



ADDIS ABABA INSTITUTE OF TECHNOLOGY

ASSESSMENT OF CONSTRUCTION PERFORMANCE CHALLENGES IN
SELECTED UNIVERSITY BUILDING CONSTRUCTION PROJECTS

BY

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University Building Construction Projects**

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ABSTRACT

Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders, shareholders, regulatory bodies and others. In Ethiopia the number of building projects is increasing from time to time. However, it has become difficult to complete projects in the allocated cost, time and quality. The aim of this study is to determine performance related problems, to identify the factor that affect project performance and to identify the key performance indicators in south region selected university construction projects and forwarding recommendation to minimize performance problems. The study was carried out based on literatures review, a questionnaire survey and Case study. A total of forty-seven questionnaire survey was distributed to 12 owner's representatives, 19 contractors and 16 consultants in south region selected university building construction projects. A total of thirty five questionnaire survey was returned 10 (83 %) from owners, 14 (74 %) from contractors and 11 (69 %) from consultants

Based on the data collected from the samples and questionnaire analyzed by percentage analysis method the finding of study revealed that the major performance problems that most frequently occur have been cost, time and quality. The critical factors that affecting performance has been escalation of material prices, unavailability of resources, number of disputes between owners and project parties, review of failures and solving them and quality of equipments or machineries and raw materials. The main key performance indicators have been cost, time and quality. It's hoped that these findings will guide efforts to improve the performance of the construction industry in the future

Key Words: *Factors, Performance, Key Performance Indicators and Construction Projects.*

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LIST OF ABBREVIATIONS

AEC	Architectural, engineering and construction
DBB	Design-Bid-Build
EC	Ethiopian Calendar
ECI	Early Contract Involvement
SI	Supplier Involvement
IT	Information Technology
KPT	Key Performance Technology
MS	Microsoft
PAR	Performance Appraisal and Reporting
PM	Project Management
PPMS	Project Performance Measurement System
PPMS	Project Performance Monitoring System
UK	United Kingdom
AU	Arbaminch University
WSU	Wolaita Sodo University
WAU	Wachamo University
WU	Wolkite University

1. INTRODUCTION

1.1. Background of the Study

Throughout the world, the business environment within which construction organizations operate continues to change rapidly. Organizations failing to adapt and respond to the complexity of the new environment tend to experience survival problems. With increasing higher users' requirements, environmental awareness and limited resources on one side, and high competition for construction business market place on the other side, contractors have to be capable of continuously improving their performance (Shaban S, (2008)

A number of studies have been conducted to examine factors impacting on project performance in developing countries. Shortage of skills of manpower, poor supervision and poor site management, poor workmanship; client satisfaction, unsuitable leadership; shortage and breakdown of equipment among others contribute to construction delays (Mohammed (2004).

The construction industry is complex in its nature because it comprises large numbers of parties as owners (clients), contractors, consultants, stakeholders', shareholders and regulators. The performance of the construction industry is affected by national economies (Shaban, (2008).

Construction industry in Ethiopia suffers from many problems and complex issues in performance. Performance is related to many topics and factors such as time, cost, quality, client satisfaction; productivity and safety. In the selected universities there are many construction projects such as roads, buildings and water supply projects which are executing by small and medium scale local contractors. These construction projects have problems in their performance. As a result of many factors which affect the successful completion of the project, especially time, cost and quality of the projects. Therefore, this research work will try to find out mainly the performance problems and factors affecting performance of construction projects on selected south region university construction projects.

1.2. Statement of the Problem

In Ethiopia, construction industry plays an essential role in socio-economic development of the country. Since construction project comprises from many processes starting from initiation to completion, it passes several activities in each significant stages to accomplish the project goals. In Ethiopia construction project performance problems appears through different directions. Due to several reasons construction projects in Ethiopia University construction projects challenges in their performance instead of achieving their planned goals. Most these challenges are related what we call it project performance problems.

Therefore, this research will evaluate the factors affecting the performance of construction projects in selected university construction projects in south region in order to assist owners, consultants and contractors to overcome performance problems and to improve performance of their construction projects.

1.3. Objectives of the Study

1.3.1. General Objective

- ❖ To identify the critical factors that affects the performance of building construction projects in selected university construction projects in south region

1.3.2. Specific Objectives

- ❖ To identify the performance problems that occurred frequently in selected university construction projects in south region
- ❖ To identify the main key performance indicators in selected university construction projects in south region
- ❖ To give remedial measures for project performance problems in selected university construction projects in south region

1.4. Research Questions

- ❖ What are the critical factors that affect the performance of building construction projects in selected university construction projects in south region?

- ❖ What are the most performance problems that occurred frequently in selected university construction projects in south region?
- ❖ What are the main key performance indicators in selected university construction projects in south region
- ❖ What are the remedial measures to be taken to improve project performance problems

1.5. Justification of the Study

Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders and others. Construction projects in Ethiopia suffer from many problems and complex issues in performance because of many reasons and factors. This thesis is very important to identify and to evaluate the critical factors affecting the performance of construction projects and performance problems and then to formulate recommendations to improve performance of construction projects.

Because of performance problem in construction projects as shown previously and because previous studies about this topic do not deal with all aspects of construction project performance; this study is required and very important to be considered. In this study, it will be studied the factors affecting the performance and effects performance problems of construction projects in selected south region university construction projects.

1.6. Significance of the Study

The important of this research paper is expressed in the following ways. First, it may benefit the different stakeholders involving in construction projects in general and particularly for new university construction projects related to project performance. Second, it helps owners contractors and consultants to know the causes and effects of performance problems in construction projects and the thirdly to take remedial measures to prevent the occurrence of the problems. And finally, serves as a benchmark for further studies.

1.7. Scope and Limitations of the Study

Due to different constraints such as finance, time and labor, the study is limited both in scope and depth. Accordingly, the study area is limited on Selected south region university building construction projects started from the year 2013 G.C. to 2016 G.C., completed more than 70%, building heights G+2 and above with or without basement and the projects has registered consultants and contractors and limited to selected south region university Building Construction projects including main and sub campus.

The research is limited to project performance problems, factors affecting project performance. In doing the research, the researcher faced the following problems and challenges. Some of the respondents especially consultants and owners did not return the questionnaires as per the planned schedule. The other problems were project reports and archival documents have not been sufficient information's related to the research topics except cost and time.

1.8. Structure of Research

This research consists of five main chapters as follows:

1. Chapter one: Introduction: this chapter shows background of the study, statement of the problem, objectives of research, research questions, justification, significance and scope and limitations of the research.
2. Chapter two: Literature review: this chapter shows a detail review from concepts and definitions to identify the main factors affecting the performance and key performance indicators in Building construction projects.
3. Chapter three: Research methodology: this chapter shows the methodology used in this research in order to achieve the required objectives and to answer the research questions.
4. Chapter four: Result analysis and discussions: this chapter shows result, description and discussion of research results.
5. Chapter five: Conclusions and recommendations.

2. LITERATURE REVIEW

2.1. Definitions and Concepts

For many people it is still unclear the distinction between criteria and factors. The Oxford Advanced Learner's Dictionary describes the criterion as "a standard or principle by which something is judged, or with the help of which a decision is made" while a factor is explained as "a fact or situation which influences the result of something".

- ❖ Performance means carrying out a task, the progress of which can be measured and compared using a set of stated requirements.
- ❖ Therefore, performance factor is a fact or situation which influences a progress of work which can be measured and compared using a set of stated requirements.

Performance can be considered as an evaluation of how well individuals, groups of individuals or organizations have done in pursuit of a specific objective (Ankrah and Proverbs, (2005). These objectives vary significantly, but from an industry or organizational perspective, they generally revolve around satisfying the key stakeholders such as customers, employees, shareholders, the various suppliers, government and society as a whole. Mullins (1993) described performance as relating to such factors as increasing profitability, improved service delivery or obtaining the best results in important areas of organizational activities. In construction, because of the numerous participants who contribute towards the achievement of project objectives, performance has been defined in one sense as a participant's (client, consultant or contractor) contribution to the execution of the task required to complete the project (Mullins, 1995).

The characteristics of the construction industry are such that a project is often a major business endeavor representing a major investment by the client, however the most research published in the construction management literature on performance in the construction context mainly focus attention on the contractor's role (Hobday, 2000). This implies that ultimately it is the project performance that determines overall business performance. These characteristics make project performance critical.

Because the client is the principal stakeholder in the construction process, good performance has been defined typically in terms of the delivery of projects on time, to specification and within budget, providing good service and achieving reasonable life-cycle costs. More recently, the requirements of the other stakeholders such as employees and society have come into focus with the need to promote sustainable construction and corporate social responsibility, and this is reflected in a more comprehensive set of industry. Key Performance Indicators (KPIs) of project performance covering such issues as environmental protection and respect for people (Hobday, 2000).

According to Kingsley (2010), performance indicators specify the measurable evidence necessary to prove that a planned effort has achieved the desired result. In other words, when indicators can be measured with some degree of precision and without ambiguity they are called measures. However, when it is not possible to obtain a precise measurement they are usually referred to as performance indicators.

KPIs enable a comparison between different projects and enterprises to identify the existence of particular patterns (Karim and Marosszeky, 1999) cited in S. A. Shaban (2008). Samson and Lema (2002) cited in S. A. Shaban (2008) stated that KPIs are very important in order to deliver value to stakeholders. So, companies must be sure they have right processes and capabilities in place. The KPIs also allow to suggest which processes and capabilities must be competitively and distinctive, and which merely need to be improved or maintained.

The key performance indicators are identified by Hobday (2000) as an applicable indication of project and/or company levels. In some cases the company indicator is the average value of that company's project indicators. Shaban (2008) stated that the owner satisfaction for performance can be defined as the gap between what the owner expects and the level of performance they believe is being delivered by the contractors.

In order to define the KPIs throughout the lifetime of a project in Design-Bid-Build (DBB) project procurement system, five key stages have been identified as shown below (Hobday, 2000):

- A. **Commit to Invest:** the point at which the client decides in principle to invest in a project sets out the requirements in business terms and authorizes the project team to proceed with the conceptual design.
- B. **Commit to Construct:** the point at which the client authorizes the project team to start the construction of the project.
- C. **Available for Use:** the point at which the project is available for substantial occupancy or use. This may be in advance of the completion of the project.
- D. **End of Defect Liability Period:** the point at which the period within the construction contract during which the contractor is obliged to rectify defects ends (often 12 months from point C).
- E. **End of Lifetime of Project:** the point at which the period over which the project is employed in its original or near original purpose ends. As this is usually many years after the project's completion, this is a theoretical point over which concepts such as full life costs can be applied.

2.2. Problem of Performance in Construction Industry

The failure of any construction project is mainly related to the problems and failure in performance. Moreover, there are many reasons and factors which attribute to such problem. Shaban S.A. (2008) stated that the construction industry performance problems in developing economies can be classified in three layers: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies.

The subject of performance measurement or assessment has become a matter of concern to several countries at different levels of socio-economic development which have realized the need to improve the performance of their construction industry (Kingsley A. N. 2010). Navon (2005) identified in various forms as low productivity, delays, cost overrun, poor, and quality and so on. Poor project performance has been noted as the bane of construction industries of several countries, particularly, developing countries.

Ling et al (2007) remarked that architectural, engineering and construction (AEC) firms may face difficulties managing construction projects performance in China because they are unfamiliar with this new operating environment. International construction projects performance is affected by more complex and dynamic factors than domestic projects; frequently being exposed to serious external uncertainties such as political, economical, social, and cultural risks, as well as internal risks from within the project.

2.2.1. Time and Cost Overrun in Ethiopian Construction

Time and cost overruns in construction projects in Ethiopia is one of the most significant problems in the field construction management. Research and studies in this field in Ethiopia are few compared to the problem of time and cost overrun. Having this in to consideration this research is done on factors affecting performance in university building construction projects. Despite the importance and the significant of the construction sector in Ethiopia, it is noted that the parties of project (owner, consultant, and contractor) didn't give sufficient evaluation for time and cost overruns at the end of the project.

Fetene (2008), examined factors that cause cost overrun during construction and their effects on public building construction projects in Ethiopia. Utilizing questionnaire survey of 70 completed public building construction projects in Ethiopia. The authors identified, and assessed the impact of cost overrun on the delivery of construction projects. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects. The most important causes of cost overrun were found to be inflation or increase in the cost of construction materials, poor planning and coordination, change orders due to enhancement required by clients, excess quantity during construction.

2.2.2. Quality in Ethiopia construction

In Ethiopia Quality is an important issue in building construction projects. The objective of any construction project is to finish the construction within the estimated budget, time and according to the quality requirements. Poor quality of work leads to loss of money and time. The owner has

the right to ask for rework when the executed job is not complying with the agreed quality standards. But if the required quality standards are not clearly defined in the contract, the client might overstate the quality requirement which will create problems with the contractor.

2.3. Project Management and Project Performance

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

Kuprenas (2003) stated that while project management is only one of the many criteria upon which project performance is contingent, it is also arguably the most significant as people formulating the processes and systems who deliver the projects. Ugwu and Haupt (2007) remarked that an adequate understanding and knowledge of performance are desirable for achieving managerial goals such as improvement of institutional transformations, and efficient decision making in design, specification and construction, at various project-level interfaces, using appropriate decision-support tools. Ling et al (2007) investigated project management (PM) practices adopted by Singaporean construction firms. It was determined that the performance level of their projects in China; identifies PM practices that led to better performance; and recommended key PM practices that could be adopted by foreign construction firms in China to improve project performance.

Since the client is the principal stakeholder in the construction process, by managing him/her, good performance has been defined typically in terms of the management of delivery of projects on time, to specification and within budget, providing good service and achieving reasonable

life-cycle costs. More recently, managing the requirements of the other stakeholders such as employees and society has come into focus with the need to promote sustainable construction and corporate social responsibility (Ankrah and Proverbs, 2005).

2.4. Construction Projects and Project Performance

Success of construction projects depends mainly on success of performance. Many previous researches had been studied performance of construction projects. (Dissanayaka and Kumaraswamy (1999) remarked that one of the principle reasons for the construction industry's poor performance has been attributed to the inappropriateness of the chosen procurement system. Reichelt and Lyneis (1999) remarked three important structures underlying the dynamic of a project performance which are: the work accomplishment structure, feedback effects on productivity and work quality and effects from upstream phases to downstream phases.

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

2.5. Construction Project Manager and Project Performance

Mohd, F. B. (2006), define Construction Project Manager as a person who gain experienced in managing, monitoring, controlling of projects. He should able to coordinates and communicates the entire project process from the inception to the completion of the project which are including the project feasibility study, planning, design, coordinating the project team, controlling the

project process, cash flow study, and many more towards the objectives of completing the project with high quality, minimum cost and within time.

According to Mohd, F. B. (2006), quality, time and cost are significantly associated with the achievement of the deliverables of the project. It has been a challenge in selecting the most competence Project Manager to leading project. None of the companies had the same criteria for their Project Manager but in the sense of the completion of the project it had the same goals. These differences (criteria) of the companies give challenges to the Project Managers in fulfilling the needs of employer or end user. Since the construction industry is a fragmented industry and the needs to be competence in the globalize world; there is a need for management efficiency and competency to gain a higher level of competitiveness.

Morris (1994) had seen that the need of Construction Project Manager/ project management services to be defined in the context of the increasing magnitude of projects undertaken around the world and the requirements for employer to be more competitive in their execution.

Cheung et al (2004) studied the project performance related to project managers. It is remarked that development of a Web-based construction Project Performance Monitoring System (PPMS) can assist project managers in exercising construction project performance indicators and can help senior project management, project directors, project managers, etc., in monitoring and assessing project performance.

Mohd, F. B. (2006) stated that construction industry is often known as a very fragmented industry where it involves a huge numbers of activities with different types of parties and professional such as architects, engineers, quantity surveyor, contractor teams, suppliers, financiers and others. By looking at the fragmented industry and the needs to be competence in the globalize world; there is a need for management efficiency and competency to gain a higher level of competitiveness. The successful project managers should be able complete their project with high quality, minimum cost and within time. Most individual companies and organizations, which require the construction project services, did not have enough resources and expertise to carry out the role of the project manager to complete the projects with intended performance

(Mohd, F. B., 2006). He marked that there should be a construction Project Manager to manage projects with the intention that projects get delivered efficiently on time, within budget and of the specified quality.

The project manager is the executive level for delegated authority from the client or top management. As such, it is his responsibility to generate the capacity and responsiveness in the project system (methods and procedures) to meet the performance requirements. The major challenge for every project manager is in the use of time and the allocation of all other resources to make the most productive use of the available time (Kuprenas, (2003)).

2.6.Factors Affecting Performance of Construction Project Managers

Kuprenas (2003) recommended the need for focused effort by economy managers and construction industry associations to provide the infrastructure needed for efficient project management and performance. Dissanayaka and Kumaraswamy (1999) stated that the knowledge that would influence potential performance enables project managers to pay special attention to control performance more effectively. Chan and Kumaraswamy (2002) remarked that effective communication and fast information transfer between managers and participants help to accelerate the building construction process and performance. Kuprenas (2003) studied the impact of the use of a project management based organizational structure, project manager training, frequency of design meetings, and frequency of design reports on design phase cost performance. The process of a design team meeting frequency and the process of written reporting of design phase progress were found to be statistically significant in reducing design phase costs.

Navon (2005) stated that data are collected and used for construction managers as a basis to evaluate the project performance indicators (PPI) actual value to compare it with the planned value and forecast its future value based on past performance. Kuprenas (2003) identified the importance of the working environment variables for the performance of a project manager in the private and public sectors according to three main groups which are job condition, project characteristic and organizational related categories. The result revealed that working hours,

physical condition of project site, complexity of project, material and supplies, project size, duration of project and time availability were viewed differently in terms of importance by the contractors and consultants groups. Team relationship was ranked as the most important variable affecting the performance of a project manager. It is obtained that project managers' experiences do not have much effect on how they perceive their working environment.

The table 2.1 below shows summary of factors that affect the performance of project managers' from the above different authors.

Table 2.1: Factors affecting performance of Project Managers

S/N	Factors affect the performance of managers	Authors'
1	Knowledge	Dissanayaka and Kumaraswamy (1999)
2	Effective communication and fast information transfer between managers and participants	Chan and Kumaraswamy (2002)
3	Working hours, physical condition of project site, complexity of project, material and supplies, project size, duration of project and time availability, team relationship	Kuprenas (2003)

2.7. Information Technology and Construction Project Performance

Information technology technique is very important in the entire world. Information technology (IT) opens new visions in the businesses and industries performance of the world. The construction industry is considered as one of the industries using IT technique such as software management systems, database and communications. For many years, many processes, functions, operations were done difficulty because of absence of IT field. In addition, most of the work was done manually which lead to more cost, time and poor performance. Furthermore, IT usage in the construction industry leads to many changes, innovations and developing in many aspects which lead finally to good and strong performance (Schwegler et al, 2001).

Schwegler (et al, 2001) listed out the benefits and relations of using IT in the construction projects such as:

- ❖ greater use of IT correlates with better project performance,
- ❖ owners and contractors realize meaningful benefits,
- ❖ IT affects schedule compression beneficially, and
- ❖ overall project cost savings which lead to a success performance of project

Nitithamyong et al (2004) remarked that information Technology (IT) is now routinely used in the construction industry as a tool to reduce some of the problems generated by fragmentation. The use of IT improves coordination and collaboration between firms participating in a construction project, leading to better communication practices and so good performance. Its benefits include an increase in the quality of documents and the speed of the work, better financial control and communications, and simpler and faster access to common data as well as a decrease in documentation errors.

Becerik (2004) proposed contractor Performance Appraisal and Reporting (PAR) system for reviewing contractor performance at an organizational level. Advancements in World Wide Web techniques provide enhanced capacities to collect compile and disseminate performance-related information to various construction stakeholders in a timely and cost-effective manner. Becerik (2004) stated that the rapid advances of web-based project management and collaboration technology offer new opportunities to improve existing construction project performance. Cheung et al (2004) obtained framework software to measure project performance based on project performance measurement system (PP'MS). The system contains four stages which are data entry, database, reporting and action. This system has eight categories to measure performance which are people, cost, time, quality, safety and health, environment, client satisfaction, and communication.

Goh (2005) remarked that information technology management leads to performance improvement in the construction industries. For instance, in Singapore 2003, general administration, design, project management, site management was enhanced by using of IT. In

addition, there were more advantages as quick working, good quality of work and fast access of information.

2.8. Organizational Culture and Project Performance

The culture that exists within an organization is important for a number of reasons. According to Thompson (1993), for an organization to be effective, similarity must exist between the organization's values, its resources and the environment. The culture within the organization reflects in the way that people perform tasks, set objectives and administer the necessary resources to achieve these objectives (Thompson, 1993). It also affects the way people make decisions, think, feel and act in response to the opportunities and threats affecting the organization (Thompson, 1993).

The fit between cultural characteristics and management practices is considered to be another important factor in the successful implementation of management practices (Erez and Gati, 2004). According to Mullins (1993), a strong culture is crucial for successful management. It was noted in Deal and Kennedy (1982) that a strong culture sets out the system of informal rules which determines how people are to behave most of the time.

It has long been recognized that organizational culture plays a significant role in project performance outcomes. A strong, unique, and appropriate corporate culture, in the view of Tharp (2005), has the ability to:

- ❖ reduce uncertainty by creating a common way to interpret events and issues;
- ❖ create a sense of order in that members know what is expected;
- ❖ create a sense of continuity;
- ❖ provide a common identity and a unity of commitment; and
- ❖ Provide a vision of the future around which the company can bring together.

2.9. Factors Affecting Cost and Time Performance

Okuwoga (1998) stated that cost and time performance has been identified as general problems in the construction industry worldwide. Chan and Kumaraswamy (1996) stated that a number of

unexpected problems and changes from original design arise during the construction phase, leading to problems in cost and time performance. It is found that poor site management, unforeseen ground conditions and low speed of decision making involving all project teams are the three most significant factors causing delays and problems of time performance in local building works. Dissanayaka and Kumaraswamy (1999) remarked that project complexity, client type, experience of team and communication are highly correlated with the time performance; whilst project complexity, client characteristics and contractor characteristics are highly correlated with the cost performance. Reichelt and Lyneis (1999) obtained that project schedule and budget performance are controlled by the dynamic feedback process. Those processes include the rework cycle, feedback loops creating changes in productivity and quality, and effects between work phases.

Kuprenas (2003) stated that process of a design team meeting frequency and the process of written reporting of design phase progress were found to be statistically significant in reducing design phase costs. Otherwise, the use of project manager training and a project management based organizational structure were found to be processes that do not create a statistically significant in reducing design phase costs.

Iyer and Jha (2005) remarked that the factors affecting cost performance are: project manager's competence; top management support; project manager's coordinating and leadership skill; monitoring and feedback by the participants; decision making; coordination among project participants; owners' competence; social condition, economical condition and climatic condition. Coordination among project participants was as the most significant of all the factors having maximum influence on cost performance of projects. Love et al (2005) examined project time-cost performance relationships by using project scope factors for 161 construction projects that were completed in various Australian States. It is noticed that gross floor area and the number of floors in a building are key determinants of time performance in projects.

Chan and Kumaraswamy (1996) proposed specific technological and managerial strategies to increase speed of construction and so to upgrade the construction time performance. It is remarked that effective communication, fast information transfer between project participants,

the better selection and training of managers, and detailed construction programs with advanced available software can help to accelerate the performance. Le-Hoai et al (2008) stated that managing speed in engineering, procurement and construction projects is a key factor in the competition between innovative firms. It is found that customers can consider time as a resource and, in that case, they will encourage the contractor to improve the time performance. Le-Hoai et al (2008) listed out those factors causing time delay and cost overruns from eight countries. These are:

1. Time delay causes

- ❖ Poor project management assistance
- ❖ Site management
- ❖ Changed site conditions
- ❖ Unforeseen ground conditions
- ❖ Inadequate early planning of the project
- ❖ Too many change orders from owner
- ❖ Financial constraints
- ❖ Materials
- ❖ Poor contract management
- ❖ Clients' cash flow problem

2. Cost overrun causes

- ❖ Financial difficulties of owner
- ❖ Inadequate contractor experience
- ❖ Failure to provide site
- ❖ Exceptionally low bids
- ❖ Slowness of the owner's decision-making process
- ❖ Poor planning and scheduling of the project by the contractor
- ❖ Owner's lack of experience
- ❖ Financial constraints
- ❖ Material procurement
- ❖ Architects' incomplete drawing

2.10. Factors Affecting Construction Project Performance

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

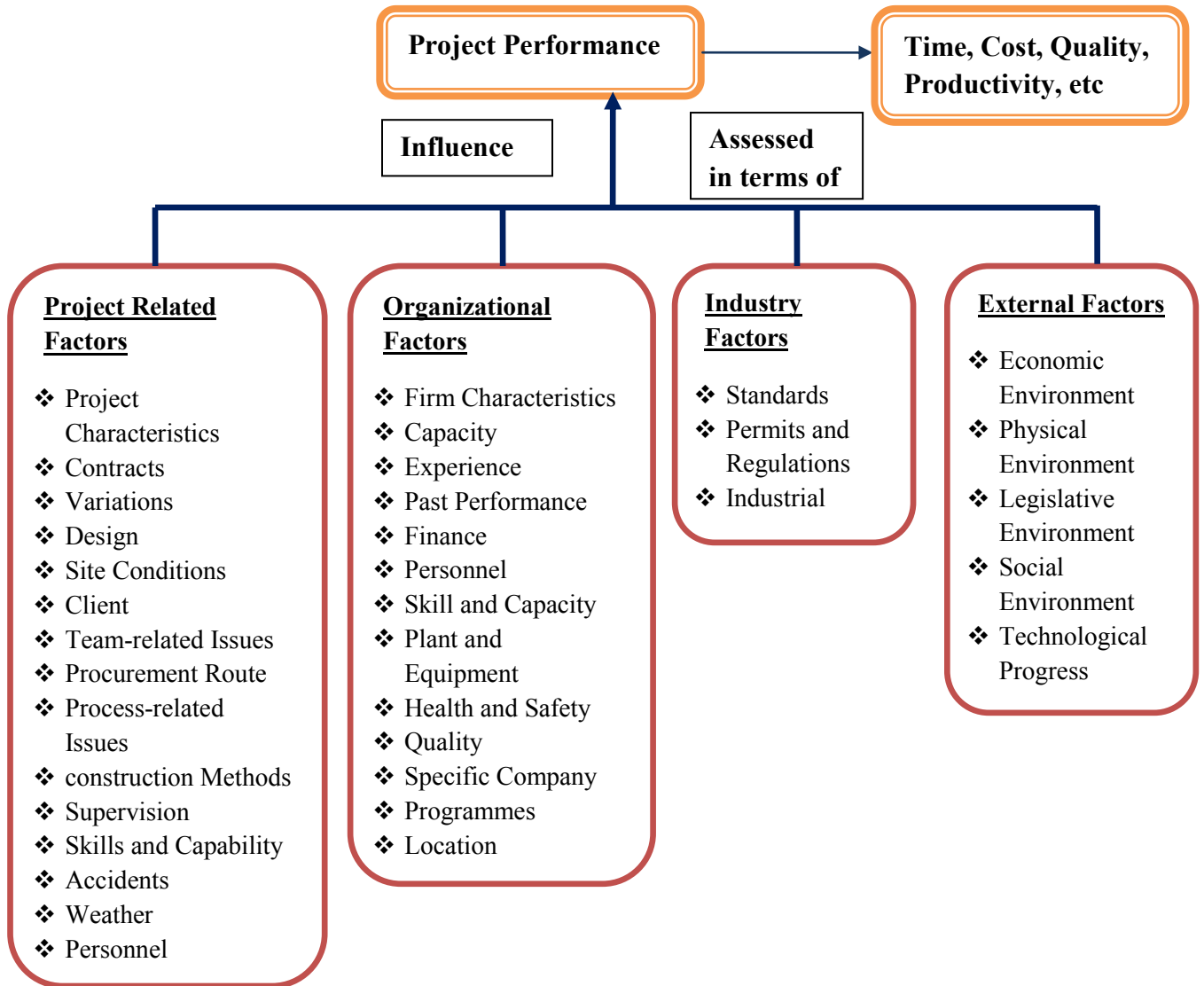
Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety (Cheung et al. 2004).

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

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

N.A. Ankrah (2007) listed out the factors influencing contractors' performance in different groups and summarized in the following figure format; figure 2.1

Figure 2.1: Factors Influencing Contractors' Performance (N.A. Ankrah (2007))



Ankrah N.A. (2007) classifies the factors that influence the project performance in to uncontrollable and controllable. From a project perspective, uncontrollable factors include the external constraints and industry factors. By definition, these are beyond the control of project participants and hence may be difficult, if not impossible to influence at a project level in trying to improve performance, whereas the controllable factors which include project and organization-related factors.

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.

Belassi and Tukel (1996) identified the factors groups that affecting the performance of construction projects in tabular form as follows. Table

Table 2.2: Factors Affecting the Performance of Construction Projects (Belassi and Tukel (1996))

Performance Factor Groups	Factors
Factors relating to the project manager	Ability to delegate authority, ability to trade-off, ability to coordinate, perception of his role & responsibilities, competence, commitment
Factors relating to the project team members	Technical background, communication skills, trouble shooting, commitment
Factors relating to the project	Size and value, uniqueness of project activities, density of a project, life, urgency.
Factors relating to the organization (firm)	Top management support, project organizational structure, functional managers' support, project champion
Factors relating to the external environment	Political environment, economic environment, social environment, technological environment, nature, client, competitors, sub-contractors.

Generally, performance dimensions may have one or more indicators, and could be influenced by various project characteristics. For example, 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. Similarly, Iyer and Jha (2005) identified many factors as 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 the most significant of all the factors, having maximum influence on cost performance.

Shaban S. A. (2008) summarized from his research study the factors affecting the performance of construction projects in different groups. The main factors that listed under each group are as follows.

- a) **Cost** factors include market share of organization, cash flow of project, profit rate of project, overhead percentage of project, project design cost, material and equipment cost, project labour cost, project overtime cost, cost of rework, cost of variation orders, waste rate of materials, cost control system, escalation of material prices, differentiation of currency prices, and liquidity of organization.
- b) **Time** factors include site preparation time, planned time for construction, percentage of orders delivered late, time needed to implement variation orders, time needed to rectify defects, average delay in claim approval, average delay in payments from owners to contractors, unavailability of resources, and average delay because of closures leading to materials shortage.
- c) **Quality** factors include conformance to specification, unavailability of competent staff, quality of equipment and raw materials, quality assessment system in organization and quality training/meeting.

- d) **Productivity** factors include project complexity, management-labour relationship, absenteeism rate through project, number of new projects / year and sequencing of work according to schedule, local climate conditions, wedges amount, local cultural characteristics (non-working holidays), employees' motivation and employee attitudes.
- e) **Client Satisfaction** factors include leadership skills for project manager, number of disputes between owner and project parties, speed and reliability of service to owner, number of rework incidents, information coordination between owner and project parties.
- f) **Regulatory and Community Satisfaction** factors include site condition problems, quality and availability of regulator documentation, cost of compliance to regulators requirements and number of non-compliance regulations.
- g) **Health and Safety** factors include reportable accidents rate in project, application of health and safety factors in organization, assurance rate of project, easiness to reach to the site (location of project), wastes around the site, air quality and noise level.
- h) **Innovation and Learning** factors include learning from own experience and past history, learning from best practice and experience of others, review of failures and solving them, work group, training the human resources in the skills demanded by the project.

2.11. Summary of Factors Affecting Performance of Construction Projects

From the above literatures review, there are different main and group factors affecting the performance of construction projects. From the literature review I found one factors may affect another group factor like shortage of material affect cost, time and Quality performances, project complexity affects time and productivity performance. Dissanayaka and Kumaraswamy (1999), Iyer and Jha (2005), Ugwu and Haupt(2007), Cheung et al. (2004), Okuwoga (1998), Reichelt and Lyneis (1999), Le-Hoai et al (2008), Le-Hoai et al (2008), Ankrah (2007), Takim and Akintoye (2002) and basically from S. A. Shaban (2008), the following summarization are the main and group factors that affect the performance of construction projects according to the reviews of literatures.

1. Cost Factors

- ❖ Market share of organization
- ❖ Cash flow of project
- ❖ Profit rate of project
- ❖ Material and equipment cost
- ❖ Project labour cost
- ❖ Project overtime cost
- ❖ Cost of rework
- ❖ Cost of variation orders
- ❖ Waste rate of materials
- ❖ Escalation of material prices
- ❖ Differentiation of currency prices
- ❖ Incomplete drawing

2. Time Factors

- ❖ Too many change orders from owner
- ❖ Poor project management assistance
- ❖ Unforeseen ground conditions
- ❖ Low speed of decision making
- ❖ Project complexity
- ❖ Effective communication
- ❖ Financial constraints
- ❖ Average delay in claim approval
- ❖ Average delay in payments from owner to contractors
- ❖ Site preparation time
- ❖ Unavailability of resources

- ❖ Time needed to rectify defects
- ❖ Time needed to implement variation orders

3. Quality Factors

- ❖ Conformance to specification
- ❖ Unavailability of competent staff
- ❖ Quality of equipments or machineries and raw materials
- ❖ Quality assessment system in organization
- ❖ Quality training or meeting
- ❖ Escalation of material prices
- ❖ Incomplete drawing
- ❖ Incomplete technical specification

4. Productivity Factors

- ❖ Project size and complexity
- ❖ Management-labour relationship
- ❖ Absenteeism rate through project (late start and early exists)
- ❖ Number of new projects per year
- ❖ Sequencing of work according to schedule
- ❖ Local cultural characteristics
- ❖ Non-working holidays
- ❖ Local climate conditions
- ❖ Wedges amount
- ❖ Employees motivation
- ❖ Employee attitudes

5. Client Satisfaction Factors

- ❖ Leadership skills for project manager
- ❖ Number of disputes between owner and project parties
- ❖ Speed and reliability of service to owner
- ❖ Number of rework incidents
- ❖ Information coordination between owner and project parties

- ❖ Conflict
- ❖ Poor workmanship and incompetence workers

6. Regulatory and Community Satisfaction factors

- ❖ Site condition problems
- ❖ Quality and availability of regulator documentation
- ❖ Cost of compliance to regulators requirements
- ❖ Number of non-compliance regulations

7. Health and Safety

- ❖ Reportable accidents rate in project
- ❖ Application of health and safety factors in organization
- ❖ Assurance rate of project
- ❖ Easiness to reach to the site (location of project)
- ❖ Wastes around the site
- ❖ Climate condition and Air quality
- ❖ Noise level

8. Innovation and Learning

- ❖ Learning from own experience and past history
- ❖ Learning from best practice and experience of others
- ❖ Review of failures and solving them
- ❖ Work group.
- ❖ Training the human resources in the skills demanded by the project

Table 2.3 Summary of the main group affecting the performance of construction projects and their references

Key performance indicators	Dissanayaka and Kumaraswamy (1999)	Okuwoga (1998)	Reichelt and Lyneis (1999)	Shaban (2008)	Ugwu and Haupt (2007)	Ankrah (2007)	Le-Hoai et al (2008)	Cheung	Iyer et al (2005)	Takim and Akintoye (2002)
Cost	✓	✓	✓	✓	✓	✓	✓	✓		
Time	✓	✓	✓	✓		✓	✓	✓	✓	✓
Quality			✓	✓	✓			✓	✓	✓
Productivity	✓		✓	✓	✓				✓	✓
Client Satisfaction				✓				✓	✓	✓
Regulatory & Community Satisfaction				✓					✓	
Safety & Health			✓	✓				✓	✓	✓
Innovation & Learning's				✓						

2.12. Key Performance Indicators' in Construction Projects

Takim and Akintoye (2002) defined the purpose of KPI's as to enable a comparison between different projects and enterprises to identify the existence of particular patterns. Dissanayaka and Kumaraswamy (1999) used different representation values to evaluate time and cost performance such as project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, external condition. Takim and Akintoye (2002) stated that the development and use of key performance indicators (KPI's) can help to identify dysfunctional in the procurement process. Takim and

Akintoye (2002) studied the development of key performance indicators to measure performance such as cost of pricing the tender as a percentage of contract value, cost of pricing the tender as a percentage of contract value, no. of times base tender price changed, time from the first tender to actual award of contract, average delay in payment of base claim, average delay in payment of agreed variations, average time for approval of agreed variations.

Cheung et al (2004) remarked that characteristics of emerging performance measurement indicators need analysis of both the organization and environment such as: nature of work, global competition, quality awards, organizational role, external demands and power of IT. The indicators should be able to identify causes of problems, address all possible performance drivers, and identify potential opportunities for improvement.

Cheung et al (2004) remarked seven main key indicators for performance which are: time, cost, quality, client satisfaction, client changes, business performance, and safety and health. Takim and Akintoye (2002) identified good project performance consists of seven key project performance indicators: construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service. They also divide company performance indicators in to three, namely: safety, profitability and productivity.

Ugwu and Haupt (2007) stated that project performance can be determined by two common sets of indicators. The first set is related to the owner, users, stakeholders and the general public which are the groups of people who will look at project performance from the macro viewpoint. The second are the developer, a non-operator, and the contractor which are the groups of people who will look at project performance from the micro viewpoint.

Ugwu and Haupt (2007), studied the relationship-based factors that affect performance of general building projects in China. Thirteen performance metrics was used to measure the success level of construction projects. These factors were categorized into four groups namely cost, schedule, quality and relationship performance. It was recommended that foreign firms that have entered or are going to enter the Chinese construction industry should learn how to build

cooperative and harmonious relationships with Chinese partners and finally achieve satisfactory project performance by paying sufficient attention to the aforementioned factors.

Takim and Akintoye (2002) stated successful construction project performance can be grouped along three orientations: procurement, process and result orientations. Predictability of design cost and time, and predictability of construction cost and time can be regarded as procurement orientated, safety as process orientated and defects, client satisfaction with the product, client satisfaction with the service, profitability and productivity listed under result orientation.

Ugwu and Haupt (2007) developed and validated key performance indicators (KPI) for sustainability appraisal using South Africa as a case study. It is used four main levels in a questionnaire to identify the relative importance of KPI. The main indicators were: economy, environment, society, resource utilization, health and safety and project management and administration.

Cordero (1990) list key performance indicators for construction projects under four main groups of aspects. The first is cost aspect; construction cost, cost certainty, client satisfaction on cost, secondly time aspect; construction time, time certainty, client satisfaction on time, thirdly quality aspect; defects, liability period, client satisfaction on cost and the fourth aspect is sustainable development; profitability, partnership, environmental protection and health and safety.

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

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

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

Takim and Akintoye (2002) in their research result found out in a table format the performance indicators in relation to stakeholders' performances based on three-phases of project life cycle (procurement, project and phasing-out stage). Table 2.3

Table 2.4: Performance indicators in relation to stakeholders' performances based on phases of project life cycle (Takim and Akintoye, 2002)

Client	Consultant	Contractor	Supplier	End-user	Community
PROCUREMENT STAGE - PERFORMANCE					
<ul style="list-style-type: none"> ✚ Client attribution ✚ Procurement & delivery Strategy ✚ Project viability ✚ Contractual arrangement ✚ Briefing Process ✚ Communication ✚ Decision effectiveness ✚ Risks and opportunities ✚ Excessive bureaucracy ✚ Commitment from employees ✚ Interactive Process ✚ Social Obligations 	<ul style="list-style-type: none"> ✚ Project management capabilities ✚ Good working relationship ✚ Competency ✚ Consultation mode ✚ Commitment ✚ Strategic cost advise ✚ Meeting functional requirements ✚ Meeting technical specification ✚ Proper communication ✚ Interactive process ✚ Efficiency of technical approval authorities 	<ul style="list-style-type: none"> ✚ Level of experience ✚ Financial stability & financial Management ✚ Past performance ✚ Management capabilities ✚ Performance of project personnel ✚ Construction method and technology ✚ Manpower and technical capabilities ✚ Project innovation 	<ul style="list-style-type: none"> ✚ Quality assurance on products ✚ Quality control system ✚ Product life span ✚ Replacement value ✚ Product mechanization ✚ Track record ✚ Level of service ✚ Team turn-over rate ✚ Capabilities of key personnel ✚ Top management support 	<ul style="list-style-type: none"> ✚ Involvement in need definition ✚ Contribution of ideas and requirements ✚ Commitment via representatives ✚ Involvement in decision making process ✚ Joint evaluation on procurement selection 	<ul style="list-style-type: none"> ✚ Pressures ✚ Demands ✚ Community Involvement ✚ Community Policy ✚ Battle ground ✚ Closer relationship

Client	Consultant	Contractor	Supplier	End-user	Community
IMPLEMENTATION PHASE - PERFORMANCE					
<ul style="list-style-type: none"> + Management structure + Project interfaces + Fragmentation + Conflicts + Control measures + Political, economic, social, legal & environment influences + Loyalty + Quality of work life 	<ul style="list-style-type: none"> + Team Management + Project interfaces + Coordination + Accountability + Conflicts management style + Communications and reporting + Quality control system + Quality assurance + Dispute resolution process 	<ul style="list-style-type: none"> + Performance standard + Good working relationship + Construction method & technology + Labour utilization & relaxation + Productivity rate + Safety + Constructability + Communications and reporting + Cost control mechanism + Efficiency 	<ul style="list-style-type: none"> + Material procurement + Co-operation + Commitment + Coordination + Ability to deliver + Product reliability + Delivery time + Contractual agreement + Product defects 	<ul style="list-style-type: none"> + Continuous participation + Involvement in maintenance documentation 	<ul style="list-style-type: none"> + Support + Co-operation + Disruptions + Expedite + Environmental effect

Client	Consultant	Contractor	Supplier	End-user	Community
PHASING-OUT STAGE - EXPECTATION					
<ul style="list-style-type: none"> + Meets pre-stated objectives + Meets time + Meets budget + Technical specification + Acceptable quality + Meets Corporate priorities + Harmony + Absence of any claims & Proceedings + Reduction of conflicts/ disputes + Transfer of experience + Investment opportunity + Value for money 	<ul style="list-style-type: none"> + Profitability + Future Jobs + Learning & growth + Generated positive reputation + Harmony + Absence of any legal claims & proceedings + Increase the level of professional 	<ul style="list-style-type: none"> + Profitability + Achieve business purpose (strategically, tactically & operationally) + Learning and growth + Settlements of conflicts + Minimum risk (reduction of disputes) + Business relationship + New market penetration + Generated positive reputation + Develop new knowledge & expertise 	<ul style="list-style-type: none"> + New market penetration on products + Future potential + Exploit technology + Profitability 	<ul style="list-style-type: none"> + Meets requirements + Functionality + Desired outcomes + Free from defects + Meets quality thresholds + On time delivery + Minimum cost of ownership + Required future service + Safety + Flexibility (for future expansion) + Usable life expectancy + 	<ul style="list-style-type: none"> + Benefits + Use of it + Safety + Pleasant environment (blend to the surroundings) + Public image

The Summary table shows the key performance indicators for construction project with their respective authors from the above literatures. Table 2.4

Table 2.5: Summary of Key Performance Indicators in Construction Projects

S/N	Authors	Key Performance Indicators
1	Samson and Lema (2002)	Time, cost, quality, client satisfaction, client changes, business performance, and safety and health.
2	Takim and Akintoye (2002)	Cost, time, client satisfaction, safety, profitability and productivity.
3	Cordero (1990)	Cost, time, client satisfaction, defects liability period, Profitability, partnership, environmental protection and health and safety.
4	Wateridge (1998)	Client satisfaction, defects, profitability, productivity, safety, construction cost and construction time.
5	Egan (1998)	Construction cost, construction time, defects, client, satisfaction, profitability, productivity, safety.

Based on the summarized table and discussions above, the key performance indicators are listed below.

- ❖ Cost
- ❖ Time
- ❖ Quality
- ❖ Productivity
- ❖ Client satisfaction
- ❖ Regulatory and community satisfaction
- ❖ Health and safety
- ❖ Learning and Innovation

3. METHODOLOGY

3.1. Introduction

The previous chapter discuss about the problems, cause and effects of failure in project performance of construction projects. This chapter on the other hand will explain all the method used in gather all the information in this study. The methodology used was developed at initial point of the research. The methodology describes the practical way in which the whole research project has been organized (Oliver, 2004). According to Wallimam (2005) , a plan of action must be developed that shows how the problem will be investigated, what information will be collected using which methods, and how this information will be analyzed in order to arrive at conclusions and develop recommendations. The main factors in considering methodology used are based on the objectives of the research.

3.2. Identifying the Problem Statement and Objectives

Developing problem statement and objectives were the first step in this research. This can be done in various ways but in this particular research, reading materials and personal perspective or observation play very important roles.

From personal perspective or observation, project performance seems to be a big problem in construction industry. Being working with consultant, contractor and owner before, project performance problems seems to be endless. Based on this, the researcher decides to initiate research in this particular issue.

Problem statement was then developed. A developed written statement from this research would then be determined. Later stage was to developing objectives of the research. The next step in this research was to do some literatures reviews to get deeper information about the issue of the study.

3.3. The study approach and source of data

Study explains to some level of understanding the cause construction performance failure in selected university construction projects. Inductive survey established on cause and impact of construction performance failure in selected university construction projects with diligent investigation, attempting to collect facts.

To improve the validity of study findings, the combination of qualitative and quantitative methods adopted to study observational. For the following basic document collected: respondent's documents and archival documents. The respondents' documents were collected using questionnaires from clients, contractor and consultants. Study questionnaire survey has both open ended and closed ended questionnaires. Archival documents were mostly from completed project contract document, monthly reports, correspondence letters, consultancy completion reports and payment certificates were investigated thorough which were very important in identifying the frequent problems related performance failure in university construction projects.

The study examines the cause of performance failure on selected university construction projects to achieve the study objectives, a critical review of relevant literature will done coupled with questionnaire survey to collect information on potential cause of performance failure un selected university construction projects. Through the literature review, causes of performance failure will identify which provided the basis of formulation of questionnaire. The identified causes were earlier subjected to test by the professionals to determine the relevance of causes of performance failure; questionnaire will be distributed to the construction professionals, consultants, contractor and clients.

3.4. Research Type

The research tries to explore, examine and identify the major problems of project performance, the causes and effects of project performance failure and remedial measures to improve project

performance in construction projects, and it implements more of descriptive, exploratory and both qualitative analysis and quantitative approach.

3.5. Sources of Data

To achieve the intended objective and to answer the research questions of the study, different sources of data will be used. As a primary data, questionnaire, semi-structured interview and site observation sources were used. To collect secondary data literatures, archival documents will be used.

3.6. Population of the Study

The populations used in this research were south region selected University construction projects and participants such as, owners, contractors and consultants of projects.

The population used in this research were G+2 and above with or without basement, ongoing building construction projects in Selected south region University Building Construction projects, which started from 2013 G.C. to 2016 G.C and more than 70% completed, not suspended due to different reasons and those projects had a registered consultants and contractors. The others populations were project participants such as, owners, contractors and consultants of the selected project.

3.7. Sample process and sample size

The objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out while ensuring that the sample provides a good representation of population (Fellows & Liu, 1997). Walliman (2005) indicated that sample should be free from bias. Otherwise, the type of selected sample will greatly affect the reliability of subsequent generalization. Sampling strategies are categorized into main groups, namely probably and non probably sampling (Blaxter,et,al) both sampling strategies will be used in the study

3.7.1. Determination of the Sample Size

The target groups in this study were south region selected university construction projects and their participants that are owners, contractors and consultants.

3.7.2. Sampling Technique

The purpose of sampling is used for data collection. Systematic random sampling technique was used for selecting the projects. The questionnaires were distributed for contractors at their offices and sites, for consultants at their project office and for the owners the questionnaires were distributed at the offices.

3.8. Design of Research Instruments and Method of Data Collection

3.8.1. Questionnaire

In this research, a set of questionnaires will be used because it is an inexpensive way to gather data from respondents. Often questionnaires are the only feasible way to reach a number of respondents large enough to allow statistically analysis of the results (Nii Amponsah, 2007). The choices of using this method are made based on a variety of factors including the type of information to be gathered and the available resources for the research.

3.8.2. Design of Questionnaire

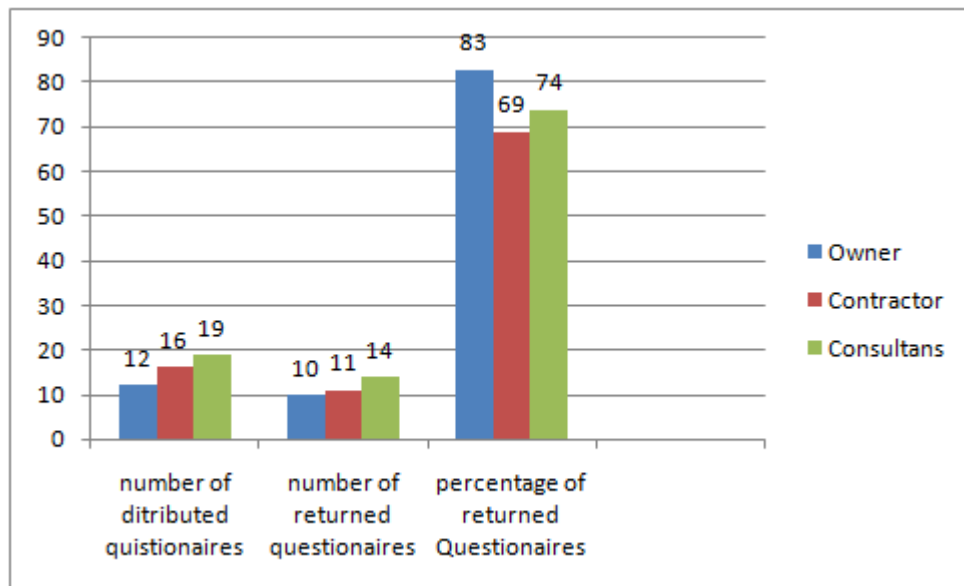
A questionnaire is a series of questions asked to individuals to obtain statistically useful information about a given topic. When properly constructed and responsibly administered, questionnaires become a vital instrument by which statements can be made about specific groups or people or entire populations. In designing the questionnaire, the objectives of the study were first established. This will be done to help in determining what questions to ask and how to ask them. Again, very short and concise questions were fielded as questions that are long and wordy may appear confusing to respondents. All these were done in order to ensure that the responses received would be reliable.

The questionnaire was designed into four main parts. The first part dealt with the demographics of the organizations and respondents. This background information was essential in order to determine the likely reliability and credibility of the data. The second part dealt with the project performance related problems, third: causes that affect project performance and the fourth dealt with the effect of failure of project performance. The general format and component of the questionnaire is found on Appendix.

3.8.3. Questionnaire Administration

A Total of 47 questionnaires were distributed for 12 owner’s representatives, 19 contractors Representatives and 16 consultant representatives. These questionnaires were filled by project managers, site and office engineers and others in different companies. 35 questionnaires were returned (75.3%) as follows: 10 (83%) from owners, 14 (74%) from contractors and 11 (69%) from consultants as respondents. Figure 3.1 shows details of the responsiveness of the questionnaire.

Figure 3.1: The responsiveness rate of the questionnaire



3.9. Data measurement

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there is/are an appropriate method/s that can be applied and not others. In this research, ordinal scales were used. Ordinal scales as shown in the tables are a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned (1, 2, 3, 4, 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels. Based on Linker scale we have the following tables.

Ordinal scale used for the measurement of rate of occurrence of performance related problems:

Table 3.1: Rating scale for project performance problems

Item	Never	Sometimes	Usually	Frequently	Most Frequently
Scale	1	2	3	4	5

Ordinal scale used for the measurement of the importance of factors that affecting performance of building construction projects:

Table 3.2: Rating scale for factors affecting project performance

Item	Very Low Important	Low Important	Medium Important	High Important	Very High Important
Scale	1	2	3	4	5

Ordinal scale used for the measurement of the effect of the occurrences of performance related problems to determine the key performance indicators of building construction projects:

Table 3.3: Rating scale for key performance indicators

Item	Very Low	Low	Medium	High	Very High
Scale	1	2	3	4	5

5.

3.10. Data analysis

The relative importance index method (RII) was used to determine and rank the performance problems, the factors that affect project performance and key performance indicators in building construction projects. And all analyzed by the programme MS-Excel.

The relative importance index is computed as (Cheung et al, 2004; Iyer and Jha, 2005; Ugwu and Haupt, 2007): using equation 3.1

$$RII = \frac{\sum w}{AN'} \dots \dots \dots \text{equation 3.1}$$

Where:

RII is relative importance index,

W is the weight given to each factor by the respondents and ranges from 1 to 5

A = the highest weight = 5

N = the total number of respondents.

The most commonly used methods to measure the relationship between variables are Spearman Rank's Correlation Coefficient method and Pearson's correlation. I used Spearman Rank's Correlation Coefficient method because it's often used to evaluate relationships involving ordinal values.

Spearman Rank's Correlation Coefficient method, which values varies between -1 and +1, was used to know owners, consultants and contractors perceptions of project performance related problems, factors that affect project performance and the key performance indicators of selected university construction projects in south region. The Spearman's Rank Correlation Coefficient is computed as (Crawshaw, J. and J. Chambers, (2001)): using equation 3.2




$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)} \dots \dots \dots \text{equation 3.2}$$

Where:

r_s is Spearman's Rank Correlation Coefficient,

d is the difference in the factors ranks given by the respondents, and

n is the number of data pairs.

-  A correlation coefficient of **+1** means perfect positive correlation.
-  A correlation coefficient close to **0** means no correlation.
-  A correlation coefficient of **-1** means perfect negative correlation

3.11. Summary of the Research Process

The research problem, initiated from observation and reading literatures in the construction industry. The research basic information is assessed in the literature review part of the research. The literature review has helped in the assessment and identification of variables. Once the variables are identified, research instrument preparation, and data collection will be executed in their order. Consequently, analysis of the data obtained from questionnaires and interviews have process which involves simple statistical approach, examining, tabulating and categorizing based on the chosen measurement scale. After the collected data will be analyzed, the findings and results will discuss. Finally, the researchers will give their conclusion and recommendation, based on the analysis and discussion.

4. RESULTS AND DISCUSSIONS

4.1.Introduction

This part of the study provides an indication of the results and discussions found from the data analysis. The results are found from the questionnaire respondents and the selected case studies from selected south region university construction projects. Each part answers the research questions and achieves the objectives of the research. The tables shows participants' Relative Importance Index (RII) and rank of project performance problems, factors affecting project performance, key performance indicators and correlation between respondents in each part. And the figures show the combined RII and ranks. The discussions are drawn from the combined RII and on the top rank, major and critical variables in university building construction projects, correlations between the respondents and perceptions of the respondents in each group factors that affects project performance.

4.2.Project Performance Problems in Building Construction Projects

The results of this part of study provides an indication of the participants' and combined relative importance index (RII) and rank of performance related problems in university building construction projects and correlation coefficients between the respondents.

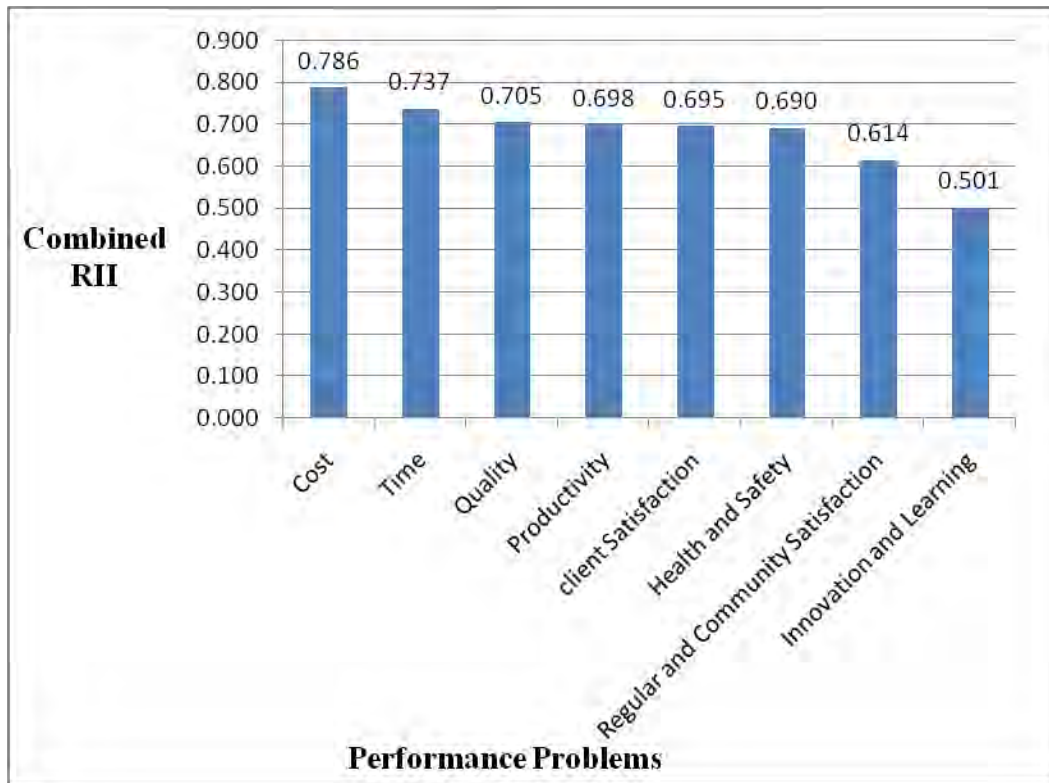
There are eight project performance problems in construction projects that were identified from the literature reviews and the major problems in university building construction projects are discussed below.

Table 4.1, figure 4.1 and Table 4.2 shows summary of the participants', combined RII of performance problems and correlations between the respondents respectively. After the figure the discussions are made on the top and major performance problems ranked by the respondents.

Table 4.1: Participants’ RII and rank of project performance problems.

S.No.	Performance Problems	Owner		Contractor		Consultant	
		RII	RANK	RII	RANK	RII	RANK
1	Cost	0.783	1	0.800	1	0.775	2
2	Time	0.717	2	0.743	3	0.750	3
3	Quality	0.700	4	0.714	4	0.700	5
4	Productivity	0.583	7	0.786	2	0.725	4
5	Client Satisfaction	0.710	3	54.30	7	0.825	1
6	Regulatory and community satisfaction	0.667	5	0.600	6	0.575	7
7	Health and safety	0.633	6	0.786	2	0.650	6
8	Innovation and Learning	0.383	8	0.671	5	0.450	8

Figure 4.1: Combined RII and rank of project performance



From the combined result shown on figure 4.1, the major performance problems which have been occurs on the projects are cost and time with a RII of 0.786 and 73.67 respectively. These is due to variation orders from owner, escalation material prices, shortage of construction materials on the market and the time taken to import materials from foreign countries.

Following to cost and time; quality (0.704), productivity (0.698), client satisfaction (0.695) and health and safety (0.689) are the second major performance problems. The reasons for these are labor skills, poor supervision, quality of equipments, delay on during project execution and awareness of labor about the advantage of the use of safety equipments and there have not been first aid medication services on the project site.

The least, but the important performance problems have been regulatory and community satisfaction (0.614) and innovation and learning (0.501). The problems related to regulatory and community satisfaction performance are incomplete documentation on the project office, wastes around the site which interrupt the movements of peoples' near the site, health and safety application, and contractors' levels not fitted with the number of stories with building.

Related to innovation and learning performance; the problems are there is no skill training for the labors demanded by them, there are no modern equipments and technologies applied on the project. Although modern equipments and technologies are available on the project, they have not been operated by a well experienced person.

From the selected case studies of four projects from selected south region universities from the major and top performance problems which occurs on the projects are cost, time, quality, productivity, client satisfaction, regulatory and community satisfaction and health and safety. Almost there is no the occurrence of innovation and learning problems. This implies that there is no any practice related to innovation and learning, this means there is no skill training demanded labors.

Table 4.2: Spearman’s correlation coefficient of project performance problems

	Owner	Contractor	Consultant
Owner	1.00	0.19	0.76
Contractor	0.19	1.00	0.19
Consultant	0.76	0.19	1.00

On table 4.2, the spearman correlation coefficient indicates that there is strong relation between on the responses of owner-consultant, and weak relations between contractor-owner and contractor-consultant.

The strong relation between owner and consultant indicates that they have the same attitudes and perceptions towards the performance problems. This is because of most of consultants are the representatives to owners and act as them. But they should act as fair both owners and contractors.

The weak relation of contractor to owners and contractors implies that contractors have too different attitudes with the owners and consultants and the contractor was the only challenged party due to the occurrence of the problems.

4.3. The Major Project Performance Problems

Based on the literatures reviews there were eight project performance problems in construction projects. From the analysis and discussions made above the major six problems of project performance on selected university building construction projects with a combined relative importance index of 0 .690 and above identified as follows:

Table 4.3: The major project performance problems

Rank	Project Performance Problems	Combined RII
1	Cost	0.786
2	Time	0.737
3	Quality	0.705
4	Productivity	0.698
5	Client Satisfaction	0.695
6	Health and safety	0.690

4.4. Factors Affecting the Performance of Building Construction Projects

The results of this part of the study provides an indication of the participants' and combined relative importance index (RII) and rank of factors affecting the performance of building construction projects according to all and each participants' respectively and correlation coefficients between responses of the participants.

There are eight main groups that affect the performance of construction projects that is the successful completion of the project. Totally sixty-seven factors were identified from the literatures reviews that affect the performance of construction projects and each are sub-grouped in to the main eight groups' factors. And the critical factors are discussed below.

The following tables and figures are shows the summary of participants' and combined relative importance index (RII) and rank of project performance factors according to each target participants and correlations between the participants.

Immediately next to all tables and figures discussions will follow on the top and the critical factors in each main group of project performances. Also discussions are made to the correlations between the respondents.

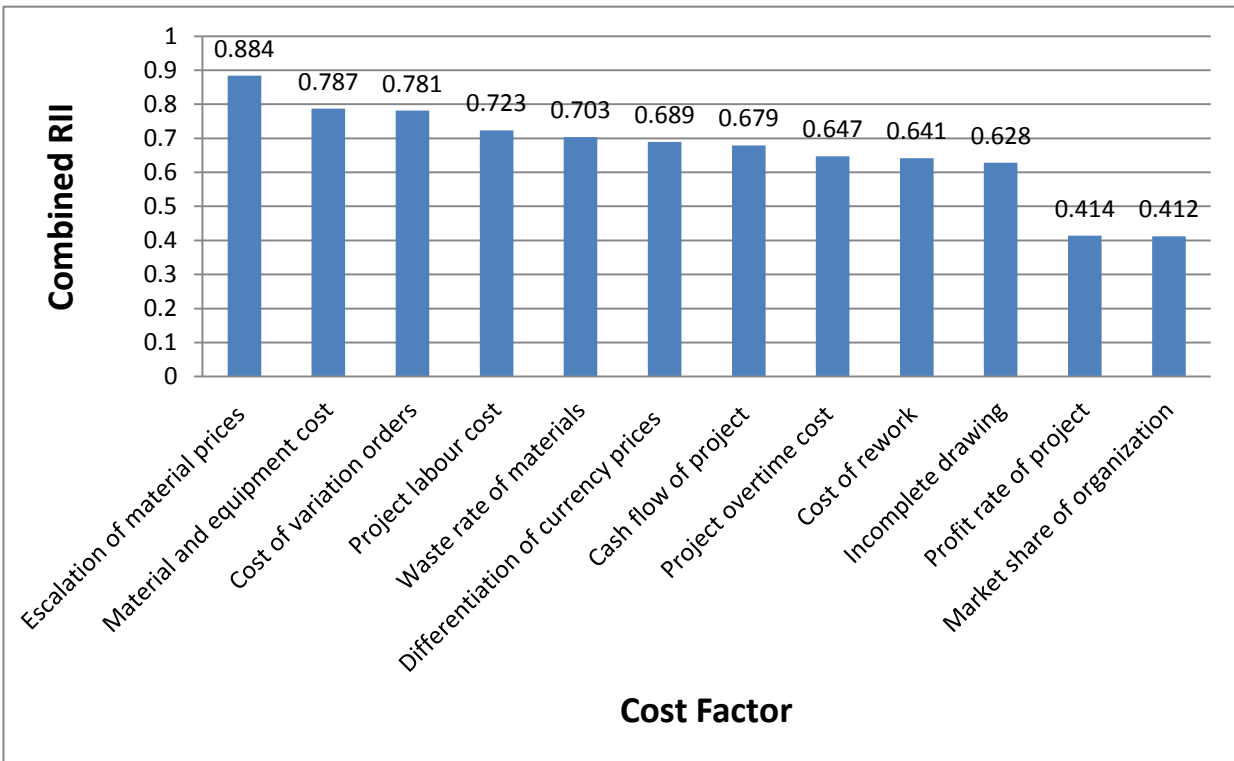
4.4.1. Cost Factors in building construction projects

Twelve factors were identified from the literature reviews that affect the performance of cost. Based on the combined relative importance index (RII) and rank the critical ones on selected university building construction projects are discussed. Table 4.4 and figure 4.2 show the results of participants' and combined RII and the rank of factors affecting cost performance respectively.

Table 4.4: Participants' RII and rank of cost factors

Cost Factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Cash flow of project	0.633	7	0.629	6	0.775	2
Material and equipment cost	0.800	3	0.786	2	0.775	2
Project labour cost	0.733	5	0.786	2	0.650	6
Project overtime cost	0.617	8	0.700	4	0.625	7
Cost of rework	0.633	7	0.614	7	0.675	5
Cost of variation orders	0.833	2	0.786	2	0.725	3
Waste rate of materials	0.667	6	0.743	3	0.700	4
Escalation of material prices	0.883	1	0.943	1	0.825	1
Differentiation of currency prices	0.767	4	0.700	4	0.600	8
Incomplete drawing	0.667	6	0.743	3	0.475	11
Market share of organization	0	9	0.686	5	0.550	9
Profit rate of project	0	9	0.743	3	0.500	10

Figure 4.2: Combined RII and rank of cost factors



Based on the combined relative important index and rank as shown on figure 4.2, the critical and top ranked factors of cost performance are discussed below.

Escalation of material prices (0.884) became the main factors of cost performance. This is because of escalation of material prices are affects the liquidity of projects and cost performance of projects. The cost of construction materials are increases from time to time because of a limited suppliers, factories, shortage of raw materials and cost of transportation from foreign countries.

Material and equipment cost (0.787), cost of variation orders (0.781), project labor cost (0.723) became the critical factors next to escalation of material prices. Materials and equipments cost affects the liquidity and project cost performance. Variations orders from owners related to design change, increase of labor cost and material and equipment cost are leads to the increments of project cost. This is due to problem of assumptions during planning stage. Project

labor cost affects the cost performance of project because labor costs are one of the main inputs for project cost.

Waste rate of materials (0.703), differentiation of currency prices (0.689) and cash flow of project (0.679) have been also the factors which leads to projects not executed on their budgeted cost. If the construction materials which consumed on site are not properly managed, there will be the occurrence of a large amount of wastes and this leads to cost overrun and it affects the cash flow of the project. Differentiation of currency prices are affects profit rate of the project and cost performance. Contractors have been suffered from differentiation of currency prices because of economical and political situation of the country. Cash flow are also affects the project budget and project cost performance, because cash flow can give an important evaluation for the cost performance at any stage of project.

The critical factors of cost performance from the selected case studies are project over time cost, escalation of materials prices other than cement, reinforcement and fuel, shortage of materials, material and equipment cost, cost of variation orders, additional works, problem in planned cost, cash flow of the project, profit rate of the project, design and technical matters and too much number of test orders for HCB.

Table 4.5: Spearman’s correlation coefficient of cost factors

	Owner	Contractor	Consultant
Owner	1.00	0.76	0.69
Contractor	0.76	1.00	0.33
Consultant	0.69	0.33	1.00

On table 4.5, the spearman correlation coefficient indicates that the owner has somewhat strong relations with the responses of contractor and a moderate relation consultant and there is a weak relation between the responses of contractor and consultant. The reason for strong relations between owner and contractor is that both give attention for the project cost and they are equally affected by the in change cost on the project and the moderate relations between owner and

consultant on the cost implies that the role of controlling the project cost beside of the owner is the consultant. Whereas for the weak relation between the responses of contractor and consultant is that they have different awareness's on which factors greatly affects the project cost.

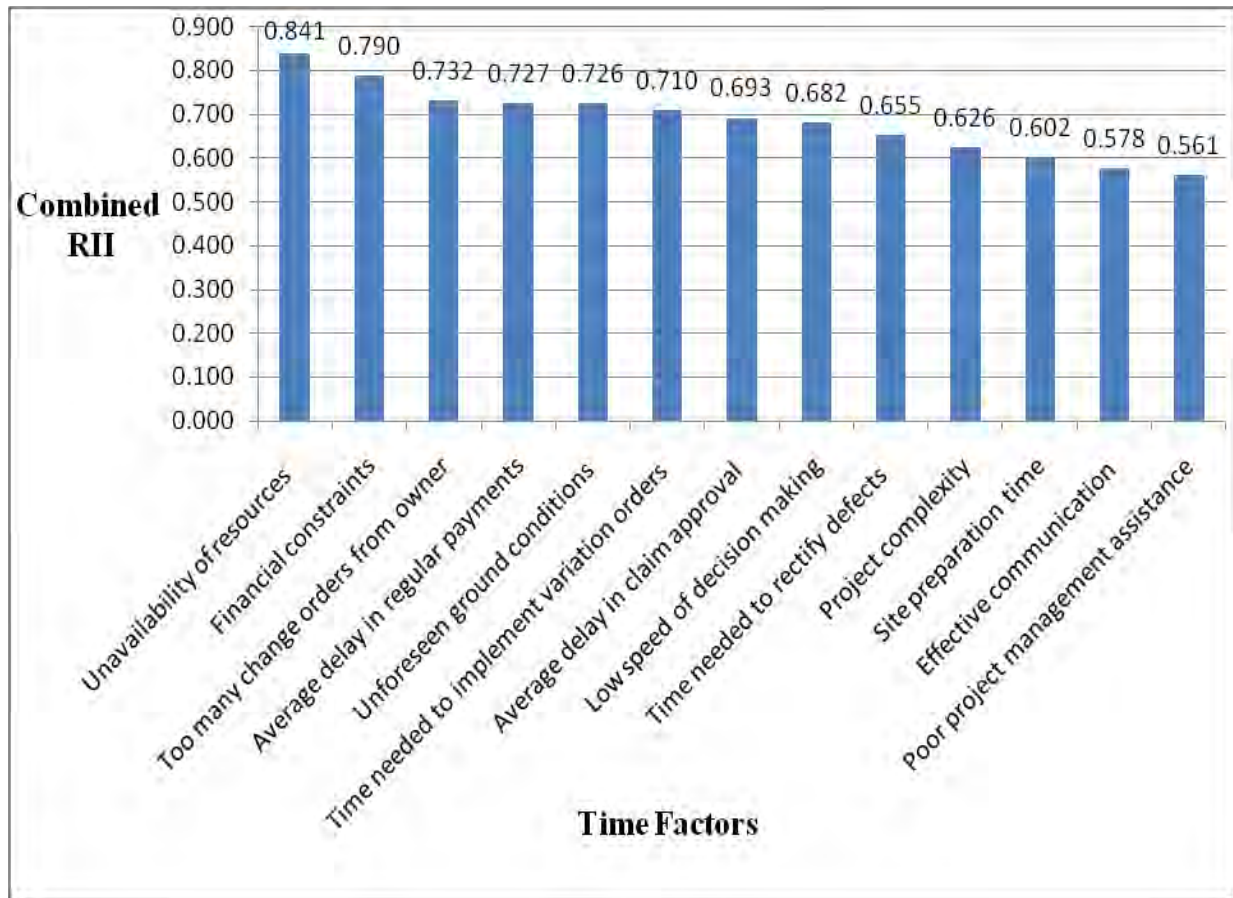
4.4.2. Time Factors in university building construction projects

There were thirteen factors of time performance in construction projects that were identified from the literatures reviews and based on the combined RII and rank given by the respondents, the critical factors are discussed. Table 4.6 and figure 4.3 are shows the results of participants and combined RII and the rank of factors affecting time performance respectively.

Table 4.6: Participants' RII and rank of time factors

Time factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Too many change orders from owners	0.783	1	0.814	3	0.600	10
Poor project management assistance	0.533	8	0.600	8	0.550	12
Unforeseen ground conditions	0.633	6	0.771	5	0.775	3
Low speed of decision making	0.683	4	0.714	6	0.650	8
Project complexity	0.633	6	0.671	7	0.575	11
Effective communication	0.567	7	0.543	10	0.625	9
Financial constraints	0.73	3	0.786	4	0.850	2
Average delay in claim approval	0.500	9	0.829	2	0.750	4
Average delay in payments from owner to contractors	0.667	5	0.814	3	0.700	6
Site preparation time	0.567	7	0.714	6	0.525	13
Unavailability of resources	0.767	2	0.857	1	0.900	1
Time needed to rectify defects	0.683	4	0.557	9	0.725	5
Time needed to implement variation orders	0.683	4	0.771	5	0.675	7

Figure 4.3: Combined RII and rank of time factors



Based on the combined (RII) and rank shown on figure 4.3, unavailability of resources with RII equals to (0.841) has been the critical factor that affects the time performance. This factor affects directly and practically on project performance such as time. If resources are not available as planned through project duration, the project will suffer from problem of time and cost performance. And it also affects the whole performance of projects. This is because resource availability as planned schedule can improve time performance of projects.

Financial constraints (0.790) have been the second critical time performance factor. Shortage of finance by the contractors is the most factor because it affected by project cash flow, escalation

of material prices and differentiation on currency. But shortage of finance is not seen from clients

Too many change orders from owners (0.732), average delay in payments from owner to contractors (0.727), unforeseen ground conditions (0.726) and the time needed to implement variation orders (0.710) also have been critical factors of project time performance.

The amount of change orders from owners are directly affects time performance. This is because change orders will interrupt the schedule of the project and sometimes suspend the project due to incomplete design changes which affect the sequence of the project activities. And the time required to implement these variation orders will affect the project time performance. This is because some variations takes or requires more time than the first planned activities. So that the project doer will suffer time and cost performance problems due to the time needed to implement these orders.

The delay in payments from owners to contractors directly causes delay in project time. Any payment which needed by the contractor to paid on time, it assures that the contractor to execute the project within the schedule. The key major factor in time performance is ground conditions. Grounds those have problems, especially unforeseen like poor bearing capacity, black cotton soil and hard rock which are difficult to driven and water table near to the ground are affect the time performance of projects.

The critical factors that affect time performance from the case studies projects have been too much variation orders from the owner, design change, project complexity, disruption, time needed to rectify defects, major materials supply shortage, work suspension, time needed to importing materials that are not locally available, delay related to sub-contract works and delay in payments from owner to contractor

Table 4.7: Spearman’s correlation coefficient of time factors

	Owner	Contractor	Consultant
Owner	1.00	0.72	0.38
Contractor	0.72	1.00	0.52
Consultant	0.38	0.52	1.00

Based on the spearman’s correlation coefficient on table 4.7, there is strong relation between the responses of owner-contractor, moderate relation between contractor-consultant and weak relation between owner-consultant.

The reason for the occurrence of strong relation between owner and contractor is that the rank of responses to poor project management assistance, unforeseen ground conditions, project complexity, financial constraints and unavailability of resources were the same. This implies that completing the project on time is the main objective of them.

Whereas for the moderate relation between the responses of contractors and consultants is that they have the same rank on unavailability of resources and near the same on low speed of decision making, effective communication, average delay in claim approval and time needed to implement variation orders.

And for the weak relation between owners and consultants are that too different responses to too many change orders from owners, low speed of decision making, project complexity, average delay in claim approval and site preparation time. This indicates that the owners’ attention is only to receive the project on time.

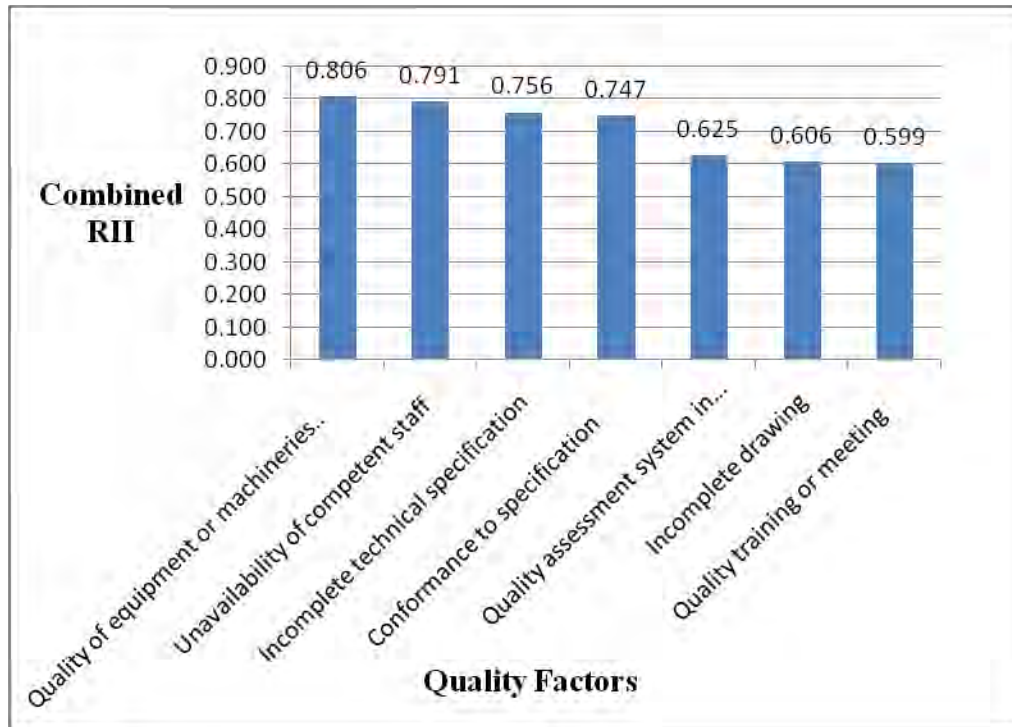
4.4.3. Quality Factors in university building construction projects

From the literatures reviews there were eight factors that affect the quality performance of construction projects. Table 4.8 and figure 4.4 show the results of participants and combined RII and rank of factors affecting quality performance respectively. Next to figure 4.4 discussions are made on the critical factors based on the top rank.

Table 4.8: Participants' RII and rank of quality factors

Quality factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Conformance to specification	0.733	4	0.757	3	0.750	2
Unavailability of competent staff	0.833	2	0.814	2	0.725	3
Quality of equipment or machineries and raw materials	0.867	1	0.700	5	0.850	1
Quality assessment system in organization	0.650	5	0.600	6	0.625	5
Quality training or meeting	0.583	6	0.714	4	0.500	7
Incomplete drawing	0.517	7	0.700	5	0.600	6
Incomplete technical specification	0.750	3	0.843	1	0.675	4

Figure 4.4: Combined RII and rank of quality factors



From figure 4.4, quality of equipment or machineries and raw materials RII of 0.806, unavailability of competent staff RII equals to 0.791 and escalation of material prices RII of 0.787 have been the top three critical factors that affect quality performance of projects.

The materials, equipments and machineries used in any project can affect the quality of the work executed. In Ethiopia most of the available materials are produced by a limited number of producers with a little variation in quality. The staffs' (labor) that are being available on the market are semi-skilled and un-skilled. These incompetent staffs mainly affect the quality of the project. When the price of materials escalate from the contract price, unless otherwise price adjustment is made on the contract, the quality of the materials consumed on the project will greatly affected by the escalation. This is because the contractor wants himself to be free from bankruptcy; he will use some low cost materials and quality.

On the same figure, incomplete technical specifications (0.756), conformance to specification (0.747) have been the critical quality performance factors. Incomplete technical specifications will leads challenges to project doers due to they couldn't know which type of work execute by what type materials, equipments and workmanship. If these factors i.e. type materials, equipments and workmanship are not specified on the contract document, the contractor may use low quality materials equipments and workmanship. Conformance to specification and unavailability of quality materials has been the critical factors that affect quality performance from the selected case studies projects.

Table 4.9: Spearman's correlation coefficient of quality factors

	Owner	Contractor	Consultant
Owner	1.00	0.46	0.86
Contractor	0.46	1.00	0.32
Consultant	0.86	0.32	1.00

On table 4.9, the spearman correlation coefficient indicates that there is a strong relation between the responses of owner-consultant. This is due to they have similar perception towards the quality factors. This indicates the quality application on the project has been supervised by both owners and consultants and most of the time consultant is worried about owners' satisfaction.

Also this correlation table shows contractors' response have a weak relation between owners and consultants. This implies that the contractor quality performance is affected by escalation of materials prices but owners do not give attention to quality problem. This means that owners want to control and supervise only what works executed on the project site by what types of materials, equipments and workmanship.

4.4.4. Productivity Factors in building construction projects

There are eleven factors productivity performance that were identified from the literatures reviews. Table 4.10 shows results of the RII and rank of factors affecting productivity performance between owners, contractors and consultants. Based on the combined RII and rank shown on the figure 4.5 the discussions are made.

Table 4.10: Participants' RII and rank of productivity factors

Productivity Factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Project size and complexity	0.600	8	0.629	5	0.475	9
Management-labour relationship	0.633	7	0.514	9	0.625	5
Absenteeism rate through project (late start and early exits)	0.783	3	0.814	1	0.650	4
Number of new projects per year	0.683	5	0.557	8	0.525	8

Sequencing of work according to schedule	0.667	6	0.614	6	0.600	6
Local cultural characteristics	0.567	9	0.643	4	0.625	5
Non-working holidays	0.483	11	0.743	2	0.550	7
Local climate conditions	0.767	4	0.814	1	0.775	1
Wedges amount	0.900	1	0.629	5	0.675	2
Employees motivation	0.517	10	0.686	3	0.550	7
Employees attitudes	0.867	2	0.571	7	0.657	3

Figure 4.5: Combined RII and rank of productivity factors

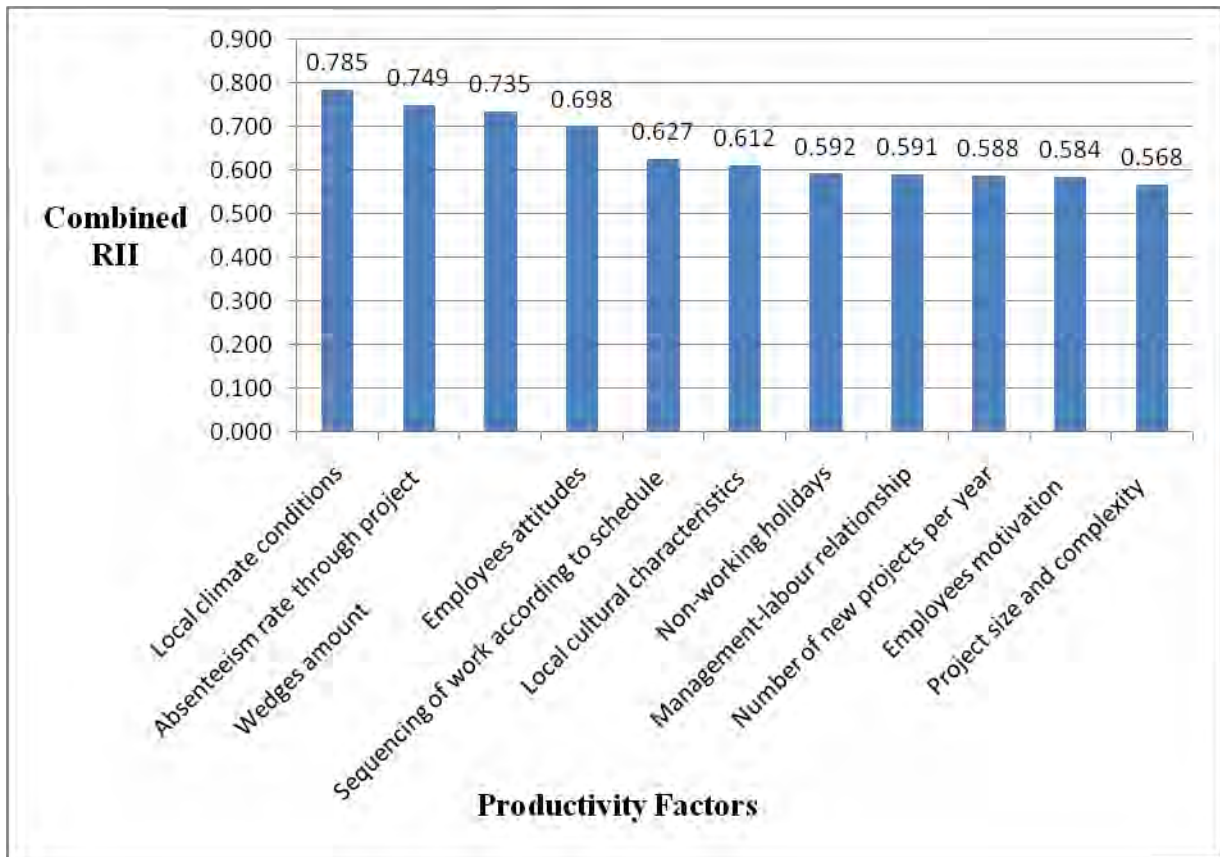


Figure 4.5 shows that local climate conditions with RII of 0.785, absenteeism rate through project RII of 0.749 and wedges amount with RII of 0.735 have been the top and the critical factors that affect the performance of productivity.

The changes in local climate through the year greatly affect the productivity rate of a project. The rain intensity from the month June to September is higher than that of from November to March. On the months of high rain intensity the productivity of most construction projects greatly affected because the rain will cause unsuitable working conditions for labour and machineries on the project site.

Absenteeism rate through the project will affect the productivity performance of project. Therefore, the project will suffer from delay due to these late entries and early exits of labors from the site. The wedges or salary amount which paid for labors will greatly affect the productivity of them. Labors those have more salary usually more motivated than less salary labors. And because of this difference on salary the productivity of projects will be affected.

The above combined RII and rank figure 4.5 of productivity factors indicates employees' attitudes (0.698), sequencing of work according to schedule (0.627) and local cultural characteristics (0.612) also has been the critical factors that affect performance productivity.

The attitudes of employees on the project will affect the productivity performance. Sequencing of work according to the schedule assists the project doer to implement the project according to scheduled time. Therefore, the project will not suffer from time and cost performance problems and there will no delay or cost overruns. The characteristics of local cultures has been put its effect on the project. This is due to the applicable norms of the community on the area of the project being executed.

From the result of selected case studies projects the critical productivity factors have been sequencing of work according to schedule, weather condition, shortage of manpower, unskilled machine operators, unavailability of equipments, and shortage of manpower as per the planned schedule and failure of machines.

Table 4.11: Spearman’s correlation coefficient of productivity factors

	Owner	Contractor	Consultant
Owner	1.00	-0.05	0.70
Contractor	-0.05	1.00	0.51
Consultant	0.70	0.51	1.00

Based on table 4.11, the spearman correlation coefficient indicates that there is somewhat strong relation between the responses of owner and consultant. This indicates that they have similar awareness on the effect of sequencing of work according schedule, wedges amount, employees’ attitudes, absenteeism rate through project and project size and complexity on project productivity.

From correlation table 4.11, the response of contractors has a moderate relation with consultants’ response and a negative weak relation with the response of owners. The moderate relation between contractors and consultants indicates that they have moderately similar response rank on number new projects per year, local climate conditions, sequencing of work according to schedule and local cultural characteristics.

The reason for the negative and weak relation between owners and contractors is that their opposite response ranks except for sequencing of work according to schedule.

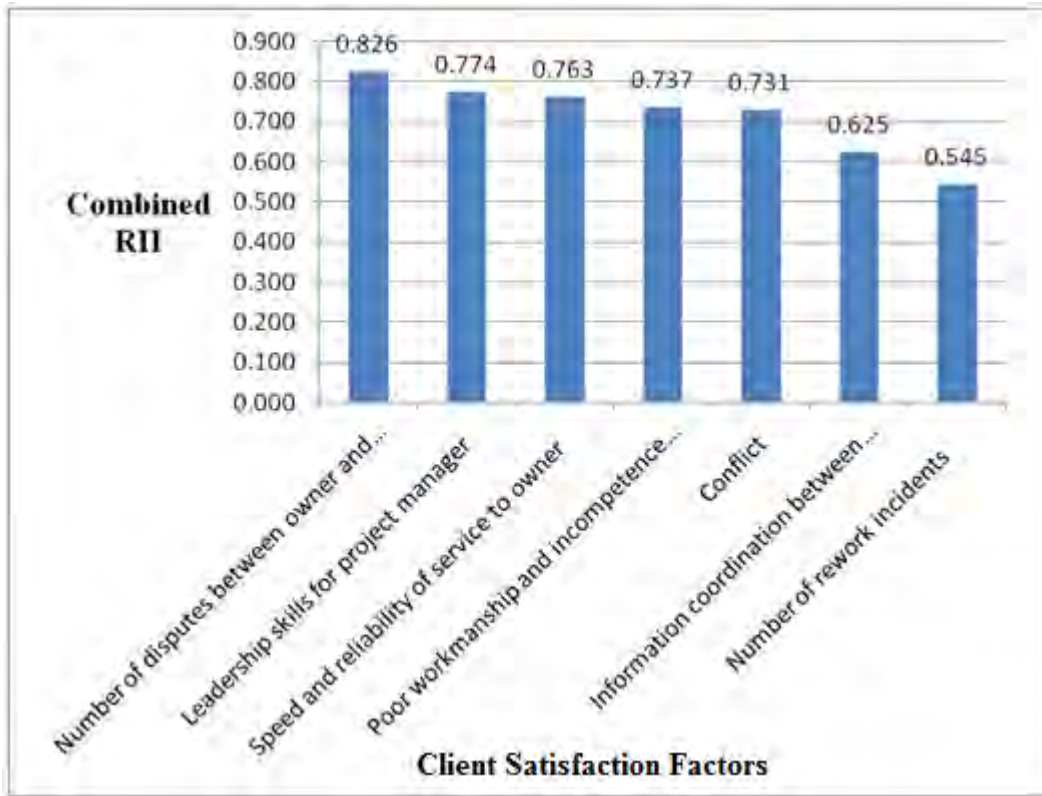
4.4.5. Client Satisfaction Factors in building construction

There are seven factors that affect client satisfaction performance that were identified from literatures reviews. Table 4.12 and figure 4.6 are show the results of individuals and combined relative importance index and rank of factors that affecting client satisfaction performance respectively. Based on figure 4.6 the top rank and critical factors discussions are made.

Table 4.12: Participants’ RII and rank of client satisfaction factors

Client Satisfaction Factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Leadership skills for project manager	0.883	1	0.714	4	0.725	3
Number of disputes between owner and project parties	0.883	1	0.771	1	0.825	1
Speed and reliability of service to owner	0.733	3	0.757	2	0.800	2
Number of rework incidents	0.450	5	0.586	7	0.600	5
Information coordination between owner and project parties	0.717	4	0.657	6	0.500	6
Conflict	0.783	2	0.686	5	0.725	3
Poor workmanship and incompetence workers	0.783	2	0.729	3	0.700	4

Figure 4.6: Combined RII and rank of client satisfaction factors



As shown on the figure 4.6, number of disputes between owner and project parties has been the first rank and the critical factor which affects the performance of client satisfaction with RII having 0.826. Disputes between owner and contractor and owner and consultants will affect the relationship between them and the degree of client satisfaction will be affected.

Leadership skill of project manager RII equals to 0.774, speed and reliability of service to owner RII equals to 0.763, poor workmanship and incompetence workers RII equals to 0.737 and conflict RII equals to 0.731 have been the second critical client satisfaction performance factors next to number of disputes between owner and project parties.

Leadership skill for project manager is the most important one because leadership skills for project manager affect the construction project performance and it is significant and an important for effectiveness on project performance because client satisfaction depends up on it.

It also assists to supervise the project with strong and suitable performance. This will convenient and satisfy the project client. Speed and reliability of service from contractor or consultant to client or client representative affect the degree of satisfaction with respect to client. This is because the clients need to take the project on time even before time so that it generates money rapidly.

The existence of poor workmanship and incompetent staff on the project site will greatly affect the client satisfaction. This is an important factor of client satisfaction because it affects the quality of the project and service life of the project. Conflicts between contractors to labors and labors themselves on the project site will greatly affect the degree of clients' satisfaction. This is because any unnecessary conflict on the project may cause death or injuries.

Based on the result of the selected case studies speed of delivering the project to the owner, number of claims submitted from the contractor and performance of contractor has been the critical factors affecting the performance of client satisfaction.

Table 4.13: Spearman's correlation coefficient of client satisfaction factors

	Owner	Contractor	Consultant
Owner	1.00	0.50	0.75
Contractor	0.50	1.00	0.82
Consultant	0.75	0.82	1.00

On table 4.13, the spearman correlation coefficient shows that the consultant responses have very strong relation with the contractor and somewhat strong relation with the responses of owner. This implies that consultants and contractors tries to satisfy owners on the overall project performance and both have been affected by the factors.

The strong relation between consults and owners indicates that they have similar response on number of disputes between owner and project parties, number of rework incidents, conflict and speed and reliability of service to owner.

Also the correlation table shows that there is a moderate relation between owners and contractors. This is due to the same response ranks between them on number of disputes between owner and project parties, speed and reliability of service to owner and poor workmanship and incompetent workers.

But all participants have the same response on the number of disputes between owner and project parties.

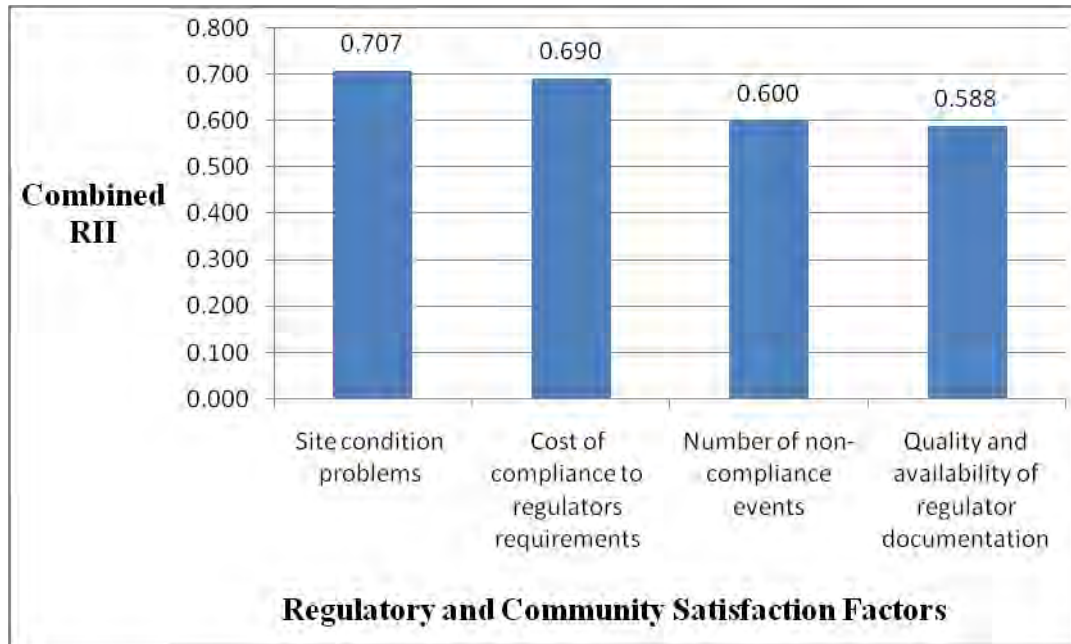
4.4.6. Regulatory and Community Satisfaction Factors in building construction projects

From literatures reviews there were four factors that affect the regulatory and community satisfaction performance. Table 4.14 and figure 4.7, shows results the RII of participants and combined and rank of these factors. The critical factors are discussed below based on the combined RII and the top rank.

Table 4.14: Participants’ RII and rank of regulatory and community satisfaction factors

Regulatory and Community Satisfaction Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Site condition problems	0.583	3	0.714	1	0.825	1
Quality and availability of regulator documentation	0.583	3	0.557	4	0.625	3
Cost of compliance to regulators requirements	0.750	1	0.671	2	0.650	2
Number of non-compliance events	0.600	2	0.600	3	0.600	4

Figure 4.7: Combined RII and ranks of regulatory and community satisfaction factors



From figure 4.7, site conditions problems with RII equals to 0.707 has been the critical and the first top factor which affects the performance of regulatory and community satisfaction. This factor is the most important one for all parties. The problem has been related to most project sites are affects the movement of peoples' near the site. This problem affects the time performance of project and causes disputes and delays.

The figure also shows that cost of compliance to regulators requirements has been the second critical regulatory and community satisfaction performance factor with RII of 0.690. The amount cost of compliance (conformity) which paid to regulatory bodies and the compensation cost paid for the properties of land greatly affect the degree of satisfaction of regulators and community and also this affects the cost performance of project.

Number of non-compliance events which RII equals to 0.600 has been the third critical factor which affects the performance of regulatory and community satisfaction. The more increase in non-compliance events will be the more factor which affect the degree of regulatory and community satisfaction on the project. This will affect the overall project performance.

Unfitted contractors' level with the number of stories and falling of materials from the building on peoples moving near to the site have been the critical factors of regulatory and community satisfaction performance from the selected case studies projects.

Table 4.15: Spearman's correlation coefficient of regulatory and community satisfaction factors

	Owner	Contractor	Consultant
Owner	1.00	0.30	0.10
Contractor	0.30	1.00	0.80
Consultant	0.10	0.80	1.00

Based on the spearman's correlation coefficient table 4.15, owner have is weak relation with contractors and consultants. The reason for weak relations of owners to contractors and consultants were that owners have different responses of all factors of regulatory and community satisfaction except that the same responses rank with consultants on quality and availability of regulatory documentation. These are site condition problems, quality and availability of regulator documentation, cost of compliance to regulators requirements and number of non-compliance to regulations.

But there is a strong correlation between contractors' and consultants' responses. This is because of they had similar response rank between site condition problems and cost of compliance to regulators requirements.

4.4.7. Health and Safety Factors in university building construction

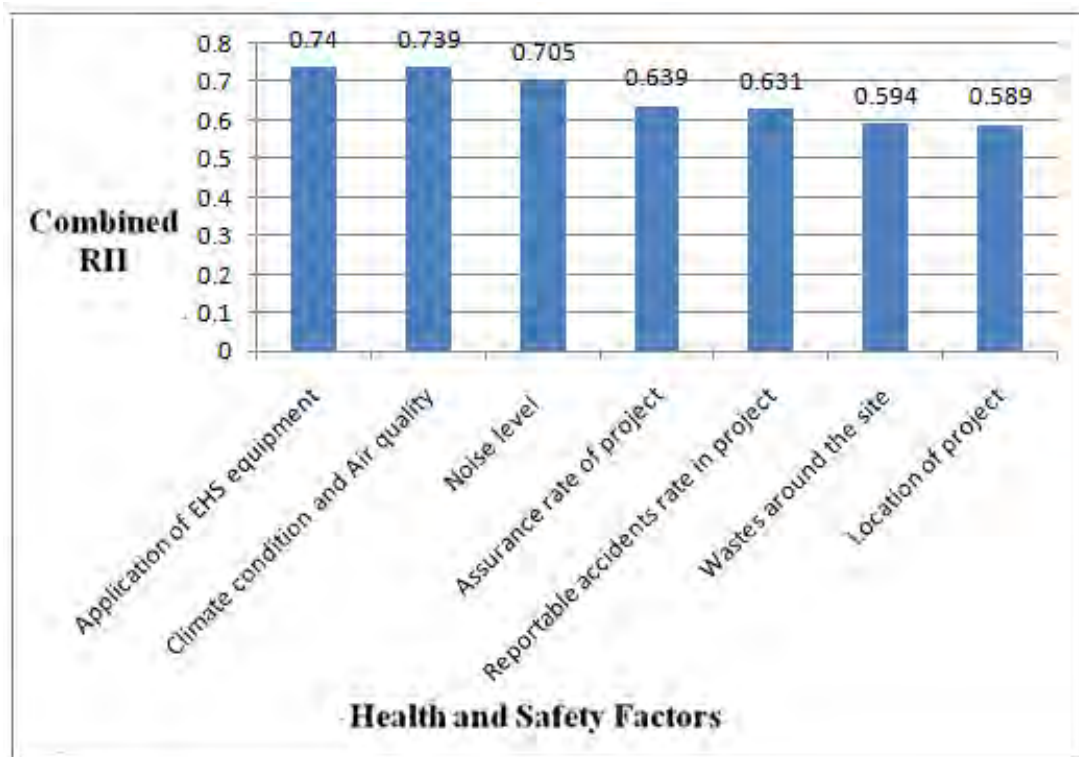
There are seven factors of health and safety performance that were identified from the literatures reviews. Table 4.16 shows the results of RII and rank of factors affecting health and

safety performance between owners, contractors and consultants. Discussions are made to the critical factors based on the combined RII and rank shown on figure 4.8.

Table 4.16: Participants’ RII and rank of health and safety factors

Health and Safety Factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Reportable accidents rate in project	0.717	5	0.60	5	0.575	5
Application of health and safety factors in organization	0.817	1	0.729	1	0.675	3
Assurance rate of project	0.650	6	0.643	3	0.625	4
Easiness to reach to the site (location of project)	0.650	6	0.543	6	0.575	5
Wastes around the site	0.733	4	0.600	5	0.450	6
Air quality	0.767	3	0.700	2	0.750	1
Noise level	0.800	2	0.614	4	0.700	2

Figure 4.8: Combined RII and rank of health and safety factors



As shown on the figure 4.8, application of health and safety factors in organization (0.740) and climate condition and air quality (0.739) has been the critical and top rank health and safety performance factors. The application of health and safety factors on projects will decrease the occurrence problems related to health and safety and it will improve the awareness of the workers. This factor affects strongly on performance of projects because it affects the safety system in projects. The air quality with in and around the site will greatly affect productivity of the labors; this is because it affects their health and safety of the labors.

It is shown on the same figure, noise level with RII equals to 0.705, assurance rate of project RII of 0.639 and reportable accidents rate in project RII equals to 0.631 has been the second critical factors affecting the performance of health and safety. The noise level of equipments and machineries on the site will directly affects the health of workers, especially workers working with near the equipments and machineries. When the level of noises high, it will decreases the

level of communications between workers and this will affect the productivity on the site; because communications between workers will greatly affect the productivity of them.

Assurance is a type of insurance in which money is paid out after an agreed period of time when somebody dies. Assurance (guarantee) rate of project affects the safety and cost performance of project. Reportable accidents rate in project is related to the number of occurrence of injuries and illness on the employees. This factor is the critical one because reportable accidents rate usually affects the safety performance and the client and regulatory satisfaction in projects.

From the selected case studies workers' lack of awareness to safety, improper using of safety equipments, problems in bracing of formworks and scaffoldings have been the critical factors that affects health and safety performance on the projects.

Table 4.17: Spearman's correlation coefficient of health and safety factors

	Owner	Contractor	Consultant
Owner	1.00	0.73	0.70
Contractor	0.73	1.00	0.80
Consultant	0.70	0.80	1.00

As shown on the spearman's correlation coefficient table 4.17, there is a strong relation between all respondents. This implies that all factors have the same effect on the projects.

This strong relation between contractors and consultants was happens because of similar response on reportable accidents rate in project and near the same response on the other factors.

Whereas the reason for strong relation between owners and contractors was that were similar responses on reportable accidents rate in project, easiness to reach to the site (location of project) and application of health and safety factors in organizations.

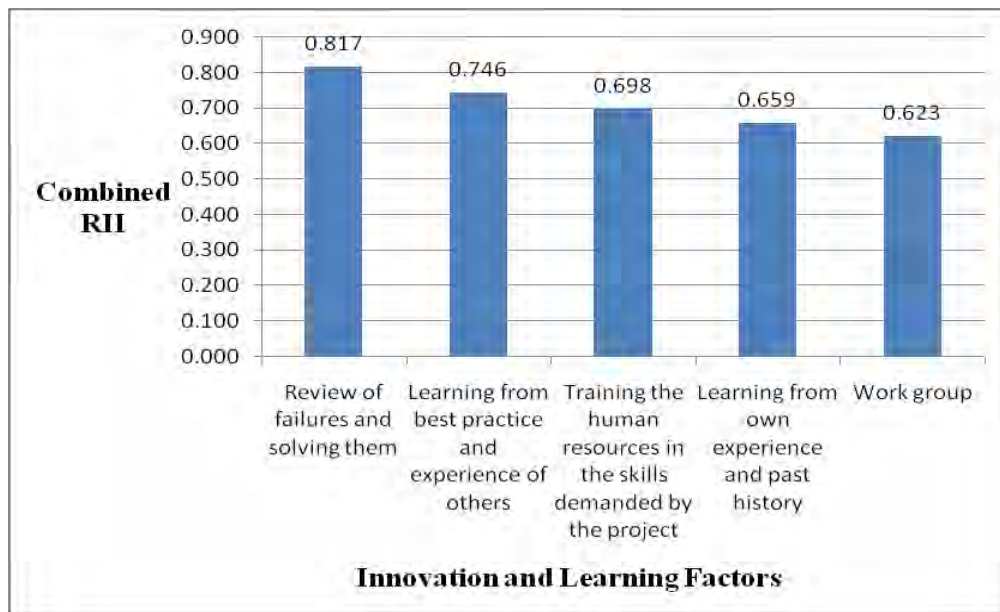
4.4.8. Innovation and Learning Factors in building construction

From the literatures reviews there were five factors that affect innovation and learning performance in construction projects. Table 4.18 and figure 4.9, show the results of participants and combined RII and rank of factors affecting innovation and learning performance respectively. Based on the combined RII shown on figure 4.9, the discussions are made.

Table 4.18: Participants’ RII and rank of innovation and learning factors

Innovation and Learning Factors	Owner		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Learning from own experience and past history	0.617	4	0.686	4	0.675	4
Learning from best practice and experience of others	0.733	2	0.729	2	0.775	3
Review of failures and solving them	0.800	1	0.800	1	0.850	1
Work group	0.600	5	0.743	3	0.525	5
Training the human resources in the skills demanded by the project	0.650	3	0.643	5	0.800	2

Figure 4.9: Combined RII and rank of innovation and learning factors



Based on figure 4.9, review of failures and solving them with RII equals to 0.817 have been first and the critical factor which affects the innovation and learning performance of a project. Once failures occurred in a project, reviewing, solving and protecting them before happen again will improve the cost, time and quality of project performance. This factor also will enhance project performance and will satisfy the project stakeholders.

Figure 4.9 shows that learning from best practice and experience of others (0.746) has been the second critical factor that affects innovation and learning performance project. Learning from best practice and experience of others will improve performance of projects. It can also improve and develop the performance of current and future projects. Taking the practice and experience of best organizations will make others organizations to minimize risks related to safety, health, time, cost and quality performance of projects.

As shown on the same figure, training the human resources in the skills demanded by the project with RII of 0.698 has been the third critical learning and innovation performance factor of the projects. Training the human resources in the skills demanded by the project assists employees to perform the project effectively and successfully. This is an important learning and innovation factor because it improves the productivity performance of a project.

Table 4.19: Spearman’s correlation coefficient of innovation and learning factors

	Owner	Contractor	Consultant
Owner	1.00	0.60	0.90
Contractor	0.60	1.00	0.30
Consultant	0.90	0.30	1.00

Based on table 4.19, it is shown that there is a moderate relationship between owners’ and contractors’ responses. The different responses in group work and training the human resources in the skills demanded by the project were made this weak relation. The correlation coefficient

table also shows that there is a weak relation between the responses of contractors and consultants. This is because of different responses on learning from best practice and experience of others, group work and training the human resources in the skills demanded by the project.

On the same table, there is very strong relation between owners and consultants. This happens because of similar response ranks between them on the learning from own experience and past history, learning from best practice and experience of others.

But all of the respondents had the same responses on learning from own experience and past history and review of failures and solving them.

4.5. The Critical Factors that Affects Project Performance

Based on the literatures reviews there were sixty-seven factors that affects the performance of construction projects that sub-grouped in eight major groups. From the analysis and discussions made above the critical and top thirty-five factors of performance in University building construction projects with a RII of 0 .680 and above are established as follows:

Table 4.20: The critical factors that affecting project performance

Rank	Factors Affecting Project Performance	Combined RII	Group Factor
1	Escalation of material prices	0.884	Cost
2	Unavailability of resources	0.841	Time
3	Number of disputes between owner and project parties	0.826	Client Satisfaction
4	Review of failures and solving them	0.817	Innovation and Learning
5	Quality of equipment or machineries and raw materials	0.806	Quality
6	Unavailability of competent staff	0.791	Quality
7	Financial constraints	0.790	Time

8	Material and equipment cost	0.787	Cost
9	Local climate conditions	0.785	Productivity
10	Cost of variation orders	0.781	Cost
11	Leadership skills for project manager	0.774	Client Satisfaction
12	Speed and reliability of service to owner	0.763	Client Satisfaction
13	Incomplete technical specification	0.756	Quality
	Factors Affecting Project Performance	Combined RII	Group Factor
14	Absenteeism rate through project (late start and early exists)	0.749	Productivity
15	Conformance to specification	0.747	Quality
16	Learning from best practice and experience of others	0.746	Innovation and Learning
17	Application of health and safety factors in organization	0.740	Health and Safety
18	Air quality	0.739	Health and Safety
19	Poor workmanship and incompetent workers	0.737	Client Satisfaction
20	Wedges amount	0.735	Productivity
21	Too many change orders from owner	0.732	Time
22	Conflict	0.731	Client Satisfaction
23	Average delay in payments from owners to contractors	0.727	Time
24	Unforeseen ground conditions	0.726	Time
25	Project labour cost	0.723	Cost
26	Time needed to implement variation orders	0.710	Time

27	Site condition problems	0.707	Regulatory and community Satisfaction
28	Noise level	0.705	Health and Safety
29	Waste rate of materials	0.703	Cost
30	Training the human resources in the skills demanded by the project	0.698	Innovation and Learning
Rank	Factors Affecting Project Performance	Combined RII	Group Factor
31	Employees attitudes	0.698	Productivity
32	Average delay in claim approval	0.693	Time
33	Cost of compliance to regulators requirements	0.690	Regulatory and community Satisfaction
34	Differentiation of currency prices	0.689	Cost
35	Low speed of decision making	0.682	Time

4.6. Perceptions of Respondents towards the Critical Factors of Project Performance

The results of this part of study provide an indication of perceptions of the respondents on the critical factors that affecting the performance of building construction projects on the selected university projects based on their relative importance index and rank. The factors are selected based on the combined relative index and rank of factors of project performance. Table 4.21 to Table 4.38 shows the summary of the respondents' relative importance index factors and rank according to each type of target group.

4.6.1. Perception of respondents to Cost Factors

This part of study provides an indication of perceptions of respondents for the cost factors on the selected university projects based on their relative importance index and rank

Table 4.21: RII and rank of the critical factors of cost performance

Cost Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Material and equipment cost	0.800	3	0.786	2	0.775	2
Project labour cost	0.733	5	0.786	2	0.650	6
Cost of variation orders	0.833	2	0.786	2	0.725	3
Waste rate of materials	0.667	6	0.743	3	0.700	4
Escalation of material prices	0.883	1	0.943	1	0.825	1
Differentiation of currency prices	0.767	4	0.700	4	0.600	8

4.6.1.1. Owners View to cost factors

Escalation of material prices has been ranked by the owners’ respondents in the first position. It is worth noticing that this factor is the critical one for owners because rapid shortage of construction materials leads to escalation of construction material prices. This escalation of material prices affect the liquidity of owners' projects and cost performance of their projects.

Cost of variation orders has been ranked by the owners’ respondents in the second position. This is an important factor for owners because changes from time to time affect their liquidity and this will disturb their cash flow on the project.

Material and equipment cost has been ranked by the owners respondents in the third position. This factor affects the owner's liquidity and project cost performance.

Differentiation of currency prices has been ranked by the owners’ respondents in the fourth position. This factor affects the owners' liquidity, project budget and cost performance. Because of economical situation there has been differentiation of currency prices in Ethiopia.

4.6.1.2. Contractors View to cost factors

Escalation of material prices has been ranked by the contractors' respondents in the first position. This factor is the critical important one for contractors because rapid shortage of construction materials leads to escalation of construction material prices. This escalation of material prices affect the liquidity of contractors and profit rate of their projects.

Material and equipment cost, project labour cost and cost of variation orders has been ranked by the contractors' respondents in the second position with RII equal 0.786. Material and equipment cost factor is considered as one of project cost components. Therefore, material and equipment cost affects the contractors' profit rate and hence their cost performance.

Cost of variation orders is an important factor for contractors because changes that come from owners from time to time affect their liquidity and this will disturb their cash flow on the project.

Project labor cost factor affects the cost performance of project because labor cost is one of the main components of project cost. Therefore it affects the project budget and cost performance of contractors.

Waste rate of materials has been ranked in third position by the respondents of contractors. This is an important factor for contractors because the amount or rate of materials waste on the site affects the liquidity and budget of the project so that it affects the cash flow of contractors and cost performance.

Differentiation of coins prices has been ranked by the contractors' respondents in the fourth position. Differentiation of currency prices affects the project's profit rate for contractors and the contractors' cost performance.

4.6.1.3.Consultants View to cost factors

Escalation of material prices has been ranked by the consultants’ respondents in the first position. Shortage of construction materials leads to the escalation of construction material prices. This escalation of material prices affect the cost performance of projects which is related to client's representative.

Material and equipment cost has been ranked by the consultants’ respondents in the second position. This in an important factor which affect cost performance of the owner's liquidity and project cost performance for consultants because as consultants are clients representatives.

Cost of variation orders has been ranked by the consultants’ respondents in the third position. This is an important factor for consultants because a change from owners has been designed by the consultants.

4.6.2. Perception of respondents to Time Factors:

This part of study provides an indication of perceptions of respondents for the time factors on the selected university projects based on their relative importance index and rank

Table 4.22: RII and rank of the critical factors of time performance

Time Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Too many change orders from owners	0.783	1	0.814	3	0.600	10
Unforeseen ground conditions	0.633	6	0.771	5	0.775	3
Low speed of decision making	0.683	4	0.714	6	0.650	8
Financial constraints	0.733	3	0.786	4	0.850	2
Average delay in claim approval	0.500	9	0.829	2	0.750	4
Average delay in payments from owner to contractors	0.667	5	0.814	3	0.700	6
Unavailability of resources	0.767	2	0.857	1	0.900	1
Time needed to implement variation orders	0.683	4	0.771	5	0.675	7

4.6.2.1. Owners View to Time Factors

Too many change orders from owners has been ranked in first position by the owners' respondents. This factor is an important factor for owners because it affects the speed of service to them and cost performance.

Unavailability of resources has been ranked by the owners' respondents in the second position. This factor affects directly and practically on project performance such as time. If resources are not available as planned through project duration, the project will suffer from problem of time and cost performance. This is because resource availability as planned schedule can improve time performance of projects.

Financial constraint has been ranked by owners' respondent in the third position. This factor affects directly and practically on project time performance. If financial resources are not available as the time needed especially from contractors, the project will suffer from problem of time performance.

Low speed of decision making and time needed to implement variation orders has been ranked on the fifth position by owners' respondents with RII equal 0.683.

The speed of decision taken by the project participants greatly affects the project time performance. Delay in decision making will suffer projects in time, cost and productivity performance.

Time needed to implement variation orders will affect the performance of basic schedule. Due to time needed to implement variation orders estimated schedule will be changed and modified and this factor affects strongly the time performance.

4.6.2.2. Contractors View to Time Factors

Unavailability of resources has been ranked by the contractors' respondents in the first position. This factor affects directly and practically on contractors' performance through projects. If resources are not available for contractors as planned through project duration, the project will

suffer from problem of time and cost performance. Resource availability affects on processes performance of contractors.

Average delay in claim approval has been ranked in the second position by the contractors' respondents. This factor directly affects on contractors time and cost performance. If claims are not approved within a short period of time, the contractor will suffer delay in project. Therefore, this is greatly affects the time and cost performance contractors.

Too many change orders from owners and average delay in payment from owner to contractor has been ranked by the contractors' respondents in the third position with RII of 0.814.

The number of change orders from owners affects the project schedule and estimated time. This factor is an important factor for contractors because it affects the time and cost performance.

Delay in payment from owner to contractor lead to delay of contractors' performance and cause problem in time performance. This may also lead to disputes and claims between contractor and consultant of project. All of that will affect the overall performance of project that has been implemented.

Financial constraint has been ranked by contractors' respondent in the fourth position. This factor affects directly and practically on project time performance. If financial resources are not available as the time needed, the project contractor will suffer from problem of time performance.

4.6.2.3. Consultants View to Time Factors

Unavailability of resources has been ranked by the consultants' respondents in the first position. This factor affects directly and practically on project performance such as time. If resources are not available as planned through project duration, the project will suffer from problem of time performance. Resource availability is an important factor for consultants because it affects the processes performance of construction projects.

Financial constraint has been ranked by consultants’ respondent in the second position. This factor affects directly and practically on project time performance. If financial resources are not available as the time needed, the project will suffer from problem of time performance.

Unforeseen ground condition has been ranked in the third position by the consultants’ respondents. The conditions of ground on the project site, especially when it is unforeseen, it will affect the work executed on the project. Therefore, the consultants’ design mainly affected by these unforeseen ground conditions and so that project time performance also affected.

Average delay in claim approval has been ranked in the fourth position by the consultants’ respondents. This factor directly affects the time and cost performance. If claims are not approved within a short period of time, the project will suffer delay in project. Therefore, this is greatly affects the time and cost performance project.

4.6.3. Perception of respondents to Quality Factors:

This part of study provides an indication of perceptions of respondents for the Quality factors on the selected university projects based on their relative importance index and rank

Table 4.23: RII and rank of the critical factors of quality performance

Quality factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Conformance to specification	0.733	4	0.757	3	0.750	2
Unavailability of competent staff	0.833	2	0.814	2	0.725	3
Quality of equipment or machineries and raw materials	0.867	1	0.700	5	0.850	1
Incomplete drawing	0.517	7	0.700	5	0.600	6
Incomplete technical specification	0.750	3	0.843	1	0.675	4

4.6.3.1. Owners View to Quality Factors

Quality of equipments or machineries and raw materials in project has been ranked by the owners' respondents in the first position. The owners usually want materials used in their project with a good quality and according to specification. In Ethiopia, most of available materials are with little variation in quality and produced by a limited number of producers. Therefore, this factor affects the quality project performance and the degree of owners' satisfaction.

Unavailability of competent staff has been ranked by the owners' respondents in the second position. Availability of competent staff with a high experience and qualification in project leads to implementation of project with suitable cost, time and with professional quality which satisfy the owner.

Incomplete technical specification has been ranked in third position by owners' respondents. Complete technical specification in the contract document has a great effect on the quality of the project being executed. This is an important factor for owners because it affects the time and cost performance of project.

Conformance to specification has been ranked by the owners' respondents in the fourth position. This factor is the most important one for owners because this factor is an important to owner's satisfaction. The owner usually seeks to implement project according to specification.

4.6.3.2. Contractors View to Quality Factors

Incomplete technical specification has been ranked in the first position by contractors' respondents with RII of 0.843. Complete technical specification in the contract document has a great effect on the quality of the project being executed. This is an important factor for owners because it affects the time and cost performance of project.

Unavailability of competent staff has been ranked by the contractors' respondents in the second position. Availability of competent staff with a high experience and qualification in project leads to implementation of project with suitable cost, time and with professional quality.

Conformance to specification has been ranked by the contractors' respondents in the third position. This factor is significant for contractors as it is related to consultants and owners satisfaction.

4.6.3.3.Consultants View to Quality Factors

Quality of equipments or machineries and raw materials in project has been ranked by the consultants' respondents in the first position. Consultants usually want materials used in supervised project with a good quality and according to specification. This factor affects the project performance and the degree of owners' satisfaction which is one of the main responsibilities of consultants.

Conformance to specification has been ranked by the consultants' respondents in the second position. This factor is an important to client representative satisfaction because it is mainly related to owner satisfaction.

Unavailability of competent staff has been ranked by the consultants' respondents in the third position. This factor is the most important one for consultants because availability of staffs with high experience and qualification assist consultants to supervise the project with a good professionalism and also this assist them to satisfy the owner with a successful performance of project.

4.6.4. Perception of respondents to Productivity Factors:

This part of study provides an indication of perceptions of respondents for the Productivity factors on the selected university projects based on their relative importance index and rank

Table 4.24: RII and rank of the critical factors of productivity performance

Productivity Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Absenteeism rate through project (late start and early exists)	0.783	3	0.814	1	0.650	4
Local climate conditions	0.767	4	0.814	1	0.775	1
Wedges amount	0.900	1	0.629	5	0.675	2
Employees attitudes	0.867	2	0.571	7	0.657	3

4.6.4.1. Owners View to Productivity Factors:

Wedges amount has been ranked by the owners' respondents in the first position. When the wedges amount of workers high, their motivation to work will be high and this increases the productivity on the project. Therefore, it is very important factor for owners because it affects their cost and productivity performance of project.

Employees' attitudes have been the second ranked position by the owners' respondents. Attitudes of employees on the project will affect the productivity performance of project. It is very important factor for owners because it affects the productivity of project performance. Therefore, the owner will suffer delay of project.

Absenteeism rate through project (late start and early exists) has been ranked by the owners' respondents in the third position. Absenteeism through project will affect the productivity performance of project. Therefore, the owner will suffer from delay of project. Absenteeism through project implementation is very important for owners because it affects on productivity performance of construction projects.

Local climate condition has been ranked in the fourth position by the owners' respondents. The different situation of local climate condition will affect the productivity performance of project.

In the difficult climate condition some activities of the project will stop and this cause suffer delay the owners on the project.

4.6.4.2. Contractors View to Productivity Factors:

Absenteeism rate through project (late start and early exists) and local climate condition have been ranked by the contractors' respondents in the first position with RII equals to 0.814.

Absenteeism through project will affect the productivity performance of project. Therefore, the contract will suffer from cost overrun of project. Absenteeism through project implementation is very important for contractors because it affects on time, cost and productivity performance of construction projects.

The different situation of local climate condition will affect the productivity performance of project. In the difficult climate condition some activities of the project will stop and this cause suffer less productivity on the project. This is an important factor for contractors because it affects the time and productivity performance on the project.

Wedges amount has been ranked by the contractors' respondents in fifth positions. When the wedges amount of workers high, their motivation to work will be also high and this increases the productivity on the project. Therefore, it is very important factor for contractors because it affects their cash flow on the project, cost and productivity performance of project.

4.6.4.3. Consultants View to Productivity Factors:

Local climate condition has been ranked in the first position by the consultants' respondents. The different situation of local climate condition will affect the productivity performance of project. In the difficult climate condition some activities of the project will stop and this cause suffer delay the owners on the project. Therefore, it is very important for consultants because it affects the satisfaction of owners.

Wedges amount has been ranked in second position by the consultants’ respondents. When the wedges amount of workers high, their motivation to work will be high and this increases the productivity on the project. It also affects the cash flow of owners on the project. Therefore, it is very important factor for contractors because it affects clients’ satisfaction performance on the project.

Employees’ attitudes have been the third ranked position by the consultants’ respondents. Attitudes of employees on the project will affect the productivity performance of project. It is very important factor for consultants because it affects the productivity of project performance. And the owner will suffer delay of project and it affects the speed of service to owners.

Absenteeism rate through project has been ranked by the consultants’ respondents in the fourth position. Absenteeism through project will affect the productivity and time performance of project. Absenteeism affects the productivity performance of construction projects. This also affects owners’ satisfaction on the project.

4.6.5. Perception of respondents to Client Satisfaction Factors

This part of study provides an indication of perceptions of respondents for the Client Satisfaction factors on the selected university projects based on their relative importance index and rank

Table 4.25: RII and rank of the critical factors of client satisfaction performance

Client Satisfaction Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Leadership skills for project manager	0.883	1	0.714	4	0.725	3
Number of disputes between owner and project parties	0.883	1	0.771	1	0.825	1
Speed and reliability of service to owner	0.733	3	0.757	2	0.800	2
Conflict	0.783	2	0.686	5	0.725	3
Poor workmanship and incompetence workers	0.783	2	0.729	3	0.700	4

4.6.5.1. Owners View to Client Satisfaction Factors

Leadership skills for project manager and number of disputes between owner and project parties have been the first ranked position by the owners' respondents having a RII of 0.883.

Leadership skills for project manager are the critical important one for owners because leadership skills for project manager affect the degree of project performance and client satisfaction.

Disputes between owner and project parties will affect on relationship between them and also the degree of client satisfaction will be decreased. All of that can affect the performance of project. This factor is high important for owners because number of disputes affects strongly on client satisfaction and project performance.

Poor workmanship and incompetent workers and conflict have been the second ranked position by owners' respondents with RII of 0.783.

The existence of poor and incompetent workers on the project site will affect the quality and productivity of projects. This is an important factor because it affects performance of owners' satisfaction.

Conflicts between workers on site will affect the health and safety of them. This effect will cause decrease in productivity on the site. It is an important factors for owners because affects regulatory and community satisfaction performance on the project.

Speed and reliability of service to owner has been ranked by the owners' respondents in the third position. This factor increases the degree of satisfaction with respect to client. This factor is very important for owners because it affects strongly on client satisfaction.

4.6.5.2. Contractors View to Client Satisfaction Factors

Number of disputes between owner and project parties has been ranked by the contractors' respondents in the first position. Disputes between owner and contractor will affect the relationship between them and the degree of client satisfaction will be affected. All of that affects on performance of contractors. This factor is high important for contractors because number of disputes affects strongly on client satisfaction and construction contractors performance.

Speed and reliability of service to owner has been the second ranked position by the contractors' respondents. Speed and reliability of service from contractor to client representative affect the degree of satisfaction with respect to client. This factor affects strongly on project performance because it affects the client satisfaction degree.

Poor workmanship and incompetent workers have been the third ranked position by contractors' respondents. The existence of poor and incompetent workers on the project site will affect the quality and productivity of projects. This is an important factor because it affects the degree of owners' satisfaction.

Leadership skills for project manager have been ranked by the contractors' respondents in the fourth. This factor is the most important one for contractors because leadership skills for project manager affect the construction contractors' performance. This factor is an important for contractors because it is significant for effectiveness on project performance.

4.6.5.3. Consultants View to Client Satisfaction Factors

Number of disputes between owner and project parties has been ranked by the consultants' respondents in the first position. Disputes between owner and consultant will affect on relationship between them and the degree of client satisfaction will be affected. All of that can affects the performance of project. This factor is an important for construction project performance because it affects strongly on client satisfaction.

Speed and reliability of service to owner has been the second ranked position by the consultants' respondents. Speed and reliability of service from consultant to owner affect the degree of satisfaction with respect to client. This factor is an important for effectiveness on construction project performance because it affects strongly on client satisfaction.

Leadership skills for project manager and conflict have been ranked by the consultants' respondents in the third position with RII equal 0.724.

Leadership skills from project manager have been the fourth factor. Leadership skills for project manager factor are the most important one for consultants because leadership skills for project manager assist consultants to supervise the project with strong and suitable performance. This will convenient and satisfy the client of project. This factor is an important for effectiveness on project performance because client satisfaction depends up on it.

Conflicts between workers on site will affect the health and safety of them. This effect will cause decrease in productivity on the site. It is an important factors for consultants because affects the degree of client satisfaction on the project.

Poor workmanship and incompetent workers has been the fourth ranked position by consultants' respondents. The existence of poor and incompetent workers on the project site will affect the effectiveness, quality and productivity of projects. This is an important factor for consultants because it affects the degree of owners' satisfaction.

4.6.6. Perception of respondents to Regulatory and Community Satisfaction Factors

This part of study provides an indication of perceptions of respondents for the regulatory and community satisfaction factors on the selected university projects based on their relative importance index and rank

Table 4.26: RII and rank of the critical factors of regulatory and

Community satisfaction performance

Regulatory and Community Satisfaction Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Site condition problems	0.583	3	0.714	1	0.825	1
Cost of compliance to regulators requirements	0.750	1	0.671	2	0.650	2

4.6.6.1. Owners View to Regulatory and Client Satisfaction Factors

Cost of compliance to regulators requirements has been ranked by the owners’ respondents in the first position. Cost of compliance to regulators requirements affects the cost performance of project. This factor is important for owners because it affects the regular and community satisfaction.

Site conditions problems have been the third ranked position by the owners’ respondents. This problem affects the time performance of project and causes disputes and delays. Therefore, it affects the satisfaction degree of regulatory and community.

4.6.6.2. Contractors View to Regulatory and Client Satisfaction Factors

Site conditions problems have been ranked by the contractors’ respondents in the first position. This problem affects the performance of contractors and causes disputes and delay of project. This factor is the most important for contractors because it affects on regular and community satisfaction and performance of contractors.

Cost of compliance to regulators requirements has been ranked by the contractors’ respondents in the second position. Cost of compliance to regulators requirements affects the cost

performance of project. This factor affects on regular and community satisfaction and performance of contractors.

4.6.6.3.Consultants View to Regulatory and Client Satisfaction Factors

Site conditions problems have been the first ranked position by the consultants’ respondents. This problem affects the consultant performance of project and causes disputes and delays.

Cost of compliance to regulators requirements has been ranked by the consultants’ respondents in the second position. Cost of compliance to regulators requirements affects the cost performance of project. This factor is the most important one for consultants affects the regular and community satisfaction.

4.6.7. Perception of respondents to Health and Safety Factors:

This part of study provides an indication of perceptions of respondents for Health and safety factors on the selected university projects based on their relative importance index and rank

Table 4.27: RII and rank of the critical factors of health and safety performance

Health and Safety Factors	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Application of health and safety factors in organization	0.817	1	0.729	1	0.675	3
Air quality	0.767	3	0.700	2	0.750	1
Noise level	0.800	2	0.614	4	0.700	2

4.6.7.1. Owners View to Health and Safety Factors:

Application of health and safety factors in organization has been ranked by the owners' respondents in the first position. Application of health and safety factors in construction projects will satisfy the owners. This factor affects strongly on performance of projects because it affects the safety system in projects.

Noise level has been ranked in the second position by owners' respondents. The level noise which comes from equipments and machineries will affect the health and safety of workers and community around the site. Therefore, this factor is an important for owners because it affects the productivity rate on the project. Air quality has been ranked by the owners' respondents in the third position. This factor is important for owners because the level of air quality in the project site can greatly affects the health of employees in the site, so that productivity and time performance of construction projects.

4.6.7.2. Contractors View to Health and Safety Factors:

Application of health and safety factors in organization has been the first ranked position by the contractors' respondents. This factor is the critical important one for contractors because application of health and safety factors in construction projects will improve construction contractors' performance in project.

Air quality has been ranked by the contractors' respondents in the second position. This factor is important for contractors because the level of air quality in the project site can greatly affects the health of employees in the site, so that productivity and time performance of construction projects.

Noise level has been ranked by the contractors' respondents in the fourth position. The level noise which comes from equipments and machineries will affect the health and safety of workers and community around the site. Therefore, this factor is an important for contractors because it affects the productivity rate on the project.

4.6.7.3.Consultants View to Health and Safety Factors:

Air quality has been ranked by the consultants’ respondents in the third position. This factor is important for consultants because the level of air quality in the project site can greatly affects the health of employees in the site, so that productivity and time performance of construction projects.

Noise level has been ranked in the second position by the consultants’ respondents in the fourth position. The level of noise equipments and machineries will affect the health and safety of workers and community around the site. Therefore, this factor is an important for consultants because it affects the productivity rate on the project and the degree of client satisfaction.

Application of health and safety factors in organization has been ranked by the consultants’ respondents in the third position. This factor is the critical important one for consultants because application of health and safety factors in construction projects will satisfy the owners. This factor is significant for consultants because it affects strongly the safety performance in projects.

4.6.8. Perception of respondents to Innovation and Learning Factors

This part of study provides an indication of perceptions of respondents for Innovation and learning factors on the selected university projects based on their relative importance index and rank

Table 4.28: RII and rank of the critical factors of innovation and learning performance

Innovation and Learning	Owner		Contractor		Consultant	
	RII	RANK	RII	RANK	RII	RANK
Learning from best practice and experience of others	0.733	2	0.729	2	0.775	3
Review of failures and solving them	0.800	1	0.800	1	0.850	1
Training the human resources in the skills demanded by the project	0.650	3	0.643	5	0.800	2

4.6.8.1.Owners View to Innovation and Learning Factors

Review of failures and solving them has been ranked by the owners' respondents in the first position. This factor will enhance project performance and will satisfy the owner. This factor will satisfy the owner of the project.

Learning from best practice and experience of others has been ranked by the owners' respondents in the second position. It can improve and develop performance of current and future projects. Learning from best practice and experience of others affects the performance of construction projects because it affects the innovation and learning required for construction. This is related to clients' satisfaction.

Training the human resources in the skills demanded by the project has been ranked by the owners' respondents in the third position. Training the human resources in the skills demanded by the project assists employees to perform project successfully and with high professional degree. All of that will increase satisfaction of owner.

4.6.8.2.Contractors View to Innovation and Learning Factors

Review of failures and solving them has been the first ranked position by the contractors' respondents. Review of failures and solving them will enhance contractors' performance and will satisfy the owner.

Learning from best practice and experience of others has been ranked by the contractors' respondents in the second position. This factor is the most important one for contractors because it can improve and develop construction contractors' performance of current and future projects. This factor is strongly related to contractors' party.

Training the human resources in the skills demanded by the project has been ranked by the contractors' respondents in fifth position. Contractors should train their employees with different and improved skills in order to implement different and complex types of projects. This is important for contractors because training the human resources in the skills demanded

by the project will develop the skills of employees so that the quality of work executed by the workers can be improved.

4.6.8.3. Consultants View to Innovation and Learning Factors

Review of failures and solve them has also been ranked by the consultants respondents in the first position. This factor is the critical important for consultants because review of failures and solving them will enhance project performance and will satisfy the owner.

Training the human resources in the skills demanded by the project has been the second ranked position by the consultants' respondents. This is an important factor for consultants because it training the human resources demanded by the project can improve the productivity of them.

Learning from best practice and experience of others has been ranked by the consultants' respondents in the third position. This factor is the most important one for consultants because it can improve and develop consultants' performance of current and future projects. Learning from best practice and experience of others affects the performance of consultants as it affects the innovation and learning required for supervision. This is also related to clients' satisfaction.

4.7. The Key Performance Indicators in Building Construction Projects

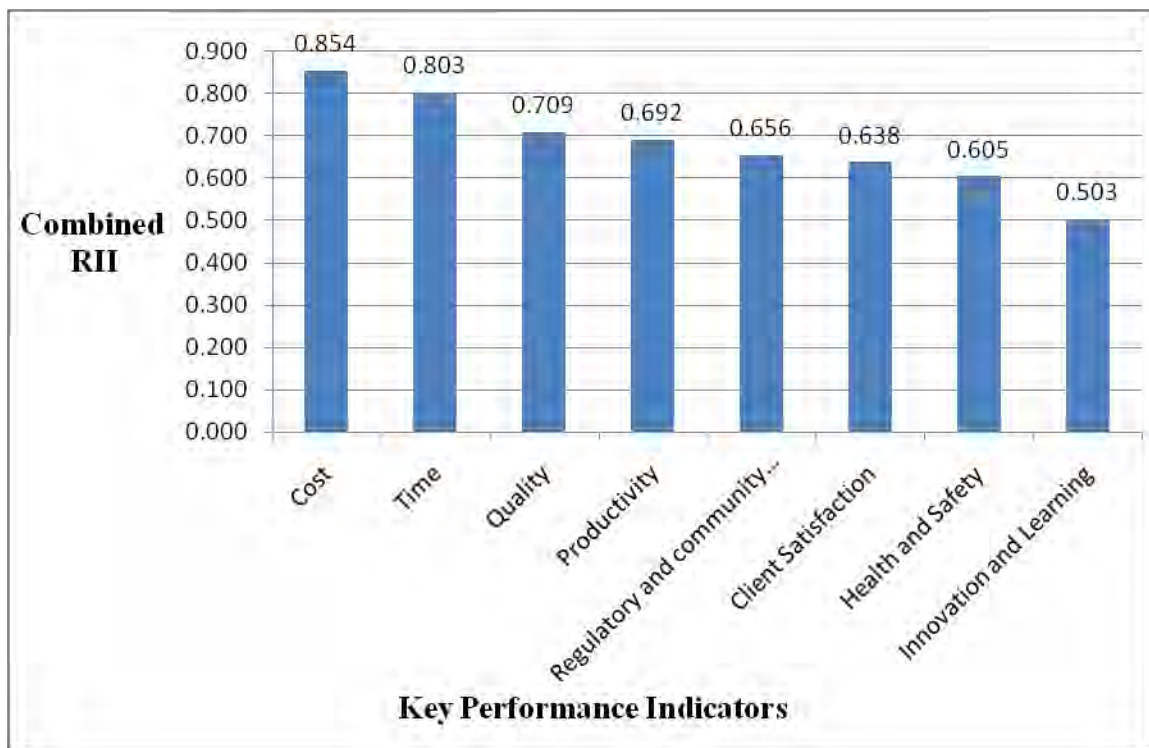
Results of this part of the study provides an indication of the participants' and combined relative importance index (RII) and rank of the key performance indicators of building construction projects according to all and each participants' respectively and correlation coefficients between responses of the participants.

There were eight key performance indicators in construction projects that were identified from the literatures reviews. Table 4.29 and figure 4.10, shows the RII of participants' and combined and correlations between the respondents. Next to all tables and figures discussions will followed on the top and main key performance indicators. Also discussions made to the correlations between respondents.

Table 4.29: Participants’ RII and ranks of Key performance indicators

S.No.	Key Performance Indicators	Owner		Contractor		Consultant	
		RII	RANK	RII	RANK	RII	RANK
1	Cost	0.833	1	0.829	1	0.900	1
2	Time	0.833	1	0.800	2	0.775	2
3	Quality	0.717	2	0.686	4	0.725	3
4	Productivity	0.833	1	0.643	5	0.600	5
5	Client Satisfaction	0.683	7	0.557	7	0.675	4
6	Regulatory and community satisfaction	0.717	2	0.700	3	0.550	6
7	Health and safety	0.700	3	0.614	6	0.500	7
8	Innovation and Learning	0.517	4	0.443	8	0.550	6

Figure 4.10: Combined RII and rank of key performance indicators



From the combined RII and ranks result shown on figure 4.10, cost has been ranked the first main key performance indicator with RII of 0.854. This is because the effect of cost on the project performance is very high and it has been the first rank performance problem in construction projects.

Time has been the second main key performance indicator with RII equal 0.803. Time has a great effect on the overall performance of construction projects.

The third main key performance indicator is quality having 0.709 shown on the figure 4.10. Its effect on the overall project performance will be high.

Productivity has been ranked the fourth main key performance indicator with RII equals to 0.692. The productivity on the project has a great effect on the overall performance of construction projects.

Based on the combined figure 4.10, regulatory and community satisfaction has been ranked on the fifth position with RII of 0.656. It affects the overall project performance.

Client satisfaction has been the six top ranked key performance indicator with RII of 0.638 next to regulatory and community satisfaction. This factor ranked in this position is due to that its effect on the overall project performance has been moderate.

Health and safety and innovation and learning have been the least key performance indicators in the seventh and eighth position having RII of 0.605 and 0.503 respectively. This is because their effects on the overall performance of projects have been very low.

Table 4.30: Spearman’s correlation coefficient key performance indicators

	Owner	Contractor	Consultant
Owner	1.00	0.44	0.25
Contractor	0.44	1.00	0.71
Consultant	0.25	0.71	1.00

On table 4.22, the spearman correlation coefficient indicates that there is strong relation between the responses of owners and contractors, and contractors and consultants. And moderate relation between owners and consultants.

The reasons for strong relation between the responses of owners and contractors there were the same rank on cost, quality, client satisfaction, health and safety and innovation and learning, whereas the reason for strong relation between contractors and consultants are the same ranked on the response of cost, time and productivity and near the same ranked response on quality.

For the moderate relation between owners and consultants, table 4.22 shows there are moderately similar responses on the ranks of cost, time and quality.

4.8. The Main and Top Ranked Key Project Performance Indicators

Based on literatures reviews, there were eight key project performance indicators in construction projects. From the analysis and discussions made above the top six key performance indicators with a combined RII of 0.630 and above have been establish as follows:

Table 4.31: The main and top ranked key performance indicators

Rank	The Most Key Performance Indicators	Combined RII
1	Cost	0.854
2	Time	0.803
3	Quality	0.709
4	Productivity	0.692
5	Regular and community satisfaction	0.656
6	Client Satisfaction	0.638

4.9. Results of the Selected Case Studies

Case studies were collected from four building construction projects from Arbaminch, Welkite, Wachamo, and Wolaita Sodo universities that have been under execution from the year 2006E.C. to 2008 E.C. The data were collected from archival documents, Discussion with participants on the project site and monthly progress report from contractors and consultants. The general profiles of the projects such as project location, commencement date, completion date, contract period, contract amount, contractor, consultant, building purpose, building height and project status are included in the case studies. The case studies findings are project performance problems and factors that affecting the performance of the projects. Table 4.32 shows the results of the selected case studies.

Project A

Location.....	Arbaminch University main campus
Commencement date.....	January 14, 2014
Completion date.....	January 9, 2017
Contract period.....	1090 calendar days
Contract amount.....	120,000,000 ETB
Contractor.....	A''
Consultant.....	A'
Building purpose.....	Assembly hall and office
Building height.....	B+G+3
Project status.....	71 %

Project B

Location..... Welkite University
Commencement date..... April 23, 2015
Completion date..... April 07, 2016
Contract period..... 365 calendar days
Contract amount..... 12,012,637.25 ETB
Contractor..... E’’
Consultant..... E’
Building purpose..... Dormitory
Building height.....G+3
Project status..... 74 %

Project C

Location..... Wachamo University
Commencement date..... November 01, 2014
Completion date..... November 01, 2016
Contract period..... 730 calendar days
Contract amount..... 20,655,537.68 ETB
Contractor..... H’’
Consultant..... H’

Building purpose.....Auditorium and office

Building height..... G+2

Project status..... 90 %

Project D

Location.....Welaita sodo University

Commencement date.....March 2, 2014

Completion date.....April 27, 2016

Contract period.....785 calendar days

Contract amount..... 12,376,496.29 ETB

Contractor.....D''

Consultant.....D'

Building purpose..... Library

Building height..... G+2

Project status.....84 %

S.NO.	Project Performance Problems	Factors Affecting the Project Performance			
		Project A	Project B	Project C	Project D
1	Cost	<ul style="list-style-type: none"> - Escalation of material prices other than cement, reinforcement and fuel - Problem in estimated cost 	<ul style="list-style-type: none"> - Cost of variation orders - Too much number of test orders for HCB - Shortage of materials 	<ul style="list-style-type: none"> - Design and technical matters - Project over time cost 	<ul style="list-style-type: none"> - Cash flow of the project - Additional works - Project overtime cost - Material and equipment cost - Problem in estimated cost
2	Time	<ul style="list-style-type: none"> - Design change - Project complexity - Late decision on approval of material and design change 	<ul style="list-style-type: none"> - Too much variation orders - Disruption - Time needed to rectify defects 	<ul style="list-style-type: none"> - Major materials supply shortage - Work suspension - Time needed to import materials that are not locally available - delay related to sub-contract works 	<ul style="list-style-type: none"> - Too much variation orders from the owner - Delay in payments from the owner to the contractor

S.NO.	Project Performance Problems	Factors Affecting the Project Performance			
		Project A	Project B	Project C	Project D
3	Quality	- Unavailability of quality materials	- Conformance to specification - Unavailability of quality materials	- Unavailability of competent workers	- Conformance to specification
4	Productivity		- Weather condition - Unavailability of equipments - Shortage of manpower as per the planned schedule - Sequencing of work according to schedule	- Failure of machines - Unskilled machine operators	- Weather condition - Sequencing of work according to the schedule - Shortage of manpower as per the planned schedule

S.NO.	Project Performance Problems	Factors Affecting the Project Performance			
		Project A	Project B	Project C	Project D
5	Client satisfaction	<ul style="list-style-type: none"> - Speed of delivering the project to the owner 	<ul style="list-style-type: none"> - Performance of the contractor - Speed of delivering the project to the owner - Number of that claims submitted from the contractor 		
6	Regulatory and community satisfaction	<ul style="list-style-type: none"> - Unfitted contractors' level to the stories number - Falling of materials from the building on peoples' moving near the site 			

4.32. Results of the selected case studies

5. CONCLUSION AND RECOMMENDATION

From the questionnaire survey and case studies results and discussions made before, the following conclusions drawn for the study.

5.1. Conclusions

1. The major performance problems that most frequently occurs in the selected university building construction projects has been cost, time, quality, productivity, client satisfaction and health and safety and In most of project sites, there is no any innovation and learning practice.
2. Escalation of material prices has been the critical factor that leads to project cost overrun and affect cost performance of the project. Material and equipment cost has a great impact on the project cost performance. And there have been too much variation orders on the projects and due to this the costs of these variation orders were too high.
3. There have not been sufficient resources in the project sites to accomplish the projects on the schedule and the critical factors which affect the time performance of the projects have been too much variation orders from owners, design change and financial constraints of contractors and also there has been delay in regular payments from owners to contractors.
4. Unavailability of quality materials and equipments or machineries has been the critical quality factors and most of the projects have not competent staff to achieve the quality of the projects and also contractors have problems of performance to conform the specifications of quality.
5. The critical factors which lead the projects to failure in productivity performance have been sequencing of work according to schedule, weather condition, shortage of manpower, unskilled machine operators, unavailability of competent staff and failure of machines. There has been a great absenteeism rate through the projects and due to this there is productivity problem on the project sites.
6. There has been the problem of delivering the projects to the owner and this leads to unsatisfying the project owners. The critical factors which affect client satisfaction has been number of disputes between owner and project parties and number of claims submitted from contractor.

7. There has been a lack awareness of workers to safety and a problem proper use of safety equipments. There has not been any health and safety application in the project site. The air quality and noise level which comes out from the machineries and equipments has been affecting the health of workers and also Falling of materials from the building on peoples moving near to the site has become the critical EHS problem.
8. The main key performance indicators have been cost, time, quality and productivity.

5.2. Recommendations

It's important for construction organization to identify the weakness of performance in order to solve and overcome. Based on the findings of the research, the following recommendations are suggested

5.2.1. Recommendations for owners

Owners are recommended to facilitate payment to contractors in order to overcome problem of delay, disputes and claims. All managerial levels should participate with sensitive and important decision-making. Continuous coordination and relationship between project participants are required through project life cycle in order to solve problems and develop project performance and it is recommended to minimize disputes between owner and project parties.

5.2.2. Recommendations for Contractors

Contractors should not increase the number of projects that cannot be performed successfully. In addition, contractors should consider business environment risk in their cost estimation in order to overcome delay because of materials shortage. A proper motivation and safety systems should be established for improvement of productivity performance of construction projects. Contractors are recommended to develop application of health and safety factors and awareness of workers on the advantages and usage of safety equipments. Contractors are recommended to minimize waste rate through project implementation in order to improve cost performance. They should be more interested with conformance to project specification to overcome disputes, time and cost performance problems. Contractors should be more interested with quality materials to improve cost, time and quality

performance and Contractors are recommended to give more attention with sequencing of work according to schedule.

5.2.3. Recommendations for Consultants

Consultants should be more interested with design cost by using multi criteria analysis and choosing the most economic criteria in order to improve their performance and to increase owners' satisfaction. In addition, consultants are recommended to facilitate and quicken orders delivered to contractors to obtain better time performance and to minimize disputes and claims.

5.2.4. Recommendations for Future Research

It is recommended to develop performance measurement framework and modeling system in order to measure performance of construction organizations and projects. In addition, it is recommended to study and evaluate other types of construction projects like roads and water and building construction projects which differs from the population used in this research.

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APPENDIXES

APPENDEX- A: QUESTIONNAIRE

Part One: General Information: Please add (X) as appropriate:

1. Type of Organization:

<input type="radio"/> Owner	<input type="radio"/> Contractor	<input type="radio"/> Consultant
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2. Job title of the respondent:

<input type="radio"/> Project Manager
<input type="radio"/> Site Engineer/ office engineer
<input type="radio"/> Others (specify)_____

3. Years of experience of the respondent :

<input type="radio"/> Less than 1 year	<input type="radio"/> From 1 to 5 years
<input type="radio"/> From 6 to 10years	<input type="radio"/> Over 10 years

4. Company Size (Number of labors or employees)

<input type="radio"/> Less than 50	<input type="radio"/> From 50 to less than 100
<input type="radio"/> From 100 to 250	<input type="radio"/> More than 250

Part Two: Performance Related Problems in Building Construction Projects

Below are numbers of performance related problems in building construction projects. From your experience, please express your opinion on rate of occurrences in building construction projects based on the representative numbers listed below. (Please tick the appropriate box).

1= Never, 2= Sometimes, 3= Usually, 4= Frequently and 5= Most Frequently.

S.No.	Performance Problems	Rate of Occurrences				
		1	2	3	4	5
1	Cost					
2	Time					
3	Quality					
4	Productivity					
5	Client Satisfaction					
6	Regular and community satisfaction					
7	Health and safety					
8	Innovation and Learning					

If any other, please specify.....

Please specify the reasons on the rate of occurrences on the above performance problems.

1. Cost: _____

2. Time: _____

3. Quality: _____

4. Productivity: _____

5. Client Satisfaction: _____

6. Regular and community satisfaction: _____

7. Health and Safety: _____

8. Innovation and Learning: _____

Part Three: Factors Affecting the Performance of Building Construction Projects

Below are numbers of factors affecting the performance of construction projects. From your experience, please express your opinion on the importance of the following as factors that affecting performance of building construction projects in university projects based on the associated numbers given here. (Please tick the appropriate box).

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

<i>Groups/Factors</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
(1) Cost factors					
Market share of organization					
Cash flow of project					
Profit rate of project					
Material and equipment cost					
Project labour cost					
Project overtime cost					
Cost of rework					
Cost of variation orders					
Waste rate of materials					
Escalation of material prices					
Differentiation of currency prices					
Incomplete drawing					
If any other,please specify					

<i>Groups/Factor</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
(2) Time factors					

Too many change orders from owner					
Poor project management assistance					
Unforeseen ground conditions					
Low speed of decision making					
Project complexity					
Effective communication					
Financial constraints					
Average delay in claim approval					
Average delay in payments from owners to contractors					
Site preparation time					
Unavailability of resources					
Time needed to rectify defects					
Time needed to implement variation orders					
If any other, please specify					
(3) Quality factors					
Conformance to specification					
Unavailability of competent staff					
Quality of equipment or machineries and raw materials					
Quality assessment system in organization					
Quality training or meeting					
Escalation of material prices					
Groups/Factor	1	2	3	4	5
Quality factors					
Incomplete drawing					
Incomplete technical specification					
If any other, please specify					

(4) Productivity factors					
Project size and complexity					
Management-labour relationship					
Absenteeism rate through project (late start and early exists)					
Number of new projects per year					
Sequencing of work according to schedule					
Local cultural characteristics					
Non-working holidays					
Local climate conditions					
Wedges amount					
Employees motivation					
Employees attitudes					
If any other,please specify					
Groups/Factor	1	2	3	4	5
(5) Client Satisfaction factors					
Leadership skills for project manager					
Number of disputes between owner and project parties					
Speed and reliability of service to owner					
Number of rework incidents					
Information coordination between owner and project parties					
Conflict					
Poor workmanship and incompetence workers					
If any other,please specify					

(6) Regular and community satisfaction factors					
Site condition problems					
Quality and availability of regulator documentation					
Cost of compliance to regulators requirements					
Number of non-compliance events					
If any other,please specify					
(7)Health and Safety					
Reportable accidents rate in project					
Application of health and safety factors in organization					
Assurance rate of project					
Easiness to reach to the site (location of project).					
Wastes around the site					
Climate condition and Air quality					
Noise level					
If any other,please specify					
Groups/Factor	1	2	3	4	5
(8)Innovation and Learning					
Learning from own experience and past history					
Learning from best practice and experience of others					
Review of failures and solving them					
Work group					

Training the human resources in the skills demanded by the project					
If any other, please specify					

Part Four: Key Performance Indicators’ Building Construction Projects

Based on the occurrence of performance related problems you filled under part two, below are numbers of key performance indicators’ of building construction projects. From your experience, please fill the effect of these occurrences on project performance to determine the key performance indicators of building construction projects in the selected university on the following rating numbers. (Please tick the appropriate box).

1=Very Low, 2=Low, 3=Medium, 4=High, 5=Very High

S.N.	Key Performance Indicators’	1	2	3	4	5
1	Cost					
2	Time					
3	Quality					
4	Productivity					
5	Client Satisfaction					
6	Regular and community satisfaction					
7	Health and Safety					
8	Innovation and learning					

If any other, please specify.....

APPENDIX – B: INFORMATION OF THE PROJECTS

S.No.	Client	Location	Building Purpose	Consultant	Contractor	Building Ht
1	AMU	Arbaminch University Main Campus	Assembly hall and office	A'	A''	B+G+3
2	AMU	Arbaminch University Sawla Campus	Class Room	B'	B''	G+2
3	AMU	Arbaminch University Sawla Campus	Dormitory	B'	B''	G+2
4	WSU	Woliata Sodo University	Library	D'	D''	G+2
5	WU	Welkite University	Dormitory	E'	E''	G+2
6	WU	Welkite University	Dormitory	E'	F''	G+2
7	WU	Welkite University	Dormitory	E'	G''	G+2
8	WU	Welkite University	Laboratory	E'	H''	G+2
9	WU	Welkite University	Dormitory	E'	H''	G+2
10	AMU	Arbaminch University Abaya Campus	Graduation hall and Office	F'	I''	G+2
11	AMU	Arbaminch University Main Campus	Office Complex	G'	A''	G+3
12	AMU	Arbaminch University AKULFO campus	Instructor Dormitory	A'	J''	G+3
13	WAU	Wachamo University	Dormitory	H'	K''	G+2
14	WAU	Wachamo University	Lecture Hall	H'	L''	G+2
15	WAU	Wachamo University	Dormitory	H'	M''	G+2

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16	WAU	Wachamo University	Auditorium and office	H'	M''	G+2
17	WAU	Wachamo University	Dormitory	H'	N''	G+2
18	AMU	Arbaminch University	Sport and recreation center	I'	L''	G+2
19	AMU	Arbaminch University Main Campus	Architecture Department Building	A''	A''	G+4
20	WAU	Wachamo University	Dormitory	H'	K''	G+2
21	WSU	Wolaita sodo university	Library	D'	O''	G+2
22	WSU	Wolaita Sodo university	Dormitory	A'	P''	G+2
23	WSU	Wolaita Sodo university	Office building	D'	P''	G+3
24	WSU	Wolaita Sodo university	Class room	A'	M''	G+2
25	WSU	Wolaita Sodo university	Lecture Hall	A'	H''	G+2
26	WSU	Wolaita Sodo university	Dormitory	D'	D''	G+2
27	AMU	Arbaminch University	lecture hall	A'	Q''	G+2
28	AMU	Arbaminch University Main campus	Management building	A'	R''	G+3
29	WSU	Wolaita Sodo university Ottona campus	Lecture Hall	A'	S''	G+2
30	WSU	Wolaita Sodo university	Office	D'	T''	G+2
31	WU	Welkite University	Dormitory-CYT	E'	G''	G+2
32	WU	Welkite University	Dormitory T1	E'	U''	G+2
33	WU	Welkite University	Dormitory T1	E'	V''	G+2

APPENDEX- C: GENERAL INFORMATION:

Type of Respondents Organization:

Type of Organization	Frequency	Percentages %
Owner	10	28.57 %
Contractor	14	40.00 %
Consultant	11	31.43 %
Total	35	100

Job title of the respondent:

Job title of the respondent	Type of Organization					
	Owner		Contractor		Consultant	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Project Manager	3	30.00 %	7	50 %	3	27.27 %
Site or Office Engineer	4	40 %	4	28.57 %	5	45.46 %
Others	3	30 %	3	21.43 %	3	27.27 %
Total	10	100 %	14	100 %	11	100 %

Years of experience of the respondent:

Years of experience of the respondent	Type of Organization					
	Owner		Contractor		Consultant	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Less than 1 year	2	20.00 %	1	7.14 %		-
From 1 to 5 years	4	40.00 %	7	50.00 %	3	27.28 %
From 6 to 10years	3	30.00 %	4	28.57%	7	63.63 %
Over 10 years	1	10.00 %	2	14.28 %	1	9.09 %
Total	10	100 %	14	100 %	11	100 %

DECLARATION

I declare that this thesis entitled “**Assessment of construction performance challenges in selected university building construction projects**” is my original work. This thesis has not been presented for any other university and it’s not concurrently submitted in candidate of any other degree and that all sources of material used for thesis have been duly acknowledge

Name: Biyadgign Tagesse

Signature.....

June, 2017

