p<0.05$ ), project risk management ( $\beta=0.13$ ,  $t=2.26$ ,  $p<0.05$ ) and communication management ( $\beta=0.20$ ,  $t=3.67$ ,  $p<0.05$ ) each have significant positive effect on project time performance. However, contractors competency ( $\beta=0.07$ ,  $t=1.18$ ,  $p<0.05$ ), and project team effectiveness ( $\beta=0.07$ ,  $t=1.18$ ,  $p<0.05$ ) has not significant positive effect.

### **The Effect of success factors on cost performance**

The result of the test presented in Table 4 model 2 shows, there was a significant relationship ( $F=18.95$ ,  $p<0.001$ ) between the project success criteria such as completing the project within budget and the six success factors. In addition to this table 4.5 demonstrated the combined association was relatively strong ( $R^2=0.62$ ), which means cost performance was affected positively by the six success factors.

The regression coefficient result at table 5, we can understand that project managers leadership/administrative effectiveness ( $\beta=0.23$ ,  $t=4.37$ ,  $p<0.05$ ), contractors competency ( $\beta=0.14$ ,  $t=2.61$ ,  $p<0.05$ ), project team effectiveness ( $\beta=0.10$ ,  $t=2.07$ ,  $p<0.05$ ), project risk management ( $\beta=0.092$ ,  $t=1.96$ ,  $p<0.05$ ), and project communication management ( $\beta=0.15$ ,  $t=3.24$ ,  $p<0.05$ ) each has significant positive effect on project cost performance. But stakeholders participation ( $\beta=0.08$ ,  $t=1.73$ ,  $p<0.05$ ) has not significant positive effect on project cost performance.

### **The Effect of success factors on quality performance**

The result of the test presented in Table 4, model 3 suggested that, there was a significant relationship ( $F=15.99$ ,  $p<0.05$ ) between the project success criteria such as completing the project with specification and the six success factors,

which means that 58.2% of the total variation in project quality performance was positively affected by the six success factors.

From the  $\beta$  coefficients generated from regression of quality performance in table 5 below, it can be concluded that project managers leadership effectiveness ( $\beta=0.15$ ,  $t=2.18$ ,  $p<0.05$ ) project team effectiveness ( $\beta=0.32$ ,  $t=4.90$ ,  $p<0.05$ ), stakeholders participation ( $\beta=0.13$ ,  $t=2.07$ ,  $p<0.05$ ) and project risk management ( $\beta=0.24$ ,  $t=3.82$ ,  $p<0.05$ ) each has significant positive effect on quality performance. But contractors competency ( $\beta=0.11$ ,  $t=1.6$ ,  $p<0.05$ ) and communication management ( $\beta=0.02$ ,  $t=0.3$ ,  $p<0.05$ ) each has not significant positive effect.

Table 5. Regression of Dependent and Independent Variable tests

Variables	Model 1		Model 2		Model 3		Model 4 (Overall performance)	
	B	t	B	t	B	t	B	T
Constant	0.45	1.23	0.78	2.53	-0.04	-0.10	0.40	1.47
PLE	0.28	4.43 <sup>***</sup>	0.23	4.37 <sup>***</sup>	.154	2.18 <sup>**</sup>	0.22	4.79 <sup>***</sup>
CC	0.07	1.18	0.14	2.61 <sup>***</sup>	.112	1.6 <sup>**</sup>	0.11	2.34 <sup>**</sup>
PTE	0.07	1.18	0.10	2.07 <sup>**</sup>	.323	4.9 <sup>***</sup>	0.17	3.81 <sup>***</sup>
SM	0.12	2.11 <sup>**</sup>	0.08	1.73	.130	2.07 <sup>**</sup>	0.11	2.67 <sup>***</sup>
PRM	0.13	2.26 <sup>**</sup>	0.09	1.96 <sup>*</sup>	.238	3.82 <sup>***</sup>	0.15	3.71 <sup>***</sup>
PCM	0.20	3.67 <sup>***</sup>	0.15	3.24 <sup>***</sup>	.018	0.30	0.12	3.06 <sup>***</sup>

<sup>\*\*\*</sup>Significant at  $p<0.01$ , <sup>\*\*</sup> significant at  $p<0.05$  and <sup>\*</sup> significant at  $p<0.1$

Source: Own result

**Note:** (1) Dependent variable for model 1: Completing the project within time; dependent Variable for model 2: Completing the project within budget; and dependent variable for model 3: Completing the project with specification

(2) The variables denoted as PLE = Project manager's leadership / Administrators effectiveness, CC= Contractors competency, PTE= Project team effectiveness, SM= Stakeholders participation, PRM= Project Risk management and PCM= Communication management

Regarding the above findings, the six success factors each has significant positive effect on construction project success. Therefore, all the hypotheses are accepted and the null hypothesis is rejected.

## Major Challenges Facing to Ethiopian Railway Projects

The qualitative data collected was analyzed based on the research question and presented focusing on the core points. The following are found to be critical failure factors for the Railway Project construction in Ethiopia and other similar countries.

1. **High Investment Costs:** Right-of-Way: compensation payments for land acquisition, Construction costs: site preparation, earth works, infrastructure, supervision of work and contingencies and Rolling stock. For instance, in Ethiopian topography a 1 km railway construction may cost an estimated amount of 7 million dollar.
2. **Lack of skilled manpower in the sector:** Because it is not yet fully formed sector, the most challenging factors were monitoring and controlling of railway projects on site, Operation and Maintenance of Railway Infrastructure, contract administration, etc...need experienced manpower. Respondents said *“manpower allocation for the project was not enough some times during peak times especially during monitoring and evaluation times”*.
3. **Problems related to project Integration management:** there were problems of **Integration** with Utilities (Right-of-Way problems). That was Right of way issues along the Roots of the railway were challenging. For instance, Coordination with AACRA, AWSA, big factories, flower farms, EEU, Ethio telecom, and other Addis Ababa city and regional authorities was difficult during the railway project construction.
4. **Poor participation of relevant stakeholders:** the public (Principally farmers and related people) alongside of the roots did not sufficiently participate.
5. **Project scope management problems:** they said *“During planning stage of the railway projects, a very detailed plan for the communication of stakeholders and risk management was not done sufficiently and this became a headache during the implementation phase”*. This means, the project planning phases must have considered stakeholders to participate at relevant process groups or stages.
6. **Contract administration constraints:** the project used selected contract delivery method (EPC).According to respondents, *“The communication with the contractors was not open as client contractors”*. *The local/ the corporation’s monitoring and supervision team had not full power in*

*controlling the work/process as per the plan to be with best quality. Some Respondents wrote on the questionnaire “Due to Conflict of interests, there were multiple interests of the stakeholders for example to gain unnecessary economic advantage at the expense of the corporation costs”. There were also Constraints of technology transfer. “There was contractor’s unwillingness to transfer knowledge to Ethiopian engineering professionals”.*

- 7. Geological and weather challenges:** difficulty of earth work particularly at Beseka Lake, unexpected flood and destruction of culverts, etc. in the down steams of the roots were Geological challenges of the railway construction.

### **Summary of Findings**

According to Saifur et al. (2014), leadership competency has positive impact on the project success. The finding of this study revealed, that leadership/administrative effectiveness has significant positive effect on railway project success. This result is in line with the literature discussed above. Regarding the project leadership practices, the interview participants said *“in this railway project, we have seen Strong political will and commitment from the government”. There was a project steering committee that was headed by core higher officials and members of it were ministers, and more concerned sector authorities. In addition to this, the ERC board was a responsible body to administer the overall project leadership to move towards success*.”. *“Both the steering committee and the board were evaluating the performance of the project activities every fifteen days and gave strong directions to the project leadership and also to the core stakeholders (like ERC, Ethio telecom, EEU, transport minister, regional governments, Ethiopian revenue authority, and others)”.*

These shows, there were strong project administrative activities which made the project to be successful. We can say, the project managers had strong top management support. The top management of the corporation was cascading their vision and mission both physically and spiritually many more times to their subordinates.

Both the quantitative and qualitative analysis revealed that project leadership played significant role on the overall project success. In the descriptive

frequency and mean distribution leadership and team effectiveness were the most important success factor for project success. In addition to this, the regression analysis demonstrated that the success factors tested has positive significant effect on the railway project success. Furthermore, these results have agreed with other researchers ((PMI, 2004; Kernzer, 2013; Belout and Gauvreau, 2004; Wong et al., 2003).

### **CONCLUSION AND RECOMMENDATIONS**

The study concluded that project success factors such as: Project managers leadership/ administrative effectiveness, project team effectiveness, contractor's competency, project Cost management, project communication management, project time management, project quality management, project risk management, and project stakeholders participation respectively are found to be critical success factors contributing to the railway construction project success. That means all the variables tested are critical factors which strongly influence the success of the railway construction projects in Ethiopia. However, stakeholder participation factor was weakly managed. In addition, each of these success factors has significant positive effect and has linear relationship with each of the corresponding success measuring criteria and also with the overall railway construction project success.

The study findings has also concluded that Major challenges of the railway construction in Ethiopia are: investment costs, skilled manpower, project integration management, stakeholder management, scope management, contract administration, and land topography which have been influencing negatively. Based on the above finding and conclusion the researcher forwarded the following recommendations.

- The Ethiopian railway corporation (ERC) has to participate relevant stakeholders such as: farmers on the road sides, people to be displaced and others that may be affected by the project. ERC should give emphasis on improving contract administration by developing skilled manpower and project lesson development activities. Success factors that have significant effect on the overall success of the project should be managed selectively according to their effects.
- Contract administration constraints such as implementing strong monitoring and control practices, technology transfer and keeping quality according to



agreements must be solved in other similar projects by taking lesson from these projects.

- Projects management subsidiary plans such as project scope management plan, cost, time, quality, risk; HRM, stakeholder participation, communication and contract administration plans need to be prepared and implement to solve integration and coordination problems and also must be managed properly for the success of the project.
- This study was limited to project success at operational perspectives (construction aspects) only. Further studies are recommended to study the railway project success at tactical perspectives (such as project effectiveness, overall impacts and relevance of the project) and also at strategic perspectives focusing on sustainability of railway projects at broader and complex level to test whether the project contributes to economic development or positive changes in society or to the country.

### **Limitations of the study**

This study was conducted with some sort of limitations. The researcher was faced many problems which, in fact, may affect the quality of the study. The following limitations were expected: unwillingness of the respondent to fill the questionnaire, delay in returning back the questionnaire, unavailability of well-organized secondary data that could be easily accessed for the purpose, shortage of time and budget to undertake the study. To minimize the effects of these problems, the researcher has used maximum effort through spending more time and giving more attention.

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