



**ASSESSING THE REGULATORY TOOLS RELATED FACTORS
AFFECTING THE PERFORMANCE OF BUILDING
CONSTRUCTION PROJECTS: A CASE OF ADDIS ABABA CITY**

MSc THESIS

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HAWASSA UNIVERSITY, HAWASSA, ETHIOPIA

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**A THESIS SUBMITTED TO THE DEPARTMENT OF
CONSTRUCTION TECHNOLOGY AND MANAGEMENT, FACULTY
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**SCHOOL OF GRADUATE STUDIES
HAWASSA UNIVERSITY
ADVISORS' APPROVAL SHEET**

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DECLARATION

I hereby declare that this M.Sc. thesis entitled “**Assessing the regulatory tools related factors affecting the performance of building construction projects: a case of Addis Ababa city**” is my original work and has not been presented for a degree in any other university, and all sources of material used for this thesis have been duly acknowledged /or referred.

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ABBREVIATIONS

Df	Degree of Freedom
Dev	Deviation
EFPPAP	Ethiopian Federal Government Procurement and Property Administration Proclamation
KMO	Kaiser Meyer Olkin
MoUDC	Ministry of Urban Development and Construction
No.	Number
PCA	Principal Component Analysis
Sig	Significance
SPSS	Statistical Package for Social Science
Std	Standard

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ABSTRACT

The present state of the construction industry falls short of meeting domestic and international quality standards and the different performance parameters expected from the sector in Ethiopia. Ineffective regulatory system of the industry and low level of regulatory enforcement has its own share in this low performance. Effectiveness and efficiency of regulatory system is primarily dependent on capacity of the regulatory body and the regulatory tools. The regulatory body designates the government and tools include the registration system, the building permit and the procurement system. This study focuses on assessing the major factors related to these regulatory tools affecting the performance of building construction projects in Addis Ababa. A mixed method research was adopted and structured questionnaire, semi structured interview and document analysis were used for data collection. In the questionnaire survey, totally 150 professionals were involved from client, contractor, academics and consultant. The statistical analyses of mean, standard deviation, one sample T-test, factor analysis and regression analysis were conducted using SPSS to summarize, interpret the data and to find the implications of the responses given by the respondents. The findings indicate that the applicable regulatory system needs improvement in terms of attaining the intended objectives. From the findings the top three registrations related factors are poor project inspection, inadequate evaluation and measuring mechanism in upgrading professionals and firms and inadequate monitoring of professionals and firms performance. The top three building permit related factors are bureaucratic delay, low level of using information technology for keeping and retrieving land records and weak building regulations enforcement. The top three procurement system related factors are poor procurement plan, inadequate assessment of bidders and poor communication in procurement process. It is recommended that there should be appropriate evaluation and measuring mechanisms in upgrading the class of firms and professionals so as to enhance the competency of the developers. Building permits should be issuing on time so as to prevent delay in building construction project and appropriate procurement plan shall be exist before the commencement of any activity so as to prevent the conflict of the requirements in building construction projects.

Key words: *building permit, procurement system, registration system, regulatory system*

CHAPTER ONE

INTRODUCTION

1.1 Background

The Ethiopian construction industry has been showing significant yearly growth at a rate of 12.34% (MoUDC, 2012). Though the overall demand of the industry continued increasing, the performance is constrained with different factors. According to Biyadgign (2017) despite its buoyant state, the construction sector faces various challenges at its early stage from maintaining its booming trajectory to roaring on its full potential. The common problems are the question of quality of output and level of professionalism in the industry in terms of timely delivery of projects, safety of workers and the public (Nuhamin, 2018). As MoWUD (2006) report indicates the construction industry falls short of meeting domestic and international quality standards and the performance demand expected from the sector. In addition it was also indicated that ineffective regulatory system and low level of regulatory enforcement contributes to the low performance of the Ethiopian construction industry (Mengistu & Mahesh, 2019).

Government plays its regulatory roles in construction industry through dedicated authorities. In every country, construction regulatory authorities are established to harmonize the applicable construction laws found in the country which may contradict each other, control uncontrolled and unchecked buildings and construction, control and enforce the mechanisms on the application of the building code in the construction industry, prevent easy entry and penetration of unqualified contractors, and improve on the bureaucratic requirements and procedures in approval of building plans (Simon, 2015).

In addition, construction regulations are statutory tools setting out the minimum legal requirements for construction works and relate primarily to the health, safety and welfare of the workforce which must be taken into account when planning construction operations and during the actual construction period (Chudley & Greeno, 2006). According to Mohammed (2010) construction regulations must incorporate a provision that the contractor who plans to perform any construction shall before carrying the work notify in writing the competent authority for construction planning.

Regulatory system of the construction industry in Ethiopia is not centralized. For example at the federal level Ministry of Urban Development and Construction has a role to establish and oversee the construction industry and coordinate its development. Whereas, public procurement and property administration under the control of Ministry of Finance and Economic Development and its function is to oversee and manage the public procuring entities and the procurement systems of the country. This research focuses on assessing the regulatory tools factors affecting the performance of building construction projects mainly related to registration practice (professionals, contractors and consultants), the procurement system and building permits.

1.2 Statements of the problem

Construction project performance dimensions are cost, time, quality, productivity, client satisfaction, health and safety, innovation and learning factors (Shaban, 2008) different studies have indicated that regulatory factors are among the factors that affect these performance dimensions (Ifedolapo et. al, 2015; Nyangwara & Datche, 2015 & Simon, 2015). In Ethiopia, the regulatory non-compliance related factors are major challenges for the success of construction project performance (Biyadgign, 2017). For example according to Fetene (2008) cost overrun can be caused by several factors that are either not controllable

or that to varying degree un manageable; from these factors the degree of government regulation and regulatory factors are the factors contributable to cost overrun in construction project in Ethiopia.

In addition Aschalew (2017) has indicated that regulatory related factors are one barrier for the success of public building construction projects performance in Addis Ababa. Andulaem (2014) has also indicated that in Addis Ababa one of the causes for cost overrun in construction projects are regulatory factors like building permit and related regulatory issues.

However, the regulatory factors are identified as the factor affecting construction project performance by different researchers; it's not detailed and specific to the regulatory tools. Detail assessment of the practice and identify the important factors in the regulatory system that affects the performance of building construction projects in Addis Ababa will help to give practical recommendation. Hence, this study has focused on the applicable common regulatory tools to identify the factors related to these tools affecting the performance of building construction projects. The regulatory tools on which the study has focused are: registration system (professionals, contractors and consultants), the procurement system and building permits.

1.3 Research questions

The study is guided by the following key researchable questions:

- How is the regulatory system works in construction industry?
- What are the major regulatory factors that affect the performance of building construction projects related to the registration system, the procurement system and the building permit?
- How these factors affect the performance of building construction projects?

1.4 Research objective

1.4.1 General objective

The general objective of the research is assessing the regulatory tools related factors affecting the performance of building construction projects focusing on the tools related to registration system, building permit and procurement system.

1.4.2 Specific objectives

Specific objectives of the research are:

- To assess the regulatory system practice in construction industry in Ethiopia related to registration system, procurement system and building permit: a case of Addis Ababa city.
- To identify the major factors affecting the performance of building construction projects related to the registration system, procurement system and building permit.
- To assess impacts of the identified significant factors on building construction project performance in Addis Ababa focusing on three performance dimensions: cost, quality and time.

1.5 Significance of the study

Findings of the study will benefit stakeholders of the industry; clients, contractors, consultants and the concerned regulatory bodies. The study is hoped to further help them appreciate and acknowledge the importance of regulation in the industry and thus enable them embrace it for their own benefit in terms of reduction of costs and avoidance of liabilities if they are correctly implemented and enforced. The finding would be helpful for decision making by policy makers and enhance the awareness of the regulatory system factors that could influence successful delivery of building construction projects.

This study is also hoped to benefit scholars as reference for thoughts and ideas on similar studies and research in future. This study also hopes to act as a bridge and add to the knowledge available for research.

1.6 Scope of the study and limitation

The scope of this research is limited to assess the practice of regulatory system and identifying regulatory factors affecting the performance of building construction project. The factors are limited to the performance parameters time, cost and quality of building construction project in Addis Ababa city. Addis Ababa is selected because most of the building construction projects in Ethiopia are concentrated in and around the capital city. In addition, the study focuses on three regulatory instruments/tools: construction permit, procurement system and registration system (professionals and firms) as these are the major applicable regulatory tools in the construction industry to regulate and harmonize the practice.

1.7 Organization of the study

This research work is organized in five chapters. The first chapter and presents the statement of the problem, research objectives, research questions, scope, limitation, beneficiaries and significance of the study. The second chapter reviews literature related with the topic of the research and attempts to present a theoretical background and framework for the research. The third chapter explains the approaches and methods followed to achieve research objectives. It presents the strategies implemented to collect as well as analyze and present results. The fourth chapter presents the results and findings of the research and discusses them in detail. The fifth chapter is the last chapter of the research. It summarizes and presents the conclusions and recommendations drawn based on the research findings. Finally, references and appendices are presented.

CHAPTER TWO

LITERATURE REVIEW

This chapter covers general introduction to project performance, factors affecting, the regulatory factors related to registration system, the procurement system and building permits, conceptual framework of the study, research gap and summary of the literature review.

2.1 Construction project performance

Construction project is a mission, undertaken to create a unique facility, product or service within the specified scope, quality, time, and cost (Chitkara, 2011). In practice, however, some construction projects encounter cost and time overrun. Cost overrun, poor quality workmanship and time overrun of construction projects require an in depth investigation to improve outputs of the construction industry (Pandit et.al., 2015).

It is not uncommon to see construction projects failing to achieve their mission of creating facilities within the specified cost and time (Fetene, 2008). Hardly few projects get completed on time and within budget since construction projects are exposed to uncertain environments because of such factors as construction complexity; presence of various interest groups such as the project owners, end users, consultants, contractors, financiers; materials, equipment, project funding; climatic environment; the economic and political environment and statutory regulations (Fetene, 2008).

Many previous researchers had been studied about performance of construction projects. Cheung et al. (2004) identified project performance dimensions such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication. These

performance dimensions are affected by different factors as discussed in the subsequent subtopics.

2.2 Factors affecting construction project performance

A number of studies have been conducted to examine factors affecting project performance in developing countries. Mohammed (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.

Ankrah (2007) classified 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.

The controllable factors include procurement route, contracts, variations, project complexity, project duration and cost, design time, plant and equipment, personnel, interaction between project participants, some process related issues, skills and capability, health and safety, quality and specific company programmer.

Generally, performance dimensions may have one or more indicators, and could be influenced by various project characteristics. Dissanayaka and Kumaraswamy (1999) found that project time and cost performances get influenced by project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, and external conditions like political intervention and regulatory issues.

Similarly, Iyer and Jha (2005) identified many factors having influence on project cost performance. These include: project manager's competence, top management support, project manager's coordinating and leadership skills, monitoring and feedback by the participants, decision-making, coordination among project participants, owners' competence, social condition, economic condition, and climatic condition. Coordination among project participants which is close coordination between client, consultant, constructor and regulatory bodies was significant of all the factors, having maximum influence on cost performance. Shaban (2008) summarized from his research study the factors affecting the performance of construction projects in different groups. One of the sections in the group was regulatory related factors.

In Ethiopian perspective, according to Fetene (2008) cost overrun can be caused by several factors that are either not controllable or that to varying degree unmanageable; from these factors the degree of government regulation and regulatory factors are the factors contributable to cost overrun in construction project. Similarly Biyadgign (2017) identified that regulatory factors are the major construction project performance challenges in Ethiopia. Aschalew (2017) as well suggested that regulatory related factors are one barrier for the success of public building construction projects performance in Addis Ababa. Andualem (2014) moreover indicated that one of the cause for cost overrun in Addis Ababa public building construction projects are regulatory factors like building permit and related regulatory issues.

2.3 Regulatory system in construction industry

Regulation is treated as synonymous with law. Regulations are rules or norms adopted by government and backed up by some threat of consequences, usually negative ones in the form of penalties while a regulatory system on the other hand, refers to a system of

regulations and the means used to enforce them (Simon, 2015). They are usually established by industry regulators to regulate the specific activities (Edinburgh, 2003). Similarly, regulatory system is a system created and designed to regulate professionals, practice and firms (Office of Housing and Construction Standards, 2015).

According to the Architectural Association of Kenya, regulatory system is the due process of regulation surrounding a single topic that entails all of the relevant legislative documents (acts, regulations, annexes) and describes the agency or body responsible for administering the framework. The reason for this is to bring them in to conformity with rules designed to create conducive environment in construction industry. Therefore, effective and efficient regulatory system is necessary to furnish fair practice in the construction industry (Simon, 2015).

Effectiveness and efficiency of regulatory system is primarily dependent on capacity of the regulatory body and the regulatory tools (Mengistu and Mahesh, 2019). Capacity can be expressed in institutional organization structure of the statutory authority and adequacy of the establishment. The concerned statutory authorities should be adequately organized so that they can timeously and effectively implement the strategies set out in the policy (Mengistu and Mahesh, 2019).

2.4 Regulatory system and performance of building construction projects

As different researchers noted that regulatory system related factors are among the main factors that affect construction project performance. The factors are based on emerging scenarios related to physical, social and economic changes that are taking place in the country and globally like international requirements, human needs and responsibilities and technological changes. Edinburgh (2003) indicated that the factors included climate

changes, resource conservation, waste minimization, biodiversity and health and well-being of individuals and communities in and around the building.

The relationship between construction practices and regulations and a variety of economic growth, environmental quality and social prosperity factors is increasingly being recognized globally (Christensen, 2009).

The current regulatory system in developing countries results in conflicts due to inadequacy at the boundaries of the responsibilities of its composite agencies and inevitably policy and development aspirations (Grimshaw, 2001). An ideal situation may be unachievable, but few would argue that no improvement is possible. The sustainable development agenda in particular has already brought many important issues and conflicts to the fore particular in respect of planning, land use and construction activities (Warren & Wilkinson, 2008).

According to Mengistu and Mahesh (2019) the regulatory tools that the government used to regulate and control the construction are:

- ❖ Registration system
- ❖ building permits
- ❖ The procurement system
- ❖ Building codes and standards

The tools specifically the registration system, the building permit and the procurement system are the main focus of the paper for further investigation the practice of regulatory system, identifying each individual factor affecting the performance of building construction project and to assess the major regulatory related factors influence on the performance of building construction projects.

2.4.1 Registration system

According to Ethiopian construction industry registration proclamation the term registration is defined as the record containing entries of the names and other particulars of

The construction professionals and contractors related construction works that are qualified to be registered. And also according to Oferi (2004) registration as a term, is used to refer to a number of forms of official recognition which construction professionals and organizations may be required to have. Under licensing, each construction organization must meet certain technical requirements, including, in some cases, the need for some of its employees to pass an examination. Licensing is backed by statute, implying that to operate as a contractor and consultants on any project (whether public or private) in the particular country, the firm must be licensed.

2.4.1.1 Registration criteria and classification of firms in Ethiopia

Prior to contractors, architects and engineers undertake any construction work, they need to be licensed and registered. The requirements for licensing and registration may vary from country to country or from one legal system to the other (Hagos and shewangizaw, 2009). And also all registration systems require the firm to meet certain requirements. The most common of these are financial resources, equipment owned by the firm and personnel employed by the firm (Oferi, 2004). The applicant must submit documentary evidence to support the information which it provides in order to secure the certificate of competence. A certificate of competence has different category and grade for each professional and organizations (firms).

The present basis for licensing of contractors in Ethiopia is to ensure that applicants for a project have the necessary capacity and capability. For contracts works in other countries and for multilateral donor projects, this requirement is met through the prequalification

process for each tender. This requires information on the current status and past performances of the contractor. The current procedure of registration and issuance of graded licenses depend on ownership of relevant equipment and number of staff. These criteria for licensing and registration relate neither to past performance nor to the contractors (architect's, engineer's or consultant's) ability to lease or hire equipment; thus making it challenging for contractors, with all-encompassing technical and financial performance in other fields, to enter new markets (Hagos and shewangizaw, 2009).

According to Ethiopian Directives for the registration of Construction Professionals and Contractors No. 23 /2013, the requirements to be registered as construction professionals and contractors are mentioned below:

A. Contractors

All contractors desiring to carry out construction works are required to register with the Ministry of Urban Development and construction (MoUDC) in accordance with the Guidelines for the Registration of Construction Professionals and Contractors No. 23 /2013. According to Part 3 of the guidelines, all contractors registering under the guidelines are required to register first with the Ministry of Trade in accordance with the Commercial Code of Ethiopia and related directives of the MoUDC. It is after securing a registration certificate from the Ministry of Trade that an application for registration with the MoUDC can be entertained. Accordingly, every contractor has to submit a photocopy of such a certificate to the MoUDC before being licensed as a contractor.

According to the guideline every contractor has the option of submitting application for registration as general contractors, building contractors, road Contractors and specialized contractors.

According to directives for the registration of construction professionals and contractor (MoUDC directive No 19, 2013) in any of the categories listed above vary based on the grade to which the contractor is applying. There are 10 grades which are categorized accordingly based on the construction cost of the project that the contractor is seeking to undertake. General contractors, building contractors and road contractors can register in the ten grades based on the specified criteria as indicated in the appendix.

Moreover, as far as specialized contractors are concerned, the contractors can register in the ten grades based on the cost of the construction or installation of the specialized trades as indicated in the appendix.

Similarly the guideline stated that once a contractor who wishes to register in any of the ten grades fulfills the criteria of the cost required, he/she has to have certain experience and qualification as well as staff requirements that he/she needs to fulfill. While registered a contractor is used, the work permit license under the name of the Technical Manager (MoUDC directive No 19, 2013).

For all categories of contractors, Grades 1 and 2, the general or technical manager should be a registered as Professional Engineer IV. For Grades 3 and 4, the general or technical manager has to be a registered as Associate Engineer IV or a Professional Engineer III. For Grade 5, the general or technical manager has to be a registered as Professional Engineer or Associate Engineer III. For Grade 6, he/she shall be a registered as Associate Engineer or Professional Engineer I. For Grades 7 and 8, he/she shall be a registered Engineering Aid or Construction Superintendent with eighteen years of relevant experience and for Grades 9 and 10, the applicant can either be a Graduate Engineering Aide with four years of construction experience or a Graduate Associate Engineer with at least two years of construction experience or any person able to read, understand and interpret blue prints

with at least seven years of practical experience in construction works (MoUDC directive No 19, 2013).

After fulfilling the experience and qualification requirements, a contractor has to fulfill staff requirement before he/she can be registered as a contractor. The staff requirements vary from grade to grade and sometimes from category to category. The staff requirements for the different categories of contractors of different grades can be seen in the appendix.

Once a contractor accomplishes the above mentioned requirements and pays the registration fee set by the Guidelines. He/she is expected to submit a record of past performances and an audited statement of accounts along with the number, type and capacity of the equipment's he/she intends to use (MoUDC directive No 19, 2013). There are various equipment requirements set by the guidelines for the registration of different categories of contractors in different grades.

Categories and grades to which a contractor is registered may be varied, upon the application of the contractor, by decision of the Registration Committee after having examined the financial, experience and staff and other resources or quality of performance of the contractor (MoUDC directive No 19, 2013). This decision of the Committee, however, is subject to the approval of the Minister of Urban Development and construction (Hagos and shewangzaw, 2009). Contractors may apply for grade and category change only once in a fiscal year provided that they are able to meet fully all the requirements set by the Guidelines.

According to directives for the registration of construction professionals and contractor (Directive No19) once a contractor is registered as such, the registration shall be effective for a period of one calendar year beginning from the year of such registration. At the end

of the one year period, each contractor is expected to be renewed every calendar year thereafter. The renewal of registration is only being achieved only after the person seeking the renewal complies with the requirement of registration set forth by the Guidelines. If the renewal year has lapsed, the contractor has the option of having the registration renewed within three years of the expiry date upon payment of the amount overdue plus a fifty percent of the renewal fee for the period within which the registration has not been renewed. Any registration that is not renewed within three years of its expiry date shall be considered to be cancelled automatically (MoUDC directive No 19, 2013).

B. Architects and Engineers

According to Ethiopian directives for registration of design professionals and consultants (2013) architects and engineers may be registered as professional architects and engineers, graduate architects and associate engineers, engineering aides and associate engineering aides after having fulfilled the registration requirements set forth in Part II of the Guidelines. Additionally, the applicants must also fulfill registration fees specified under the Guidelines.

Applicants must hold at least a B.Sc. degree or the equivalent in architecture or engineering from a recognized university or a similar institution (MoUDC directives No 22, 2013). The applicant must also submit acceptable evidence of at least four years of relevant and progressive design and supervision experience acquired after graduation. Likewise, the applicant may be engaged in the preparation of design documents and in the supervision of construction works for projects sponsored by his/her employer (MoUDC directives No 22, 2013).

Similarly the directive indicated that for registration as graduate architects and engineers, the applicants must hold at least a B.Sc. degree or the equivalent in architecture or engineering from a recognized University or a similar institution. The applicant must also have up to four years of relevant experience in the field for which he/she is applying. Moreover, the applicant may be engaged in the preparation of design documents and in the supervision of construction works for projects sponsored by his/her employer (MoUDC directives No 22, 2013).

For registration as associate engineers, the applicants must hold a diploma or the equivalent in an approved course in construction from a recognized university, or a similar institution (MoUDC directives No 22, 2013). The applicant must also submit satisfactory evidence of at least six years of relevant experience acquired after graduation in construction or supervision works of projects. Moreover, the applicant may be engaged in construction superintendence or supervision for projects sponsored by his/her employer. Similarly, for registration as Graduate Associate Engineers, the applicants must hold a diploma in building engineering or the equivalent in an approved course in construction from a recognized university, or a similar institution (MoUDC directives No 22, 2013). The applicant must also submit satisfactory evidence of at least six years of relevant experience in the fields of construction or supervision works of all projects. Moreover, the applicant may be engaged, either on part-time bases or full time, in construction or project supervision.

Moreover, according to Ethiopian directives for registration of design professionals and consultants (2013) for registration as engineering aide, an applicant must hold a technical school certificate or the equivalent from a recognized university, or a similar institution. The applicant must also submit satisfactory evidence of at least six years of relevant

experience in the fields of construction acquired after obtaining such certificate or the equivalent qualification. Moreover, the applicant may be engaged in drafting and in surveying works. Similarly, for registration as associate engineering aide, the applicants must hold a technical school certificate or the equivalent in an approved course in construction from a recognized university or a similar institution. The applicant may also be engaged, either part time or full time bases, in drafting and surveying works of projects.

C. Consulting Offices

According to Ethiopian directives for registration of design professionals and consultants (2013) consultants registering in office for consulting architects and engineers may participate in the preparation of total design documents for building and civil projects befitting their categories. Those consultants registered in the office for Consulting Architects may participate in the preparation and design of building projects befitting their categories. Those consultants registered in the office for general consulting engineers may participate in the preparation of all engineering design works befitting their category (MoUDC directives No 22, 2013). On the other hand, applications for registration in the office of specialized consulting engineers may be submitted in the specific fields of engineering like structural, road, sanitary and mechanical, foundational, electrical, quantity surveying, and surveying. Consultants registered in any of the above specialized fields may participate in the preparation of design projects befitting their categories (MoUDC directives No 22, 2013).

According to the guideline all applicants wishing to register in any of the consulting offices have to submit satisfactory evidence that the owner or manager at the consulting office being applied for is a registered practicing architect or engineer along with satisfactory evidence that the firm or organization has the finance, equipment, and office

and office facilities required for the consulting office applied for (MoUDC directives No 22, 2013). Moreover, the applying offices are required to submit satisfactory evidence showing that the firm or organization has the minimum number of registered staff set out by the Guidelines as well as a certificate of registration from the Ministry of Domestic Trade in accordance with the Commercial Code of Ethiopia.

2.4.1.2 Registration system related factors affecting the performance of construction project

According to Ethiopian construction industry registration proclamation the objectives of registration system are: ensuring the establishment of a scheme for the transparent and accountable registration and certification of professionals related construction works and organization engaged in construction, promoting the contribution of the construction sector in meeting the national demand for improved uniformity quality performance and establishing a system for the application of best practices aimed at continuous improvement and follow up in the performance of the construction works to private and public sector clients by professionals, contractors, related construction works and other stakeholders.

However, there is inefficient and ineffectiveness in registration system in achieving the above listed objectives. This can be assured by the abandoned and collapse of high rise building in Addis Ababa and in some of the regional states (Ethiopian Herald newspaper, 2016). As the newspaper reported that the death of construction workers and the delay in completion of many construction projects are among the phenomenon of Ethiopian construction industry.

Some of the registration system related factors affecting the building construction project performance are summarized below:

Table 2.1: Registration system related factors affecting construction project performance

Factors	References
Lack of the effectiveness of enforcement of the pre-qualification criteria for registration	• (Ofori, 2004)
Poor documentation in the system	• (Ofori, 2004)
Inadequate checkup of the validity of the documents submitted by the professionals and firms	• (Simon, 2015)
Lack of appropriate revision in construction registration directives	• (Mengistu & Mahesh, 2019)
Lack of clarity in construction directives	• (Mengistu & Mahesh, 2019)
Inadequate monitoring of professionals and firms performance	• (Omollo, 2019)
Poor project inspection	• (Omollo, 2019)
Inadequate evaluation and measuring mechanism in upgrading professionals and firms	• (Ofori, 2004)

2.4.2 Procurement system

The procurement concept has been defined in many ways. Most definitions have concentrated on the contractual arrangements for individual projects (the tactical level) whereas Davidson and Mohsini (1987 & 1989) suggest that "strategically, the set of contracts prepared for any one project must enable the building owner to meet his building needs as effectively as possible...", and "...the procurement strategies of all the active building owners has an impact on the overall performance of the building industry". Having identified procurement as a strategic management decision Davidson

and Mohsini give a more formal definition as "the acquisition of new buildings, or space within buildings, either by directly buying, renting or leasing from the open market, or by designing and building the facility to meet a specific need". And similarly Procurement can be defined as the act of obtaining or buying goods, services and works. The process includes preparation and processing of a demand as well as the end receipt and approval of payment. It often involves purchase of planning, standards determination, specification development, supplier's research and selection, value analysis, financing, price negotiation, making the purchase, supply contract administration, inventory control and stores, and disposal and other related functions (www.Businessdictionary.com).

2.4.2.1 The procurement system in Ethiopia

The procurement system in Ethiopia is run and controlled by ministry of finance and economic development and in Addis Ababa city administration it is mobilized by Addis Ababa city public procurement and property disposal agency.

Public procurement and property administration shall have to comply with the following principles: Ensure value for money in the use of public fund for procurement, nondiscrimination among candidates on grounds of nationality or any other criteria not having to do with their qualification, except in cases of preference specifically provided in the Proclamation, transparency and fairness of the criteria on the basis of which decisions are given in public procurement as well as of decisions in each procurement, accountability for decisions made and measures taken with regard to public procurement and property administration and Careful handling and proper use of public property (EFGPPAP NO. 649/2009).

According to EFGPPAP NO. 649/2009, the methods of procurement allowed to exercise within Ethiopian public sector are: open bidding, request for proposals, two stages

tendering, Restricted tendering, and request for quotation and direct procurement. Except and otherwise provided in this Proclamation, public bodies shall use open bidding as the preferred procedure of procurement.

2.4.2.2 Procurement system related factors affecting building construction project performance

In construction, the procurement system plays an important role in regulating the industry and keeping the best value of money and protecting unpleasant practice in selection of consultants and contractors to undertake the construction projects (Mgawe & Masanja, 2018). Even if there are good practices there are undeniable procurement system related causes that could tackle in finishing the building construction project on time, with in budgeted cost and intended quality. Some of the procurement related factors affecting the construction project performance are summarized in the table below:

Table 2.2: Procurement system related factors affecting construction project performance

Factor	Reference
Poor procurement plan	• (Nzau & Njeru, 2014), (Kr & Maharjan, 2018)
Delay in procurement process	• (Nzau & Njeru, 2014)
Lack of transparency in procurement process	• (Masindano & Namusonge, 2018)
Political interference with in tender process	• (Masindano & Namusonge, 2018), (Kr & Maharjan, 2018)
Incapable and incompetent procurement staff	• (Nzau & Njeru, 2014)

Weak procurement rules and regulations enforcement	• (World Bank, 2018), (Masindano & Namusonge, 2018)
Poor documentation in the system	• (Nzau & Njeru, 2014)
Poor communication in procurement process	• (Ngesa, 2012)
Poor/inadequate assessment of bidders	• (Ngesa, 2012)

2.4.3 The building permit

According Somiah (2014) building permits defined as granting approval to prospective developers to build structures in approved locations. This building activity must take place within an established time frame and in accordance with national building regulations. The building permit is a legal document and covers any property whose plans are judged to be suitable for implementation and subsequent human dwelling. The author further states that building permits are normally approved for residential, industrial and commercial buildings which are permanent structures. Temporary or makeshift structures can also be given approval. Such temporary structures include kiosks metal containers and advertising hoardings or boards(Hammah & Ibrahim, 2014).

Construction projects typically require a building permit, a plan check, and inspections. Building permits are required when any type of construction is planned that will change or add structure to an existing property or land parcel (Eirinaki et al., 2018). Often, more than one permit is required even for a simple construction project, such as updates to a bedroom or a bathroom. The building permit system is an important control for regulating the construction and maintenance of domestic and commercial building works and certifying compliance with building regulations. The purpose of the system is to ensure that all building works meet minimum standards and safety requirements (Tasantab, 2016).

However, further complications arise because even after multiple visits to a city's permit office it is often very difficult for a permit-applicant to determine whether a permit is required. The type of permits, rules and regulations vary significantly between cities, making the process for obtaining building permits complex, non-transparent, and inefficient, often involving a significant amount of “legwork” for the citizens (Eirinaki et al., 2018).

2.4.3.1 Building permit practice in Ethiopia

One of the quality control measures in the construction industry is the statutory requirement for the acquisition of permits before the commencement of construction work (Kpamma & Adjei-Kumi, 2013). To acquire construction permit the client or the owner of the building should pass different procedures.

According to Ethiopian building proclamation number 624/2009 the following are the steps for acquiring construction permit in Ethiopia.

1. A building officer shall check submitted plan documents to ensure compliance with the provisions of the Proclamation and other laws. Approval of plans shall not be withheld on account of requirements not included in the Proclamation or other laws.
2. A building officer may approve plans with comments provided that the comments refer to minor non-compliance and if the required rectification work can easily be carried out during construction.
3. Approved plans shall be stamped “**APPROVED**” and shall bear a registration number and date of approval and shall be signed by a building officer.
4. Application forms submitted with approved plans shall be stamped “**APPROVED**” in the appropriate space provided and shall bear a registration number and date of

approval. Comments if any, shall be entered on the form in the space provided and shall be signed by a building officer.

5. Upon approval, one set of application form and accompanying plan, as stamped and signed in accordance with step 3, and shall be returned to the applicant and the other set shall be retained by the urban administration or designated organ.
6. A copy of the signed and sealed application form and approved plans shall be permanently displayed at the building site. All original approved application forms and plan shall be kept in good condition and presented at any time, before and during construction, upon the request of the urban administration or designated organ or the building officer or an authorized inspector.

2.4.3.2 Building permit related factors affecting building project performance

One of the quality control measures in the construction industry is the enforcement of regulations requiring the acquisition of permits before construction commences. Regulations, standards and codes are an essential framework for ensuring a quality structure (Emmitt, 2002). The issue of the permits is based on compliance of designs with standards and specifications. The processes associated with obtaining permits however interrupt the flow of pre-construction activities leading to delays, and possibly cost overruns as well as decreased in value and affects the overall performance of the construction project (Kpamma & Adjei-Kumi, 2013).

The time and cost overruns can partly be attributed to activities at the design and documentation stage, of which permit acquisition is key. In relation to construction cost overruns, design-related causes constitute the major category (Josephson and Hammarlund, 1996).

The design solution and many work phases in a construction project delivery process are subject to checking and approval by regulatory authorities. These interventions by the authorities cause uncertainty and constraints to the process (Koskela, 1992). Getting approval for a design solution is unpredictable and also causes delays. Therefore, permitting delay is the one factor which negatively affects the performance of construction projects. Similarly, as different researchers identified there are different construction permit related factor that affects the performance of construction project as summarized in table below:

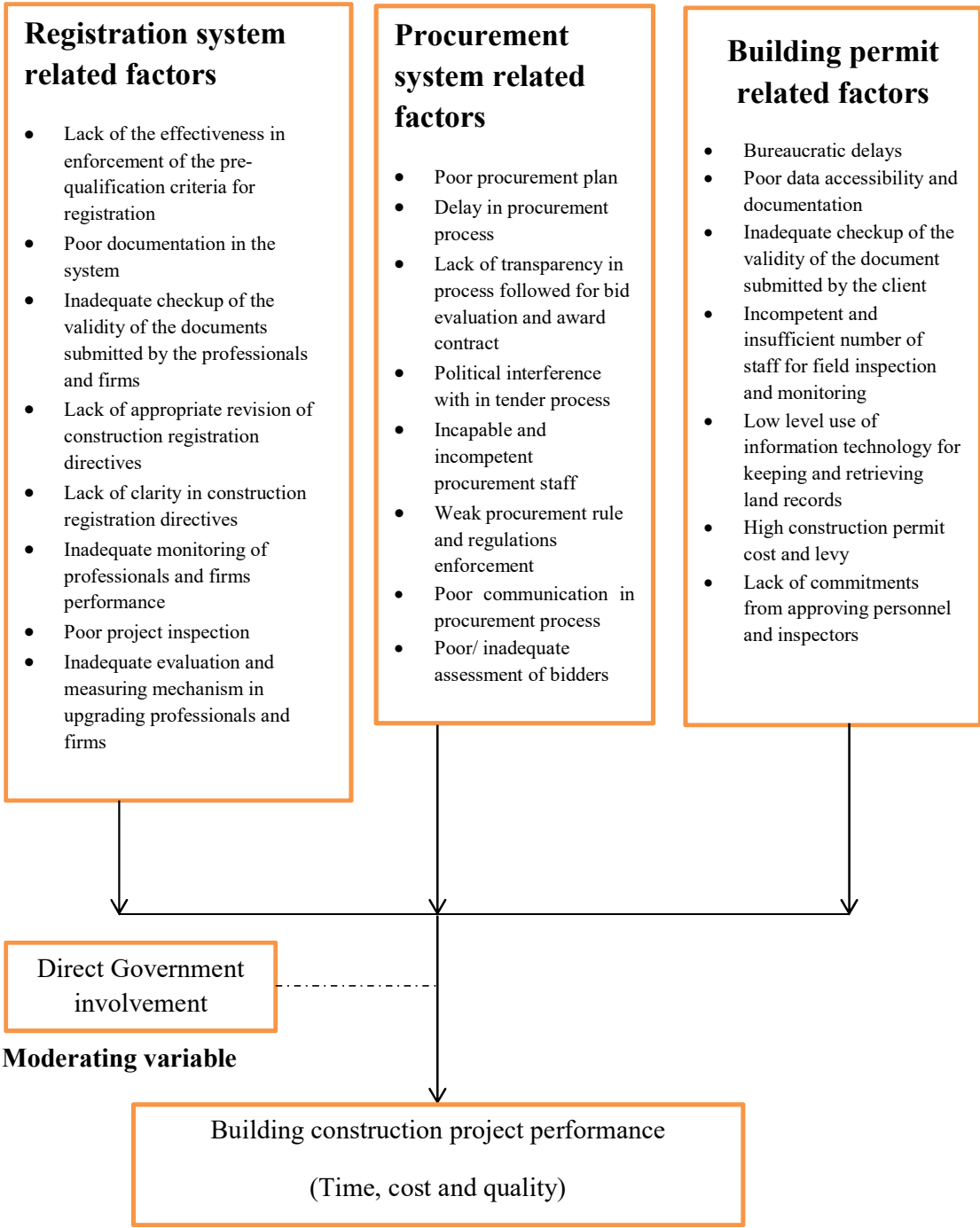
Table 2.3: Building permit related factors affecting the construction project performance.

Building permit related factors	Reference
Bureaucratic delays,	• (Stephen et al., 2016)), (Asante & Sasu, 2018)
High construction permit cost and levy	
Inadequate checkup of the validity of the document submitted by the client,	• (Mandi, Adnyana, & Gunapatniyatsunu, 2019)
Low level of using information technology for keeping and retrieving land records.	• (Kpamma & Adjei-Kumi, 2013),
Weak building codes, standards and regulation enforcement	• (Asante & Sasu, 2018)
Inadequate building regulations	• (Williams,2002)
Lack of enough staff to thoroughly review permit applications	• (Williams,2002)

2.5 Conceptual framework

Conceptual framework is a scheme of concepts or variables in which the study operationalizes in order to achieve the set objectives (Simon, 2015 & Negesa, 2012). This is illustrated in Figure 2.1. The independent variables in this study are the construction registration system, building permit and the procurement system and how they impacts the performance of building construction project on the performance dimensions of time, cost and quality in Addis Ababa. The performance of the building construction projects will therefore be a result of the changes that will take place in each of the three independent variables mentioned above. The dependency relationship of factors emanating from regulatory system practice related to the three regulatory instruments (registration system, the building permit and procurement system) and the building project performance (time, cost and quality). The schematic diagram in Figure 2.1 below illustrates the relationship between independent variables and dependent variable (Timely, cost and quality of building construction project). The diagram shows how the presence of any one of the factors in a building construction project leads to delay in timely completion, cost overrun and poor quality of the building construction project.

Independent variables



Dependent variables

Figure 2.1: Conceptual framework (Simon, 2015 & Negesa, 2012)

2.6 Research gap

Researchers in some of developing countries like Kenya, Ghana, Nigeria and South Africa were conducted to assess the building permit practice, the procurement system and the regulatory incompliance challenges in construction projects. This indicates that the researchers were studied by taking one single regulatory tool as a separate study and focused on studying the practice only (Asante & Sasu, 2018; Nzau & Njeru, 2014; & Omollo, 2019). This is the one research gap which is identified by the researcher. Therefore; unlike to the above researchers this study will focus both on assessing the practice of regulatory system, the major regulatory factors affecting the performance of building construction projects and the impacts of the identified significant factors on the performance of building construction project time, cost and quality. The major regulatory tools that will be studied in this research includes: registration, procurement and construction permit.

In Ethiopian perspective as discussed in the literature review section regulatory system related factors are identified by the number of researchers as one of the factors affecting the performance of building construction projects. Even though; it is identified as a one factor affecting the performance of building construction project further study was not carried out on the basis of the regulatory system focused on the major tools to identify the most important factors and their impacts on the performance of building construction projects and to know how is the practice of regulatory system in Ethiopian construction industry towards attaining the intended objective in case of Addis Ababa.

CHAPTER THREE

MATERIALS AND METHODS

This section of the research explains and justifies the methods and means in which the objectives of the study were met. Steps taken to gather all relevant information are presented in detail. It also presents research instruments and strategy used in the study. It finally presents the sample size, data collection approaches and method for the analysis of the data gathered.

3.1 Description of the study area

The proposed study area was Addis Ababa that is the capital city of Ethiopia. The total population of the city is estimated over 3 million with annual growth rate of 3.8%. The city has divide in 10 sub-cities. The city economy is growing annually by 14%. The city alone currently contributes approximately 50% towards the national gross domestic product, highlighting its strategic role within the overall economic development of the country (UN habitat, 2006).

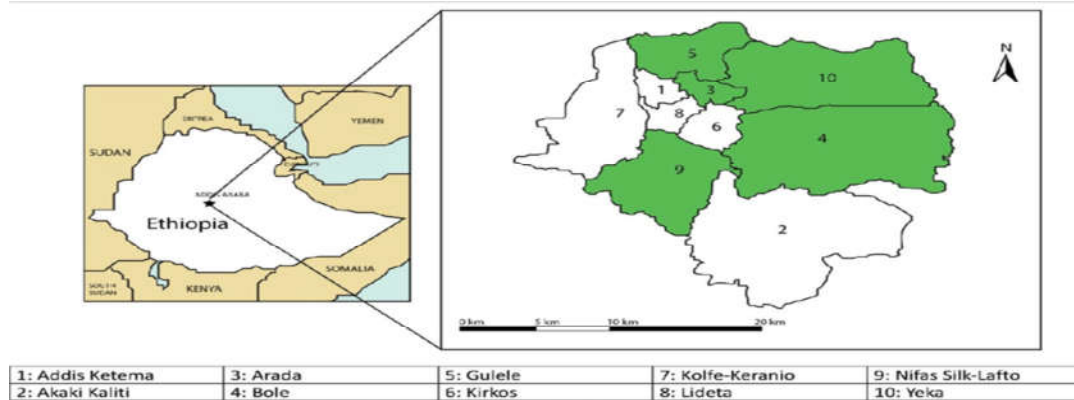


Figure 3.1: Map of Addis Ababa city Administration (www. Addis ababa.gov.et retrieved: September 21, 2020).

3.2 Research design

Research design refers to the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in the procedure (Yin, 2009). The study adopted a mixed method research design which includes both qualitative and quantitative research designs. Mixed method research provides researchers, across a research discipline, with a rigorous approach to answering research question.

The methodology used to accomplish this research was questionnaires, semi structured interview and document analysis. The document studied included construction registration directives, procurement regulations, procurement directives and building regulations of Ethiopia. Qualitative and quantitative approaches were then employed to analyze the primary data collected. Questionnaires were distributed and responses were statistically analyzed using statistical package for social science (SPSS). The collected and analyzed data from the questionnaires were substantiated by concepts from literature review. The questionnaire was used as one tool to achieve the objectives of the proposed research in addition to interview and document analysis. The findings of the research were used to draw conclusions and propose possible solutions to the regulators of the construction industry. The details of the research methodology and plan are further explained below in Figure 3.2.

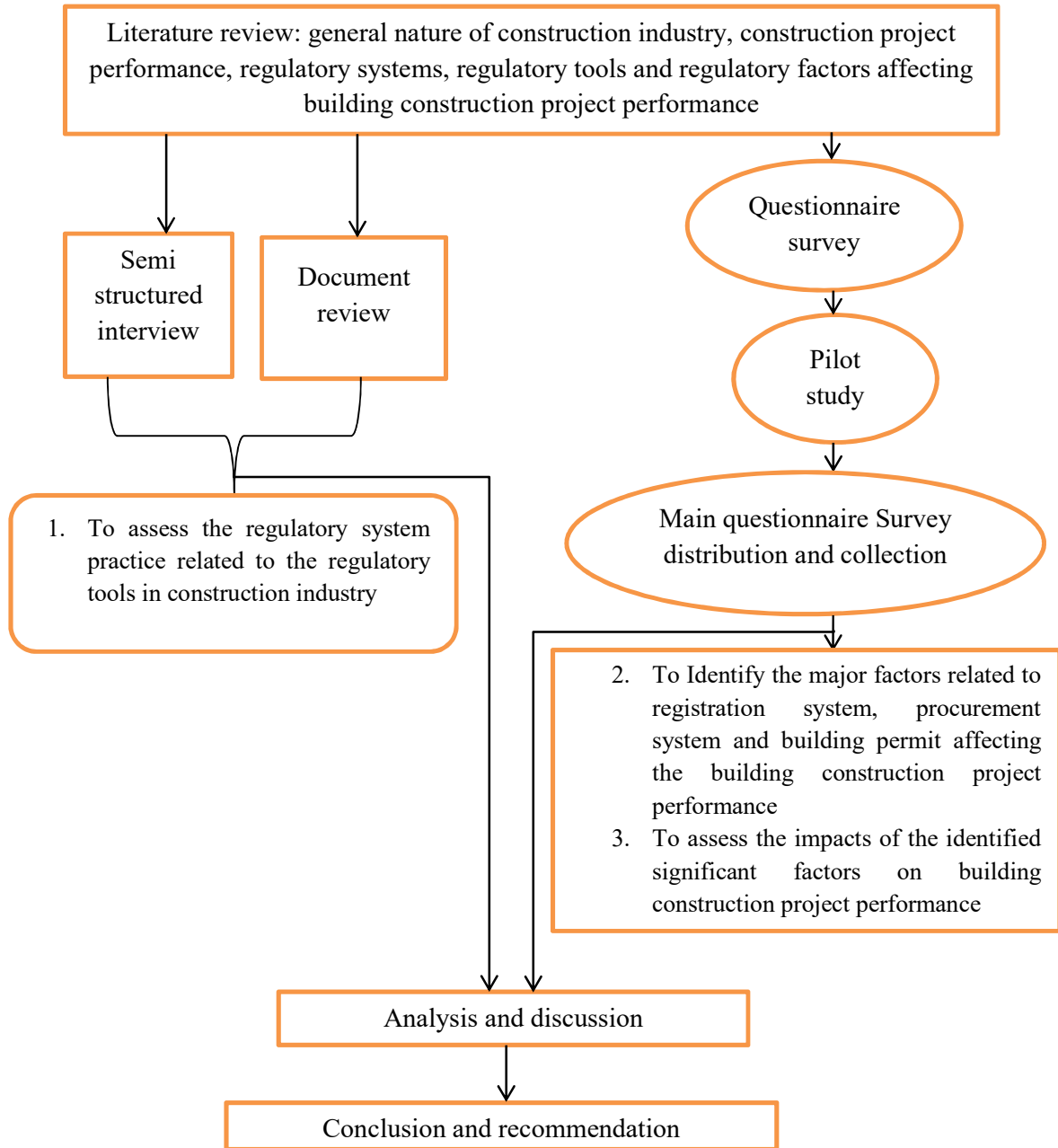


Figure 3.2: Flow chart for overall research plan

3.3 Target population

This study targeted collection of construction professionals working under clients, consultants, contractors and academics in Addis Ababa, Ethiopia.

3.4 Sampling procedure and sample size

This section describes the sampling procedures and sample size as shown in the sub sections below.

3.4.1 Sampling procedure

Sampling is a procedure, where in a fraction of the data is taken from a large set of data, and the inference drawn from the sample is extended to whole group. The study used purposive non random sampling; because the primary consideration in purposive sampling is your judgment as to who can provide the best information to achieve the objectives of your study (Kumar, 2011).

Ngechu (2004) acknowledges that in determining the purpose of the study and population size, three criteria should be specified to determine the appropriate sample size: the level of precision, the level of confidence or risk, and the degree of variability in the attributes being measured. The degree of variability in the attributes being measured refers to the distribution of attributes in the population. The more heterogeneous a population, the larger the sample size required to obtain a given level of precision.

3.4.2 Sample size

A larger sample is much more likely to be representative of the population (Singh, 2006). Keeping that in mind, sample size for this study was determined based on the result of the sampling technique chosen i.e. purposive non random sampling.

The number of construction professionals in Addis Ababa is unknown or too big. So, sample size formula for unknown population will be used in determining sample size. For populations that are large, Cochran (1963:75) developed the Equation to yield a representative sample for proportions.

$$SS = \frac{Z^2 P(1-p)}{C^2} \dots \dots \dots \{Equation; 3.1\}$$

Where:

SS= sample size

z = standardized variable

p = percentage picking a choice, expressed as a decimal

c = confidence interval, expressed as a decimal

As with most other research, a confidence level of 95% was assumed (Munn and Drever, 1990). For 95% confidence level (i.e. significance level of $\alpha = 0.05$), $z = 1.96$. Based on the need to find a balance between the level of precision, resources available and usefulness of the findings (Maisel and Persell, 1996), a confidence interval (c) of $\pm 10\%$ was also assumed for this research. According to Czaja and Blair (1996), when determining the sample size for a given level of accuracy, the worst case percentage picking a choice (p) should be assumed. This is given as 50% or 0.5. Based on these assumptions, the sample size was computed as follows:

$$SS = \frac{1.96^2 0.5(1-0.5)}{0.1^2}$$

$$SS = 96$$

The sample size still remains approximately 96 construction professionals. It is hard to get 96 responses out of 96 distributed questionnaire survey for this reason it was necessary to adjust the sample size to account for non-response. According to Takim et al. (2004), 20 – 30% is believed to be the norm. Assuming a response rate of 30%, the appropriate sample size to be surveyed was calculated as:

$$\text{Survey sample size} = \frac{\text{New ss}}{\text{response rate}}$$

$$\text{Survey sample size} = \frac{96}{0.3} = 320 \text{ professionals}$$

Respondents only with experience of 2 years and above working under clients; consultants and contractors are used in the analysis of the study.

3.5 Data collection methods

Data collection tools are the instruments which are used to collect the necessary information needed to serve or prove some facts (Mugenda and Mugenda, 2003). The study used both quantitative and qualitative data to answer the established research objective.

3.5.1 Qualitative data

Qualitative methodologies are explanatory in nature with the principal aim of trying to unearth answers to ‘how?’ and ‘why?’ questions (Walker, 1997) or trying to develop themes from the data (Creswell, 2003). It can be seen that this approach is ideally suited to the assessment of the practice of regulatory system in Ethiopian construction industry to the case of Addis Ababa for the purpose of this research both interviews and document review were used as a means of gathering qualitative data.

3.5.1.1 Interview

The interviews were an opportunity to ignore a priori ideas and to draw on the knowledge of practitioners without imposing biases or knowledge obtained directly from literature or experience (Cf. Nicolini, 2002). The interview was carried out with selected professionals. To give more freedom to the interviewee the semi structured questions were adopted so as

to encourage the respondent to give an in-depth and felt response without feeling held back in revealing of any information (Mugenda and Mugenda, 2003).

In framing the interview questions the objectives were considered as themes of discussion. Hence, the questions focus on how the construction industry regulation practiced in relation to the building permit, registration and the procurement system in Ethiopia in case of Addis Ababa.

Ten semi-structured interviews were held among construction professionals working in different organizations for validating the results of this research. All the 10 collected interviews were used and the interviews lasted for 20 minutes to 30 minutes which was recorded and transcribed. Analysis of interview was based on thematic analysis which is the process of identifying patterns and themes within the data (Braun & Clarke, 2006).

The interviewed personnel were three project managers, three resident engineers, two consultants and two construction supervisors. The interviewees are selected based on their experience in the construction industry and all the interviewees experience are above 8 years in the industry which is the most important for the validity and acceptance of the interview data.

3.5.1.2 Document review

The other qualitative data gathering technique used was the review of documents related to design and construction professionals and firm's registration, procurement system and building permit. Those documents include building regulation, procurement regulation, procurement directives and construction registration directives 19 and 21.

3.5.2 Quantitative data

A quantitative approach to this research was considered necessary because as noted in Walker (1997) empirical research provides strong evidence for explaining phenomenon, enabling researchers to address the questions ‘how much’ or ‘how many?’. More appropriately in the context of this investigation this kind of research enables the researcher to establish “which variables are significant, and to what extent, in a scientific way” (Walker, 1997), thus allowing the objective of explanatory assertions about the sample, and by inference the population, to be achieved (Babbie, 1990; Czaja and Blair, 1996).

The quantitative data for this study was collected using a questionnaire. The questionnaire comprised of two sections. The first was designed to determine fundamental issues including the demographic characteristics of the respondent, while the second part consisted of questions about the three regulatory tools related factors and their impacts on the performance of building construction projects were focused. The questionnaire was designed in line with the objectives of the study. Structured questions were used in an effort to conserve time and money as well as to facilitate easier analysis as they are in immediate usable form.

3.5.2.1 Questionnaire development

The questionnaire was prepared with closed ended questions with ordinal scale drawn in accordance with the set objectives of the study. The questionnaire was organized in subsections: part one was on the demographic information of the respondents; part two was on the major regulatory factors affecting project performance and the impacts of the major regulatory factors on the selected building construction project performance dimensions such as time, cost and quality.

The layout and format of the questionnaire was also given a lot of consideration to maximize response and to ensure that respondents did not inadvertently miss questions. Instructions were also provided generally and at the beginning of each section for completing the questionnaire. Once developed, the questionnaire was ready for testing.

3.6 Pilot Study

In order to evaluate the clarity and comprehensiveness of the questionnaire, as well as the feasibility of the survey as a whole, a pilot survey was conducted. As argued by several researchers like Munn and Drever (1990) such test run surveys are necessary to demonstrate the methodological rigor of a survey. And also a pilot test helps to test the reliability and validity of data collection instruments.

Validity refers to the extent to which an instrument measures what is supposed to measure data need not only to be reliable but also true and accurate. If a measurement is valid, it is also reliable (Joppe, 2000).

To conduct a pilot test a total of 15 questionnaires were distributed through hand delivery to professionals containing of project managers, instructors, office engineers and site engineer. However, to ensure that the study findings are not compromised, the respondents who take part in the pilot study was not included in the final study.

3.6.1 Respondent characteristics

Of the 15 questionnaires sent out to the selected sample, 12 were returned representing a response rate of 80%. Of the respondents, 41.67% represented contractors, 33.33% represented clients and 25% were academics (Figure 3.3).

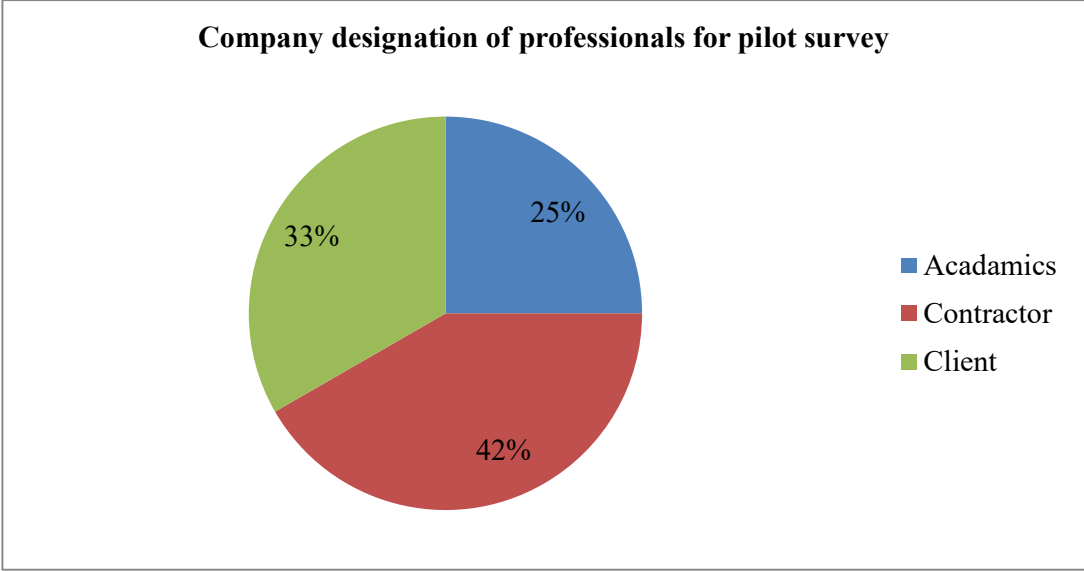


Figure 3.3: Company designation of professionals for pilot survey

3.6.2 Impact of analysis on questionnaire development for main survey

As a result of the analysis of the pilot survey, the questionnaire was taken through a process of revision to make it more suitable for the main questionnaire survey. From the feedback provided by respondents, two factors were completely withdrawn from the category of registration related factors because all respondents gave exactly the same response, or did not provide an adequate response at all.

An example was delay in registration procedure and cumbersome of registration requirements that the firms should meet are not a factors that affects the performance of the building construction projects rather they are the factors which affects the timely registration of construction professionals and firms before they are undertaking any building construction projects. The other comment by the respondents were in the category of procurement system related factors that corruption and lack of transparency in process followed for bid evaluation and contract award were parallel and lack of transparency can be an indicator for corruption.

Therefore, lack of transparency in process followed for bid evaluation and contract award was included and corruption was withdrawn from the list of the factors.

Some of the questions on the major regulatory related factors affecting the building project performance were also re-worded as the feedback from the respondents seemed to suggest that they found them ambiguous. And having completed the revision of the questionnaire, it was ready for deployment in the main survey.

3.7 Data management and analysis techniques

In order to analyze collected data, Mugenda and Mugenda (2003) observed that a researcher needs to have the following information about the statistical data analysis tools namely: descriptive, inferential and test statistics. Before processing the responses, the completed questionnaires will be checked for completeness to ensure consistency. The data will then be coded to enable the responses to be grouped into various categories.

3.7.1 Quantitative data analysis techniques

Different analysis techniques were adopted for the objectives as they have different nature. For objective two mean and standard deviation were used to rank the variables and then spearman correlation coefficient was conducted in order to assess perception consistency of the real practitioners of the industry consisting client, contractor and consultants on the ranking of the major factors related to registration system, procurement system and building permit affecting the Performance of building construction projects.

Spearman Rank Correlation Coefficient is calculated based on the following formula:

$$\text{Spearman rank coefficient} = 1 - \frac{6 \sum d^2}{(n^3 - n)} \dots \dots \dots \{ \text{Equation; 3.2} \}$$

Where “d” is the difference between ranks indicated by the two parties and “n” is the number of records.

One sample t-test was also conducted to identify the significant variables going to be used in the factor analysis and regression analysis. The findings will be presented using tables. A Likert scale of 1 to 5 rating based on their degree of impact was used to analyze the mean score and standard deviation. Percentages, tabulations, means and standard deviations were used to present the data.

Factor analysis was used to summarize data to enable patterns and their associations to be easily comprehended and interpreted. It aims at summarizing data to allow patterns and relationships to be effortlessly deduced and understood. It is usually applied in rearranging variables into a limited set of groups constructed on common variance and assists to segregate concepts and constructs (Yong and Pearce, 2013).

Examination of the appropriateness of Factor Analysis was attained using the Bartlett's Test and KMO, which is commonly applied in research. The Bartlett's test shows whether the correlation matrix is significantly different from an identity matrix. For the data to be suitable for analysis, Bartlett's test of sphericity has to be significant (Field, 2013), $p \leq 0.05$. The KMO has to be larger (higher than 0.50, as recommended by Kaiser, 1974). This gave credibility to PCA as a suitable technique for further Factor Analysis. In addition (Beavers et al., 2013), suggest a factor loading greater than 0.5 for the sample size of 150 up to 200. In this study the sample size is 150; therefore, factor loading greater than 0.50 were retained for factor analysis.

Variables significantly affecting the performance of building construction projects were considered for the factor analyses. The significant variables were identified using one sample t-test at a test value of 3. The factor analysis was conducted using principal component analysis with varimax orthogonal rotation, and Kaiser Criterion method (Eigenvalue exceeding one) was used to select the factors.

On the other hand, for explore objective three of the study regression analysis was used. Regression analysis is concerned with the study of the dependence of one variable, the dependent variable, on one or more other variables. Therefore, for the third objective multivariate regression analysis was conducted considering the significant variable factors in each independent variable category and time, cost and quality were taken as a dependent variable to assess the impacts the factors in each category on project time, project cost and project quality.

The multivariate regression equation is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \epsilon$$

Whereby:

Y = Performance dimensions of building construction projects (time, cost and quality)

X = the independent variable (registration system, building permit and procurement system related variables)

ϵ = Error term/Erroneous variables

β_0 = the minimum change in Y when the rest of the variables are held at a constant zero

β = measure of the rate of change i.e. β_1 measures the rate of change in Y as a result of a unit change in X_1 .

The collected data will be analyzed using Statistical package for the social sciences (SPSS) version 20 software package because it suited the type of the research as well as the analysis method chosen. The approaches used in the study were descriptive statistics and

inferential data analysis methods. This computer program will help to reduce the occurrence of error during data analysis. Besides, it is fast and more accurate.

3.7.2 Qualitative data analysis techniques

3.7.2.1 Interview analysis

To analyze the qualitative data gathered from interview the thematic analysis was adopted. Thematic analysis is a method of identifying and reporting patterns (Pinho, 2016). It is possible to use an a priori themes based on the theory and the predefined themes in this analysis were the research questions which are; practice of the construction regulatory system on the performance of attaining their intended objectives, the major factors emanating from the construction regulatory systems practice that affect the current practice, the performance dimensions majorly affected and Respondent’s opinion and suggestions to improve the tools to attain its intended objective as summarized in Figure 3.4.

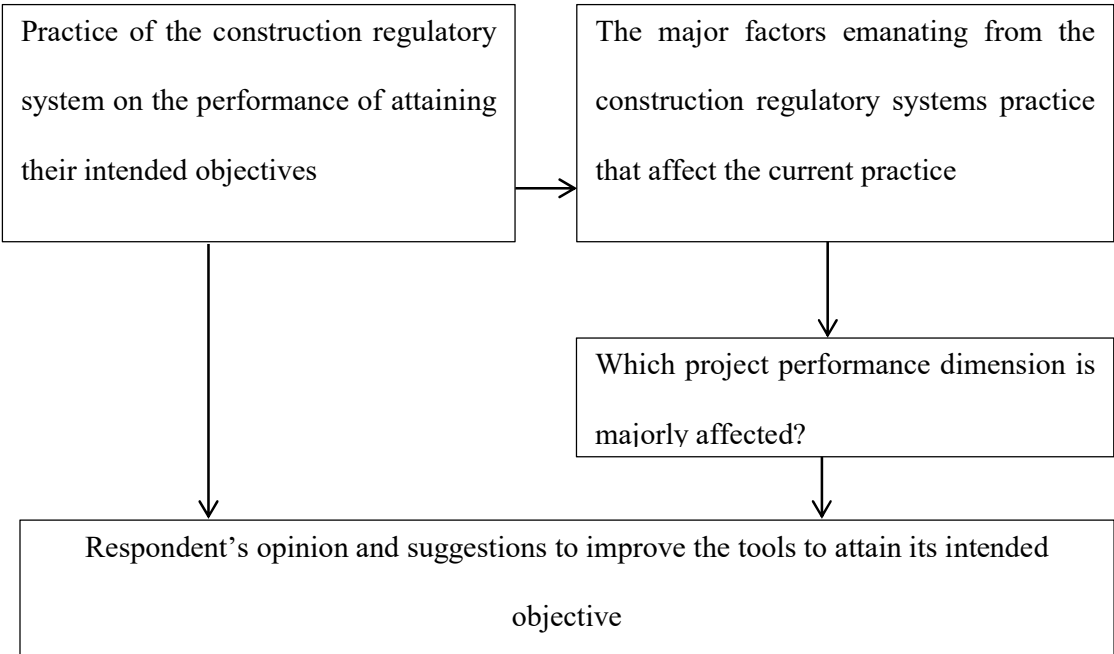


Figure 3.4: Data analysis flow chart for semi structured interview

3.7.2.2 Document analysis

Document analysis involves skimming (superficial examination), reading (thorough examination), and interpretation (Bowen, 2009). In this study the document analysis was carried out by having the research objectives as theme. the available documents are reviewed to assess the practice, point out the factors which affects the current practice and discussed which project performance dimensions are majorly affected. The review method was summarized in the Figure 3.5 below.

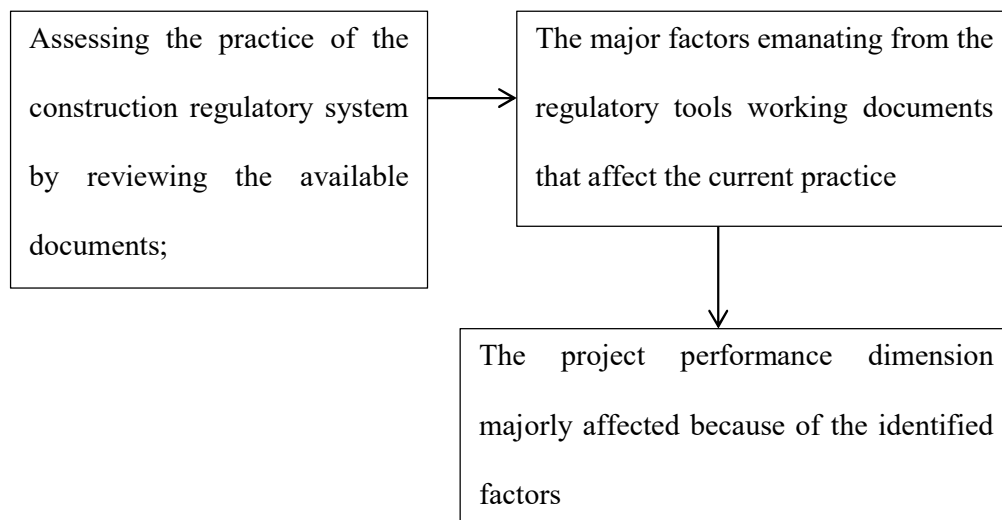


Figure 3.5: Document analysis flow chart

3.8 Validity and reliability of the research

To ensure validity and reliability of the research, variables are comprehensively defined. This also helps to reduce misunderstandings thus increase the reliability of the measuring instruments. Moreover, triangulation of results employed to ensure reliability of the data collected. Thus, all the data acquired from different sources compared and cross checked.

Besides, to ensure validity and reliability of the data, the questionnaires were tested prior to distribute to the intended respondents (pilot study) and the pilot test was comprised of a member of academician, building contractors, consultants and client. However, to ensure

that the study findings are not compromised, the respondents who take part in the pilot study was not included in the final study.

3.8.1 Validity of the data

In terms of measurement procedures, validity is the ability of an instrument to measure what it is designed to measure (Kumar, 2011). The validity of the data was also acquired through careful selection and use of appropriate size of the sample. One of the methods to test validity of a research is content validity, which refers to whether or not the content of the apparent variables (questionnaire) is right to measure the concept that the researcher is trying to measure (Asika, 2000). Content validity is done through the judgment of the external experts if the items or questions are representative of the construct investigated.

The content validity of the data collection instruments was determined through discussing the stated questions in the instruments with selected construction professionals listed in the pilot survey part of the study to test the validity of the research instrument. Therefore, validity is premised on the assumption that what is being studied can be measured or captured, and seeks to confirm the truth and accuracy of this measured and captured data, as well as the truth and accuracy of findings or conclusions drawn from the data (O'Leary, 2004). The comments and concerns raised by the advisor during this review process have been acknowledged and incorporated to improve the questionnaire.

3.8.2 Reliability of the data

Reliability is the consistency, stability or dependability of the data. Whenever an investigator measures a variable, he or she wants to be sure that the measurement provides dependable and consistent results (Cooper & Schindler, 2003). To measure the reliability

of the data collection instruments an internal consistency technique using Cronbach's alpha was applied to the gathered data (Mugenda & Mugenda, 2003).

Cronbach's alpha is a coefficient of reliability that gives an unbiased estimate of the data generalizability and an alpha coefficient of 0.70 or higher indicates that the gathered data is reliable as it has a relatively high internal consistency and can be generalized to reflect opinions of all respondents in the target population (Zinbarg et.al, 2005).

Table 3.1: Cronbach's α reliability coefficient

No.	Research constructs	Number of variables	Cronbach's α
1	Registration related	8	0.866
2	Building permit related	7	0.862
3	Procurement system related	9	0.893

As result shown in the above Table 3.1 all Cronbach's α coefficient values are higher than 0.7 which means the data is reliable and has high internal consistency.

3.9 Ethical consideration

Ethics in research requires personal integrity from the researcher. The goal of ethics in research is to ensure that no one is harmed or suffer adverse consequences from research activities (Cooper & Schindler, 2003). The researcher assured the respondents that the questionnaires are non-invasive and the information gathered solely for academic purposes only and not for any other purpose.

CHAPTER FOUR

RESULT AND DISCUSSION

This chapter provides the result and discussion of the data gathered through reviewing available documents, semi structured interview and questionnaire survey from construction professionals who are engaged in different work area representing client, consultants, contractors and academics.

4.1 Document review and interview result

4.1.1 Assessing the regulatory system practice in construction industry in Ethiopia related to the regulatory tools: a case of Addis Ababa city

The regulatory tools in which the analysis focuses on are the registration system, building permit and the procurement system. The findings are discussed in detail as shown below:

4.1.1.1 The practice of registration system in Addis Ababa

Results from reviews of directives for registration of construction professionals and contractors reveals that the current practice for the procedure of the registration and issuance of graded licenses are rely on ownership of equipment and number of staff. All contractors desiring to carry out construction works are required to register with MoUDC in accordance with the guideline for registration of construction professionals and contractors number 23/2013. According to the guideline, all contractors in registering under the guideline are required to register first with ministry of trade in accordance with the commercial code of Ethiopia and related directives of the MoUDC. After securing the registration certificate from ministry of trade that an application for a registration with the MoUDC can be entertained. Accordingly every contractor has to submit a photocopy of such a certificate to the MoUDC before being licensed as a contractor.

According to the guideline every contractor has the option of submitting an application for registration as a contractor in any of the following categories: general contractor, building contractor, road contractor and specialized contractor as it is discussed in the literature review parts of this study. The criteria for registration of contractors in any of the categories listed above differ based on the grade to which the contractor is applying. There are 10 grades which are categorized accordingly based on the construction cost of the project that the contractor is seeking to undertake.

Moreover, a results of reviews form directives for design professionals and consultants reveals that Architects and engineers may be registered as professional architects and engineers, graduate engineers and associated engineers, engineering aids and associate engineering aids after fulfilling the registration requirements set forth in the guidelines. Similarly, the guide line indicates that consultants in registering in office for consulting architects and engineers may participate in the preparation of the total design documents for building and civil projects be fitting their categories.

The above registration procedures, requirements and the registration practice for professionals and firms are also supported by the results from the semi structured interview. But all the interviewees were agreed that there are drawbacks in effectively performing on time registration of professionals and firms. In addition, there is inadequacy in cross examining the correctness of the documents submitted by the applicants.

4.1.1.2 Practice of building permit processing in Addis Ababa

According to Ethiopian building regulation proclamation No.624 (2009) before the building permit was granting to the applicant, the applicant must submit the plans and necessary documents and accordingly the building officer shall check all the documents and the plans as per the stated requirement in the building proclamation and other laws.

Then the building officer may approve plans with comments provided that the comments refer to minor noncompliance and possible rectification works can easily be carried out during construction. After the approved plan is stamped as “approved” and in the appropriate space provided bear a registration number and date of the approvals. According to the proclamation the copy of sign and sealed plans shall be permanently displayed at the building site.

The results from review of the building regulation the above stated procedures in getting building permit are also supported by the semi structured interview results. But the interview result indicates that in attaining the established objectives the building permit practice in Addis Ababa had shortcomings on effectively performing on time permit processing and poorly performing in assuring compliance to regulation in building construction project.

4.1.1.3 The practice of procurement system in Addis Ababa

Results from the review of public procurement regulation proclamation and directives indicates that the methods of procurement allowed to exercise with in public sector are open bidding, request for proposal, two stages bidding, restricted tendering, request for quotation and direct procurement. But the procurement proclamation has also recommended that the public bodies shall use open bidding as the preferred procedure for procurement. Similarly, the result from the interview shows that the procurement procedures most frequently selected in construction sector is open bidding. Sometimes direct procurement has also selected in special conditions.

The extracted interview result shows the procurement system practice is poor in attaining its established objectives. The evaluations and selections of the winner are not only on the

basis of technical and financial matters but also on the give and take approach (corruption). And collusive practices are highly exercised in between the bidders.

4.2 Questionnaire survey result

A total of 230 questionnaires were sent to the four groups of respondents' from clients, contractors, consultants and construction professionals worked in academic institutions and 150 were returned and used which comprises 34 clients representative, 30 consultants representative, 50 contractors representative and 36 academics representatives. This gives a response rate of 65.21 %. This was therefore considered a representative sample for further analysis.

Their positions in the individual firms they represented constituted a variety of roles; chiefly among the respondents were general managers, branch managers, department heads (design, contract administration, architecture, construction supervisors, collateral valuator, structural engineer, project coordinators, site engineers, resident engineers, project managers, office engineers and university lecturers.

4.2.1 Profiles of respondent

The purpose of section is to know the type of organization working, educational and experience of the respondents to undertake the study. The survey result shows that 51.25% of the respondents were BSc. holder and 48.75 % of the respondents were the M.Sc. holders. As the survey result shows that 22.67% professionals were working under client, 24% were working under consultant, 20% were working under contractor organizations and 33.33% of the respondents are academicians.

The survey also shows that it was well represented by better qualified experienced professionals in building construction in which 7.46% of the respondents had 0-2 years of

experience, 45.14% of the respondents had 3-5 years of experience, 29.42% of the respondents had 6-10 years of experience, 10.31% of the respondents had 11-15 years of experience, 6.67% of the respondents had an experience of 16-20 years and 1% of the respondents had an experience of more than 20 years as shown in Table 4.1 below.

Table 4.1: Profiles of the respondents

Description		Response (%)
Respondents type of organization	Client	22.67
	Consultant	24
	Contractor	20
	Academics	33.33
Respondents Educational background	BSc.	51.25
	MSc.	48.75
Experience of the respondents	0-2 years	7.46
	3-5 years	45.14
	6-10 years	29.42
	11-15 years	10.31
	16-20 years	6.67
	>20 years	1

4.2.2 Identifying the major factors affecting the performance of building construction projects related to the regulatory tools

The respondents were asked to indicate the extent of impacts of regulatory system related factors to the performance of building construction project. Here, the regulatory system related factors are categorized under the three main tools those are construction registration system, building permit and procurement system. The means and standard deviations of the

ratings were calculated to rank the variables. One sample T-test was also computed to test the significance of the variables at a hypothesized mean (test value) of 3 and the findings are summarized in Table 4.2, Table 4.4 and Table 4.6 for registration system, building permit and procurement system respectively.

Table 4.2: Ranking of variables emanating from registration system

	N	Mean	Std. Dev.	One sample t- test sign	Rank
Poor project inspection	150	3.82	0.96	0.00	1
Inadequate evaluation and measuring mechanism in upgrading professionals and firms	150	3.7	0.901	0.00	2
Inadequate monitoring of professionals and firms performance	150	3.65	0.976	0.00	3
Inadequate checkup of the validity of the documents submitted by the professionals and firms	150	3.64	0.921	0.00	4
Poor documentation in the system	150	3.64	0.95	0.00	5
Lack of effectiveness of enforcement of the prequalification criteria for registration	150	3.59	0.905	0.00	6
Lack of appropriate revision in construction registration directives	150	3.54	1	0.00	7
Lack of clarity in construction registration directives	150	3.48	1.11	0.00	8

From Table 4.2, the result shows the mean value, the one sample-test and the aggregate ranks of the variables. The spearman's rank order correlation indicates the strong agreement among the ranking of clients and contractors (spearman's correlation coefficient (r_s) =0.798 which is greater than the critical value (r_o) =0.738), contractor and consultant (r_s =0.81> critical value (r_o) =0.738) and client and consultant (r_s =0.821> critical value (r_o) =0.738) (see the ranks in the appendix). The one sample T-test indicates that all the

variables emanating from the registration system are significantly affect the building project performance.

As indicated in the Table 4.2, the aggregate result shows the major factors are: poor project inspection, inadequate evaluation and measuring mechanism in upgrading professionals and firms and inadequate monitoring of professionals and firms performance.

Poor project inspection- poor project inspection is ranked by overall respondents in 1st with aggregate mean of = 3.82. Project inspection is a basic approach to enhance compliance to countries building regulation, to enhance ethical practice in building construction industry and to enhance the output in performance of building construction projects by imposing sanctions on errand developers. Omollo (2019) is in agreement with this result that poor project inspection has high influence on the performance of building project performance and can be a door for exercising unethical practice in construction project.

Inadequate evaluation and measuring mechanisms in upgrading professionals and firms- Inadequate evaluation and measuring mechanisms in upgrading professionals and firms is ranked by overall respondents in 2nd with aggregate mean of = 3.7. in this regard, Ofori (2004) is in agreement with this result that Inadequate evaluation and measuring mechanisms in upgrading professionals and firms has a huge influence in the performance of building construction project. In addition, As discussed in interview report and document analysis in Addis Ababa there is no single document or directives highlights about the necessities of measuring and evaluation during professionals and firms upgrading their level but the requirement is only the necessary documents and reports submitted by the professionals and firms. This kind of approach can negatively affect the performance of

building construction projects because this kind of practice could facilitate to bring unqualified developers and workmanships to building construction projects.

Inadequate monitoring of professionals and firms performance- inadequate monitoring of professionals and firms performance is ranked by overall respondents in 3rd with aggregate mean of = 3.65. It is well known that one of the roles of the government to influence on the success in performance of construction projects and the overall performance in construction industry are monitoring of the professionals and firms performance. Therefore, inadequate monitoring of the professionals and firms performance could be the door for the prevalence of unprofessional acts and errand developers in building construction project. Fox & Scott (2014) are in agreement with this result that inadequate monitoring of professionals and firms hugely influences to the performance of building construction projects time, cost and quality. This was also assured by the interviewees that inadequate monitoring of professionals and firm's performance is the main factor which affects the practice and the performance of building construction projects in Addis Ababa.

The interviews indicated that the above three major factors have an enormous influence to the performance dimensions time, cost and quality in building construction projects.

The finding from document analysis also shows that the registration system still works using unrevised construction registration directives. Both directives 19 and 22 in which directives for the registration of construction professionals and contractors and architects and directives for the registration of design professionals and consultants respectively are effective since 2013 and still works without having a single revise due to unreasonable negligence. Similarly from both directives foreign companies are restricted not to participate below class one in national competitive bidding this kind of system has a huge

impact on the competitiveness of domestic contractors, technology transfer and the performance of building construction project. Both registration directives have no stipulated statements about how professionals and firms are examined and evaluated during upgrading of their level.

In the abstract part of the interview response on the question of how the current practice of registration can be improved; the interviewees said that having; technologically supported registration practices, adequate follow up and furnishing capacity development program to the registered professionals and firms, establishing appropriate evaluation and measuring mechanisms in upgrading the class of firms and professionals in the system.

4.2.2.1 Factor analysis of variables emanating from registration system

KMO values of the registration system related factors is 0.777 which is greater than 0.5 and the result of Bartlett's test of sphericity indicates that significant ($p < 0.05$). Therefore, the data are appropriate to conduct factor analysis. Table 4.3 shows the result of factor analysis for registration system related factors.

Table 4.3: Factor analysis of the registration system related variables

	Component	
	1	2
Poor documentation in registration system	0.792	
Lack of effectiveness of enforcement of the prequalification criteria for registration	0.785	
Poor project inspection	0.686	
Inadequate checkup of the validity of the document submitted by the professionals and firms	0.637	
Inadequate monitoring of registered professionals and firms performance	0.775	
Lack of appropriate revision in construction directives		0.753

Lack of clarity in construction directives		0.7
Inadequate evaluation and measuring mechanisms in upgrading professionals and firms		0.656
Total variance explained %	43.22	14.3
Cumulative variance explained	57.52	

Factor analysis of the registration system related variable yielded two components with 57.52 % cumulative variance explained as summarized in Table 4.3. The components are named: component 1 (inadequate surveillance) and component 2 (lack of clarity and revision in registration directives).

Inadequate surveillance in the system – the extent of surveillance determines the effectiveness in the practice of registration system in the construction industry. Factors like poor documentation in registration system, lack of effectiveness of enforcement of the prequalification criteria for registration, poor project inspection, inadequate checkup of the validity of the document submitted by the firms and inadequate monitoring of professionals and firms performance are improved only become if adequate surveillance is guaranteed in the system (Omollo, 2019).

Lack of clarity and revision in registration directives- clarity and revision of the construction registration directives could determine the practice of the registration system. The directives are the guide lines and standards that the registration system follows to effectively perform the registration practice. As Mengistu & Mahesh (2019), indicated that the construction registration directives should be amended to promote continuous professional development in the construction industry.

Therefore, if the directives are not revised and made clear to the user best fit to the current construction industry technology advancement and economic conditions it will create incompliances in the industry due to the existence of unqualified workmanship in the

industry and as a result the performance of the construction projects will be negatively affected. For example, in both directives, directive no. 19 and 22 there is brief statement on how to examine and evaluate professionals and firms during class upgrading. This will affect the quality of workmanship in the project.

Table 4.4: Ranking of variables emanating from building permit practice

	N	Mean	Std. Dev.	Rank	One sample t-test sign
Bureaucratic delay	150	3.72	1.061	1	0.00
Low level of using information technology for keeping and retrieving land records	150	3.56	1.045	2	0.00
Weak building code, standards and regulations enforcement	150	3.54	1.121	3	0.00
Lack of enough staff to thoroughly review permit applications	150	3.52	1.04	4	0.00
Inadequate building regulations	150	3.47	1.09	5	0.00
Inadequate checkup of the validity of the document submitted by the client	150	3.46	0.973	6	0.00
High construction permit cost and levy	150	3.1	0.97	7	0.18

From Table 4.4, the result shows the mean value, the one sample-test and the aggregate ranks of the variables. The spearman's rank order correlation indicates the strong agreement among the ranking of clients and contractors (spearman's correlation coefficient (r_s) =0.821 which is greater than the critical value (r_o) =0.786), contractor and consultant (r_s =0.875> critical value (r_o) =0.786) and client and consultant (r_s =0.946> critical value (r_o) =0.786) (see the ranks in the appendix). The one sample T-test indicates that except one variable called high construction permit cost and levy (0.18>0.05), all the variables emanating from the Building permit practice are significantly affect the building project performance ($P \leq 0.05$).

As indicated in the Table 4.3, the aggregate result shows the major factors are: bureaucratic delay, Low level of using information technology for keeping and retrieving land records and Weak building code, standards and regulations enforcement.

Bureaucratic delay- bureaucratic delay is ranked by overall respondents in 1st with aggregate mean of = 3.72. construction projects typically require a building permit to start the construction but as discussed in the literature review part of the study developers find themselves interfaced with national, regional and district bureaucracies at all levels of a project to obtain building permits this approach create a delay to the start of the construction and consequently it will create a delay to the completion time and increase the cost of the building construction projects. And this argument is also supported by Stephen et al., (2016), which states that bureaucratic delays in building permit lead to increased cost of construction and loss of value.

Low level of using information technology for keeping and retrieving land records - low level of using information technology for keeping and retrieving land records is ranked by overall respondents in 2nd with aggregate mean of = 3.56. Effective and efficient use of information technology can reduce the regulatory cost of construction and reduces the unreasonably increasing cost of building construction. Stephen et al., (2016) are in agreement with this result that low level of using information technology for keeping and retrieving land records will have a serious impact to facilitate building permit on time. It creates delay in timely completion of the projects and it increases regulatory cost of construction project.

Weak building code, standards and regulations enforcement- weak building code, standards and regulations enforcement records is ranked by overall respondents in 3rd with aggregate mean of = 3.54. It is well know that regulations, standards and building codes

are established at the national level is for the purpose of ensuring customer and public satisfactions in terms of cost, time and quality output. S. Ofori & Corresponding (2015) are also in agreement with this result that weak building code, standards and regulation enforcements will have a huge influence on the quality output of the building construction project.

The above factors were also supported by the interviewees. Most interviewees agreed that factors like bureaucratic delays during permit processing, low level of using information technology for keeping and retrieving land records and weak building code, standards and regulations enforcement are currently hugely affects the current practice of the building permit in Addis Ababa and as a result the performance of building construction projects are negatively affected due to the factors emanated from the current practice.

The findings from the document reviews show that the practice of design approval and building permit are carried out with regulation effective since 2011 and still it is not revised. There is a gap of 11 years respectively from now. Within these years several cost effective building technologies are fabricated. This kind of practice could negatively affect the time, cost and quality performance of the building construction project. Therefore; the building proclamation and regulations need to be revised periodically to create balance in technological and economic factors. And also, building proclamation and the regulation lacks clarity. For example, besides indicating the appointment of building officers with the required qualification; the minimum qualifications and requirements are not clearly stipulated and listed in both documents. This approach could affect the recruitment practice and could be door for hiring incompetent building officers.

Most of the interviewee agreed that; issuing construction permits on time, enhances penalties on errand developers to increase compliance, establishing adequate institutional

capacity to enforce the building construction regulations are in place, ensuring design review and approval are given by competent professional and experienced building officer, periodical inspection and monitoring of construction site to ensure compliance with the regulation could improve the current practice of design approval and building permit.

4.2.2.2 Factor analysis of variables emanating from building permit

KMO values of the building permit related factors is 0.697 which is greater than 0.5 and the result of Bartlett’s test of sphericity indicates that significant ($p < 0.05$). Therefore, the data are appropriate to conduct factor analysis. Table 4.5 shows the result of the factor analysis for building permit related factors.

Table 4.5: Factor analysis of building permit related variables

	Component	
	1	2
Inadequate building regulation	0.9	
Weak building codes, standards and regulation enforcement	0.884	
Inadequate checkup of the validity of the document submitted by the client	0.743	
Bureaucratic delay		0.887
Low level of information technology for keeping and retrieving land records		0.828
lack of enough staff to thoroughly review permit applications		0.748
Total variance explained %	49.46	23.31
Cumulative variance explained	72.77	

Factor analysis of the building permit related variable yielded two components with 72.77% cumulative variance explained as summarized in Table 4.5. The first three variables are strongly loaded in to component 1 named as (inadequate building regulation and regulation enforcement) and the other three variables are strongly loaded to component 2 named as (Delay in processing building permit).

Inadequate building regulation and regulation enforcement- controversies and inadequacy of building regulations create delay in building permit. If delays are created in permit it will have a serious impact on the total completion time of the projects. and also inadequate building regulations technically restrain the choice of cost saving techniques and methods in construction (Khan, 2010). And regulations are established at the national level is for the purpose of ensuring customer and public satisfactions in terms of cost, time and quality output (S. Ofori & Corresponding, 2015). Therefore, weak regulation enforcement could have the reverse effect to the time, cost and quality performance of the building construction project.

Delay in processing building permit- the creation delay in processing building permit is due to bureaucratic delay, low level of information technology for keeping and retrieving land records and lack of enough staff to thoroughly review permit applications. Delay in permitting process leads to increased cost of construction and loss of value (Stephen et al., 2016).

Table 4.6: Ranking of variables emanating from procurement system

	N	Mean	Std. Dev.	Rank	One sample t-test sign
Poor procurement plan	150	4.04	0.892	1	0.00
Poor/ inadequate assessment of bidders	150	4.01	0.866	2	0.00
Poor communication in procurement process	150	4	0.802	3	0.00
Lack of transparency in procurement process	150	3.92	0.93	4	0.00
Weak procurement rule and regulation enforcement	150	3.8	0.962	5	0.00
Delay in procurement process	150	3.78	0.989	6	0.00
Poor procurement documentation	150	3.74	0.928	7	0.00

Incapable and incompetent procurement staff	150	3.69	0.982	8	0.00
Political interference with in tender process	150	3.02	1.113	9	0.752

From Table 4.6, the result shows the mean value, the one sample-test and the aggregate ranks of the variables. The spearman's rank order correlation indicates the strong agreement among the ranking of clients and contractors (spearman's correlation coefficient (r_s) =0.867 which is greater than the critical value (r_o) =0.683), contractor and consultant (r_s =0.725 > critical value (r_o) =0.683) and client and consultant (r_s =0.825> critical value (r_o) =0.683) (see the ranks in the appendix). The one sample t-test indicates that except one variable called political interference with in tender process (0.752>0.05), all the variables emanating from the procurement system practice are significantly affect the performance building construction project ($P \leq 0.05$).

As indicated in the table 4.6, the aggregate result shows the major factors are: poor procurement plan, poor/ inadequate assessment of bidders and poor communication in procurement process.

Poor procurement planning- poor procurement planning is ranked by overall respondents in 1st with aggregate mean of = 4.04. Procurement planning encompasses the aspect of forecasting to help in the process of predicting costs and cash flows. Ultimately, the purpose of procurement planning is to safeguard against delayed implementation of public projects and to avoid situations of budgetary constraints which would hinder successful project execution and completion. Kr & Maharjan (2018) are in agreement with this result that poor procurement practice has a huge impact on project cost, and time performance of building construction projects.

Inadequate assessment of bidders- inadequate assessment of bidders is ranked by overall respondents in 2nd with aggregate mean of = 4.01. Proper assessment of bidders is a crucial to achieve better performance in time, cost and quality of the built construction project. Ngesa (2012) is in agreement with this result that poor assessment of bidders could leads to incompetent, overloaded, inexperienced and uncommitted contractors and as a result it leads to the delay, unreasonably high cost of completion and loss of quality of building construction projects.

Poor communication in procurement process- poor communication in procurement process is ranked by overall respondents in 3rd with aggregate mean of = 4.0. As excellent flow of communication of stakeholders in construction project procurement is a backbone for the successful accomplishing of the building construction projects. Mwandali (1996) & Ngesa (2012) are in agreement with the result that poor communication in procurement process is the major contributing factor to time and cost overrun in building construction projects.

As indicated in the semi structured interview result the above three major procurement system factors are the headache in today's procurement system practice in Addis Ababa.

All the interviewees have the same thought on the factors that affects the practice of procurement system and the extracted opinion of the respondents showed that accountabilities are not adequately ensured for decisions made and measures taken in the execution of public procurement. As the interviewees emphasized that, the above mentioned factors are enormously affect and hinder the procurement system to attain its established objective. As a result the time, cost and quality performance of the building construction project could be negatively affected.

Findings from the document analysis show that the procurement system is practiced still with unrevised procurement directives, proclamation and regulations. With the gap 11 years still it was not revised but the requirements inside the documents are changed informally in today's procurement practice. For example, the amount of money to declare national competitive or international competitive bidding specified in Ethiopian procurement directives are informally changed in current procurement and tendering practice. Therefore, if the procurement proclamations, directives and standard bidding documents are not periodically revised according to the situation and current state of the market it would have negative influence on the bidders and as a result the performance of construction industry will be negatively affected.

Interview extract indicated that some ways to improve construction procurement system practice to enhance good performance are: having an institution that candidates are not discriminated or excluded from participating in public procurement on ground of nationality or other reasons which are not related to evaluation criteria, Any criteria applied in making procurement decision and decisions taken on each procurement should be transparent to all concerned body, accountabilities should be ensured for decisions made and measures taken in the execution of public procurement, and providing appropriate training, advice and assistance of the procuring entities were mentioned as the possible solutions to improve the system.

4.2.2.3 Factor analysis of the variables emanating from the procurement system

KMO values of the procurement system related factors is 0.778 which is greater than 0.5 and the result of Bartlett's test of sphericity indicates that significant ($p < 0.05$). Therefore, the data are appropriate to conduct factor analysis. Table 4.7 shows the result of the factor analysis for procurement system related factors.

Table 4.7: Factor analysis of procurement system related variables

	Component	
	1	2
Delay in procurement process	0.926	
Poor procurement plan	0.87	
Weak procurement rule and regulation enforcement	0.756	
Poor/ inadequate assessment of bidders	0.666	
Lack of transparency in procurement process	0.612	
Incapable and incompetent staff		0.871
Poor procurement documentation		0.662
Poor communication in procurement process		0.651
Total variance explained %	48.21	15.84
Cumulative variance explained	64.05	

Factor analysis of the procurement system related variable yielded two components with 64.05 % cumulative variance explained as summarized in Table 4.7. The components are named: component 1 (poor procurement planning and weak procurement regulation enforcement) and component 2 (incapable and incompetent procurement staff).

Poor procurement planning and weak procurement regulation enforcement- states that good procurement plan should describe the process in detail to appoint pertinent developer contractually. At the beginning, the items needed to procure are defined, and then the process for acquiring those items is expounded in detail. Finally, the timeframe for delivery is scheduled (Hamza, Gerbi, & Ali, 2016). Therefore, poor procurement planning will negatively affect the selection and evaluation process of bidders, the transparency in procurement process and on the timely delivery of the building project due to the creation of delays in procurement process.

Procurement rule and regulations are established to create compliance in the system (Kr & Maharjan, 2018). Therefore, weak regulation enforcement affects the overall procurement process and the performance of building construction projects.

Poor staff competency in procurement process -Armstrong and Baron (1995) explain that competency is the application of knowledge and skills, performance delivery, and the behavior required to get things done very well. According to Russell (2004), absence of adequate knowledge in procurement matters, may end up with serious consequences. Further, As Ngesa (2012), indicated that incompetent procurement staff leading to lack of guidance to the contractor and poor work that has to be condemned contributes to delay in timely completion of the project. Therefore, competency of the procurement staff will determine the availability of good documentation and communication in procurement process.

4.2.3 Assessing the impacts of the identified significant factors on the performance of building construction projects (time, cost and quality)

In this section, the multivariate regression technique was applied to investigate the relationships between the regulatory system factors and the building project performance dimensions; time, cost and quality.

In a regression model, the dependent variables are a linear combination of the independent or explanatory variables. The independent variables are the factors, which contribute to the poor performance of time, cost and quality, and the dependent variable is the resulting time, cost and quality (Y_i).

Before establishing the linear relationships of the independent variable with the dependent variables the regression model output of correlation coefficient(R) and the R squared

values are discussed to check that the predictor variables have a strong influence and best describe the dependent variables. Similarly, Anova tests are also conducted to check the significance of F-value at $p \leq 0.05$ which is important to decide the fit of the model to conduct regression analysis. And finally, the constants (B_0) and the coefficients (B) values are calculated to establish the linear relationships of the independent variables (X) and the dependent variables (Y).

The impact of registration system related factor on the performance of building project time

The values of registration system related factors impacts on building project time used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t- vlaues and significance. Table 4.8 shows the analysis of the registration system related factors that contribute to time overrun in the building construction project.

Table 4.8: Analysis of registration system related factors contributing to time overrun

Registration system related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.704	0.313	2.252	0.026	0.63/0.609 , R=0.559 F=29.85, P=0.000
Lack of effectiveness of enforcement of the prequalification criteria for registration	0.365	0.056	6.516	0.00	
Poor documentation in the system	0.031	0.063	0.482	0.631	
Lack of clarity in construction directives	0.164	0.065	2.526	0.013	
Inadequate monitoring professionals and firms performance	0.446	0.068	6.588	0.00	
Poor project inspection	0.036	0.074	0.486	0.628	

Inadequate evaluation and measuring mechanisms in upgrading professionals and firms	0.054	0.066	0.811	0.419	
Lack of appropriate revision in construction directives	0.003	0.055	0.058	0.953	
Inadequate checkup of the validity of the document submitted by professionals and firms	0.028	0.059	0.474	0.637	

From the findings in Table 4.8, R was 0.559 meaning that there was a strong positive relationship between the registration related factors and time overrun of building construction projects. R^2 was 0.63 implying that the registration system related factors accounts 63% influence to the performance of building project time.

From the findings in Table 4.8 the results indicated that the model had an F ratio of 29.985 and the p value was $0.000 < 0.05$, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of registration system related factor on the performance of building project time is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

Moreover, from the Table 4.8 the model shows that the B value, standard error, the t value (significance level) and the significance values. According to the model lack of effectiveness of enforcement of prequalification criteria for registration ($B=0.365$, $t(141)=6.516$, $p=0.000 < 0.05$), lack of clarity in construction directives ($B=0.164$, $t(141)=2.256$, $p=0.013 < 0.05$), inadequate monitoring of professionals and firms performance ($B=0.446$, $t(141)=6.588$, $p=0.00 < 0.05$) shows significant impact on the performance of building project time. The impact relationship linear equation will be:

Time (Y) = 0.704 + 0.365 (lack of effectiveness of enforcement of prequalification criteria for registration) + 0.164 (lack of clarity in construction directives) + 0.446 (Inadequate monitoring professionals and firms performance)

From the regression equation established, taking all the factors constant at zero the time performance would be 0.704.

Further, if all the variables are kept constant, a unit increases in lack of effectiveness of enforcement of prequalification criteria for registration will lead to 0.365 increases in completion time of the project. A unit increase in lack of clarity in construction directives will lead to 0.164 increases in completion time of building project. A unit increase in inadequate monitoring of professionals and firm's performance will lead to 0.446 increases in completion time of the project. These results imply inadequate monitoring of professionals and firm's performance contributes more to increasing the total completion time of the building project.

The impact of registration system related factor on the performance of building project cost

The values of registration system related factors impacts on building project cost used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t-values and significance. Table 4.9 shows the analysis of the registration system related factors that contribute to cost overrun in the building construction project.

Table 4.9: Analysis of registration system related factors contributing to cost overrun

Registration system related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	1.372	0.247	5.67	0.00	0.648/0.628, R=0.805
Lack of effectiveness of enforcement of the prequalification criteria for registration	0.012	0.055	0.224	0.823	F=32.945, P=0.000
Poor documentation in the system	0.111	0.063	1.937	0.065	
Lack of clarity in construction directives	0.099	0.064	1.544	0.125	
Inadequate monitoring of professionals and firms performance	0.365	0.058	6.258	0.00	
Poor project inspection	0.694	0.073	9.547	0.00	
Inadequate evaluation and measuring mechanisms in upgrading professionals and firms	0.039	0.066	0.601	0.549	
Lack of appropriate revision in construction directives	0.028	0.054	0.524	0.601	
Inadequate checkup of the validity of the document submitted by professionals and firms	0.043	0.067	0.647	0.519	

From the findings in Table 4.9, R was 0.805 meaning that there was a strong positive relationship between the registration related factors and cost overrun in building construction projects. R² was 0.648 implying that the registration system related factors accounts 64.8% influence to the performance of building project cost.

From the findings in Table 4.9 the results show that the model had an F ratio of 32.495 and the p value was 0.000<0.05, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of registration system related factor on the performance of building project cost is statistically significant and can be used for

prediction purposes at 5 % significance level, this further indicate that the variables used in this model are statistically significant.

Similarly, from the Table 4.9 the model shows only inadequate monitoring of professionals and firms performance and poor project inspection significantly affects the cost performance of building construction project. Having $B=0.365$, $t(141) =6.258$, and $p=0.000<0.05$ and $B=0.694$, $t(141) =9.547$. $p=0.000<0.05$ respectively. The impact relationship linear equation will be:

$$\text{Cost (Y)} = 1.372 + 0.281 (\text{inadequate monitoring of professionals and firms performance}) + 0.694 (\text{poor project inspection})$$

From the regression equation established, taking all the factors constant at zero the cost performance would be 1.372.

Further, if all the variables are kept constant, a unit increases in inadequate monitoring of professionals and firm's performance will lead to 0.281 increases in overall cost of the project. A unit increase in poor project inspection will lead to 0.694 increases in completion cost of the building project. These results imply that poor project inspection contribute more to increasing the total completion cost of the building project.

The impact of registration related factor on the performance of project quality

The values of registration system related factors impacts on building project quality used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t- vlaues and significance. Table 4.10 shows the analysis of the registration system related factors that contribute to poor quality in the building construction project.

Table 4.10: Analysis of registration system related factors contributing to poor quality

Registration system related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.23	0.315	0.729	0.467	0.662/0.643, R=0.814
Lack of effectiveness of enforcement of the prequalification criteria for registration	0.076	0.057	1.344	0.181	F=34.549, P=0.000
Poor documentation in the system	0.433	0.064	6.737	0.00	
Lack of clarity in construction directives	0.113	0.066	2.166	0.062	
Inadequate monitoring of professionals and firms performance	0.086	0.06	1.433	0.154	
Poor project inspection	0.281	0.058	2.975	0.00	
Inadequate evaluation and measuring mechanisms in upgrading professionals and firms	0.537	0.067	7.98	0.00	
Lack of appropriate revision in construction directives	0.298	0.055	5.388	0.00	
Inadequate checkup of the validity of the document submitted by professionals and firms	0.156	0.069	2.275	0.024	

From the findings in Table 4.10, R was 0.814 meaning that there was strong relationship between the registration related factors and poor quality performance of building construction projects. R² was 0.662 implying that the registration system related factors accounts 66.2 % variation (influence) to the performance of building project quality.

From the findings in Table 4.10 the results show that the model had an F ratio of 34.549 which is high and the p value was 0.000<0.05, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of registration system related factor on the quality performance of building construction projects is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

Additionally, from the Table 4.10 the model shows that only poor project inspection, inadequate evaluation and measuring mechanisms in upgrading professionals and firms significantly, lack of appropriate revision in construction directives, inadequate checkup of the validity of the document submitted by professionals and firms and poor documentation in registration system significantly affects the quality performance of building construction project. Having $B=0.281$, $t(141) = 2.975$, $p=0.00 < 0.05$; $B=0.537$, $t(141) = 5.388$, $p=0.000 < 0.05$; $B=0.156$, $t(141) = 2.275$, $p=0.024 < 0.05$ and $B=0.433$, $t(141) = 6.737$, $p=0.00 < 0.05$ respectively. Implying that registration system related factor have a strong relationship with the performance of building project quality. The impact relationship linear equation will be:

$$\text{Quality (Y)} = 0.23 + 0.433 (\text{poor documentation in registration system}) + 0.281 (\text{poor project inspection}) + 0.156 (\text{inadequate checkup of the validity of the document submitted by professionals and firms}) + 0.537 (\text{inadequate evaluation and measuring mechanisms in upgrading professionals and firms}) + 0.298 (\text{lack of appropriate revision in construction directives})$$

From the regression equation established, taking all the factors constant at zero the quality performance would be 0.23.

Further, if all the variables are kept constant, a unit increases in poor documentation in registration system will lead to 0.433 increases in reducing the quality of the project. A unit increase in poor project inspection will lead to 0.281 increases in reducing the quality of the building project. A unit increase in inadequate evaluation and measuring mechanisms in upgrading professionals and firms will lead to 0.537 increases in reducing the quality of the building project. These results imply that inadequate evaluation and

measuring mechanisms in upgrading professionals and firms contribute more to the reduction of quality in the project.

Building permit related factors impact on the performance of building construction project completion time

The values of building permit related factors impacts on building project time used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t-values and significance. Table 4.11 shows the analysis of the building permit related factors that contribute to time overrun in the building construction project.

Table 4.11: Analysis of building permit related factors contributing to time overrun

Building permit related variables	Coefficients		t	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.642	0.293	2.194	0.03	0.706/0.693, R=0.84 F=57.151, P=0.000
Bureaucratic delay	0.526	0.067	7.88	0.00	
Inadequate checkup of the validity of the document submitted by the client	0.058	0.062	0.941	0.348	
Low level of using information technology for keeping and retrieving of land records	0.204	0.079	2.577	0.011	
Weak building codes, standards and regulation enforcement	0.11	0.094	1.173	0.243	
Inadequate building regulation	0.048	0.094	0.515	0.607	
Lack of enough staff to thoroughly review permit applications	0.247	0.056	4.436	0.00	

From the findings in Table 4.11, R was 0.84 meaning that there was a strong positive relationship between the buildings permit related factors and time overrun of building

construction projects. R^2 was 0.706 implying that the building permit related factors accounts 70.6 % variation (influence) to the performance of building project time.

From the findings in Table 4.18 the results show that the model had an F ratio of 57.151 and the p value was $0.000 < 0.05$, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of building permit related factor on the performance of building project time is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

In addition, from the Table 4.11 the model shows that only bureaucratic delay ($B=0.526$, $t(143)=7.88$, $p=0.000 < 0.05$), low level of using information technology for keeping and retrieving land records ($B=0.204$, $t(143)=2.577$, $p=0.011 < 0.05$) and lack of enough staff to thoroughly review permit applications ($B=0.247$, $t(143)=4.436$, $p=0.000 < 0.05$); shows strong relationship with the performance of building project time and significantly affects the dependent variable time. The impact relationship linear equation will be:

$$\text{Time (Y)} = 0.642 + 0.526 (\text{bureaucratic delay}) + 0.204 (\text{low level of using information technology for keeping and retrieving land records}) + 0.247 (\text{lack of enough staff to thoroughly review permit applications})$$

From the regression equation established, taking all the factors constant at zero the time performance would be 0.642.

Further, if all the variables are kept constant, a unit increases in bureaucratic delay will lead to 0.526 increases in the completion time of the building project. A unit increase in low level of using information technology for keeping and retrieving land records will lead to 0.204 increases in completion time of the building project. A unit increase in lack of enough staff to thoroughly review permit applications will lead to 0.247 increases in total

completion time of the building project. These results imply that bureaucratic delay contribute more to the increasing the completion time of the project.

Building permit related factors impact on the performance of building construction project cost

The values of building permit related factors impacts on building project cost used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t-vlaues and significance. Table 4.12 shows the analysis of the building permit related factors that contribute to cost overrun in the building construction project.

Table 4.12: Analysis of building permit related factors contributing to cost overrun

Building permit related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.231	0.299	0.773	0.441	0.612/0.596, R=0.782 F=37.625, P=0.000
Bureaucratic delay	0.035	0.068	0.518	0.606	
Inadequate checkup of the validity of the document submitted by the client	0.044	0.063	0.697	0.487	
Low level of using information technology for keeping and retrieving of land records	0.388	0.081	4.794	0.00	
Weak building codes, standards and regulation enforcement	0.371	0.096	3.86	0.00	
Inadequate building regulation	0.31	0.096	3.221	0.002	
Lack of enough staff to thoroughly review permit applications	0.072	0.057	1.27	0.206	

From the findings in Table 4.20, R was 0.782 meaning that there was a strong positive relationship between the buildings permit related factors and cost overrun of building

construction projects. R^2 was 0.612 implying that the building permit related factors accounts 61.2 % variation (influence) to the performance of building project cost.

From the findings in Table 4.12 the results show that the model had an F ratio of 37.625 and the p value was $0.000 < 0.05$, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of building permit related factor on the performance of building project cost is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

Moreover, from the Table 4.12 the model shows that According to the model low level of using information technology for keeping and retrieving of land records ($B=0.388$, $t(143)=4.794$, $p=0.000 < 0.05$), weak building codes, standards and regulation enforcement ($B=0.371$, $t(143)=3.86$, $p=0.001 < 0.05$), and inadequate building regulation ($B=0.31$, $t(143)=3.221$, $p=0.002 < 0.05$) shows strong relationship with the performance of building project cost and significantly affects the dependent variable cost. The impact relationship linear equation will be:

$$\text{Cost (Y)} = 0.231 + 0.388 (\text{low level of using information technology for keeping and retrieving of land records}) + 0.371 (\text{weak building codes, standards and regulation enforcement}) + 0.31 (\text{inadequate building regulation})$$

From the regression equation established, taking all the factors constant at zero the cost performance would be 0.231.

Further, if all the variables are kept constant, a unit increases in low level of using information technology for keeping and retrieving of land records will lead to 0.388 increases in overall cost of the project. A unit increase in weak building codes, standards

and regulation enforcement will lead to 0.371 increases in completion cost of the building project. A unit increase in inadequate building regulation will lead to 0.31 increases in total completion cost of the project. These results imply that low level of using information technology for keeping and retrieving of land records contribute more to increasing the total completion cost of the building project.

Building permit related factors impact on the quality performance of building construction project

The values of building permit related factors impacts on building project time used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t-values and significance. Table 4.13 shows the analysis of the building permit related factors that contribute to poor quality in the building construction project.

Table 4.13: Analysis of building permit related factors contributing to poor quality

Building permit related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.173	0.327	0.529	0.597	0.617/0.601, R=0.785 F=38.38, P=0.000
Bureaucratic delay	0.133	0.089	1.502	0.135	
Inadequate checkup of the validity of the document submitted by the client	0.394	0.069	5.681	0.00	
Low level of using information technology for keeping and retrieving of land records	0.04	0.075	0.535	0.594	
Weak building codes, standards and regulation enforcement	0.451	0.105	4.288	0.00	
Inadequate building regulation	0.273	0.105	2.59	0.011	
Lack of enough staff to thoroughly review permit applications	0.025	0.062	0.403	0.687	

From the findings in Table 4.13, R was 0.785 meaning that there was a strong positive relationship between the buildings permit related factors and poor quality of building construction projects. R^2 was 0.617 implying that the building permit related factors accounts 61.7 % variation (influence) to the performance of building project quality.

From the findings in Table 4.13 the results show that the model had an F ratio of 38.38 which is very high and the p value was $0.000 < 0.05$, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of building permit related factor on the performance of building project quality is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

Similarly, from the Table 4.13 the model shows that weak building codes, standards and regulation enforcement ($B=0.451$, $t(143)=4.288$, $p=0.000 < 0.05$), Inadequate building regulation ($B=0.273$, $t(143)=2.59$, $p=0.000 < 0.05$), and inadequate checkup of the validity of the document submitted by the client ($B=0.394$, $t(143)=5.681$, $p=0.00 < 0.05$) shows positive relationship with the performance of building project quality and significantly affects the dependent variable quality. The impact relationship linear equation will be:

$$\text{Quality (Y)} = 0.173 + 0.451 (\text{Weak building codes, standards and regulation enforcement}) + 0.273 (\text{Inadequate building regulation}) + 0.394 (\text{inadequate checkups of the validity of the document submitted by the client})$$

From the regression equation established, taking all the factors constant at zero the quality performance would be 0.173. Further, if all the variables are kept constant, a unit increases in weak building codes, standards and regulation enforcement will lead to 0.451 increases in reducing the quality of the project. A unit increase in inadequate building regulation will lead to 0.273 increases in reducing the quality of the building project. A unit increase in

inadequate checkups of the validity of the document submitted by the client will lead to 0.394 increases in reducing the quality of the building project. These results imply that weak building codes, standards and regulation enforcement contribute more to the reduction of quality in the building project.

Procurement system related factors impact on the time performance of building construction project

The values of procurement system related factors impacts on building project time used were collected through questionnaire based on a five point likert scale. These values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F- values, t- values and significance. Table 4.14 shows the analysis of the procurement system related factors that contribute to time overrun in the building construction project.

Table 4.14: Analysis of procurement system factors contributing to time overrun

Procurement system related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.175	0.192	0.914	0.362	0.85/0.841 , R=0.922 F=88.325, P=0.000
Poor procurement plan	0.592	0.063	9.359	0.000	
Delay in procurement process	0.248	0.07	3.557	0.001	
Lack of transparency in procurement process	0.075	0.05	1.486	0.139	
Incapable and incompetent procurement staff	0.055	0.042	1.309	0.193	
Weak procurement rule and regulation enforcement	0.125	0.046	2.744	0.007	
Poor procurement documentation	0.018	0.035	0.521	0.603	
Poor/ inadequate assessment of bidders	0.058	0.047	1.227	0.222	
Poor communication in procurement	0.229	0.073	3.157	0.002	

From the findings in Table 4.14, R was 0.922 meaning that there was a very strong positive relationship between the procurement system related factors and time overrun of building construction projects. R^2 was 0.850 implying that the procurement system related factors accounts 85 % variation (influence) to the performance of building project time.

From the findings in Table 4.14 the results show that the model had an F ratio of 88.325 and the p value was $0.000 < 0.05$, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of procurement system related factor on the performance of building project time is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

Moreover, from the Table 4.14 the model shows that poor procurement plan ($B=0.592$, $t(140) = 9.359$, $p=0.00 < 0.05$), delay in procurement process ($B=0.248$, $t(140) = 3.557$, $p=0.01 < 0.05$), weak procurement rule and regulation enforcement ($B=0.125$, $t(140) = 2.744$, $p=0.007 < 0.05$) and poor communication in procurement process ($B=0.229$, $t(140) = 3.157$, $p=0.002 < 0.05$) shows strong relationship with the performance of building project time and significantly affects the dependent variable time. The impact relationship linear equation will be:

$$\text{Time (Y)} = 0.175 + 0.592 (\text{poor procurement plan}) + 0.248 (\text{delay in procurement process}) + 0.125 (\text{weak procurement rule and regulation enforcement}) + 0.229 (\text{poor communication in procurement process})$$

From the regression equation established, taking all the factors constant at zero the time performance would be 0.175.

Further, if all the variables are kept constant, a unit increases in poor procurement plan will lead to 0.592 increases in the completion time of the building project. A unit increase in delay in procurement process will lead to 0.248 increases in completion time of the building project. A unit increase in weak procurement rule and regulation enforcement will lead to 0.125 increases in completion time of the project. A unit increase in poor communication in procurement process will lead to 0.229 increases in completion time of building construction project. These results imply that poor procurement plan contribute more to the increasing the completion time of the project.

Procurement system related factors impact on cost performance of building construction projects

The values of procurement system related factors impacts on building project cost used were collected through questionnaire based on a five point likert scale. These values values are input in to SPSS to get the regression coefficients, R square, adjusted R square, F-values, t-vlaues and significance. Table 4.15 shows the analysis of the procurement system related factors that contribute to cost overrun in the building construction project.

Table 4.15: Analysis of procurement system related factors contributing to cost overrun

Procurement system related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	1.021	0.311	3.284	0.001	0.543/0.514, R=0.737 F=18.499, P=0.000
Poor procurement plan	0.152	0.077	1.991	0.048	
Delay in procurement process	0.246	0.113	2.178	0.031	
Lack of transparency in procurement process	0.187	0.081	2.295	0.023	
Incapable and incompetent procurement staff	0.03	0.068	0.443	0.659	
Weak procurement rule and regulation enforcement	0.277	0.074	3.743	0.00	
Poor procurement documentation	0.072	0.057	1.263	0.209	

Poor/ inadequate assessment of Bidders	0.446	0.102	4.359	0.00	
Poor communication in procurement process	0.035	0.06	0.587	0.558	

From the findings in Table 4.15, R was 0.737 meaning that there was more than half and has a strong positive relationship between the procurement systems related factors and cost overrun of building construction projects. R^2 was 0.543 implying that the procurement system related factors accounts 54.3 % variation (influence) to the performance of building project cost.

From the findings in Table 4.15 the results show that the model had an F ratio of 18.499 and the p value was $0.000 < 0.05$, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of procurement system related factor on the performance of building project cost is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

Moreover, from the Table 4.15; the model shows that poor procurement plan ($B=0.152$, $t(140)=1.99$, $p=0.048 < 0.05$), delay in procurement process ($B=0.246$, $t(140)=2.178$, $p=0.031 < 0.05$), lack of transparency in procurement process ($B=0.187$, $t(140)=2.295$, $p=0.023 < 0.05$), weak procurement rule and regulation enforcement ($B=0.277$, $t(140)=3.743$, $p=0.00 < 0.05$) and poor/ inadequate assessment of bidders ($B=0.446$, $t(140)=4.359$, $p=0.00 < 0.05$) shows strong relationship with the performance of building project time and significantly affects the dependent variable time. The impact relationship linear equation will be:

Cost (Y) =1.021+0.152 (poor procurement plan) +0.246 (delay in procurement process) + 0.187 (lack of transparency in procurement process) +0.277 (weak procurement rule and regulation enforcement) + 0.446 (poor/ inadequate assessment of bidders)

From the regression equation established, taking all the factors constant at zero the cost performance would be 1.021.

Further, if all the variables are kept constant, a unit increases in poor procurement plan will lead to 0.152 increases in overall cost of the project. A unit increase in delay in procurement process will lead to 0.246 increases in cost completion of the project. A unit increase in lack of transparency in procurement process will lead to 0.187 increases in completion cost of the building project. A unit increase in weak procurement rule and regulation enforcement will lead to 0.277 increases in total completion cost of the project. A unit increase in poor/ inadequate assessment of bidders will lead to 0.446 increases in total completion cost of the building construction project. These results imply that poor/ inadequate assessment of bidders contribute more to increasing the total completion cost of the building construction project.

Procurement system related factors impact on the quality performance of building construction project

The values of procurement system related factors impacts on building project quality used were collected through questionnaire based on a five point likert scale and feed in to the SPSS software to compute regression analysis. Table 4.16 shows the analysis of procurement system related factors contributing to poor quality.

Table 4.16: Analysis of procurement system related factors contributing to poor quality

Procurement system related variables	Coefficients		T	Sig.	R ² /adjusted R ²
	B	Std. Error			
(Constant)	0.85	0.359	2.37	0.019	0.697/0.678, R=0.835
Poor procurement plan	0.296	0.13	2.273	0.025	F=35.817, P=0.000
Delay in procurement process	0.045	0.118	0.382	0.703	
Lack of transparency in procurement process	0.052	0.094	0.556	0.579	
Incapable and incompetent procurement staff	0.196	0.085	2.297	0.023	
Weak procurement rule and regulation enforcement	0.046	0.07	0.656	0.513	
Poor procurement documentation	0.279	0.066	4.233	0.00	
Poor/ inadequate assessment of bidders	0.274	0.066	4.153	0.00	
Poor communication in procurement process	0.333	0.079	4.222	0.00	

From the findings in Table 4.16, R was 0.835 meaning that there was a very strong positive relationship between the procurement systems related factors and poor quality performance of building construction projects. R² was 0.697 implying that the procurement system related factors accounts 69.7 % variation (influence) to the performance of building project quality.

From the findings in Table 4.16; the results show that the model had an F ratio of 35.817 and the p value was 0.000<0.05, implying that the F ratio was statistically significant, therefore the overall regression model for assessing the impacts of procurement system related factor on the performance of building project quality is statistically significant and can be used for prediction purposes at 5 % significance level, this further indicate that the variables used in this study are statistically significant.

In addition, from the Table 4.16 the model shows that poor procurement plan (B=0.296, t (140) =2.273, p=0.025<0.05), poor communication in procurement process (B=0.333, t (140) =4.222, p=0.000<0.05), Incapable and incompetent procurement staff (B=0.196, t (140) =2.297, p=0.023<0.05), poor procurement documentation (B=0.279, t (140) =4.233, p=0.000<0.05) and Poor/ inadequate assessment of bidders (B=0.274, t (140) =4.153, p=0.000<0.05) shows strong relationship with the performance of building project quality and significantly affects the dependent variable quality. The impact relationship linear equation will be:

$$\text{Quality (Y)} = 0.85 + 0.296 (\text{poor procurement plan}) + 0.196 (\text{Incapable and incompetent procurement staff}) + 0.279 (\text{poor procurement documentation}) + 0.274 (\text{inadequate assessment of bidders}) + 0.333 (\text{poor communication in procurement process})$$

From the regression equation established, taking all the factors constant at zero the quality performance would be 0.85.

Further, if all the variables are kept constant, a unit increases in poor procurement plan will lead to 0.296 increases in reducing the quality of the project. A unit increase in poor communication in procurement process will lead to 0.333 increases in reducing the quality of the building construction project. A unit increase in inadequate incapable and incompetent procurement staff will lead to 0.196 increases in reducing the quality of the building project. A unit increase in poor documentation in procurement will lead to 0.279 increases in reduction of the quality of the building construction project. These results imply that poor communication in procurement process contribute more to the reduction of quality in the building construction project.

4.3 Summary of the result

In three of the data collection and analysis methods used in the survey questionnaire, interview and document analysis the results are discussed above. All the methods give results and findings on the practice of construction regulatory system, major regulatory related factors affecting the performance of building construction projects and their impacts to time, cost and quality performance of building construction projects in Addis Ababa.

In summing up, the regulatory practice in construction industry taking reference at the registration system, the building design review and permit and the construction procurement system practice was performed averagely and unsatisfactorily as it was assured in the interview and questionnaire survey results. The major regulatory tools which are the construction registration system, the building permit and the procurement system practices needs high level of improvement and needs special attention for the better performance in the output of construction industry. From the results it can be concluded that the results are similar with regard to the construction regulatory practice, the major regulatory related factors and their impacts on the performance of building construction projects.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The research aims to assess the major regulatory factors affecting the performance of building construction projects in Addis Ababa. With the objectives to assess the construction regulatory practice, the factors emanating from the current practice of regulatory system related to registration system, building permit and procurement system which affects the performance of the building construction project and the impacts of the identified factors on building construction project performance in Addis Ababa. Based on the findings the following conclusions were drawn:

5.1.1 Assessing the construction regulatory system practice related to the regulatory tools in Addis Ababa

As the results in questionnaires, interview and document review indicated that the construction regulatory practice with regard to the three tools which are the construction registration system, the building permit and the procurement system practices needs improvement. As this was assured in the analysis of the result construction registration system practice had drawbacks in effectively performing on time registration of professionals and firms. In addition, there is inadequacy in cross examining the correctness of the documents submitted by the applicants.

In the building permit system; practices like limitations in issuing the construction permit on time and poor periodical inspection and monitoring of construction site to ensure

compliance with the established regulation, inadequacy of revisions of the building codes and regulations show that the current state of the building permit practice needs improvement.

In procurement system practices like lack of transparency in procurement process and collusive practice in case of weak procurement rule and regulation enforcements shows that the procurement system practice needs improvement to achieve the established principles of Ethiopian public procurement system.

5.1.2 The major factors affecting the performance of building construction projects related to the regulatory tools in Addis Ababa

From registration system related factors the major factors affecting the performance of building construction projects in Addis Ababa are: poor project inspection, inadequate evaluation and measuring mechanism in upgrading professionals and firms and inadequate monitoring of professionals and firms performance.

From building permit related factors the major factors affecting the performance of building construction projects are: bureaucratic delay, low level of using information technology for keeping and retrieving land records and weak building code, standards and regulations enforcements.

From the procurement system related the major factors affecting the performance of building construction projects are: poor procurement plan, poor/ inadequate assessment of bidders and poor communication in procurement process.

Generally, the identified significance factors are further interpreted and converged using factor analysis and the output indicates that the major registration system related factors

are; inadequate surveillance in the system, and lack of appropriate revision and clarity in construction registration directives. The major building permit related factors are; inadequate building regulation and regulation enforcement, and delay in processing building permit. The major procurement system related factors are; poor procurement planning and weak procurement regulation enforcement, and incapable procurement staff.

5.1.3 The impact of the identified significant factors on the performance of the building construction projects in Addis Ababa

Regression analysis of factors among the registration system, building permit and the procurement reveals that inadequate monitoring of registered professionals and firm's performance, bureaucratic delay and poor procurement plan had considerably high impact on contributing in increasing completion time of building construction project.

A result from the study reveals that among the registration system, building permit and the procurement system related factors poor project inspection, low level of using information technology for keeping and retrieving land records and inadequate assessment of bidders had considerably high impact on project cost performance and contributed to the increments of cost in building construction project.

Finally, factors like inadequate evaluation and measuring mechanisms in upgrading the professionals and firms, weak building codes, standards and regulation enforcement and poor communication in procurement process had a considerably high impact on building project quality performance and will contribute in increasing the reduction of the quality of building construction project.

5.2 Recommendations

From the findings and conclusions drawn from the analyzed information, the following are the recommendations of the study;

5.2.1 Recommendations on construction registration system practice

- There should be appropriate evaluation and measuring mechanisms in upgrading the class of firms and professionals respectively so as to enhance the competency of the developers.
- Appropriate documentation of all the registered firms and professionals should be in place in the system so as to prevent inappropriate upgrading through providing false documentary evidence.
- The construction registration directives should be revised and amended periodically to be fit to the current construction industry development.

5.2.2 Recommendation on the design approval and building permit practice

- Construction permits should be issuing on time so as to prevent delay in building construction project.
- Establishing adequate institutional capacity to enforce the building construction regulations are in place so as to enhance the performance of building construction projects.
- Design review and approval should be given by competent professional and experienced building officer in order to prevent design errors and quality problems in the building construction projects.
- periodical inspection and monitoring of construction site shall be in place to ensure compliance with the regulation and

- The building regulation shall be revised and amended so as to increase clarity and to be fit to the current technology and construction industry development.

5.2.3 Recommendations on the construction procurement system practice

- Any criteria applied in making procurement decision and decisions taken on procurement should be transparent to all concerned body.
- Appropriate procurement plan shall be exist before the commencement of any activity so as to prevent the conflict of the requirements.
- Adequate assessment of bidders should be in place so as to prevent the entrance of overzealous incompetent contractors.
- Adequate flow of communication should be in place so as to prevent conflict with in the project stakeholders and to prevent delay in the building construction projects.
- Strong procurement rule and regulation enforcements shall be in place so as to ensure compliance and achieving the principles of the procurement system.

5.2.4 Recommendations for further research

A deeper study in the regulatory related factors related to other regulatory instruments which are not identified in this study should be carried out. Moreover, studies on the level of coordination and harmonization of the regulatory instruments in controlling the construction industry are recommended. Research is needed to compare and contrast the practice of regulatory system of Ethiopian construction industry with other countries to further explore various parameters in best assessing the practice.

Finally, undertaking of further research investigation on assessing the major regulatory related factors affecting the performance of road construction projects is recommended because this study is only focusing on building construction sector in Addis Ababa.

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APPENDICES

Appendix A: Structured Questionnaire

Dear respondent”,

I am Student of Masters of construction Technology and Management, (CoTM), at Hawassa University Institute of Technology. As partial fulfillment of the program, I am undertaking a research on the topic of “**assessing the major regulatory factors affecting the performance of building construction projects in Addis Ababa.**” And this questionnaire is prepared for the intention of achieving the objective of the research which are to assess the practice of regulatory system in Ethiopian construction industry taking Addis Ababa as a case study, identify the major regulatory related factors affecting the performance of building construction project and to assess the impacts of the major regulatory related factors on the performance of building construction projects respectively.

The research result could be used as an input for decision makers, professionals, academician and other interested groups to play their respective role for the achievement of project objectives. It is believed that your participation in this research will contribute in achieving the objectives of the research. Thus, the quality of your response towards the question items determines the quality of the research results. Therefore, please answer the questions as thoroughly, objectively and honestly as possible according to the instructions contained in the body of the questionnaire. Finally, I want to assure you that all information provided in this survey will be treated with strict confidentiality and allowed to serve only for the purpose of the research under consideration.

Thank You in Advance for your cooperation!!!

PART-I: General information about the respondents

(Please tick one box for each of the questions)

1. Type of the organization you are working in

Client

Contractor

Consultant

Academics

others _____

2. Your position in the organization

Project manager

Instructor

Contract administrator

other: _____

Site engineer

Office engineer

Construction officer

3. Educational Background

PH.D.

MSc.

BSc.

Diploma,

4. Years of experience in the construction industry

0-2 year

3-5 years

6-10 years

11-15 years

16-20 years

>20 years

PART-II: The major factors affecting the performance of building construction projects related to the regulatory system (registration system, building permit and procurement system) in Addis Ababa and the impacts of these factors on construction project performance dimensions (time, cost and quality).

From your experience, please rate the following factors emanated from current building construction regulatory practices that affect the performance of building construction projects in Addis Ababa and the level of impacts of these factors on project performance dimensions (time, cost and Quality). **(Please tick the appropriate box).**

1=Very low impact, 2= Low impact, 3= Medium impact, 4=High impact, 5=Very High impact.

Registration related factors	1	2	3	4	5
Lack of the effectiveness in enforcement of the pre-qualification criteria for registration					
Poor documentation in the system					
Inadequate checkup of the validity of the documents submitted by the professionals and firms					
Lack of appropriate revision of construction registration directives					
Lack of clarity in construction registration directives					
Inadequate monitoring of professionals and firms performance					
Poor project inspection					
Inadequate evaluation and measuring mechanism in upgrading professionals and firms					

Please rate the impacts of the above factors on the following project performance dimensions	1	2	3	4	5
On contributing to project time overrun					
On contributing to project cost overrun					
On contributing to poor project quality					
Building permit related factors	1	2	3	4	5
Bureaucratic delays					
Weak building codes, standards and regulations enforcement					
Inadequate checkup of the validity of the document submitted by the client					
Low level use of information technology for keeping and retrieving land records					
Lack of enough staff to thoroughly review permit applications					
Inadequate building regulations					
High construction permit cost and levy					
Please rate the impacts of the above factors on the following project performance dimensions	1	2	3	4	5
On contributing to project time overrun					
On contributing to project cost overrun					
On contributing to poor project quality					
Procurement system related factors	1	2	3	4	5
Poor procurement plan					
Delay in procurement process					

Lack of transparency in procurement process					
Political interference with in tender process					
Incapable and incompetent procurement staff					
Weak procurement rule and regulations enforcement					
Poor communication in procurement process					
Poor/ inadequate assessment of bidders					
Poor procurement documentation					
Please rate the impacts of the above factors on the following project performance dimensions	1	2	3	4	5
On contributing to project time overrun					
On contributing to project cost overrun					
On contributing to poor project quality					

Appendix B: Semi structured interview questions

Interview Guide,

The purpose of this interview is to collect data about the construction regulatory practice, the factors emanated from the current practice and improvement mechanism of construction regulatory practice in Addis Ababa. The data will be used for partial fulfillment of Master in construction technology and management in Hawassa University. This is therefore, the information you give is kept highly confidential. Thus feel free to mention any of your feelings about the practices.

1. Questions for the Interview

- 1. Time & Place:
- 2. Interviewee:

Interview questions:

1. How is the construction regulatory system practice looks like in terms of attaining their intended objective with regard to the registration system, the building permit system and construction procurement system?

2. What are the factors emanated from the current construction regulatory practice that affects the performance of building construction projects in Addis Ababa.

3. Which project performance dimensions are majorly affected by the factors emanated from the current practice?

4. What you recommend for the improvements of the current construction regulatory practice?

Appendix C: Financial requirements for registration of BC, RC and GC

Categories	Grade	Construction Cost (Birr)		
		BC	RC	GC
(GC,BC,RC)	1	Above 210,000,000	Above 300,000,000	Above 350,000,000
(GC,BC,RC)	2	Up to 210,000,000	Up to 300,000,000	Up to 350,000,000
(GC,BC,RC)	3	Up to 160,000,000	Up to 225,000,000	Up to 270,000,000
(GC,BC,RC)	4	Up to 110,000,000	Up to 154,000,000	Up to 185,000,000
(GC,BC,RC)	5	Up to 54,000,000	Up to 76,000,000	Up to 100,000,000
(GC,BC,RC)	6	Up to 27,000,000	Up to 38,000,000	Up to 45,000,000
(GC,BC,RC)	7	Up to 11,000,000	Up to 15,000,000	Up to 18,000,000
(GC,BC,RC)	8	Up to 5,400,000	Up to 7,500,000	Up to 9,000,000
	9	Up to 3,000,000	Up to 4,200,000	Up to 5,000,000

(GC,BC,RC)				
(GC,BC,RC)	10	Up to 1,000,000	Up to 1, 500,000	Up to 1,800,000

(Source: Registration of Construction Professionals and Contractors No. 23 /2013)

Appendix D: different grades of specialized contractor's financial requirement

Ctagory	Grade	Construction Cost (Birr)		
		BC	RC	GC
GC,BC,RC	1	Above 54,000,000	Above 76,000,000	Above 100,000,000
GC,BC,RC	2	Up to 27,000,000	Up to 37,800,000	Up to 45,000,000
GC,BC,RC	3	Up to 11,000,000	Up to 15,000,000	Up to 18,000,000
GC,BC,RC	4	Up to 5,400,000	Up to 7,600,000	Up to 9,000,000
GC,BC,RC	5	Up to 3,000,000	Up to 4,200,000	Up to 5,000,000
GC,BC,RC	6	Up to 1,100,000	Up to 1,500,000	Up to 2,000,000

(Source: Registration of Construction Professionals and Contractors No. 23 /2013)

Appendix E: Staff Requirement

Grade	Qualification	Required Staff
GC-1 & 2	Prof. Eng. IV or above	2
	Ass. Eng. IV or above	1
	Ass. Eng. III or above	1
	Eng. Aide III or above	1
	Eng. Aide II or above	2
GC-3 & 4	Prof. Eng. III or above	1

	Ass. Eng. III or above	1
	Ass. Eng. II or above	1
	Eng. Aide II or above'	1
GC-5	Prof. Eng. II or above	1
	Ass. Eng. II or above	1
	Ass. Eng. I or above	1
	Eng. Aide I or above	2
BC-1 & 2	Prof. Eng. IV or above	1
	Ass. Eng. IV or above	2
RC-1 & 2	Eng. Aide II or above	2
	Eng. Aide II or above	1
BC-3 & 4	Prof. Eng. III or above	1
	Or Ass. Eng. III or above	
RC-3 & 4	Eng. Aide II or above	1
	Eng. Aide I or above	1
(BC,RC)-5	Associate Eng. II or above	1
	Engineering Aide I or above	1
(GC,BC,RC)-6	Associate Eng. II or above	1
	Graduate Eng. Aide	1
(GC, BC, RC) -7	Eng. Aide I or above	1
	Graduate Eng. Aide or above	1
(GC, BC, RC) -8	Engineering Aide I or above	1

(Source: Registration of Construction Professionals and Contractors No. 23 /2013

Appendix F: Ranks of client, contractor and consultant for registration related factors

	Clients rank	Consultants rank	Contractors rank
Poor project inspection	2	1	2
Inadequate evaluation and measuring mechanism in upgrading professionals and firms	3	1	3
Inadequate monitoring of professionals and firms performance	2	1	2
Inadequate checkup of the validity of the documents submitted by the professionals and firms	1	4	4
Poor documentation in the system	4	3	5
Lack of effectiveness of enforcement of the prequalification criteria for registration	5	5	7
Lack of appropriate revision in construction registration directives	6	6	5
Lack of clarity in construction registration directives	7	7	6

Appendix G: Ranks of client, contractor and consultant for building permit related factors

	Clients rank	Consultants rank	Contractors rank
Bureaucratic delay	1	1	1
Low level of using information technology for keeping and retrieving land records	2	2	2
Weak building code, standards and regulations enforcement	4	3	4
Lack of enough staff to thoroughly review permit applications	3	4	4
Inadequate building regulations	5	4	3

Inadequate checkup of the validity of the document submitted by the client	5	5	3
High construction permit cost and levy	6	6	5

Appendix H: Ranks of client, contractor and consultant for procurement system related factors

	Clients rank	Consultants rank	Contractors rank
Poor procurement plan	1	2	1
Poor/ inadequate assessment of bidders	2	1	3
Poor communication in procurement process	3	2	2
Lack of transparency in procurement process	4	3	3
Weak procurement rule and regulation enforcement	6	4	7
Delay in procurement process	5	7	4
Poor procurement documentation	7	5	8
Incapable and incompetent procurement staff	8	6	5
Political interference with in tender process	7	6	6

Appendix I: Critical Values of Spearman's Rank Correlation Coefficients for Different Number of Data Set:

Number of subjects (data set)	Level of significance for one-tailed test			
	0.05	0.025	0.01	0.005
	Level of significance for two-tailed test			
	0.1	0.05	0.02	0.01
5	0.9	1	1	-

6	0.829	0.886	0.943	1
7	0.714	0.786	0.893	0.929
8	0.643	0.738	0.833	0.881
9	0.6	0.683	0.783	0.833
10	0.564	0.648	0.746	0.794
12	0.506	0.591	0.712	0.777
14	0.456	0.544	0.645	0.715
16	0.425	0.506	0.601	0.665
18	0.399	0.475	0.564	0.625
20	0.377	0.45	0.534	0.591
22	0.359	0.428	0.508	0.562
24	0.343	0.409	0.485	0.537
26	0.329	0.392	0.465	0.515
28	0.317	0.377	0.448	0.496
30	0.306	0.364	0.432	0.478

Note: When there is no exact number of subjects, use the next lowest number Source:
(Naoum, 2001).