Factors Affecting Performance of Commercial Building Projects in Lideta Sub-City, Addis Ababa

Maerege Gebrehewot[*]

Compensation Valuation and Replacement Officer, Lideta Sub–City Land Development and Management Office. Addis Ababa, Ethiopia

Maru Shete

PhD and Associate Professor, St. Mary's University, P. O. Box 1211, Addis Ababa, Ethiopia.

Abstract

The purpose of this study is to examine the factors affecting the performance of commercial building projects in Lideta Sub-city. The study employed a causal research design and used a quantitative research approach. A survey was conducted by using 174 structured close ended questions which were distributed to 58 contractors, 58 consultants and 58 owners of building construction projects. Multiple regression was used to examine the causal relationship between factors that affect project performance and project performance indicators such as construction cost, time, quality and scope. The findings of the regression analysis showed that project cost management factors, project time management factors, project quality management factors, project scope management factors and project risk management factors positively and significantly affected performances of building construction projects. Thus, this study recommended that contractors, consultants and owners should give emphasis on addressing the correlates of project performances so as to increase the efficiency, effectiveness and quality of building construction projects at the Sub-city.

Keywords: *Project cost, project time, project quality, project scope, project risk management, project performance, Lideta sub-city, Addis Ababa, Ethiopia.*

[*] Corresponding author and can be contacted through maeregemelody35@gmail.com

1. INTRODUCTION

The construction industry is vital for the development of any nation. In many ways, the pace of the economic growth of any nation can be measured by the development of physical infrastructures, such as buildings, roads and bridges. Construction project development involves numerous parties, various processes, different phases and stages of work and a great deal of input from both the public and private sectors, with the major aim being to bring the project to a successful conclusion (Navon, 2005). Construction is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Navon, 2005). Construction industry has complexity in its nature because it contains large number of parties as clients, contractors and consultants. The success of construction project depend on its performance, which is measured based on timely completion, within the budget, required quality standards and customers satisfaction (Omran, 2012).

Performance is measured in several ways as time, cost, quality, client satisfaction; productivity and safety. The most important factors affecting project performance are: delays because of materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials (Enhassi, 2009). According to Kibuchi and Muchungu (2012) research paper on performance of building construction projects in Nairobi, Kenya, discovered that despite the high quality of training of consultants in the building industry and regulation of the industry in major urban areas, construction projects do not always meet their goals. This is manifested by myriad projects that have cost overrun, delayed completion period and poor quality resulting to collapsed buildings in various parts of the

country, high maintenance costs, dissatisfied clients and even buildings which are not functional.

Previous studies on factors affecting performance of construction projects in Palestine show that the failure of any project is mainly related to failure in performance (Karim and Marosszeky 1999, DETR KPI Report 2000, Lehtonen 2001, Samson and Lema 2002, Kuprenas 2003, Cheung 2004, Iyer and Jha 2005, Navon 2005, Ugwa and Haupt 2007). While individual organizations have been measuring their performance for many years, there has been little consistency in the data, and the way it has been published. The performance can be measured by key indicators for evaluation. The purpose of Key performance indicators (KPIs) is that clients want their projects delivered: on time, on budget, free from defects, efficiently, right first time, safely, by profitable companies. So, Regular clients expect continuous improvement from their construction team to achieve year-on-year: reductions in project costs and time.

Chan and Kumaraswamy (2002) stated that construction time is increasingly important because it often serves as a crucial benchmarking for assessing the performance of a project and the efficiency of the project organization. Cheung et al (2004) identified project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication. It is obtained by Navon (2005) that a control system is an important element to identify factors affecting construction project effort. For each of the project goals, one or more Project Performance Indicators (PPI) is needed. Pheng and Chuan (2006) obtained that human factors played an important role in determining the performance of a project. Ugwu and Haupt (2007) remarked that both early contractor involvement (ECI) and early supplier involvement

(ESI) would minimize constructability-related performance problems including costs associated with delays, claims, wastages and rework, etc.

KPIs are one of the factors that constitute the project success criteria. Swan and Kyng (2005) view KPIs as the measure of a process that is critical to the success of an organization and/or project. According to a publication by Price Waterhouse Coopers (PWC), KPIs means actors by reference to which the development, performance or position of the business of the company can be measured effectively. Thoor and Ogunlana (2010), together with Humaidi and Said (2011), suggested that KPIs are helpful to compare the actual and estimated project performance in terms of effectiveness, efficiency, and quality of workmanship and product. KPIs can be used to measure the performance of project operation and are usually used in construction projects. Moreover, performance measurement can be carried out by establishing KPIs which offer objective criteria to measure project success. The formal definition for KPIs according to Public Record Office Victoria (2010) is Key Performance Indicators are quantitative and qualitative measures used to review an organizations progress against its goals. According to Mbugua (1999) performance indicators specify the measurable evidence necessary to prove that a planned effort has achieved the desired result. In other words, when indicators can be measured with some degree of precision and without ambiguity they are called measures. However, when it is not possible to obtain a precise measurement, it is usual to refer to performance indicators. Performance measures are the numerical or quantitative indicators (Sinclair and Zairi, 1995).

Project management knowledge areas of PMBOK guide of project management institute (PMI, 2013) and its construction extension (PMI, 2005) are adopted as the main factors determining the performance of projects: (1) project

integration management (2) project scope management (3) project time management (4) project cost management (5) project quality management (6) project human resources management (7) project communications management (8) project risk management (9) project procurement management and (10) project stakeholder management. Therefore, identifying factors that affect the performance of construction projects is very important to connect industry and project goals and objectives for improvement of process and method of doing things and administering projects. In addition to identification of performance factors, investigation of performance of projects should have to be done in project and industry level along with their respective process and method.

Understanding the performance or progress of a construction project can help to know and improve the projects future. A failed project can be described as one delayed, over budget, out of scope or ultimately canceled. On the other hand, a project is said to be successful when the project is on time and within budget, within scope, within the satisfaction of the customers or project stakeholders, meeting of its objectives, quality specification, project risk, safety standards, health, environmental, cultural and security requirement (Storm and Janssen, 2004; Schwalbe, 2010). According to Enhassi (2009) the factors affecting the performance of construction projects in Palestine are delays because of materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials.

In Ethiopia, 79% of projects had failed to meet their objectives (Getachew, 2015). Abadir (2011) found out that among the management knowledge areas of project in Ethiopia which determine the performance of the project, project

time management is considered the critical one with only 24% projects managed well. The execution of most of the construction projects were not completed on time, within budget and desired quality Becker and Behailu (2006). Such problems lead to loss of profits, increasing cost and leading to technical and managerial problems between project parties. Ayalew (2009) also revealed a gap in practice of basic project management body of knowledge areas. Change in defined scope, lack of proper planning, lack of proper evaluation of tender documents by contractors at tendering phase and contractor's financial problems were identified as major causes which affect the performance of the construction project. Jemal (2015) stated that the most common effects of cost over run identified are delay, supplementary agreement, adverse relations among stake holders and budget shortfall of project owners. Fetene (2008) examined factors that cause cost overrun during construction and their effects on public building construction projects in Ethiopia. Utilizing questionnaire survey of 70 completed public building construction projects in Ethiopia. The authors identified, and assessed the impact of cost overrun on the delivery of construction projects. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects.

According to a report by Federal Democratic Republic of Ethiopian, Ministry of Urban Development, Housing and Construction (2014) on project performance status evaluation stated that among 14 public building projects under construction 8 projects, i.e. 57%, have failed to meet the planned percentage, (MOUDHD, 2014). In Lideta sub-city, Addis Ababa, building construction projects performance problem appears through different directions. There are many constructed building projects fail in time

performance, others fail in cost performance, others fail in scope performance, others fail in quality performance and others fail in other performance indicators. In Lideta sub-city, Addis Ababa, According to a report from Lideta sub-city building permit and control office, from 2006-2010 E.C, 43 residential buildings and 58 commercial buildings construction license was given to owners. As per my observation and Lideta sub-city building permit and control office report, most commercial building construction projects are not finished on time, scope, cost and quality (Unpublished report, 2017). They are always asking and taking building extension permit from the office which is failing in performance. In addition, performance measurement systems are not effective or efficient to overcome such this problem. The evidences presented above indicate poor performance of building construction projects in Lideta Sub-City, Addis Ababa. Therefore, this research will identify the factors affecting the performance of commercial building construction projects and suggest ways to owners, consultants and contractors to improve performance problem and to improve their performances. More specifically, the study identifies factors related to

1. cost management knowledge area that affect performances of commercial building construction projects at Lideta sub-city.
2. time management knowledge area that affect performances of commercial building construction projects at Lideta sub-city.
3. scope management knowledge area that affect performance of commercial building construction projects at Lideta sub-city.
4. quality management knowledge area that affect performances of commercial building construction projects at Lideta sub-city.
5. risk management knowledge area that affect performances of commercial building construction projects at Lideta sub-city.

2. LITERATURE REVIEW

2.1 Problem of Performance in Construction Industry

The failure of any construction project is mainly related to the problems and failure in performance. Moreover, there are many reasons and factors which attribute to such problem. Shaban (2008) stated that the construction industry performance problems in developing economies can be classified in three layers: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies. The subject of performance measurement or assessment has become a matter of concern to several countries at different levels of socio-economic development which have realized the need to improve the performance of their construction industry (Kingsley, 2010). Navon (2005) identified in various forms as low productivity, delays, cost overrun, poor, and quality and so on. Poor project performance has been noted as the bane of construction industries of several countries, particularly, developing countries. Ling et al (2007) remarked that architectural, engineering and construction (AEC) firms may face difficulties managing construction projects performance in China because they are unfamiliar with this new operating environment. International construction projects performance is affected by more complex and dynamic factors than domestic projects; frequently being exposed to serious external uncertainties such as political, economical, social, and cultural risks, as well as internal risks from within the project.

Time and cost overruns in construction projects in Ethiopia is one of the most significant problems in the field construction management. Research and studies in this field in Ethiopia are few compared to the problem of time and cost overrun. Having this in to consideration this research is done on factors

affecting performance in university building construction projects. Despite the importance and the significant of the construction sector in Ethiopia, it is noted that the parties of project (owner, consultant, and contractor) didn't give sufficient evaluation for time and cost overruns at the end of the project. Fetene (2008) examined factors that cause cost overrun during construction and their effects on public building construction projects in Ethiopia. Utilizing questionnaire survey of 70 completed public building construction projects in Ethiopia. The authors identified, and assessed the impact of cost overrun on the delivery of construction projects. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects. The most important causes of cost overrun were found to be inflation or increase in the cost of construction materials, poor planning and coordination, change orders due to enhancement required by clients, excess quantity during construction.

Quality is an important issue in building construction projects. The objective of any construction project is to finish the construction within the estimated budget, time and according to the quality requirements. Poor quality of work leads to loss of money and time. The owner has the right to ask for rework when the executed job is not complying with the agreed quality standards. But if the required quality standards are not clearly defined in the contract, the client might overstate the quality requirement which will create problems with the contractor.

2.2 Performance Indicators for Construction Projects

Success of construction projects depends mainly on success of performance. Many previous researches had been studied performance of construction

projects. Dissanayaka and Kumaraswamy (1999) remarked that one of the principal reasons for the construction industry's poor performance has been attributed to the inappropriateness of the chosen procurement system. Reichelt and Lyneis (1999) remarked three important structures underlying the dynamic of a project performance which are: the work accomplishment structure, feedback effects on productivity and work quality and effects from upstream phases to downstream phases. Thomas (2002) identified the main performance criteria of construction projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting.

Chan and Kumaraswamy (2002) stated that construction time is increasingly important because it often serves as a crucial benchmarking for assessing the performance of a project and the efficiency of the project organization. Cheung et al (2004) identified project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication. It is obtained by Navon (2005) that a control system is an important element to identify factors affecting construction project effort. For each of the project goals, one or more Project Performance Indicators (PPI) is needed. Pheng and Chuan (2006) obtained that human factors played an important role in determining the performance of a project. Ugwu and Haupt (2007) remarked that both early contractor involvement (ECI) and early supplier involvement (ESI) would minimize constructability-related performance problems including costs associated with delays, claims, wastages and rework, etc. Ling et al (2007) obtained that the most important of practices relating to scope management are controlling the quality of the contract document, quality of response to perceived variations and extent of changes to the contract. It was recommended

for foreign firms to adopt some of the project management practices highlighted to help them to achieve better project performance in China.

Takim and Akintoye (2002) defined the purpose of KPI's as to enable a comparison between different projects and enterprises to identify the existence of particular patterns. Dissanayaka and Kumaraswamy (1999) used different representation values to evaluate time and cost performance such as project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, external condition. Takim and Akintoye (2002) stated that the development and use of key performance indicators (KPI's) can help to identify dysfunctional in the procurement process. Takim and Akintoye (2002) studied the development of key performance indicators to measure performance such as cost of pricing the tender as a percentage of contract value, cost of pricing the tender as a percentage of contract value, no. of times base tender price changed, time from the first tender to actual award of contract, average delay in payment of base claim, average delay in payment of agreed variations, average time for approval of agreed variations.

Cheung et al (2004) remarked that characteristics of emerging performance measurement indicators need analysis of both the organization and environment such as: nature of work, global competition, quality awards, organizational role, external demands and power of IT. The indicators should be able to identify causes of problems, address all possible performance drivers, and identify potential opportunities for improvement. Cheung et al (2004) remarked seven main key indicators for performance which are: time, cost, quality, client satisfaction, client changes, business performance, and safety and health. Takim and Akintoye (2002) identified good project performance consists of seven key

project performance indicators: construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service. They also divide company performance indicators in to three, namely: safety, profitability and productivity. Ugwu and Haupt (2007) stated that project performance can be determined by two common sets of indicators. The first set is related to the owner, users, stakeholders and the general public which are the groups of people who will look at project performance from the macro viewpoint. The second are the developer, a non-operator, and the contractor which are the groups of people who will look at project performance from the micro viewpoint. They studied the relationship-based factors that affect performance of general building projects in China. Thirteen performance metrics was used to measure the success level of construction projects. These factors were categorized into four groups namely cost, schedule, quality and relationship performance. It was recommended that foreign firms that have entered or are going to enter the Chinese construction industry should learn how to build cooperative and harmonious relationships with Chinese partners and finally achieve satisfactory project performance by paying sufficient attention to the aforementioned factors.

Takim and Akintoye (2002) stated successful construction project performance can be grouped along three orientations: procurement, process and result orientations. Predictability of design cost and time, and predictability of construction cost and time can be regarded as procurement orientated, safety as process orientated and defects, client satisfaction with the product, client satisfaction with the service, profitability and productivity listed under result orientation. Ugwu and Haupt (2007) developed and validated key performance indicators (KPI) for sustainability appraisal using South Africa as a case study. It is used four main levels in a questionnaire to identify the relative importance

of KPI. The main indicators were: economy, environment, society, resource utilization, health and safety and project management and administration. Cordero (1990) listed key performance indicators for construction projects under four main groups of aspects. The first is cost aspect; construction cost, cost certainty, client satisfaction on cost, secondly time aspect; construction time, time certainty, client satisfaction on time, thirdly quality aspect; defects, liability period, client satisfaction on cost and the fourth aspect is sustainable development; profitability, partnership, environmental protection and health and safety.

Wateridge (1998) examine the United Kingdom (UK) construction industry launched best practice programme on the key performance indicators for construction before few years ago. This was to create an industry-wide performance measurement system to enable good companies to demonstrate their abilities and allow clients to select contractors and consultants on the basis of reliable data. These KPI's give information on the range of performance being achieved in all construction activities and they include the following: client satisfaction – product, client satisfaction – service, defects, and predictability – cost, predictability – time, profitability, productivity, safety, construction cost and construction time.

Takim and Akintoye (2002) find out the ten key performance indicators of project performance in UK construction industry. These consist of seven project performance indicators, namely: construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service; and three company performance indicators, namely: safety, profitability and productivity. Most of these indicators can be regarded as having results orientation, except for predictability of design cost and time, and predictability of construction cost

and time, which can be regarded as procurement orientated, and safety, which can be regarded as process orientated.

Egan (1998) tried to put the most KPIs, such as Construction cost, Construction time, Defects, Client, satisfaction (product), Client satisfaction (service), Profitability, Productivity, Safety, Cost predictability (const.), Time predictability (const.), Cost predictability (design), Time predictability (design). These indicators are targeted at assessing industry-wide performance and individual companies as well. However, the findings fail to show any explicit link between the performance factors measures based on project phases (e.g., selection phase, execution phase) and the factors that may determine the project performance during the implementation phase. There is no key factor linking one phase to another. In addition, the working groups provide no indicators on the performances of the stakeholders involved in the project and prioritize their performance in determining project success.

2.3 Project Management and Project Performance

Management in construction industry is considered as one of the most important factors affecting performance of works. Ugwu and Haupt (2007) stated that documenting and archiving performance data could be useful for future reference, such as for settling disputes on claims, and in maintenance and repair works. Kuprenas (2003) remarked that quantification of the impacts of the project management processes are identified through three steps of analysis: comparison of summary statistics of design performance, proof of statistical significance of any differences and calculation of least squares regression line of a plot of design performance measurement versus amount/application of project management as a means to quantify management influence to design phase cost performance.

Kuprenas (2003) stated that while project management is only one of the many criteria upon which project performance is contingent, it is also arguably the most significant as people formulating the processes and systems who deliver the projects. Ugwu and Haupt (2007) remarked that an adequate understanding and knowledge of performance are desirable for achieving managerial goals such as improvement of institutional transformations, and efficient decision making in design, specification and construction, at various project-level interfaces, using appropriate decision-support tools. Ling et al (2007) investigated project management (PM) practices adopted by Singaporean construction firms. It was determined that the performance level of their projects in China; identifies PM practices that led to better performance; and recommended key PM practices that could be adopted by foreign construction firms in China to improve project performance. Since the client is the principal stakeholder in the construction process, by managing him/her, good performance has been defined typically in terms of the management of delivery of projects on time, to specification and within budget, providing good service and achieving reasonable life-cycle costs. More recently, managing the requirements of the other stakeholders such as employees and society has come into focus with the need to promote sustainable construction and corporate social responsibility (Ankrah and Proverbs, 2005).

2.4 Factors Affecting Performances of Construction Project

A number of studies have been conducted to examine factors impacting on project performance in developing countries. Mohammed Bader (2004) reported that shortage of skills of manpower, poor supervision and poor site management, unsuitable leadership; shortage and breakdown of equipment among others contribute to construction delays. Mohammed Bader (2004) examined causes of client dissatisfaction in the South African building industry

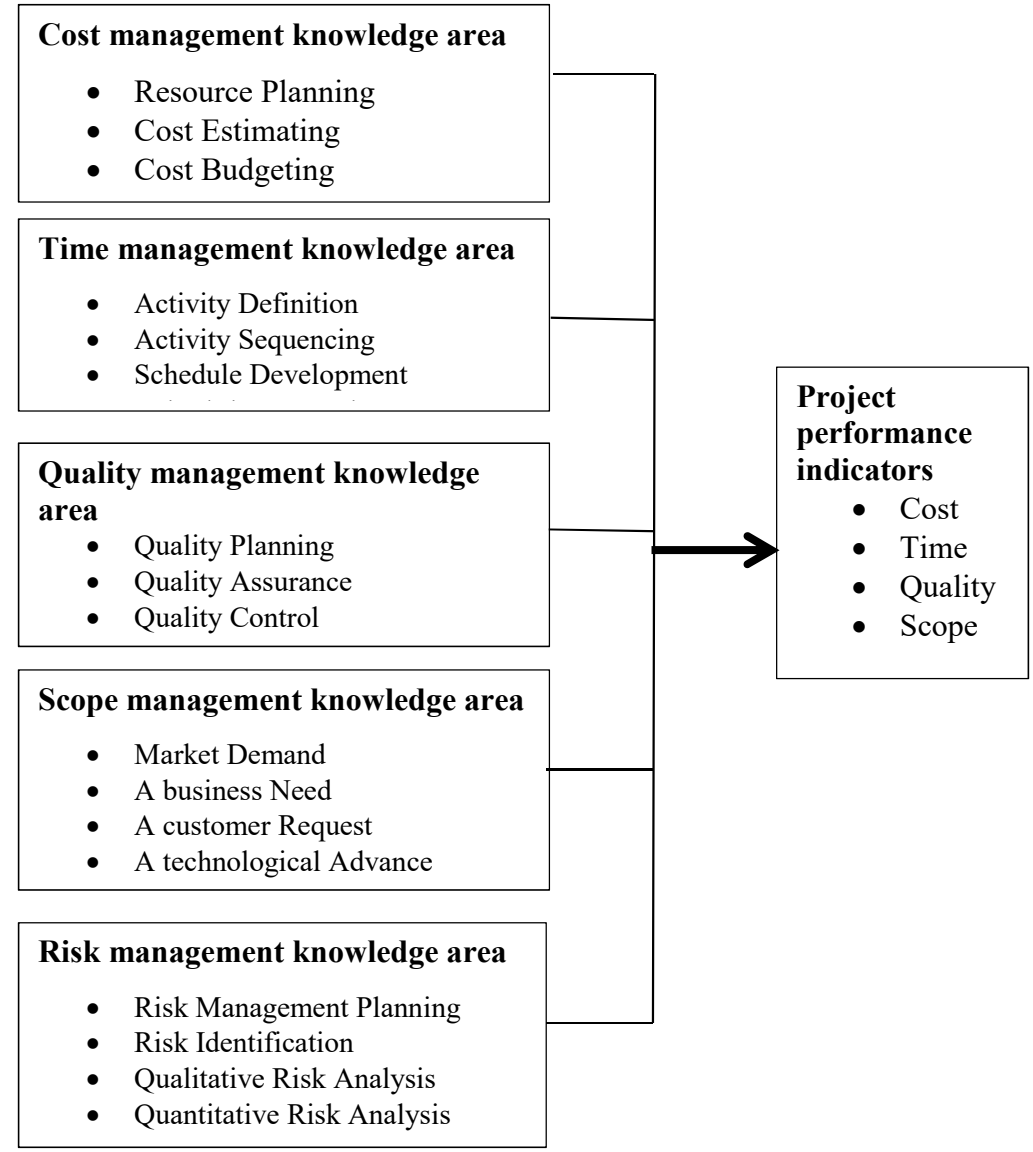
and found that conflict, poor workmanship and incompetence. Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety (Cheung et al. 2004).

Mohammed Bader (2004) found in his report the cause for the failure of performance of construction contractors. These are; Lack of experience in the line of work, replace key personnel, assigning project leader in the site, labor productivity and improvement, use of project management techniques, procurement practices, claims, internal company problems, owner's absence from the company, using computer applications, frauds, neglect, low margin profit due to competition, cash flow management, bill and collecting effectively, poor estimation practices, employee benefits and compensations, controlling equipment cost and usage, increased number of projects, increased size of projects, change in the type of work, lack of managerial maturity, national slump in the economy, construction industry regulation and bad weather.

Owusu Tawiah (1999) identified two main factors affecting contractor performance. The two factors were financial and managerial capacities of the firm. Under the financial factors contractor's financial stability in terms of access to credit was questionable and that has gone a long way to affect their performance over the years. Again under the managerial capacities, he identified site management practices, lack of technical expertise among others as factors influencing contractor performance in Ghana. Ankrah (2007) classifies the factors that influence the project performance in to uncontrollable and controllable. From a project perspective, uncontrollable factors include the

external constraints and industry factors. By definition, these are beyond the control of project participants and hence may be difficult, if not impossible to influence at a project level in trying to improve performance, whereas the controllable factors which include project and organization-related factors.

2.5 Conceptual Framework



Source: Authors' own construction based on literature review (2019)

3. RESEARCH METHODOLOGY

The research investigated the performance of commercial building construction projects in Lideta Sub-City that have taken building permit license in the past five years (2013-2018) and were are under construction. The researchers adopted a causal research design and a quantitative research approach based on primary data gathered using questionnaire. The research considered a total of 58 commercial building construction projects in Lideta Sub-City and the target populations were owners, contractors and consultants of each commercial building construction projects. The total population size of the study was 174 (58 owners, 58 contractors and 58 consultants). The researcher distributed questionnaire for the owners, contractors and consultants of commercial building construction projects. The response rate was 93.7% with 163 valid response. The analysis result is thus based on this valid responses. Data were subjected to multiple regression analysis to establish the causal relationship between the dependent variable (i.e, construction performance indicators) and the independent variables. Different tests were carried out to ensure the goodness of the regression model.

4. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statistics

This section discusses the results from descriptive statistics analysis. Table 1 presents the summary of descriptive results for the dependent variable building construction performance indicators and the independent variables project cost management factors, project time management factors, project quality management factors, project scope management factors and project risk management factors. The data consisted of 163 observations measured on six variables. The researcher conducted descriptive statistics and frequencies and percentages for categorical variables. The study conducted on explanatory

variables revealed that the mean score value for project cost management factors, project time management factors, project quality management factors, project scope management factors and project risk management factors in average was 3.65 (SD=0.79), 1.90 (SD=0.94), 2.02 (SD=1.06), 1.97 (SD=0.98), 2.43 (SD=1.14) respectively, which falls on importantly and less importantly affect the performance of building construction projects at Lideta sub-city. In regard to performance indicators, construction cost performance indicator mean score value was 3.21 (SD=1.00) which means the construction cost performance indicator falls on average, the construction time performance indicator man score value was 2.41 (SD=1.04) falls on poor, the construction quality performance indicator mean score value was 3.61 falls on good and the construction scope performance indicator mean score value was 3.43 falls on neutral.

Table 1: Summary of Descriptive statistics for Dependent and Independent Variables (n=163)

Variables	Mean	Std. Deviation
Cost Performance Indicator	3.22	0.91
Time Performance Indicator	2.41	1.04
Quality Performance Indicator	3.61	0.98
Scope Performance Indicator	3.43	1.29
Cost Management related Factors	3.65	0.79
Time Management related Factors	1.90	0.94
Quality Management related Factors	2.02	1.06
Scope Management related Factors	1.97	0.98
Risk Management related Factors	2.43	1.14

Source: Authors' based on **s**urvey data (2019)

4.2 Results of Regression Analysis

Before presenting the estimation results of the regression analysis, the model was diagnosed for problems of normal distribution, linearity, auto-correlation and multicollinearity. The test results confirmed that the regression models passed all the required diagnostic tests. Using four performance indicators such as project cost, project time, project quality and project scope, four regression models were estimated. Following what was stipulated in project management body of knowledge (PMBOK 2003), five project management knowledge areas were considered as independent variables that may affect performance of construction projects in Lideta sub-city. The estimation results of the multiple linear regression models are presented and discussed below.

1) Project cost as indicator of construction project performance (Model 1)

The overall model fit for the estimated regression equation using project cost as indicator of project performance revealed that the independent variables jointly explained 66% of the variation in the dependent variable, which is significant at $p<0.01$ ($F=59.754$). While all the variables maintained the expected signs, only the variables related to cost management and quality management knowledge areas were found to be statistically significant in explaining the construction projects in terms of efficiency (cost). When these knowledge areas are applied in a good manner, construction cost generally declines. More specifically, as the cost management related factors increase by a factor of one, construction cost declines by 0.79. Similarly, as project managers give much emphasis to quality by a factor of one, construction cost increased by 0.15. It should be noted here that there is tradeoff between quality and cost. As one opts for high quality, construction cost increases. The findings are in line with available literature (Hu & He, 2014).

Table 2: Ordinary Least Square Estimation Results for the Factors that Affect Performance of Construction Projects in Lideta Sub-City

Variables related to project management knowledge areas	**Model 1: Cost**		**Model 2: Time**		**Model 3: Quality**		**Model 4: Scope**	
	Coefficient[1]	t value	Coefficient	t value	Coefficient	t value	Coefficient	t value
Constant		1.67*		0.63		-0.46		-1.44
Cost management	-0.79	-15.59***	-0.80	-16.02***	0.86	18.37***	0.79	14.97***
Time management	-0.07	-1.12	-0.11	-1.79*	0.13	2.20*	0.05	0.74
Quality management	0.15	2.44**	0.11	1.79*	0.01	0.20	0.22	3.42***
Scope management	-0.09	-1.55	-0.01	-0.22	-0.04	-0.77	0.12	1.88*
Risk management	0.06	0.99	0.05	0.81	-0.06	-1.02	0.04	0.67
Adjusted R^2	0.66		0.67		0.71		0.63	
ANOVA	F=59.754***		F=62.875***		F=76.035***		F=52.135***	

***p<0.01; **p<0.05; and *p<0.1

Source: Authors' own analysis result (2019)

[1] Standardized coefficient

2) Project time as indicator of construction project performance (Model 2)

The overall model fit for the estimated regression equation using project time as indicator of project performance revealed that the independent variables jointly explained 67% of the variation in the dependent variable, which is significant at $p<0.01$ ($F=62.875$). Similar to the results of model 1, cost and quality management related knowledge areas were found to be statistically significant at $p<0.01$ and $p<0.1$ respectively in determining efficiency of construction projects measured in terms of time. In addition, in model 2, time management related factors were found to be statistically significant at $p<0.1$ in determining project time performance. More specifically, as time and cost related knowledge areas of project management improved by a factor of one, efficiency of the project measured in terms of time declines by 0.8 and 0.11 respectively (i.e takes lesser time to complete). As quality management related factors of project management knowledge areas improve by a factor of one, the time it takes to complete the construction projects increase by 0.11. Again, here it should be noted that as project managers give more curing time for constructions made of concrete, quality would increase than the otherwise. So, it is expected that these two factors exhibit a tradeoff in the case of construction projects.

3) Project quality as indicator construction project performance (Model 3)

The overall model fit for the estimated regression equation using project quality as indicator of project performance revealed that the independent variables jointly explained 71% of the variation in the dependent variable, which is significant at $p<0.01$ ($F= 76$). Cost and time management related knowledge areas were found to be statistically significant at $p<0.01$ and $p<0.1$ respectively

in determining quality of construction projects. More specifically, as time and cost related knowledge areas of project management improved by a factor of one, quality of the projects improves by 0.86 and 0.13 respectively. It is intuitive that better quality goes with high cost (as most of the time high quality items are more expensive) and the longer the time a construction project takes for concrete curing, the better the quality it will be.

4) Project scope as indicator of project performance (Model 4)

The overall model fit for the estimated regression equation using project scope as indicator of project performance revealed that the independent variables jointly explained 63% of the variation in the dependent variable, which is significant at $p<0.01$ ($F=52$). Cost, quality and scope management related knowledge areas were found to be statistically significant at $p<0.01$, $p<0.01$ and $p<0.1$ respectively in determining scope of construction projects. More specifically, as project managers improve cost, quality and scope management by a factor of one, scope (i.e, effectiveness) of the projects improves by 0.79, 0.22, and 0.12 respectively. Again, it is intuitive to expect better project effectiveness as we apply knowledge areas that improve outcomes in terms of effectiveness.

5. CONCLUSION

This study examined the effect of project management knowledge areas on the performance of building construction projects in terms of cost (efficiency), time (efficiency) and scope (effectiveness) int Lideta Sub-city, Addis Ababa. The finding of the study generally indicated that project performance improves as project managers give due diligence to the project management knowledge areas. The authors conclude that the findings of the study are in line with the theoretical underpinnings that when projects are managed by applying relevant

project management tools and techniques, performances of projects in terms of effectiveness and efficiency improves. We, therefore, recommend that project managers should manage carefully the construction projects guided by important knowledge areas and associated tools and techniques such as cost management, quality management, time management and scope management which were found to be statistically significant in determining performances of construction project in Lideta Sub-City, Addis Ababa.

REFERENCES

Abadir H. Yimam. (2011). Project Management Maturity in the Construction I ndustry of Developing Countries (The Case of Ethiopian Contractors). M. Sc. Thesis, University of Maryland, USA.

Ayalew, T. (2009). Causes and effects of variations in Ethiopian federal road Projects. Master's thesis, Addis Ababa University. Available at: http://etd.aau.edu.et/handle/123456789/6271

Jemal, A. (2015). Factors affecting time and cost overrun in road construction Projects in Addis Ababa. Available at: https://www.scribd.com/document/305998752/Abubeker-Jemal

Ankrah, N.A. & D. Proverbs (2005). A framework for measuring construction project performance overcoming key challenges of performance measurement Research Institute in Advanced Technologies, University of Wolverhampton, Wolverhampton, WV1 1SB, UK

Becker H.J, & D.D. Behailu (2006). Public private partnership in road projects in Ethiopia. Berlin: Techn. Univ., Inst. für Land- und Seeverkehr

Chan, D.W.M. & M.M Kumaraswamy (2002). Compressing construction durations: Lessons learned from Hong Kong building projects. *International Journal of Project Management* 20 (2002): 23-35.

Cheng, J., Fleming, C. Oduoza, C.& Proverbs, D. G. (2005).A conceptual model towards the measurement of construction client satisfaction. In: Khosrowshahi, F (Ed.), 21st Annual ARCOM Conference, 7-9 September 2005, SOAS, University of London. Association of Researchers in Construction Management, Vol. 2, 1053-62.

Dissanayaka S. M. & M.M. Kumaraswamy (1999). Comparing contributors to time and cost performance in building projects. *Building and Environment*, 34(1):31-42. DOI: 10.1016/S0360-1323(97)00068-1

Enshassi, A., S. Mohamed, Z. Abu Mustafa, & P.E. Mayer (2009). Factors affecting labor productivity in building projects in the Gaza Strip, *Journal of Civil Engineering and Management,* 13(4): 245–254.

Fetene, N. (2008). Causes and effects of cost overrun on public building construction projects in Ethiopia. MSc Thesis Submitted to Addis Ababa University in Partial Fulfilment to the Requirements Construction Technology and Management, Addis Ababa, Ethiopia.

Getachew, Y. (2015). Causes of failure of projects financed by development bank of Ethiopia:The case of corporate credit process. Master's thesis, submitted to Addis Ababa University, Ethiopia.

Hu, W. & X. He (2014). An Innovative Time-Cost-Quality Tradeoff Modeling of Building Construction Project Based on Resource Allocation. *The Scientific World Journal.* https://doi.org/10.1155/2014/673248

Humaidi, N. and N.A. Said (2011). The influence of project life cycle and key performance indicators in project management performance: Comparison between ICT and construction project. International Proceedings of Economics Development & Research, IACSIT Press: Singapore.

Iyer, K. C.; Jha, K. N. (2005). Factors affecting cost performance: evidence from Indian construction projects. *International Journal of Project Management,* 23: 283–295. doi:10.1016/j.ijproman.2004.10.003.

Karim, K. & M. Marosszeky (1999). Process monitoring for process re-engineering using key performance indicators. *International conference on construction process reengineering*, CPR 99, July 12-13, UNSW, Sedney.

Kingsley A. N. (2010). Construction Professionals Perspective on the Criteria for Rating Contractor Performance in the Ghanaian Construction Industry. Kwame Nkrumah, University Of Science and Technology, College Of Architecture And Planning Department Of Building Technology, Kumasi.

Kuprenas, J. A. (2003). Project management actions to improve design phase cost performance*, Journal of Management in Engineering* 19(1): 25–32.

Lehtonen, T.W. (2001). Performance measurement in construction logistics. *International Journal of Production Economics* 69: 107–116.

Navon, R. (2005). Automated project performance control of construction projects*, Automation in Construction* 14: 467–476. doi:10.1016/j.autcon.2004.09.006.

Reichelt K. and L. James (1999).The dynamic of project performance: Benchmarking the drivers of cost and schedule overrun*. European management journal*, 17(2): 135-150.

Shaban, S. S. A. (2008). Factors Affecting the Performance of Construction Projects in the Gaza Strip. MSc Thesis submitted to the Islamic University of Gaza. Palestine.

Swan, W. & E. Kyng. (2005). An introduction to key performance indicators Centre for Construction Innovation. Available at: https://docplayer.net/2044687-An-introduction-to-key-performance-indicators-produced-and-written-for-cci-by-dr-will-swan-and-emma-kyng.html

Thoor, S.R. & S.O. Ogunlana (2010). Beyond the iron triangle: Stakeholders perception of key performance indicators (KPIs) for large-scale public sector development projects. *International Journal of Project Management*, 28(3), 228-236.

Ugwu, O. O. & T.C. Haupt (2007). Key performance indicators and assessment methods for infrastructure sustainability a South African construction industry perspective, *Building and Environment* 42: 665–680. doi:10.1016/j.buildenv.2005.10.018.