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SCHOOL OF CIVIL ENGINEERING

STUDY ON TIME AND COST PERFORMANCE ASSESMENT OF PUBLIC CONSTRUCTION PROJECTS IN TIGRAY REGION: A CASE STUDY IN ABIADI TOWN.

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Time and Cost Performance Assessment of Public Construction Projects in Tigray Region: Case Study in Abi Adi town.

A Project Submitted to School of Civil Engineering in Partial Fulfillment of The Requirement for The Degree of Master of Engineering in Civil Engineering (Construction Technology and Management).

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DECLARATION

I declare that, this research entitled: Assessment of Time and Cost Performance of Public Construction Projects in Tigray Region: A Case Study of Abi Adi Town was composed by myself, with the guidance of my advisor, Frehiwot A. And this work has not been submitted, in whole or in part, for any other degree or professional qualification.

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ABSTRACT

Most of Ethiopian construction projects are affected by time and cost performance problems. This research was conducted in an attempt to identify major factors for such problems in the typical environment of Ethiopia Tigray region in case of Abi Adi town. The main objective of this study was to assess the performance of public construction projects in Abi Adi town with respect to their time and cost. And under this, specific objectives were also drown: To evaluate the performance of public construction projects in relation to project time and cost, to identify the factors influencing public construction projects to perform the construction project as per required time and cost in Abi Adi town. Quantitative research method was used to collect the data and questioners were prepared and distributed to the three professional bodies of the construction projects, such as owners, consultants, and contractors. To analysis the data collected from the respondents, performance index and relative important index statistical methods were used. The result of the finding indicated that, high number of time and cost performance of the projects was below target and poor performance. The study has identified client, consultant, contractor and external environment related factors that resulted on time overrun: such as, delay to payment and financial problem, delay to deliver the site, poor communication and coordination, absence of consultant site staff, poor skills and experience of labor, Poor site management and lack of site contractors' staff, lack of equipment and tools on the market, poor economic condition, Lack of materials on the market and Delay in obtaining permits from municipality. The cost performance factors were; Inadequate project preparation, planning and implementation delay in construction, technical incompetence and poor organizational structure, delays in decisions making by government, failure of specific coordinating bodies, supply of raw materials and equipment by contractors, and resources constraint such as: funds foreign exchange, power associated auxiliaries not ready. Finally the main stakeholders of the construction projects should improve problems related them and use resource effectively and efficiently.

Keywords*: *public construction projects, owner, consultant, contractor, KPI, RII, time and cost performance.

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ACRONYMS

UK	United Kingdom
RII	Relative important index
PMI	project management Institute
KPIs	Key Performance Indicators
SPI	Schedule performance index
CPI	Cost performance index
CSA	Central Statics Agency
PMI	Project Management Institute
IM	Interface management
PM	Project Manager
MoFED	Ministry of Economic Development
OCC	Oromo Cultural Community

CHAPTER ONE

1. INTRODUCTION

1.1. Back ground of the study

Construction industry plays an important role in the development and economic growth of any nation. The pace of economic growth can be measured through the development of different construction projects such as buildings, roads, highways and bridges etc. construction, processes area involved in the development of construction project as well as many contributions from both general and private parties in order to complete the project in a successful manner.

In Ethiopia construction project performance problems appears through different directions and Due to several reasons, construction projects challenges in their performance instead of achieving their planned goals. Most of these challenges are related what we call it project performance problems as cited by (Habenom.G, 2017).

The construction industry is a large and complex industry involving various stakeholders(government, industry, private parties, and investors) designers and construction monitors(engineers and architects) construction workers, field managers, supervisors; and craftsmen. Furthermore, products are usually 'custom made', with almost every project constituting a separate and unique entity which is conceived, financed, designed, constructed, and operated separately. Each of the groups that contribute directly or indirectly to construction are represented by individuals, organizations, or associations, each with diverse and often ever-increasing demands diverging interests, but in any construction project, the main people involved and who must be present are the three Cs as Clients, Consultants and Contractors according (Abadir.H, 2011).

Cost, time, and quality are used to measure the project performance and success. Generally, the success of a project is defined by accomplishing it within specified cost, time and quality. However, the construction industry is full of projects that are completed with significant time and cost overruns (Amhel etal, 2010).Construction projects represent a unique set of activities that must take place to produce a unique product. The success of a project is judged by meeting the criteria of cost, time, safety, resource allocation, and quality which are determined by the

owner. The purpose of Project Management is to achieve goals and objectives through the planned expenditure of resources that meet the project's quality, cost, time, scope, and safety requirements. The construction manager must control, deflect, or mitigate the effects of any occurrence or situation that could affect project success (Muir B. , 2005).For the purpose of this research, time overrun is defined as the time difference between the actual completion time and the estimated completion time, agreed by and between the client and the contractor during signing of the contract. And cost overrun is the cost difference between the actual completion cost and the estimated completion cost.

Construction projects are characterized by the complexity of the factors that can affect their successful completion. These factors can be caused by the owner, the contractor, the consultant and the construction site conditions. Abi Adi is the developing town in the central zone of Tigray region which has so money half-finished construction projects due to different reasons. From this idea the researcher stands to assess the performance of public construction projects and the factors that challenge/affect the construction projects time and cost performance.

1.2. Statements of the problem

Ethiopian construction projects performances were mostly challenged by time and cost overrun as stated by different Ethiopian scholars. The performance of construction projects is depending on the project time, cost and quality performances. The time and cost performance of the construction project can be challenged by a number of factors raised from different sources at different places. The purpose of this study was to evaluate time and cost performance of the public construction projects in Tigray region a case study in Abi Adi town and to identify the factors that affects the time and cost performance of those construction projects in the town.

1.3. Research questions

- What is the performance status of public construction projects in relation to construction time and cost in Abi Adi town?
- What are the main factors that affecting the time performance of public construction projects in Abi Adi town?
- What are the main factors that affecting the cost performance of public construction projects in Abi Adi town?

1.4. Objectives of the study

The main objective of this research was**:** To assess the performance of public construction projects in Abi Adi town with respect to their time and cost.

1.4.1. The specific objectives of the study:

- To evaluate the performance of public construction projects in relation to project time and cost in Abi Adi town.
- To identify the factors influencing public constructions projects to perform the construction project as per required time in Abi Adi town.
- To identify the factors influencing public construction projects to perform the construction project as per required cost in Abi Adi town.
- To recommend a solution of all factors influencing public construction projects performance in Abi-adi town

1.5. Significance of the study

The major significances of the study are:

- The study is important, to encourage construction projects to improve their performance thoroughly to avoid time and cost overrun of projects.
- It may create awareness on project performance for the respondents of this research in particular and the construction project professionals in general.
- The result of this study can be used as initial bench mark information for future study.

Generally it may formulate recommendations to improve performance of construction projects. This study is significant to professionals, decision makers, policy designers and practitioners to look for the best performance, methods and process of doing and managing public construction projects. It uses to coordinate human, material and other resources efficiently and effectively. At the end, this study may help to review existing policies, regulations, and manuals to create conducive environment for effective and efficient managing of project objectives.

1.6. Scope and limitation of the study

This study was conducted in some selected area of public construction projects found in Tigray Region located in Abi Adi town. In this project work, Abi Adi town municipality as owner, Abi Adi town Construction Office as consultant and contractors involved in public construction

projects as a contractor are constitute in the study population. Due to time and budget constraints, the study was restricted only on public construction projects in Abi Adi town. This study focuses on performance assessment of public construction projects in Abi Adi town and the study was cover the performance of public construction projects they were under construction from September 1- jun30 during the year 2016 only.

1.7. Organization of study

This work is organized into five chapters.

➢Chapter One**,** Introduction: background of the study, statement of the problem, research questions, and objectives, benefit of the study, scope and limitations of the study were provided. Chapter two, literature review, chapter three, included methodology, research design, target population and sample, data collection techniques, data analysis methods, chapter four, result and discussion, and finally, chapter five**,** presented conclusions and recommendations were made based on the findings.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Background of the construction industry

The construction industry is the largest and most complex fragmented industry that involves owners (government, industry, private parties, and investors), designers and construction monitors (engineers and architects), constructors, field managers, supervisors, and craftsmen. Furthermore, the product is usually "custom made," with almost every project a separate and unique entity, conceived, financed, designed, constructed, and operated separately. Each group that contributes directly or indirectly to construction is represented by individuals, organizations, or associations with diverse and often fragmented interests. All the other contributors to the overall construction effort, including government representatives, planners, engineers, architects, bankers, bonding companies, material suppliers, lawyers, accountants, and others, are equally diverse in their talents, interests, and ways of operating problems (Habenom.G, 2017).

As cited by (Metri .et al, 2005) the construction industry of any country is the backbone of the infrastructure and economy though it is a major contributor to the economy of any country. Among the major economic sectors, the importance of the construction industry is unique regardless of whether the country is underdeveloped, developing, or developed.

Construction, as defined by the United Nations Statistics Division, is “an economic activity directed to the creation, renovation, repair or extension of fixed assets in the form of buildings, land improvements of an engineering nature, and other such engineering constructions as roads, bridges, dams and so forth.” It is a process that consists of building or assembling infrastructure in architecture and civil engineering. It comprises the building of new structures, including site preparation, as well as additions and modifications to existing ones (CSA, 2011).

Ethiopian Construction Industry is one of the engines of the country’s economy. It has significant impacts on the efficiency and productivity of various sectors. Country’s construction industry is booming with the rising need for public facilities (Temesgen et al,, 2020). However, the practice of the construction industry faces a lot of problems from time and cost overruns. Construction projects fail to go in line with the original contract duration and contract amount due to different known and unknown factors (Nesru and Tadele, 2020).

2.2. Construction Project

A project is temporary, according to the Advance Project Management Institute (PMI, 2008) because it has a stated start and end date, as well as a defined scope and resources. It's also distinctive in that it's not a typical procedure. Construction is defined as the process of combining materials, equipment, and machines into a permanent structure. It is broadly defined to include the construction of physical infrastructure (roads, trains, and harbors), as well as all construction work (including housing) and the maintenance and repair of existing structures.

As presented by (Takim, R and Akintoye A., 2002), the construction industry is vital for the development of any nation. In many ways, the pace of the economic growth of any nation can be measured by the development of physical infrastructures, such as buildings, roads and bridges. Construction project development involves numerous parties, various processes, different phases and stages of work and a great deal of input from both the public and private sectors, with the major aim being to bring the project to a successful conclusion.

Construction is the realization phase of the civil engineering process, following conception and design. It is the role of the constructor to turn the ideas of the planner and the detailed plans of the designer into physical reality. The owner is the ultimate consumer of the product and is often the general public for civil engineering projects. Not only does the constructor have an obligation to the contractual owner, or client, but also an ethical obligation to the general public to perform the work so that the final product will serve its function economically and safely (Chen W.F. and Richard Liew J.Y., 2003).

Construction projects represent a unique set of activities that must take place to produce a unique product. The success of a project is judged by meeting the criteria of cost, time, safety, resource allocation, and quality which the owner determines. Project Management aims to achieve goals and objectives through the planned expenditure of resources that meet the projects quality, cost, time, scope, and safety requirements. The CM must control, deflect, or mitigate the effects of any occurrence or situation that could affect project success (Muir B. , 2005).In any construction project, time, cost, and quality are considered to be the basic project parameters. Often, these parameters are considered the three sides of a triangle. A project should satisfy all three parameters to be successful (Haughey.D, 2011).In the project control process, controlling the above variables is paramount. Time should be controlled by controlling and adjusting the schedule so that the project progress must be much with the planned progress. The project may

be completed within the planned contract time; cost should be controlled so that the project may be completed within the earmarked budget (the project must be completed without exceeding the authorized expenditure), the scope (performance and quality) should be controlled in order to maintain the anticipated employer's requirements and quality so that the result of the project must fit its intended purpose (Westland J., 2018).

2.3. Construction Project Management

Construction projects can be considered as the largest industry in the world. Growth during this industry, in reality, is an indicator of the economic conditions of a country. Since, most construction projects comes show value overruns, time extensions, and conflicts among parties and failure in the safety and quality sector. Design to control practical information for reaching the project objectives is a significant component of project management. The project management is the planning, organizing, directing, and controlling of company resources to achieve specific goals and objectives. In the project management which are cost, time and performance are the main objects, but in the construction project management its cost, time and quality which did not change fundamentally. (Walker, 2015) Indicates that project manager's skills and perceptions in managing different construction activities effectively contribute to project success and client satisfaction.

Project management involves monitoring project performance based on indices (Sharma R. and McDonough, 2015).professional competency in project management is attained by the combination of knowledge acquired during training, and skills developed through experience and the application of the acquired knowledge. Much of the knowledge needed to manage construction projects is unique to project management (such as critical path analysis and project cash flow forecast).Generic areas of knowledge that construction project managers are usually expected to acquire by various Accreditation Bodies and, which reflect their technical requirements for certification.

(Chen W.et al, 2007), stated that interface Management (IM) is very important in applying lean principles to construction. Effective IM over organizational or contractual boundaries can smooth information/material flows between sub-processes or disciplines and thus minimize waste. As a result, flow improvement is successfully balanced with conversion improvement. It is worth to mention although communication and coordination may not directly add value to the

project that they should be conducted more efficiently rather than suppressed. A well-controlled interface between a client and designers helps incorporate customer requirements into design and increases the output value and flexibility. Efficient IM simultaneously ameliorates other interfaces between or among designers, contractors, suppliers, fabricators, etc. The whole project process becomes transparent and control of the "complete" process is increased. IM emphasizes reducing the number of physical interfaces through component integration and standardizing interfaces. Integration decreases the number of parts, steps, linkages, and therefore simplifies the construction process and the quality management system.

As presented by (Jang ,et al, 2003), efficient management of construction material planning tasks requires an integrated approach toward various logistical functions. In particular, the fundamental construction operations of facilities, inventory control, and communication planning need to be closely coordinated. Thus, the role of the project manager (PM) who executes these operations with all parties in a contract is very important to the successful completion of a construction project. Overall understanding and proper planning of the project are factors necessary to optimize satisfaction of both the construction company and the customer.

2.3.1. Project Time Management

The success of construction project depends on its performance, which is measured based on timely completion, within the budget, required quality standards and customers' satisfaction (Omran, 2012).Project Time Management is a process of defining Activities, Sequencing Activities, Estimating Activity Resources, Estimating Activity Durations, Developing Schedule in Project Planning Process; Controlling Schedule in Project Monitoring and Control Process (PMI, 2008). Planning is the most essential and challenging phase in the project development cycle. It is highly sensitive to the project environment that is, the technology used, and the existing management and industry practice for a particular work. Planning is also the process of representing the project scope by its identifiable components.

According (Kar D., 2009),recommendation for controlling project delay is identifying the project life cycle phases using WBS for listing of activities and work packages, assigning responsibilities on specific groups and persons within and outside the project organization. It is recommended that the activity network be developed by proper interfacing of the activities in the

WBS. On the aspect of arresting slippage, it is recommended to take up the following steps, delay identification, delay quantification, problem analysis, and delay analysis.

Corrective Action On applications of corrective action, the project response to the action applied has to be measured and action has to be revised till the desired result namely, minimizing or eliminating the delay is achieved. Projects have a natural tendency of getting delayed. As presented by (Alshawi M. &Ingirige B., 2003), the need to achieve faster results with the given resources, places severe time pressures on the entire project team.

As presented by (Muir B. , 2005), time is money to owners, builders, and users of the constructed facility. From the owner's perspective there is lost revenue by not receiving return on investment, cash flow crunch, potential alienation and loss of clients/tenants, extended interest payments, and negative marketing impacts. From the users' perspective, there are financial implications similar to owners. Delays in upgrading facilities translate into operating at below optimum efficiency resulting in higher user cost. Delays in constructing or rehabilitating infrastructure negatively affect businesses and the public at-large. Time implications from the constructor's perspective include liquidated damages (negative) and incentive/disincentive payments. Delays result in extended overhead costs and put a crisis on critical cash flow. Extending project durations limits the constructor's bonding capacity and ability to bid more work (opportunity cost). Inefficient time management results in higher labor and equipment costs. A reputation for late completions is bad for business, especially in negotiated work.

As presented by (Sharma R. and McDonough, 2015), as cited in (Nuredien, 2018)Schedule performance index (SPI): represents how close actual work is being completed compared to the schedule.SPI is computed by using the equation shown below.

$$\mathrm{SPI} = \mathrm{BCWP}/\mathrm{BCWS}$$

$$\mathrm{BCWS} = \mathrm{PWPP} * \mathrm{TOTALPROJECTCOST}$$

Where: - BCWP= (budgeted cost of work performed).

BCWS = (budgeted cost of work scheduled).

PWPP = (planned work performance percent).

The rating method of performance is shown in the table below.

Table 1.Rating method of time performance using SPI

condition	Rating	index range
A	Poor performance	I $\leq$0.85

B	Below Target	$0.85 < I \leq 0.95$
C	Within Target	$0.95 < I \leq 1.05$
D	Exceeds Target	$1.05 < I \leq 1.15$
E	Outstanding performance	$I > 1.15$

In the Ethiopian construction industry, a big part of the labor forces and managers have insufficient knowledge and skills within the construction area which often causes delays and low performing quality. There are a large number of labors in projects, but old-fashioned work methods and outdated tools often make the efficiency in production low (Karlsson, P., 2011).

Project Time Management includes the processes required to manage timely completion of the project. According to (PMI, 2008), Project Time Management processes are to: Define Activities, Sequence Activities, Estimate Activity Resources, Estimate Activity Durations, Develop Schedule, and Control Schedule. The above activities include the process of identifying the specific actions to be performed to produce the project deliverables, identifying and documenting relationships among the project activities, estimating the type and quantities of material, people, equipment, or supplies required to perform each activity, approximating the number of work periods needed to complete individual activities with estimated resources, analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule, and monitoring the status of the project to update project progress and managing changes to the schedule baseline respectively.

2.3.2. Project Cost Management

Project Cost Management includes the processes involved in estimating, budgeting, and controlling costs so that the project can be completed within the approved budget (PMI, 2008)**.**As presented by (Kubba S., 2010), A project budget estimate is a financial plan to design and build a particular project and setting out the estimated costs to complete the project. Regardless of whether the project to be constructed is large or small, a prudent developer will certainly find it necessary to develop a budget for it. The primary purpose of preparing a budget is to understand and control costs and cost overruns. Cost overruns are mitigated by the inclusion of appropriate contingencies in the budget estimate to cover change orders, and these

contingency allowances are disbursed as the project proceeds to cover the additional costs. Often the initial cost plan is based on unconfirmed estimates, which nevertheless provide a fair basis for determining the validity of future assessments. The project manager is able to control costs by instituting ongoing reviews of estimates for each cost center against its target budget.

As presented by (Sharma R. and McDonough, 2015), as cited in (Nuredien, 2018), cost performance index (CPI): represents the amount of work being completed on a project for every unit of cost spent. CPI is computed by using the equation shown below.

$$\mathrm{CPI} = \mathrm{BCWP}/\mathrm{ACWP}$$

Where: - BCWP= (budgeted cost of work performed).

ACWP= (actual cost of work performed).

The rating method of performance is shown in the table below.

Table 2.The rating method of cost performance using CPI.

condition	Rating	index range
A	poor performance	$I \leq 0.85$
B	Below Target	$0.85 < I \leq 0.95$
C	Within Target	$0.95 < I \leq 1.05$
D	Exceeds Target	$1.05 < I \leq 1.15$
E	outstanding performance	$I > 1.15$

As presented by (Benator B., Thumann A., 2020), a careful review of the procurement program is essential, as the equipment or material costs can be more than 50% of the total cost. The typical considerations such as: Quality vendors information or experience of suppliers, Domestic vs. worldwide purchasing plan, Import duties, taxes, delivery charges (company exception),Currency considerations and exchange rates, Vendor servicemen requirements, Plant compatibility of existing vs. new, Ease of maintenance or operating Costs, Spare parts requirements, Inspection and expediting requirement etc.

Critical purchasing plan (schedule priority) Project Cost Management includes the processes involved in estimating, budgeting, and controlling costs so that the project can be completed within the approved budget.

According (PMI, 2008), Project Cost Management processes are to: Estimate Costs, Determine Budget, and Control Costs. generally, Estimating costs is the process of developing an approximation of the monetary resources needed to complete project activities, Determining budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline and Controlling costs is the process of monitoring the status of the project to update the project budget and managing changes to the cost baseline.

2.4. Performance Indicators

Construction project management KPIs are specific measurement tools indicating how well team members achieve particular goals. They reflect the targets of a project management team and solidify the tasks and processes at the construction job site. Key Performance Indicators (KPIs) can change the dynamics of a project: let's explore setting practical and useful construction project management KPIs help you make the right decisions to ensure better control of costs and schedule. They determine how teams achieve goals and provide critical data for effective decision-making throughout the project .in addition KPIs are therefore essential to better control costs and schedules. They are meant to determine which activities are relevant during the execution phase and could provide early warning signals to adjust the project. While keeping track of cost management is essential, construction KPIs related to safety, quality, performance, staff, and sustainability are key factors to better-controlling costs and schedules (ShanthiR., 2023).

(Elattar, 2009) defined Key performance indicator as measurable factor of extreme importance to the organization in achieving its strategic goals, objectives, vision, and values that, if not implemented properly, would likely result in a significant decrease in customer satisfaction, employee morale, and effective financial management. In relation to this, the UK working groups on Key Performance Indicators (KPIs) have identified ten parameters for benchmarking projects, in order to achieve a good performance. 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 (Takim R.and Akintoye A., 2002). It used for evaluating performance of construction projects.

These indicators can also be used for benchmarking purposes, and will be as a key component of any organization to move towards achieving best practice and to overcome performance problem (Auma, 2014),and identification of KPIs helps set a benchmark for measuring the performance of a construction project.

2.5. Factors That Influences Cost and Time Performance of Construction Projects

The challenges of construction project management in Ethiopia are low capacity of domestic private contractors in knowledge, skill, equipment ,finance and Shortage of construction materials (MoFED, 2010),contractual and bureaucratic problems (Seid, 2008).

2.5.1. Factors affecting project time performance

According to (AbubekerJemal, 2015), project time has been defined as the duration that is needed to complete the work starting from site handover until finished. Project time performance is the most important indicator of project success. Time overrun is a severe problem in the construction industry where only rare projects are completed on the estimated time. Projects are considered as overrun in time, which are completed beyond the date of completion specified in a contract, or beyond the date that the parties agreed upon for delivery of a project.

2.5.2 Definition of Time Overrun

Time overrun is any delay beyond the baseline construction schedule. Minimizing time and cost is the main goal in managing a construction project. However, time delay frequently occurs in all phases of a construction project and consequently increases the project total duration (Aftab Hamed Memos, 2011).

The same way, (AbubekerJemal, 2015) defines time overrun as the inability to complete a project either by the original planned time or budget, or both, ultimately results in project delay.

Time overrun is caused by various reasons such as poor site management and supervision, which can affect the productivity. Various researchers including (Aftab Hameed Memon, 2014)have highlighted several factors affecting time overrun.

As presented by (Shaikh,et al, 2010), delay is one of the most common, important and serious problem which impacts the time factor with relation to cost of projects in the Construction Industry, identified four delay factors representing reason of late in development projects. They are client problems, contractor problems, resources problems, and general problems.

A. Client problems include: Bid problems, incomplete drawings and specifications, Delay in work approval, Change orders or change site conditions/changes in scope of work, Delays in inspection and testing of work, late payment by client to the contractor during construction, slow decision making, delay to furnish and deliver the site, lack of working knowledge, Lack of coordination with contractors

Contractor problems include: Planning and scheduling problems, late payment by contractor to workers during construction, Poor performance of work,

C. Resource problems include: predictability of development materials suppliers, Late delivery of material, Supplier and late delivery of equipment, Low quality of materials, Shortage of workers, Shortage of equipment, Failure of equipment, Inflation.

D. General problems include: Environmental problems, Ground problems and Weather problems. All the above problems are post-project award problems which can be managed by the contractors by planning these as risks and planning their respective responses and implementing them, except Bid problem from the client side.

The survey findings indicate that the most important factors affecting project performance are: delays because of materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials (Enhassi, 2009).

(Ahmed S.et al, 2003), Identified the following factors causing delays in construction projects. They have categorized the factors that cause delays in the four categories, those are due to:

Owner's responsibility: include delay to furnish and deliver the site**,** Lack of working knowledge**,** lack of coordination with contractors, Change orders by owner during construction(replacement and addition of new work to the project and change in specifications)**,** Financialproblems(delayedpayments,financialdifficulties,andeconomicproblems)**,**Slowness in decision making process and Poor communication and coordination.

Contractor's responsibility: The factors that are related to contractor's responsibility are Poor qualification of the contractor's technical staff, Shortage of materials on site, Construction mistakes and defective work, Lack of site contractor's staff, Poor site management, Poor skills and experience of labor, Shortage of site labor, Low productivity of labor, Financial problems

Coordination problems with others and Conflicts in sub-contractor's schedule in execution of project delays in site mobilization.

Consultant's responsibility: The factors that are related to consultant's responsibilities are; absence of consultant's site staff**,** lack of experience on the part of the consultant**,** Inadequate experience of consultant**,** Delay in approving major changes in the scope of work and Mistakes and discrepancies in design documents.

External factors: include factors such as; Delay in obtaining permits from municipality, Lack of materials on the market**,** Lack of equipment and tools on the market, Poor weather conditions; poor site conditions (location, ground, etc.),Poor economic conditions (currency, inflation rate, etc.)In addition to the above, as presented by (Gizaw, 2021)the most common causes of delays and their associated costs in Ethiopian context were: Differing soil and site conditions Limited access to the site (partially or totally) not ready for work to progress, Unusual and long rainy weather condition, War and instability, Shortage of spare parts, Untimely payment, Poor planning and control, Increase in scope (design changes/extras),Poorly equipped contractors and Public sector agencies lack of motivation, and lack of experience in project management.

Most of the delays were concurrent delays. That is to say that delays occurred by contractor, owner and third party at the same time. Some delays are sole responsibility of either contractor or employer. The overlapping of the causes of delays makes difficult to identify which portion of delay is which party's sole responsibility. Poor record keeping of events makes the problem even worse. It is obvious that delays result in additional cost to both the owner and the contractor.

2.5.3. Factor affecting project cost performance

The project cost is the amount of money that is required to complete all project activities (AbubekerJemal, 2015). Project cost has its proven importance as the prime factor for project success. In spite of its proven importance, it is not uncommon to see a construction project failing to achieve its goal within the specified cost. Cost overrun is a very frequent phenomenon and is almost associated with all projects of the construction industry (Turkey, 2011). The lack of fulfillment of cost management functions often leads to project overruns producing an immediate impact on construction stakeholders.

2.5.4 Definition of Cost Overrun

According to (AbubekerJemal, 2015)cost overrun is the amount by which actual costs exceed the baseline or approved costs. As presented by (Staveren, 2006), Project cost increases due to failure costs in the construction industry. Failure costs are defined as any costs resulting from unforeseen problems in construction projects. Typical causes are incorrect actions or deliveries, delay in the procurement of permits, (too) late design changes and particularly unforeseen ground conditions. These unforeseen problems often result from a lack of communication, information and time. Failure costs result in a waste of money, time and energy for most of the stakeholders involved. Rather than bringing projects to a minimum acceptable level of quality, it is far better to use these resources to reduce costs further, or to increase profits and quality. Yet, very often senior executives driven by the ever present cost-cutting syndrome, often choose to ignore the whole integrated process of project management and concentrate on the P, C, T, S (Performance, Cost, Time, Scope) items only at the expense of the other five softer but vital issues of the discipline. This practice is perhaps the main reason for project failure and project service providers need to alert their clients to this inherent danger (Read H.W., 2008).

Poor of site supervision and management and poor project management assistance contribute to problem of cost overrun in construction projects. Poor of site management reflected the weakness and incompetency of contractors when Skillful and experience human resource is insufficient in site management (Long et al., 2008).

According to (AbubekerJemal, 2015), ten factors that influence cost overruns of construction projects were found. These factors are: Supply of raw materials and equipment by contractors, Inadequate project preparation, planning and implementation, delay in construction**,** Change in the scope of the project, Resources constraint: funds, foreign exchange, power; associated auxiliaries not ready, Delays in decisions making by government, failure of specific coordinating bodies, Wrong or inappropriate choice of site, Technical incompetence and poor organizational structure, Labor unrest and Natural calamities and Lack of experience of technical consultants, inadequacy of foreign collaboration.

As presented by (Yigezu, 2008), in addition to the delay with Ethiopian Contractors, it was also found out that cash flow problem of contractors, profit loss and poor quality output may result as a result of unpredicted price fluctuation. Therefore, it can be that price fluctuations can result in

poor project performance by delaying project time, by increasing the project cost and by making contractors to deliver poor quality projects.

The Ethiopian construction industry has a widespread problem concerning cash flow in projects. As a consequence of this problem, there are a lot of half-finished buildings that are on hold until the owner manages to finance further production. Due to the cash flow instability in projects, many sub-contractors and suppliers demand cash or check payment in advance to performed work or delivery (Karlsson, P., 2011).

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

This research was conducted in Abi Adi town and which includes separate woreda in the surrounding and it was capital former town of Tembien. The town is located about 870 kilometers north of Addis Ababa in the central zone of the Tigray region and has total surface area of 2000 hectares. Abi Adi has total population of 51000.The town has a latitude and longitude of13°37´23´´N 39°00´06´´E/13.62306°N3900167E° with an elevation ranging from1917 to 2275 meters above sea level.

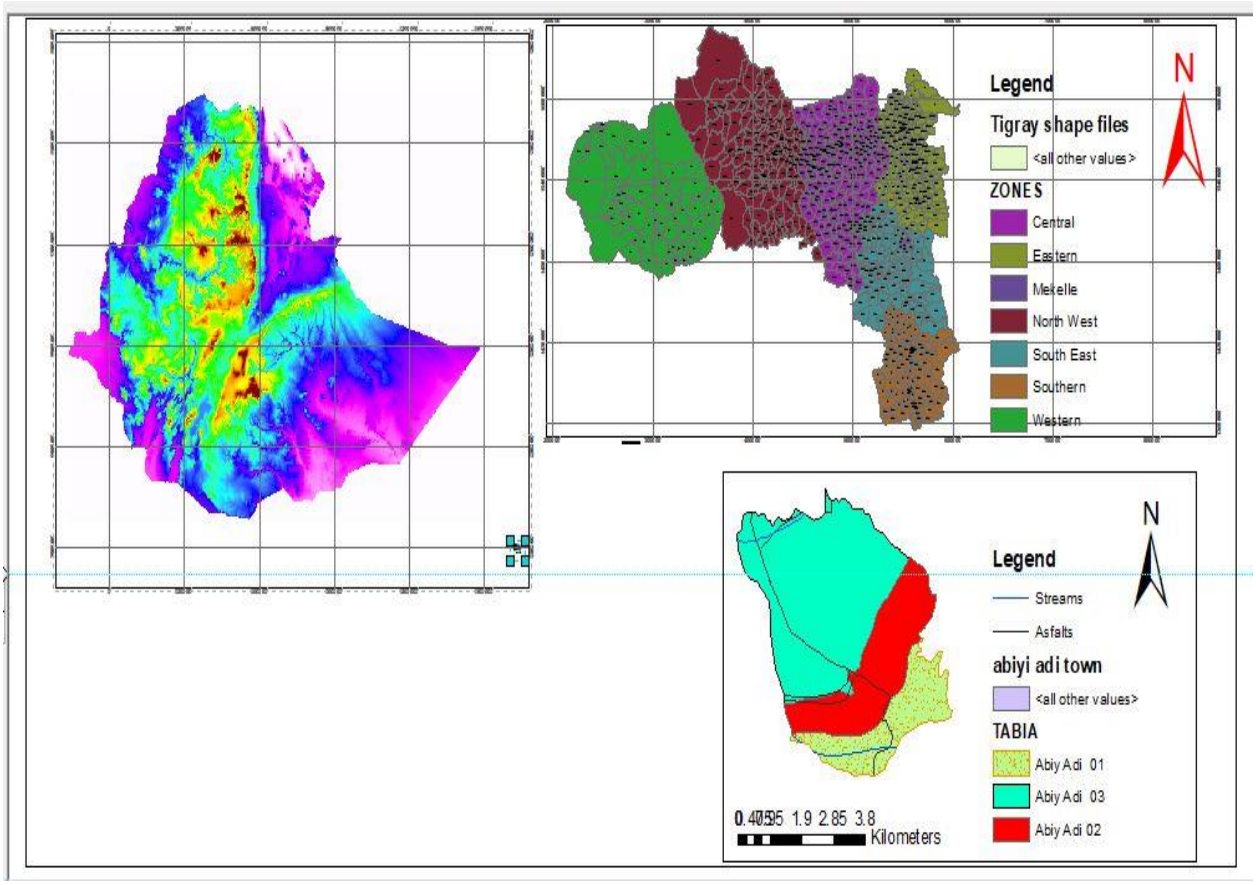

Figure3. 1.location of the study area

3.2. Research Design and Approach

In this study, quantitative research method was used and the data was collected by using the designing of a structured questionnaire survey. Questioners were prepared and distributed to the three professional bodies of the construction projects, such as owners/clients, consultants, and contractors. The data obtained from respondents were separated into three groups of contractors, consultants and Clients. Data was analyzed by using statistical approaches like mean, variance, standard deviation, severity index, coefficient of variations, and performance index, relative important index methods.

3.3. Sampling and Questioners Distribution

The population was considered all public construction projects in Abi Adi town which were under construction in the year of 2016 E.C. The selected construction projects were including roads, buildings, drainages and retaining walls. The study targeted public construction projects in Abi Adi town designed and implemented under the supervision of the town municipality. The target population was made up of 24 public construction Projects.

In the study area there were countable numbers of active public construction projects, and it is easily manageable. Due to this fact, the researcher decided to consider all (ongoing) active public construction projects during the study period by using non-probability sampling method. According to (Alemayehu, 2016) , there is a consensus among case study research methodology scholars that non-probability sampling was recommended for case study research; they suggest that samples were selected purposively because they are information-rich case studies that allow deep investigation and analysis to answer the research questions.

As planned by the researcher 50 questioners were distributed to respondents: 10 questioners for the clients, 28 questioners to contractors and 12 questioners were distributed to the consultants by using purposive sampling. The reason why the researcher uses this sampling method is that, to get best information, those who have previous and current working experiences in construction projects were selected as respondents. Out of which only 42(89.3%) of the questioners: 9(90%) questioners from the owners, 25(89.3%) questioners from the contractors and 8(66.7%) questioners from the consultants were totally filled and collected back. The results obtained from the respondents through the survey questioners were presented in the tabular forms.

3.2.3. Data collection and analysis method

The objective of the research was studied by applying the following methods:

Structured Questionnaires**:** The first to third objectives of this research work were addressed mainly through developing structured questionnaires and distributed to professionals working in the construction project area under consideration. In this, the questioners for contractors had additional structure to gather data for the project performance. The questionnaires were sent out to the proposed professionals by personal submission. Responses obtained from respondents were separated into groups of clients, consultants and contractors. Each group was independently analyzed by using performance index method and Statistical methods like the mean, standard deviation, variance, relative importance index, severity index, and coefficient of variations were used to the analyses the given data.

Objective 1: The first objective of the study was carried out, by preparing and submitting to the contractors of the public construction projects and semi structured questioner that uses to collect the data in relation to time and cost performance status of construction projects. The obtained data from the respondents were then analyzed by using the performance index method. Then, based on the result, the performance was rated and categorized in to five performance conditions. Such as: - 5, outstanding performance, 4, exceed target performance, 3, within target performance, 2, below target performance and 1, poor performance.

Objective 2: The second objective of this study was carried out, by letting respondents to rank the 29 major influencing time factors under four categories and which were considered in the study. The rankings were to be done using a five-point scale which was interpreted as: 1- not significant, 2 - slightly significant, 3 - moderately significant, 4 - very significant and 5- extremely significant. Responses to questionnaire sent out to professionals were thus analyzed using the Relative Importance Indices (RII) computed for each factor. The values of the RII were used to rank the factors according to their level of importance.

Objective 3**:** The third objective of the study was carried out, by letting respondents to rank 10 major influencing cost factors which were considered in the study. The rankings were to be done using a five-point scale which was interpreted as: 1- not significant, 2 -slightly significant, 3- moderately significant, and 4- very significant and 5-extremely significant. Responses to questionnaire sent out to professionals were thus analyzed using the Relative Importance Indices

(RII**)** computed for each factor. The values of the RII were used to rank the factors according to their level of importance.

3.3. Ethical Consideration

The researcher first informed participants about the nature of the study and requested their consent to participate. Only those organizations and personnel who were voluntary to participate in the research were approached for an interview and for comment too. The researcher also assured that, the names of respondents would not be revealed in the study. For reasons of ensuring that respondents become anonymous, direct quotations from respondents were merely ascribed to respondent's code. The researcher also committed to report the research findings in a complete and meaningful, without misleading others about the nature of the findings. Under no circumstance, the researcher fabricated data to support a particular conclusion.

Finally, the researcher took appropriate measures to ensure the research would cause no physical or psychological harm to the research participants. As a general rule, therefore, the study did not raise any ethical concerns. The flow chart of research methodology likes as follow**:**

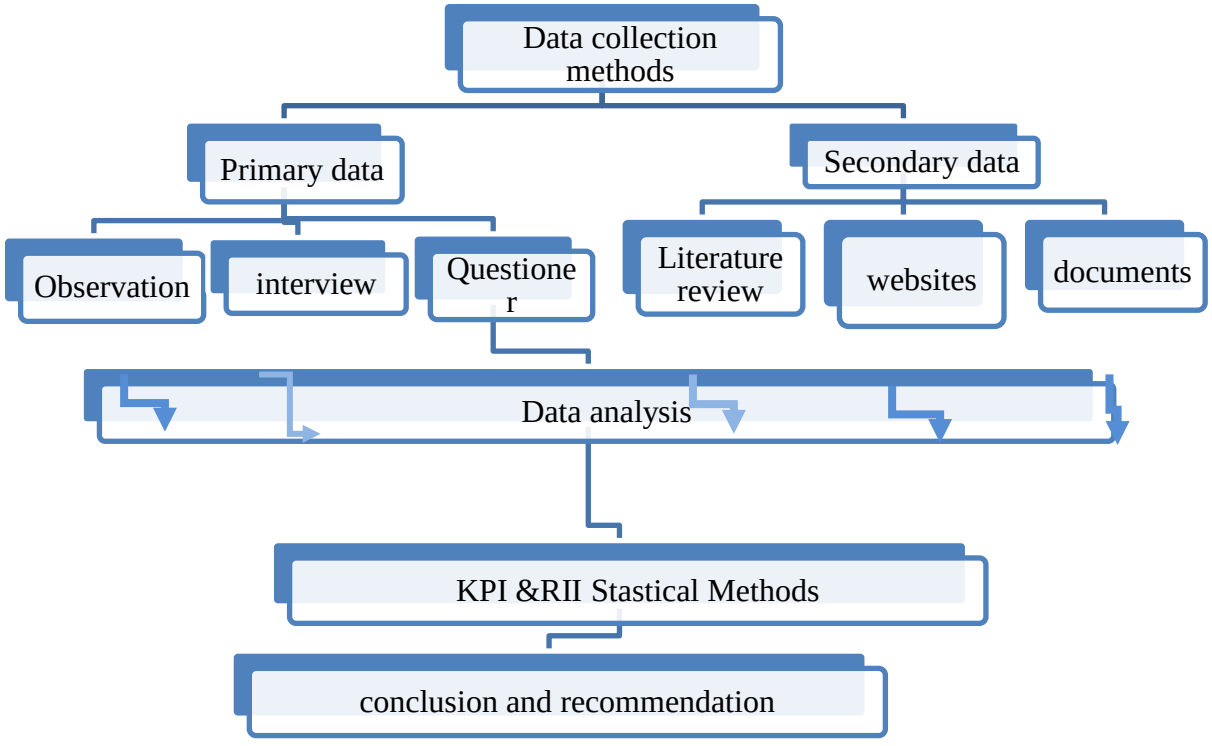

Figure3. 2.flow chart of research methodology

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

4.1. Background of the respondents

In this study the owner was Abi Adi town municipality office and one project was owned and consulted by (OCC) Oromo cultural community. So, this study was targeted on different infrastructure projects of Abi Adi town. And the consultant was Abi Adi town construction office, which is founded to provide consulting, supervising and controlling services for different construction projects of the government and private entities.

A. Age group

Table 3.Age Group of Respondents

respondents	26-32	33-39	>39
Owner	7	1	1
consultant	7	1	
contractor	17	7	1

B. Educational background

Table 4.Educational back ground of respondents

Respondents	Educational Background											
	Diploma			BSc			MSc			PhD		
	m	f	T	M	f	T	M	F	T	m	f	T
Contractor	3	1	4	10	6	13	2	1	3	2		2
Owner	1	2	3	3	2	5	1		1			
Consultant				8		8						

C. Summary: The age group of the respondents from the three stages were mostly under 26-32 and 33-39 years, while few of them were under age group of >39 years. The educational background of the majority of clients and consultants were BSc. The educational levels of the contractors were mostly BSc and two were also PhD, while few of them from the owners and

contractors sectors were diploma level. The respondents experience in construction environment were mostly 1-5, 6-10 and <1years respectively.

4.2. Cost and schedule performance of public construction projects in Abi Adi town.

In order to evaluate project time and cost performance of the public construction projects, additional structure was added on the questioner that had distributed to the contractors, to gather information related to the projects time and cost performance status. Assessment of the performance of public construction projects, a case study in Abi Adi town. See, the data obtained from construction sites in appendix B1.

The projects schedule and cost performance were evaluated by using performance index calculation principle. Schedule Performance index is calculated by using (equation 4.1) and cost performance is calculated by using (equation 4.2) shown below.

$SPI = BCWP/BCWS$……Equation 4.1

$CPI = BCWP/ACWP$……Equation 4.2

Where,$BCWS = TotalProject\ cost * PWPP$

PWP = performed work percent

PWPP= planned work performance percent

BCWP= budgeted cost of work performed

ACWP= actual cost of work performed

BCWS =budgeted cost of work scheduled

CPI= cost performance index

SPI= schedule performance index

The result of Schedule and cost Performance index of 24 projects were tabulated in the table 4.3. Cost and time performance of the projects was evaluated based on the following principles, discussed by (Sharma R. and McDonough, 2015).

$I \leq 0.85$…..... …poor performance

$0.85 < I \leq 0.95$…….....Below target performance

$0.95 < I \leq 1.05$….....within target performance

$1.05 < I \leq 1.15$…….....exceeds target performance

$I > 1.15$ ……. …….Outstanding performance.

Table 5.Time and Cost Performance Index of construction Projects

No	Type of project	Commencement date	Sitevisit date	Contract day	PWP (%)	PWPP (%)	Totalproject cost	BCWP	ACWP	BCWS	CPI	SPI
1	School	27/3/16	2/10/2016	210	58	90	179,259,849.94	110,989,347.94	103226984.1	161333864.9	1.075	0.69
2	Bridge	9/4/2016	27/09/16	280	75	100	13,894,140.45	10,420,605.32	8,931,176.16	13,894,140.45	1.17	0.75
3	Gabion	18/3/16	25/9/16	120	98	100	2,023,223.90	1982959.42	1999908.42	2023223.9	1	0.99
4	Cobblestone1	4/6/2016	25/9/16	119	95	100	4,454,358.78	4231640.84	4454307.05	4,454,358.78	0.95	0.95
5	Kobilstone2	4/6/2016	26/9/16	119	95	100	4,454,340.23	4231545.31	4,454,258.20	4,454,340.23	0.95	0.95
6	Kobilstone3	4/6/2016	26/9/16	119	95	100	4,454,300.28	4231585.26	4454255.76	4,454,300.28	0.95	0.95
7	Kobilstone4	4/6/2016	26/9/16	119	95	100	4,454,225.51	4231514.23	4454158.9	4,454,225.51	0.95	0.95
8	Kobilstone5	4/6/2016	4/10/2016	119	95	100	4,454,403.60	4321683.42	4454379.82	4,454,403.60	0.95	0.95
9	Kobilstone6	4/6/2016	6/10/2016	119	95	100	4,454,356.03	4231638.29	4454299.44	4,454,356.03	0.95	0.95
10	Kobilstone7	4/6/2016	6/10/2016	119	95	100	4,454,412.94	4231692.29	4454383.71	4,454,412.94	0.95	0.95
11	Kobilstone8	4/6/2016	9/10/2016	119	95	100	4,454,369.44	4231650.96	4454341.8	4,454,369.44	0.95	0.95
12	Kobilstone9	4/6/2016	13/10/16	119	95	100	4,454,426.54	4231705.21	4454366.07	4,454,426.54	0.95	0.95
13	Kobilstone10	4/6/2016	16/10/16	119	95	100	4,454,316.29	4231600.47	4454283.14	4,454,316.29	0.95	0.95
14	Kobilstone11	4/6/2016	12/10/2016	119	95	100	4,454,306.01	4231509.01	4454264.33	4,454,306.01	0.95	0.95
15	Retaining wall	2/5/2016	24/9/16	164	87	100	12,762,880.78	10233706.27	11094985.24	12,762,880.78	0.92	0.8
16	Retaining wall	18/3/16	24/9/16	90	99	100	493094.29	488163.34	492171.86	493094.29	0.99	0.99
17	Gabion	18/3/16	28/9/16	120	70	100	5,007,433.78	3505203.64	3343396.48	5,007,433.78	1.05	0.7
18	Rolled road1	15/3/16	29/09//16	122	80	90	2,485,622.97	1988498.37	2485566.62	2,237,060.67	0.8	0.89
19	Rolled road2	14/5/16	29/09/16	150	87	95	4,999,885.18	4349900.1	4,999,885.18	4,749,890.92	0.87	0.91
20	Manhole	2/5/2016	4/10/2016	150	85	99	2,982,442.20	2,535,075.87	2,982,011.90	2,952,617.78	0.85	0.86
21	Toilet	25/4/16	5/10/2016	150	98	100	1,961,991.89	1,922,752.05	1,959,144.08	1,961,991.89	0.98	0.98
22	Store	14/3/16	6/10/2016	120	67	98	3,172,147. 37	2,125,338.74	2,129,847.37	3,172,147.37	1	0.67
23	Toilet	14/3/16	6/10/2016	120	80	99	1,829,411.03	1,463,528.82	1,812,400	1,811,116.92	0.8	0.8
24	Store	3/5/2016	7/10/2016	120	82	98	1,389,701.08	1,389,701.08	1358255.9	1320216.03	1.02	1.05

4.3.1. Discussions of projects schedule and cost performance and evaluating.

a. Schedule Performance of Projects

According to the above table 4.3, Schedule performance index of the greatest number of projects that is 14 projects were at the interval of below target performance ($0.85< I \leq 0.95$), the performance index of 6 projects were at the interval of poor performance ($I \leq 0.85$) and the performance index of 4 projects were at the interval of within target performance ($0.95 < I \leq 1.05$.Therefore, this result agrees with the idea of (Sharma R. and McDonough, 2015), schedule performance index (SPI): represents how close actual work is being completed as compared to the schedule. This show that, schedule performance of the most percent (14, 58.33%) of the projects were below target performance and the performance of related number (6, 25%) of the projects were at the interval of poor performance. while, the performance of only (4, 16.67%) projects were within the target.

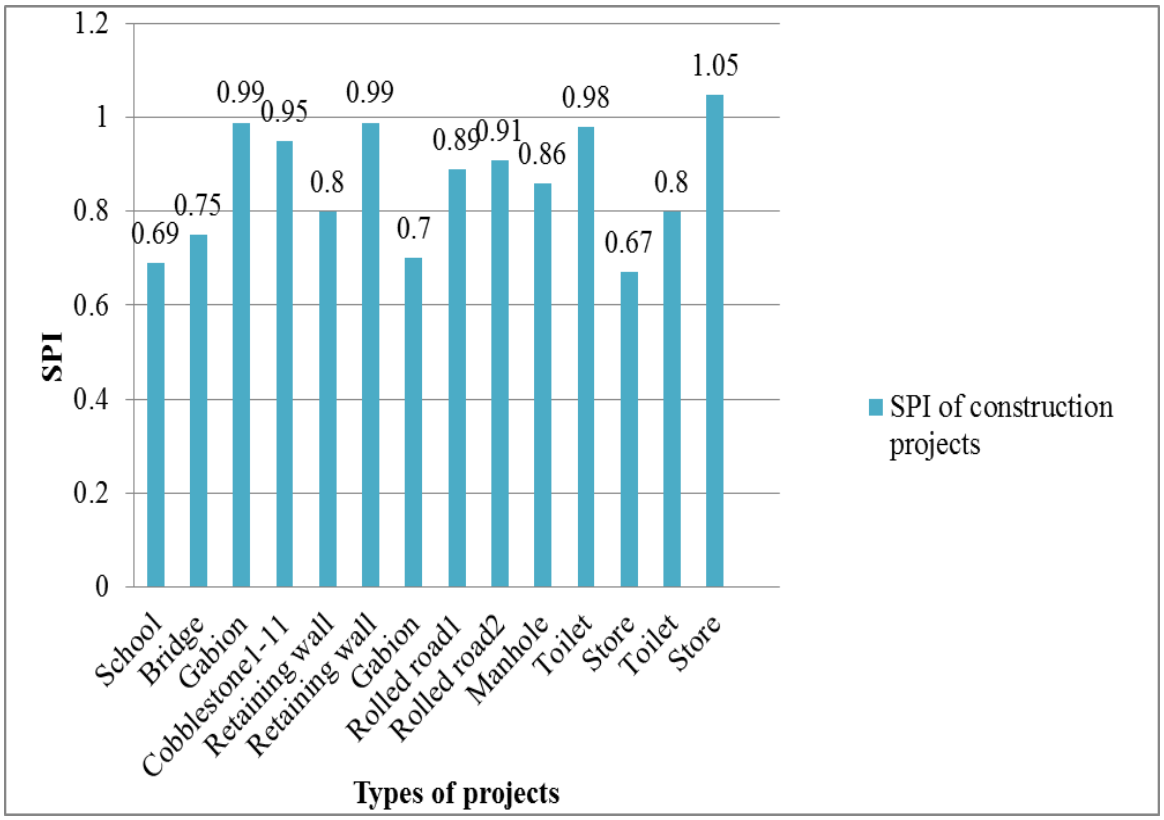

Figure4. 1Schedule performance index of construction projects

b. Cost Performance of Projects

as indicated in the above table 4.3, the cost performance index of 3 projects were at the interval of poor performance (I <= 0.85), the cost performance index of 13 projects were at the interval of below target performance (0.85 < I <= 0.95), whereas, the cost performance index of 6 projects were at the interval of within target performance (0.95 < I <= 1.05), the cost performance index of 1 project was at the interval of exceeds target performance (1.05 < I <= 1.15) and cost performance index of 1 project was at the interval of outstanding performance(I > 1.15). Therefore, this result agrees with (Sharma R. and McDonough, 2015), cost performance index (CPI): represents the amount of work being completed on a project for every unit of cost spent. This shows that, the cost performance of thirteen (13, 54.17%) projects were below target and the cost performance of six (6, 25%) projects were within target, while, the cost performance of one (1, 4.17%) project was exceeding target, the cost performance of one (1, 4.17%) project was outstanding performance and only four (3, 12.5%) projects were under poor cost performance.

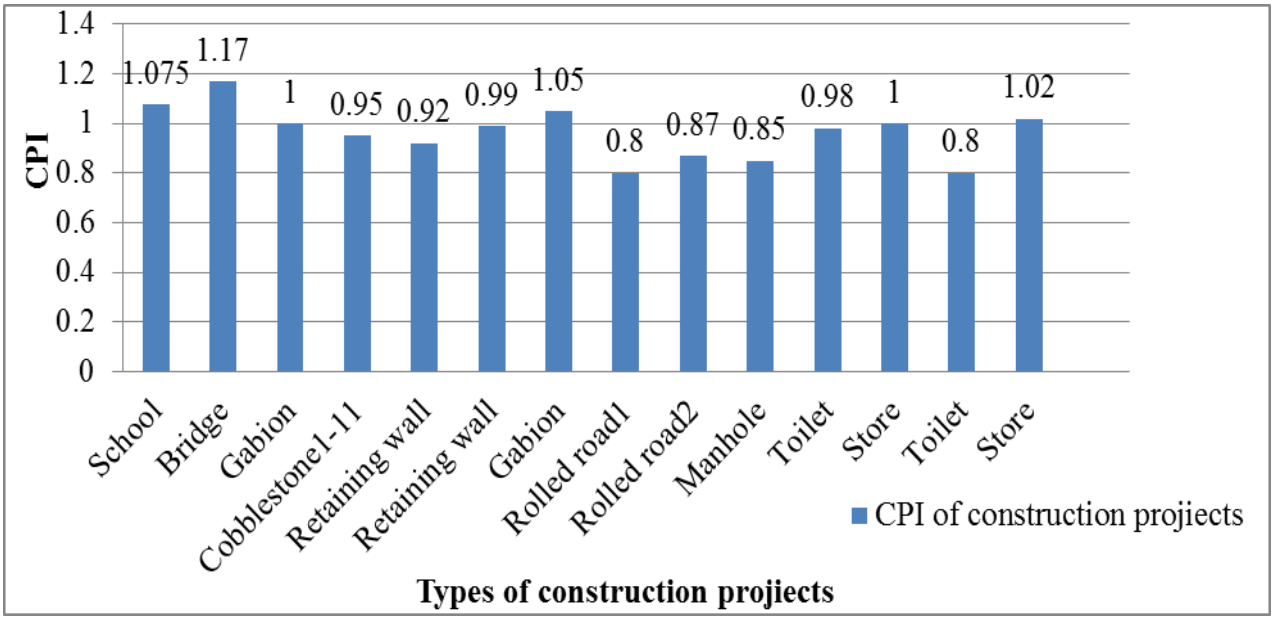

Figure 4. 2.Cost performance index of construction projects

c. Summary: As a summary, the schedule performance of the projects was at mostly poor performance and below target performance. While, only four projects were show within target schedule performance. In the case of project cost performance a case study in Abi Adi town, thirteen projects were below target performance and six within target cost performance respectively. Four projects show poor cost performance, one exceeds the target and one outstanding performance and also very small number of construction projects shows good cost performances.

4.4. Factors that challenges time performance of public construction projects in Abi Adi town.

The second objective of the study was to identify the factors that challenge the performance of public construction projects to perform as per specified time. Therefore, based on literature review 29 factors for project time that challenges the performance of projects were sated out and questioners were prepared based on those factors and distributed to collect data for the three construction bodies: clients, contractors and consultants to compare between those factors.

4.4.1. Ranking of factors that challenge the time performance of public construction projects.

The data obtained from owners, contractors and consultants through questioners were ranked as 1-5 from lower degree to higher degree of their influences. The data obtained under each rank were tabulated below. Appendix B2 shows the data obtained from clients, contractors and consultants for generating the rank of the factors that challenges schedule performance of public construction projects in Abi Adi town.

4.4.2. Analysis and discussion of time factors by using relative importance index techniques

The result obtained from the computation of the relative importance index (i.e. RII) was used to rank the time and cost factors according to their level of importance. To calculate the weighted indexes for importance and frequency of overrun variables, the research used the methodology used by (Abd El-Razek M.etal, 2008). The overrun variables were ranked according to their Severity Index (the product of Importance Index and Frequency Index).

The RII (equation 4.3) for the factors were obtained from the combined rankings assigned by respondents to each factor using a five-point scale (see in the appendix B2 below). The RII were converted into scores (multiplying by 100) which gives the severity indices (SI) of the factors, (equation 4.4). The relative importance of the factors was then determined based on their total score. A score or SI value of 67% or more is considered relevant, observed (Elhag T.,etal, 2006).

RII=ΣW/A*N……..equation 4.3.

Where; ΣW = summation of the weightings for each factor

A = highest figure of the rankings (in this case 5)

N = total number of respondents for each factor

SI=ΣW/A*N∗100…….….equation 4.4

The relative ranking of the factors which influence schedule performance of public construction projects in Abi Adi town is tabulated below. The degree of agreement among respondents group regarding a factor was also determined using the coefficient of variation (COV). Coefficient of variation expresses the standard deviation as a percentage of the mean (Equation 4.5), and it is useful in comparing relative variability of different responses (Nudge, 2004).

COV=σ/ȳ∗100%…….…..…….equation 4.5

Where; σ= Standard deviation

Ȳ = Weighted mean of sample.

4.4.3. Analysis of time factors according owners' responses

Table 6.Analysis of time factors according owners' responses

S.NO	Time factors	Owners response												
		(5)extremely significant	(4) very significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondent	Mean	Standard deviation	Coefficient of variance	Relative important index	Ranking category	Overall ranking	Strengthofcategory
A	Owners Responsibility													0.641
F1	Financial problems	7	2				9	4.77	0.42	8.8	0.95	1	1	
F2	Slowness in decision making process	5	4				9	4	0.75	18.8	0.8	2	9	
F3	Poor communication and coordination		6	3			9	3.67	0.47	13.8	0.73	3	13	
F4	Change orders by owner during construction			3	3	3	9	2	0.82	41	0.4	6	27	
F5	Lack of coordination with contractors		4	4	1		9	3.33	0.67	20.1	0.67	4	18	
F6	Lack of working knowledge			2	4	3	9	1.89	0.73	39.6	0.37	7	28	
F7	Delay to furnish and deliver the site		2	4	3		9	2.89	0.74	25.6	0.57	5	23	
B	Contractors Responsibility													0.783
F8	Low productivity of labor	5	3	1			9	4.44	0.69	15.5	0.89	2	3	
F9	Shortage of site labor		5	3	1		9	3.34	0.69	19.7	0.69	9	16	
F10	Poor skills and experience of labor;	4	3	2			9	4.22	0.79	18.7	0.84	4	5	
F11	Construction mistakes and defective work		5	2		2	9	3.11	1.2	38.6	0.62	12	20	
F12	Shortage of materials on site	4	5				9	4.44	0.5	11.3	0.89	2	3	
F13	Poor qualification of the contractor's technical staff		6	3			9	3.33	0.89	26.7	0.67	11	18	
F14	Delays in site mobilization	2	5	2			9	4	0.67	16.8	0.8	7	9	
F15	Poor site management	4	3	2			9	4.22	0.79	18.7	0.84	4	5	
F16	Lack of site contractor's staff	3	5	1			9	4.22	0.4	9.5	0.84	4	5	
F17	Conflicts in sub-contractor's schedule in execution of pr	1	5	2	1		9	3.67	0.82	22.3	0.73	8	13	
F18	Coordination problems with others		4	5			9	3.44	0.25	7.3	0.68	10	17	
F19	Financial problems	5	4				9	4.55	0.5	11	0.91	1	2	
C	Consultants Responsibility													0.586
F20	Inadequate experience of consultant		2	4	3		9	2.89	0.74	25.6	0.57	3	23	
F21	Delay in approving major changes in the scope of work		3	4	2		9	3.11	0.73	23.5	0.62	2	20	
F22	Mistakes and discrepancies in design documents.		2	4	3		9	2.88	0.73	25.3	0.57	3	23	
F23	lack of experience on the part of the consultant			4	3	2	9	2.22	0.79	35.6	0.44	5	26	
F24	absence of consultant's site staff	2	2	5				3.667	1.12	30.5	0.73	1	13	
D	External Factor													0.682
F25	Lack of equipment and toolson the market;			4	3	2	9	2.22	0.79	35.4	0.8	2	9	
F26	Poor weather conditions; poor site conditions			3	2	4	9	1.89	0.88	46.6	0.37	5	28	
F27	Poor economic conditions	2	4	3			9	3.88	0.73	18.8	0.78	3	12	
F28	Delay in obtaining permits from municipality		3	4	2		9	3.11	0.74	23.8	0.62	4	20	
F29	Lack of materials on the market	4	3	2			9	4.2	0.79	18.7	0.84	1	5	

4.4.3.1. Discussion of factors that challenges time performance of public construction projects in Abi Adi town according to owners' response.

The following were the discussion of factors that challenges schedule performance of selected public construction projects, based the result of the analysis.

a. Owners responsibility: according to the response from the owners, owners' responsibility has the rank of three among the four categories. It has score of 64.1%. There are seven determining factors under this category; five variables have coefficient variation in the range of between 8.8% and 25.6% except two variables have 39.6% and 41%, which is relatively low. Low coefficient of variation means there is some degree of agreement among the respondents with respect to ranking of the factors under this category.

The overall rankings of factors under this category were lies in the range of 1 and 28. The severity indexes of the four factors were above the threshold index, max of 95% and minimum of 67%. The remaining three factors were with severity index of below threshold index.

This shows that, according to the client only four of the factors under this category have significance, to the degree of category impacts on the time performance of construction project.

b. Contractor responsibility: According to the owners' response, contractors' responsibility has the first level of ranking among the four categories. This has the score of 78.3%. There are 12 determining factors under this category; nine factors have coefficient variation in the range of 7.3% and 20.5% and three factors have 22.3% and 38.6 % which is relatively small. Low coefficient of variation means there is same degree of agreement on the ranking of the factors under this category. The overall ranking of the factors under this category were lies in the range of 2 and 20. Except one, the severity index of the factors was above the threshold, with maximum of 91% and minimum of 67%. This shows that all of the factors under this category have important significance in the impact of the category.

c. Consultant responsibility: This category has the fourth ranking level among the four categories. This category has the score of 58.6%. Five factors are determined under this category. They have coefficient variation which lies with the range of 23.5% and 35.6% except one have 8.8% which is relatively small. Low coefficient of variation means, there are same degree of agreement among the respondents on the ranking of the factors under this category.

The overall ranking off the factors under this category were lies in the range of 13and 26. The severity index of only one of the factors was above the threshold index which is 73%. This shows that only one of the factors under this category have relatively important significant for the category.

d. External factor: According to the client response, external factor has the second level of ranking among the four categories. This has the score of 68.2%. There are five determining factors under this category; they have coefficient variation in the range of 18.7% and 46.6% which is small. Low coefficient of variation means there is same degree of agreement on the ranking of the factors under this category. The overall ranking of the factors under this category were lies in the range of 5 and 28. Only three of the factors have the severity index of above the threshold index, with maximum of 84% and minimum of 78%.

This shows that only three of the factors under this category have some degree of significance in the impact of the category.

Summary: In the summary, according to the response from the owner, contractor responsibility is being ranked at the 1st level. That means the owners believes that contractors of public construction projects including all of the factors under this are the most responsible for poor schedule performance of construction projects.

4.4.4. Analysis and discussion of time factors according to contractors' response.

Table 7.Analysis of time factors according contractor's response

S.NO	Time Factors	contractor response												
		(5)extremely significant	(4) very significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondents	Mean	Standard deviation	Coefficient of variance	Relative important index	Ranking category	Overall ranking	Strengthofcategory
A	Owners Responsibility													0.676
F1	Financial problems	15	7	3			25	4.5	0.7	15.6	0.87	1	5	
F2	Slowness in decision making process	7	9	9			25	3.9	0.8	20.4	0.78	4	12	
F3	Poor communication and coordination	10	12	3			25	4.3	0.66	15.4	0.85	2	8	
F4	Change orders by owner during construction	4	11	10			25	1.7	0.71	41.3	0.334	7	29	
F5	Lack of coordination with contractors	11	9	5			25	4.2	0.76	17.9	0.848	3	10	
F6	Lack of working knowledge			2	18	5	25	1.9	0.52	27.7	0.376	6	28	
F7	Delay to furnish and deliver the site		15	5	5		25	3.4	0.8	23.5	0.68	5	18	
B	Contractors Responsibility													0.766
F8	Low productivity of labor	13	9	3			25	4.4	0.69	15.7	0.88	1	2	
F9	Shortage of site labor	14	8	3		6	25	4.4	0.7	15.8	0.888	1	2	
F10	Poor skills and experience of labor;	2	11	3	3		25	3	1.3	43.3	0.6	12	24	
F11	Construction mistakes and defective work	5	10	7	3		25	3.7	0.93	25.3	0.736	8	17	
F12	Shortage of materials on site	10	13	2			25	4.3	0.61	14.1	0.864	4	6	
F13	Poor qualification of the contractor's technical staff	5	11	9			25	3.8	0.73	19	0.768	6	14	
F14	Delays in site mobilization	6	12	5	2		25	3.9	0.86	22.2	0.776	5	13	
F15	Poor site management	4	8	9	4		25	3.4	0.95	27.9	0.68	9	18	
F16	Lack of site contractor's staff	3	10	7	5		25	3.4	0.94	27.3	0.688	9	18	
F17	Conflicts in sub-contractor's schedule in execution of project	6	12	3	4		25	3.8	0.98	25.8	0.76	6	14	
F18	Coordination problems with others	2	9	10	4		25	3.4	0.84	25	0.672	11	22	
F19	Financial problems	14	7	4			25	4.4	0.75	17	0.88	1	2	
C	Consultants Responsibility													0.737
F20	Inadequate experience of consultant		9		3		25	3.2	0.65	20.1	0.64	4	23	
F21	Delay in approving major changes in the scope of work	8	10	5	2		25	4	0.86	21.7	0.792	2	11	
F22	Mistakes and discrepancies in design documents.		15	13	2	5	25	3.7	1.39	37.4	0.74	3	16	
F23	lack of experience on the part of the consultant		4	16	5		25	3	0.59	19.9	0.592	5	25	
F24	absence of consultant's site staff	5	14	6	4	1	25	4.3	1.43	33.1	0.864	1	6	
D	External Factor													0.682
F25	Lack of equipment and tools on the market;		7	9	5	4	25	2.8	1.03	37.3	0.55	4	26	
F26	Poor weather conditions; poor site conditions			10	6	9	25	2	0.87	42.6	0.4	5	27	
F27	Poor economic conditions		13	10	2		25	3.4	0.63	18.3	0.688	3	18	
F28	Delay in obtaining permits from municipality	8	16	1		5	25	4.3	0.53	12.4	0.85	2	8	
F29	Lack of materials on the market	18	5	2			25	4.6	0.62	13.4	0.92	1	1	

4.4.4.1. Discussion of factors that challenges time performance of public construction projects in Abi Adi town according to contractors response

a. Owners Responsibility: According to the response from the contractors, owners' responsibility has the rank of three among the four categories. It has score of 67.7%. There are seven determining factors under this category; they have coefficient variation in the range of between 15.4% and 41.3%, which is relatively low. Low coefficient of variation means there is some degree of agreement among the respondents with respect to ranking of the factors under this category. The overall rankings of factors under this category were lies in the range of5 and 28. Except two of the factors, the severity index of the factors was above the threshold index with maximum of 87% and minimum of 68%. The two factors severity index was 37.6% and 33.4% which is below threshold index. This shows that, according to the contractor almost all of the factors under this category have significance impact, to the degree of category's impact on the time performance of construction projects.

B. Contractor Responsibility: According to the contractors' response, contractors' responsibility has the first level of ranking among the four categories. This has the score of 76.6%. There are 12 determining factors under this category, 11 factors have coefficient variation in the range of 15.7% and 27.9% and one 43.3% which is small. Low coefficient of variation means there are same degrees of agreement on the ranking of the factors under this category.

The overall ranking of the factors under this category were lies in the range of 2 and 24. Except one, the severity index of the factors was above the threshold index, with maximum of 88.8% and minimum of 67.2%. The other one factor severity indexes were 60% which is below the threshold index. This shows that all of the factors under this category have important significance in the impact of the category.

c. Consultant Responsibility: This category has the second ranking level among the four categories. This category has the score of 73.7%. Five factors are determined under this category. They have coefficient variation which lies with the range of 19.9% and 37.4% .Low coefficient of variation means, there are same degree of agreement among the respondents on the ranking of the factors under this category.

The overall ranking off the factors under this category were lies in the range of 6 and 25.The severity index of three factors were above the threshold index. The maximum is 86.4% and minimum of 79.2%. The remaining two factors have severity of 64% and 59.2%.

This shows that only three of the factors under this category have relatively important significant for the category.

d. External Factor: According to the contractor external factor has the fourth level of ranking among the four categories. This has the score of 68.2%. There are five determining factors under this category; they have coefficient variation in the range of 12 and 42% which is high. High coefficient of variation means there is no same degree of agreement on the ranking of the factors under this category. The overall ranking of the factors under this category were lies in the range of 6 and 27. Only three of the factors have the severity index of above the threshold index, with maximum of 92% and minimum of 68.8%. The remaining two factors have severity index of 40% and 55% which is lower than threshold index.

Summary: In the summary, according to the response from the contractors, contractors' responsibility was being ranked at the 1st level. That means the contractors believes that, contractors of public construction projects including all of the factors under this are the most responsible for poor schedule performance of construction projects. Table 4.5 shows ranking of the category according to the contractor.

4.4.5. Analysis and discussion of time factors according consultant's response

Table 8.Analysis of time factors according consultant's response

S.NO	Time Factors	Consultants response												
		(5)extremely significant	(4) very significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondents	Mean	Standard deviation	Coefficient of variance	Relative important index	Ranking category	Overall ranking	Strength ofcategory
A	Owners Responsibility													0.743
F1	Financial problems	7	1				8	4.87	0.331	6.8	0.98	1	1	
F2	Slowness in decision making process	6	2				8	4.75	0.433	9.1	0.95	2	2	
F3	Poor communication and coordination	3	4	1			8	4.25	0.661	16	0.85	4	13	
F4	Change orders by owner during construction			2	2	4	8	1.75	0.829	47	0.35	7	27	
F5	Lack of coordination with contractors	5	3				8	4.63	0.484	11	0.93	3	5	
F6	Lack of working knowledge				6	2	8	2	0.5	25	0.4	6	26	
F7	Delay to furnish and deliver the site		6	2			8	3.75	0.433	12	0.75	5	18	
B	Contractors Responsibility													0.863
F8	Low productivity of labor	5	3				8	4.63	0.484	11	0.93	3	5	
F9	Shortage of site labor	5	2	1			8	4.5	0.7	16	0.9	6	9	
F10	Poor skills and experience of labor;	6	2				8	4.75	0.433	9.1	0.95	1	2	
F11	Construction mistakes and defective work		6	1	1		8	3.5	0.7	20	0.7	11	19	
F12	Shortage of materials on site	6	1	1			8	4.63	0.696	15	0.93	3	5	
F13	Poor qualification of the contractor's technical staff	4	2	2			8	4.25	0.829	20	0.85	9	13	
F14	Delays in site mobilization	1	5	2			8	3.88	0.6	16	0.78	10	16	
F15	Poor site management	3	5				8	4.38	0.484	11	0.88	8	12	
F16	Lack of site contractor's staff	5	2	1			8	4.5	0.7	16	0.9	6	9	
F17	Conflicts in sub-contractor's schedule in execution of project		3	5			8	3.38	0.484	14	0.68	12	20	
F18	Coordination problems with others	6	1	1			8	4.63	0.696	15	0.93	3	5	
F19	Financial problems	6	2				8	4.75	0.433	9.1	0.95	1	2	
C	Consultants Responsibility													0.57
F20	Inadequate experience of consultant				4	4	8	1.5	0.5	33	0.3	5	29	
F21	Delay in approving major changes in the scope of work		2	6			8	3.25	0.433	13	0.65	2	21	
F22	Mistakes and discrepancies in design documents.		2	4	2		8	3	0.7	23	0.6	3	23	
F23	lack of experience on the part of the consultant			3	4	1	8	2.25	0.661	29	0.45	4	25	
F24	absence of consultant's site staff	4	2	2			8	4.25	0.829	20	0.85	1	13	
D	External Factor													0.635
F25	Lack of equipment and tools on the market;	2	3	3			8	3.88	0.781	20	0.78	2	16	
F26	Poor weather conditions; poor site conditions				5	3	8	1.63	0.484	30	0.33	5	28	
F27	Poor economic conditions		2	5	1		8	3.13	0.56	18	0.63	3	22	
F28	Delay in obtaining permits from municipality		2	2	4		8	2.75	0.83	30	0.55	4	24	
F29	Lack of materials on the market	4	4				8	4.5	0.5	11	0.9	1	9	

4.4.5.1. Discussion of factors that challenges time performance of public construction projects in Abi-Adi town according to consultant's response

a. Owners' responsibility: According to the response from the consultants, owners' responsibility has the rank of two among the four categories. It has score of 74.3%. There are seven determining factors under this category; they have coefficient variation in the range of between 6.8% and 25%, which is relatively low. Low coefficient of variation means there is some degree of agreement among the respondents with respect to ranking of the factors under this category. But, one factor has coefficient of variation 47.4%.

The overall rankings of factors under this category were lies in the range of 1 and 27. Except two of the factors, the severity index of the factors was above the threshold index with maximum of 97.5% and minimum of 75%.This shows that, according to the consultant, almost all of the factors under this category have significance impact, to the degree of category's impact on the time performance of construction project.

b. Contractor Responsibility: According to the consultants, contractors' responsibility has the first level of ranking among the four categories. This has the score of 86.3%. There are 12 determining factors under this category; they have coefficient variation in the range of 9.1% and 20% which is small. Low coefficient of variation means there are same degrees of agreement on the ranking of the factors under this category.

The overall ranking of the factors under this category were lies in the range of 2 and 20. The severity index of all the factors were above the threshold index, with maximum of 97.5% and minimum of 67.5%. This shows that, all of the factors under this category have important significance in the impact of the category.

c. consultant responsibility: This category has the fourth ranking level among the four categories. This category has the score of 57%. Five factors are determined under this category. They have coefficient variation which lies with the range of 13.3% and 33.3% which is small. Low coefficient of variation means, there are same degree of agreement among the respondents on the ranking of the factors under this category.

The overall ranking off the factors under this category were lies in the range of 13 and 29. Except one of the factor, the severity index of all of the factors was below the threshold index.

The maximum is 85%. This shows that only one of the factors under this category has relatively important significant for the category.

d. External factor: According to the consultant external factor has the third level of ranking among the four categories. This has the score of 63.5%. There are five determining factors under this category; they have coefficient variation in the range of 11.1% and 30.2% which is small. Low coefficient of variation means there are same degrees of agreement on the ranking of the factors under this category.

The overall ranking of the factors under this category were lies in the range of 9 and 28. Only two of the factors have the severity index of above the threshold index, with maximum of 90% and minimum of 77.5%. The remaining three factors have severity index of 62%, 38% and 20% which is lower than threshold index. This shows that only two of the factors under this category have some degree of significance in the impact of the category.

Summary: In the summary, according to the response from the consultants, contractors' responsibility is being ranked at the 1st level. That means the consultants believe that contractors of public construction projects including all of the factors under this are the most responsible for poor schedule performance of construction projects.

4.4.6. Overall ranking of the time factors based on the responses from owner, consultant and contractor.

Table 9.overall ranking of time factors

S.NO	Time Factor	Owner		Contractor		Consultant		overall		Strength of category
		RII	Ranking	RII	Ranking	RII	Ranking	RII	Ranking	
A	Owners Responsibility									0.711
F1	Financial problems	0.95	1	0.87	5	0.975	1	0.932	1	
F2	Slowness in decision making process	0.8	9	0.78	12	0.95	2	0.843	6	
F3	Poor communication and coordination	0.73	13	0.85	8	0.85	13	0.81	10	
F4	Change orders by owner during construction	0.4	27	0.334	29	0.35	27	0.528	25	
F5	Lack of coordination with contractors	0.67	19	0.848	10	0.925	5	0.814	9	
F6	Lack of working knowledge	0.37	28	0.376	28	0.4	26	0.382	28	
F7	Delay to furnish and deliver the site	0.57	23	0.68	18	0.75	18	0.667	23	
B	Contractors Responsibility									0.804
F8	Low productivity of labor	0.89	3	0.88	3	0.925	5	0.897	3	
F9	Shortage of site labor	0.69	16	0.888	2	0.9	9	0.826	7	
F10	Poor skills and experience of labor;	0.84	5	0.6	24	0.95	2	0.797	13	
F11	Construction mistakes and defective work	0.62	20	0.736	17	0.7	19	0.685	21	
F12	Shortage of materials on site	0.89	3	0.864	6	0.925	5	0.893	4	
F13	Poor qualification of the contractor's technical st	0.67	18	0.768	14	0.85	13	0.763	15	
F14	Delays in site mobilization	0.8	9	0.776	13	0.775	16	0.784	14	
F15	Poor site management	0.84	5	0.68	18	0.875	12	0.798	12	
F16	Lack of site contractor’s staff	0.84	5	0.68	18	0.9	9	0.809	11	
F17	Conflicts in sub-contractor’s	0.73	13	0.76	14	0.675	20	0.722	17	
F18	Coordination problems with others	0.68	17	0.672	22	0.925	5	0.759	16	
F19	Financial problems	0.91	2	0.88	3	0.95	2	0.913	2	
C	Consultants Responsibility									0.627
F20	Inadequate experience of consultant	0.57	23	0.64	23	0.3	29	0.503	26	
F21	Delay in approving or changes in the scope of wo	0.62	20	0.79	11	0.65	21	0.687	20	
F22	Mistakes and discrepancies in design documents.	0.57	23	0.74	16	0.6	23	0.637	24	
F23	lack of experience on the part of the consultant	0.44	26	0.592	25	0.45	25	0.494	27	
F24	absence of consultant’s site staff	0.73	13	0.864	6	0.85	13	0.815	8	
D	External Factor									0.666
F25	Lack of equipment and tools on the market;	0.8	9	0.55	26	0.775	16	0.708	18	
F26	Poor weather conditions; poor site conditions	0.37	28	0.4	27	0.325	28	0.365	29	
F27	Poor economic conditions	0.78	12	0.688	18	0.625	22	0.698	19	
F28	Delay in obtaining permits from municipality	0.62	20	0.85	8	0.55	24	0.673	22	
F29	Lack of materials on the market	0.84	5	0.92	1	0.9	9	0.887	5	

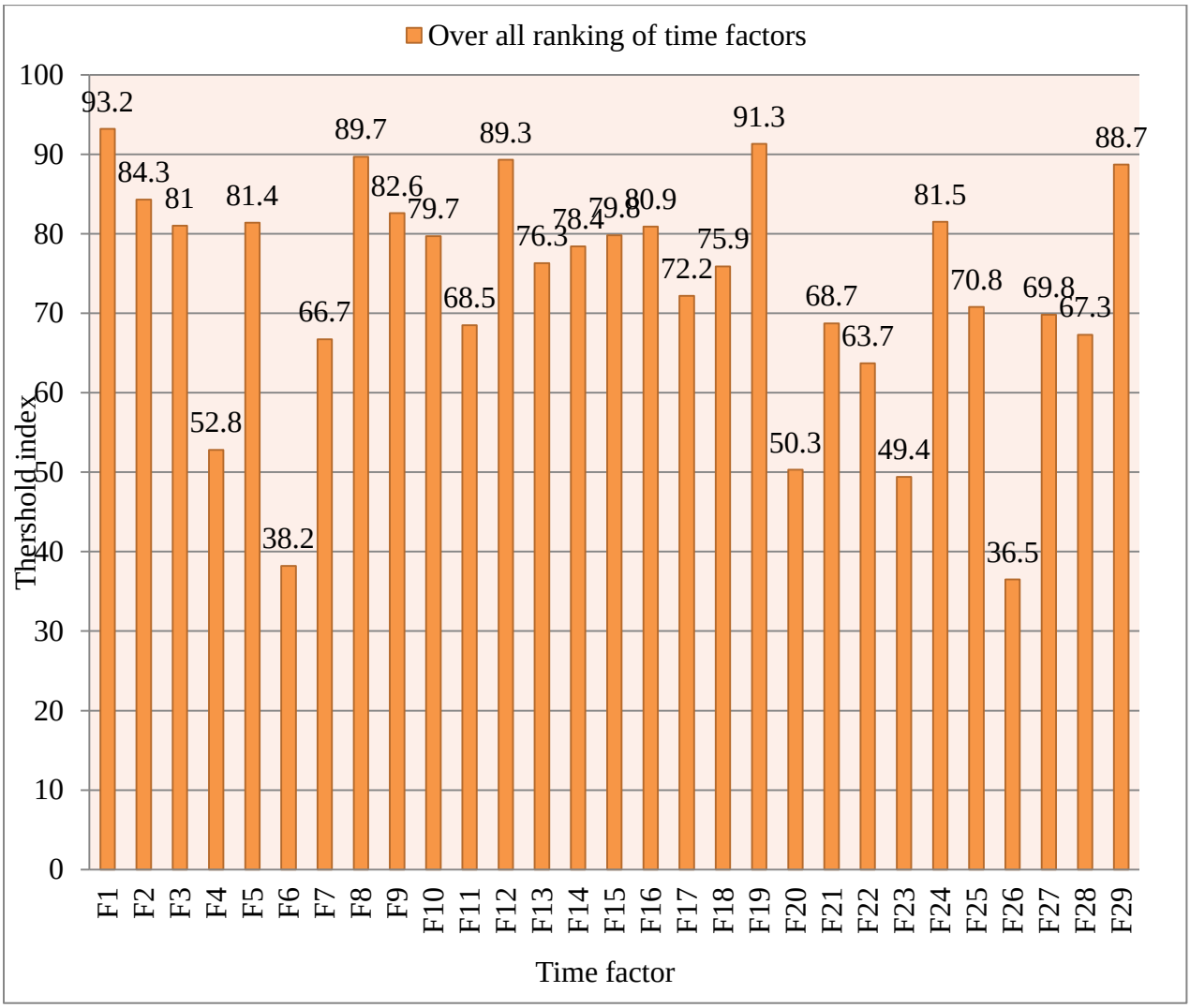

Figure4. 3.Overall ranking of time factors

4.4.7. Discussion of time factors according to overall response

A. Owners responsibility: According to the overall response owners' responsibility was ranked of second among the four categories. It has score of 71.1%. The overall ranking of factors under this category were lies in the range of 1and 28. The severity index of the four factors was above the threshold index with maximum of 93.2% and minimum of 81%. As shown in the table4.7 in the above, the three factors severity indexes were 66.7%, 52.8% and 38.2% which is

below threshold index. This shows that, the whole response, most of the factors under this category have significance impact, on the time performance of construction projects.

Financial problems scores severity indexes were 93.2%. This category have significance impact for poor schedule performance of construction projects. Findings indicate that the root causes of financial-related delays are mainly due to poor cash flow management, followed by late payment, insufficient financial resources, and financial market instability. This finding agrees with (Hamzah Abdul-Rahman,etal, 2010) conduct a study to identify Project schedule influenced by financial issues: Evidence in construction industry in Malaysia.

Poor communication and coordination scores severity indexes were 81% this category have significance impact for poor schedule performance of construction projects. Poor communication can create confusion, lead to unnecessary delays, result in budget or cost overruns, cause safety issues, and lead to problems with stakeholders. Lack of coordination with contractors scores severity indexes were 81.4%this category have significance impact for poor schedule performance of construction projects. The absence of effective coordination can lead to avoidable errors, delays, and conflicts, escalating costs and extending timelines.)This finding agrees with (Azhar Ali .etal, 2021), lack of coordination in the project directly influenced project success. Consequently, the lack of coordination in construction projects frequently contributes to project failure, thus causing construction projects to fail in Pakistan.

B. Contractor Responsibility**:** According to the overall response contractors' responsibility has the first level of ranking among the four categories. This has the score of 80.4%. There are 12 determining factors under this category. The overall ranking of the factors under this category were lies in the range of 2 and 21. The severity index of the factors was above the threshold index, with maximum of 91.3% and minimum of 68.5%. This shows that, all of the factors under this category have important significance in the impact of the category. That means, as overall response ranking, contractors including all of the factors under this are the most significant for poor schedule performance of construction projects. This finding was related to (Shaikh,et al, 2010), who conducted a study on identification of Critical Delay Factors in the Construction Industry, identified four delay factors representing reason of late in development projects.

C. consultant responsibility**:** According to the overall response this category has the fourth ranking level among the four categories. This category has the score of 62.7%. Five factors are determined under this category. The overall ranking off the factors under this category were lies

in the range of 8 and 27. Only the severity indexes of two factors were above the threshold index. The maximum is 81.5% and minimum of 68.7%. This shows that only two of the factors under this category has relatively important significant for the category. These factors are Delay in approving or changes in the scope of work and absence of consultant's site staff.

D. External Factor: According to the overall response external factor has the third level of ranking among the four categories. This has the score of 66.6%. There are five determining factors under this category. The overall ranking of the factors under this category were lies in the range of 5 and 29. Except one, four of the factors have the severity index of above the threshold index, with maximum of 88.7% and minimum of 67.3%. This shows that, almost all of the factors under this category have significant impact of the category. Poor economic conditions, delay in obtaining permits from municipality, lack of materials on the market and Lack of equipment and tools on the market.

Summary of overall time factors: generally all the above time factors score severity index greater than 67% have significant impact to delay of the public construction projects in Abi - Adi town and are agree to the finding of (Ahmed S.et al, 2003). In addition the summary of the above over all findings was related with a quantitative analysis on construction delays in Jordan has been carried out by (Sweis1, 2013), results indicated that, the main causes of delay in construction of public projects were related to designers, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity.

In addition, (Sweis1, 2013) conducted a survey aimed to identify major causes of delays in construction projects with traditional types of contracts from the viewpoint of construction contractors and consultants. Results of the survey had shown agreement among contractors and consultants that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors were among the top ten most important factors.

Project delays in Jordan constitute a major issue in the construction management field. Besides, lack of research in this field is the major reason behind this study in which factors influencing time overruns in the Jordanian construction sector were identified and ranked by professionals in the field. Figure.4.4 shows ranking of the time factors according to their influence overall.

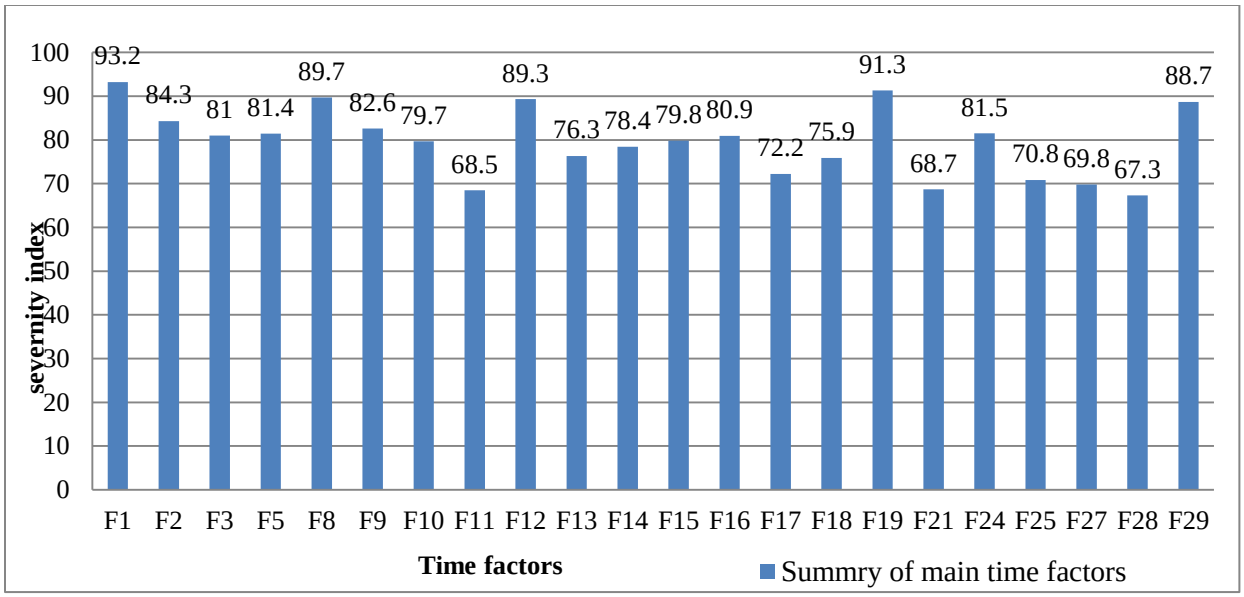

Figure 4. 4.Overall ranking of main time factors

4.5. Factors that challenges cost performance of public construction projects in Abi Adi town

The third specific objective of the study was to identify the factors that challenge the cost performance of public construction projects. Therefore, based on literature review ten factors that challenges the cost performance of construction projects were sated out and questioner were prepared based on those factors and distributed to collect data for the three construction parties: owner, contractor and consultants to compare between those factors.

4.5.1. Ranking of factors that challenge the cost performance of public construction projects in Abi Adi town.

The data obtained from the, clients, contractors and consultants through questioners were ranked as 1-5 from lower degree to higher degree of their influences. The data obtained under each rank were tabulated below. See appendix table B3.

4.5.2. Analysis of cost factors by using relative importance index techniques

The result obtained from the computation of the Relative Importance Index (i.e. RII) was used to rank the time factors according to their level of importance. The RII (Equation 4.3) used for the time analysis is used in this objective also similarly.

4.5.3. Analysis of owners' responses

Table 4.8 Summary of ranking the Cost Factor based on *owners' responses*

S.NO	Cost Factors	owners response						Mean	Standard deviation	Coefficient of variance	Relative important index	Ranking of category
		(5)extremely significant	(4) very significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondents					
F1	Technical incompetence and poor organizational structure	5	4				9	5	0.5	10.9	0.91	1
F2	Wrong /inappropriate choice of site.			2	5	2	9	2	0.7	33.3	0.4	9
F3	Delays in dens making by got, failure of specific costing bodies.	2	4	3			9	4	0.7	20	0.78	5
F4	Resources constraint: funds, foreign exchange, po not ready.	2	5	2			9	4	0.7	16.7	0.8	4
F5	Change in the scope of the project			3	4	2	9	2	0.7	34.9	0.42	8
F6	Supply of raw materials and equipment by contractors.	4	2	3			9	4	0.9	21	0.82	3
F7	Inadequate project preparation, planning and implementation, delay in constr	6	2	1			9	5	0.7	15	0.91	1
F8	Lack of experience of technical consultants, inadequacy of foreign collaboration ag	2	3	3	1		9	3	0.9	35	0.53	6
F9	Natural calamities			2	3	4	9	2	0.8	40.8	0.4	9
F10	Labor unrest			4	3	2	9	2	0.8	35.4	0.44	7

4.5.3.1. Discussion of cost factor according to owners' response.

F1.Technical incompleteness and poor organizational structure

According to the owner this factor has the first level of ranking among the ten factors. Its coefficient of variation is 10.9% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 91% which is greater than threshold index. This shows that, it has significant impacts on the cost performance of the projects.

F2.Wrong or inappropriate choice of site: According to the owner this factor has the ninth level of ranking among the ten factors. Its coefficient of variation is 33.3% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 40% which is less than threshold index. This shows that, it has not significant impacts on the cost performance of the projects.

F3. Delay in decision making by government, failure of specific coordinating bodies.

According to the owner this factor has the fifth level of ranking among the ten factors. Its coefficient of variation is 20% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 77.8% which is greater than threshold index.

This shows that, it has significant impacts on the cost performance of the projects.

F4. Resource constraint funds, foreign exchange, power, associated auxiliaries not ready.

According to the owner this factor has the fourth level of ranking among the ten factors. Its coefficient of variation is 16.7% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 80% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects.

F5. Change in the scope of the project: According to the owner this factor has the eighth level of ranking among the ten factors. Its coefficient of variation is 34.9% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 42.2% which is lower than threshold index.

This shows that, it has no significant impact on the cost performance of the projects.

F6. Supply of raw materials and equipment by contractors: According to the owner this factor has the third level of ranking among the ten factors. Its coefficient of variation is 21% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 82% which is greater than threshold index.

This shows that, it has significant impact on the cost performance of the projects.

F7. Inadequate project preparation, planning and implementation, delay in construction

According to the owners, this factor has the first level of ranking among the ten factors. Its coefficient of variation is 15% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 91% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects.

F8.Lack of technical experienced consultants, inadequacy of foreign collaboration agreement and monopoly of technology

According to the owner this factor has the sixth level of ranking among the ten factors. Its coefficient of variation is 35% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 53 % which is lower than threshold index. This shows that, it has no significant impacts on the cost performance of the projects.

F9. Natural calamities: According to the owner this factor has the ninth level of ranking among the ten factors. Its coefficient of variation is 40.8% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 40% which lower than threshold index. This shows that, it has no significant impacts on the cost performance of the projects.

F10. Labor unrest: According to the owner this factor has the seventh level of ranking among the ten factors. Its coefficient of variation is 35.4% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 44% which is lower than threshold index. This shows that, it has no significant impacts on the cost performance of the projects.

Summary: In the summary of the ranking of cost factors based on clients' response, as it is shown in the table 4.8, inadequate project preparation, planning and implementation delay in construction and Technical incompleteness and poor organizational structure were ranked first among the ten factors. And the other five factors listed in the table are those factors with severity index of greater than threshold index (67%). To mean that, factors those have significant impacts on the cost performance of the construction project according to their level of importance.

4.5.4. Analysis of the Cost Factor According to the Response of the Contractor

Table 4. 9. Summary of ranking the Cost Factors based on Contractors' response

S.NO	Factors	contractor response						Mean	Standard deviation	Coefficient of variance	Relative important index	Ranking category
		(5)extremely significant	(4) very significant	(3) moderately significant	(2) silently significant	(1) not significant	Total respondents					
F1	Technical incompetence and poor organizational structure	7	10	8			25		0.8	19.5	0.79	3
F2	Wrong o rinappropriate choice of site.	6	13	6			25	4	0.7	17.3	0.8	2
F3	Delays in decisions making by government, failure of specific co	8	11	3	3		25	3.96	1	24	0.79	3
F4	Resources constraint: funds, foreign exchange, power associated aux		9	13	3		25	3.2	0.7	19.4	0.64	6
F5	Change in the scope of the project		2	12	6	5	25	2.44	0.9	36	0.49	9
F6	Supply of raw materials and equipment by contractors.		12	8	1	4	25	3.12	1.1	34	0.62	8
F7	Inadequate project preparation, planning and implementation, c	13	6	6			25	4.28	0.8	19.3	0.86	1
F8	Lack of experience of technical consultants, inadequacy of foreign collabora			6	6	13	25	1.72	0.8	48	0.34	10
F9	Natural calamities	6	10	9			25	3.8	0.9	23	0.78	5
F10	Labor unrest	2	7	10	6		25	3.2	0.9	25	0.64	6

4.5.4.1. Discussion of cost factors according to contractors' response

F1.Technical incompleteness and poor organizational structure

According to the contractors response this factor has the third level of ranking among the ten factors. Its coefficient of variation is 19.5% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 79.2% which is greater than threshold index. This shows that, it has significant impacts on the cost performance of the construction projects.

F2. Wrong or inappropriate choice of site: According to the contractors this factor has the second level of ranking among the ten factors. Its coefficient of variation is 17.3% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 80% which is greater than threshold index. This shows that, it has significant impacts on the cost performance of the construction projects.

F3.Delay in decision making by government, failure of specific coordinating bodies

According to the contractors this factor has the third level of ranking among the ten factors. Its coefficient of variation is 24% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 79.2% which is greater than threshold index. This shows that, it has significant impacts on the cost performance of the construction projects.

F4.Resource constraint funds, foreign exchange, power, associated auxiliaries not ready

According to the contractors this factor has the sixth level of ranking among the ten factors. Its coefficient of variation is 19.4% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 64% which is less than threshold index. This shows that, it has no significant impact on the cost performance of the construction projects.

F5. Change in the scope of the project**:** According to the contractors this factor has the ninth level of ranking among the ten factors. Its coefficient of variation is 36%which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 48.8% which is lower than threshold index. This shows that, it has no significant impact on the cost performance of the construction projects.

F6. Supply of raw materials and equipment by contractors

According to the contractors this factor has the eight level of ranking among the ten factors. Its coefficient of variation is 34% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 62% which is less than threshold index. This shows that, it has no significant impact on the cost performance of the construction projects.

F7. Inadequate project preparation, planning and implementation, delay in construction

According to the contractors this factor has the first level of ranking among the ten factors. Its coefficient of variation is 19.3% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 85.6% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the construction projects.

F8.Lack of technical experienced consultants, inadequacy of foreign collaboration agreement, and monopoly of technology

According to the owner this factor has the tenth level of ranking among the ten factors. Its coefficient of variation is 48% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 33.4 % which is lower than threshold index. This shows that, it has no significant impacts on the cost performance of the construction projects.

F9. Natural calamities**:** According to the owner this factor has the fifth level of ranking among the ten factors. Its coefficient of variation is 23% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 77.6% which greater than threshold index. This shows that, it has significant impacts on the cost performance of the construction projects.

F10. Labor unrest: According to the owner this factor has the sixth level of ranking among the ten factors. Its coefficient of variation is 25% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 64% which is lower than threshold index. This shows that, it has no significant impacts on the cost performance of the construction projects.

Summary**:** In the summary of the ranking of cost factors based on contractors' response, as it is shown in the table 4.9, inadequate project preparation, planning and implementation delay in construction is ranking first among the 10 factors. And the other five factors listed in the table are those factors with severity index of greater than threshold index (67%). To mean that, factors those have significant impacts on the cost performance of the construction project according to their level importance.

4.5.5. Analysis of the Cost Factor According to the Response of the consultant

Table 4.10. Summary of ranking the Cost Factor based on Consultants' response

S.NO	Factors	consultant response						Mean	Standard deviation	Coefficient of variance	Relative important index	Ranking category
		(5)extremely significant	(4) very significant	(3) moderately significant	(2) silently significant	(1) not significant	Total respondents					
F1	Technical incompetence and poor organizational structure	4	2	2			8	4	0.89	20	0.85	2
F2	Wrong /inappropriate choice of site.			6	2		8	3	0.43	16	0.55	7
F3	Delays in decisions making by government, failure of specific coordinating bodie	2	4	2			8	4	0.71	18	0.8	4
F4	Resources constraint: funds, foreign exchange, power associated auxiliaries not	5	3				8	3	1.34	40	0.68	5
F5	Change in the scope of the project	3	3	2			8	2	0.78	37	0.43	8
F6	Supply of raw materials and equipment by contractors.	3	4	1			8	4	0.66	16	0.85	2
F7	Inadequate project preparation, planning and implementation, delay in construc	6	2				8	5	0.43	9.1	0.95	1
F8	Lack of experience of technical consultants, inadequacy of foreign collaboration agreements, r				2	6	8	1	0.43	35	0.25	10
F9	Natural calamities			2	2	4	8	2	0.66	38	0.35	9
F10	Labor unrest		2	6			8	3	0.19	13	0.65	6

4.5.5.1. Discussion of cost factor according to consultants' response.

F1.Technical incompleteness and poor organizational structure

According to the consultants this factor has the second level of ranking among the ten factors. Its coefficient of variation is 19.5% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 85% which is greater than threshold index. This shows that, it has significant impacts on the cost performance of the construction projects.

F2. Wrong or inappropriate choice of site: According to the consultants this factor has the seventh level of ranking among the ten factors. Its coefficient of variation is 15.7% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the

factors. It has severity index of 55% which is less than threshold index. This shows that, it has not significant impacts on the cost performance of the construction projects.

F3.Delay in decision making by government, failure of specific coordinating bodies

According to the consultants this factor has the fourth level of ranking among the ten factors. Its coefficient of variation is 17.7% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 80% which is greater than threshold index. This shows that, it has significant impacts on the cost performance of the construction projects.

F4. Resource constraint funds, foreign exchange, power, associated auxiliaries not ready

According to the consultants this factor has the fifth level of ranking among the ten factors. Its coefficient of variation is 39.7% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 67.5% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the construction projects.

F5. Change in the scope of the project: According to the consultants this factor has the eighth level of ranking among the ten factors. Its coefficient of variation is 36.7%which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 42.5% which is lower than threshold index. This shows that, it has no significant impact on the cost performance of the construction projects.

F6. Supply of raw materials and equipment by contractors

According to the consultants this factor has the second level of ranking among the ten factors. Its coefficient of variation is 15.6% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 85% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the construction projects.

F7. Inadequate project preparation, planning and implementation, delay in construction

According to the consultants this factor has the first level of ranking among the ten factors. Its coefficient of variation is 9.1% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 95% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the construction projects.

F8.Lack of experience of technical consultants, inadequacy of foreign collaboration agreement, and monopoly of technology

According to the consultant this factor has the tenth level of ranking among the ten factors. Its coefficient of variation is 34.6% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 25 % which is lower than threshold index.

This shows that, it has no significant impacts on the cost performance of the construction projects.

F9. Natural calamities: According to the consultant this factor has the ninth level of ranking among the ten factors. Its coefficient of variation is 37.8% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 35% which lower than threshold index. This shows that, it has no significant impacts on the cost performance of the construction projects.

F10. Labor unrest: According to the consultants this factor has the seventh level of ranking among the ten factors. Its coefficient of variation is 13.3% which is relatively small. Low coefficient of variation means, there is agreements on the ranking of the factors. It has severity index of 65% which is lower than threshold index. This shows that, it has no significant impacts on the cost performance of the construction projects.

Summary of overall: according the consultants response cost factors, as it was shown in the table 4.10, inadequate project preparation, planning and implementation delay in construction is ranking first among the 10 factors. And the other four factors listed in the table are those factors with severity index of greater than threshold index (67%). To mean that, factors those have significant impacts on the cost performance of the construction project according to their level importance.

4.5.6. Overall ranking of the cost factors based on the responses from client, consultant and Contractor

Table 4.11.overall ranking of cost factors

S.No	Cost Factor	Owner		Contractor		consultant		overall	
		RII	Ranking	RII	Ranking	RII	Ranking	RII	Ranking
F1	Technical incompetence and poor organizational structure	0.91	1	0.792	3	0.85	2	0.851	2
F2	Wrong /inappropriate choice of site.	0.4	9	0.8	2	0.55	7	0.583	6
F3	Delays in decisions making by government, Failure of specific coordinating bodies.	0.778	5	0.792	3	0.8	4	0.79	3
F4	Resources constraint: funds, foreign exchange, power associated auxiliaries	0.8	4	0.64	6	0.675	5	0.705	5
F5	Change in the scope of the project	0.422	8	0.488	9	0.425	8	0.445	9
F6	Supply of raw materials and equipment by contractors.	0.82	3	0.62	8	0.85	2	0.763	4
F7	Inadequate project preparation, planning and implementation, delay in constr	0.91	1	0.856	1	0.95	1	0.905	1
F8	Lack of experience of technical consultants, inadequacy of foreign collaborat	0.53	6	0.344	10	0.25	10	0.375	10
F9	Natural calamities	0.4	9	0.776	5	0.35	9	0.509	8
F10	Labor unrest	0.44	7	0.64	6	0.65	6	0.577	7

4.5.7. Discussion of cost factor according to overall response

F1. Technical incompetence and poor organizational structure

According to the overall response this factor has the second level of ranking among the ten factors. It has severity index of 85.1% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects

F2.Wrong or inappropriate choice of site: According to the overall response this factor has the sixth level of ranking among the ten factors. It has severity index of 58.3% which is less than threshold index. This shows that, it has no significant impact on the cost performance of the projects.

F3. Delay in decision making by government, failure of specific coordinating bodies.

According to the overall response this factor has the third level of ranking among the ten factors. It has severity index of 79% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects

F4.Resources constraint: funds, foreign exchange, power associated auxiliaries not ready.

According to the overall response this factor has the fifth level of ranking among the ten factors. It has severity index of 70.5% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects.

F5.Change in the scope of the project

According to the overall response this factor has the ninth level of ranking among the ten factors. It has severity index of 44.5% which is less than threshold index. This shows that, it has no significant impact on the cost performance of the projects or the construction in Abi -Adi town was on their initial planned scope.

F6.Supply of raw materials and equipment's by contractors

According to the overall response this factor has the fourth level of ranking among the ten factors. It has severity index of 76.3% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects

F7.Inadequate project preparation, planning and implementation, delay in construction

According to the overall response this factor has the first level of ranking among the ten factors. It has severity index of 90.5% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects. This finding was related (Chitkara, 2011),who was conducted a study and identified inadequate project formulation in the beginning was affected the cost performance of the projects the main cause of cost overruns public sector construction projects in Nigeria.

F8.Lack of experience of technical consultants, inadequacy of foreign collaboration agreements, monopoly of technology

According to the overall response this factor has the tenth level of ranking among the ten factors. It has severity index of 37.5% which is less than threshold index. This shows that, it has no significant impact on the cost performance of the projects

F9. Natural calamities**:** According to the overall response this factor has the eighth level of ranking among the ten factors. It has severity index of 50.9% which is less than threshold index. This shows that, it has significant impact on the cost performance of the projects

F10. Labor unrest: According to the overall response this factor has the seventh level of ranking among the ten factors. It has severity index of 57.7% which is greater than threshold index. This shows that, it has significant impact on the cost performance of the projects.

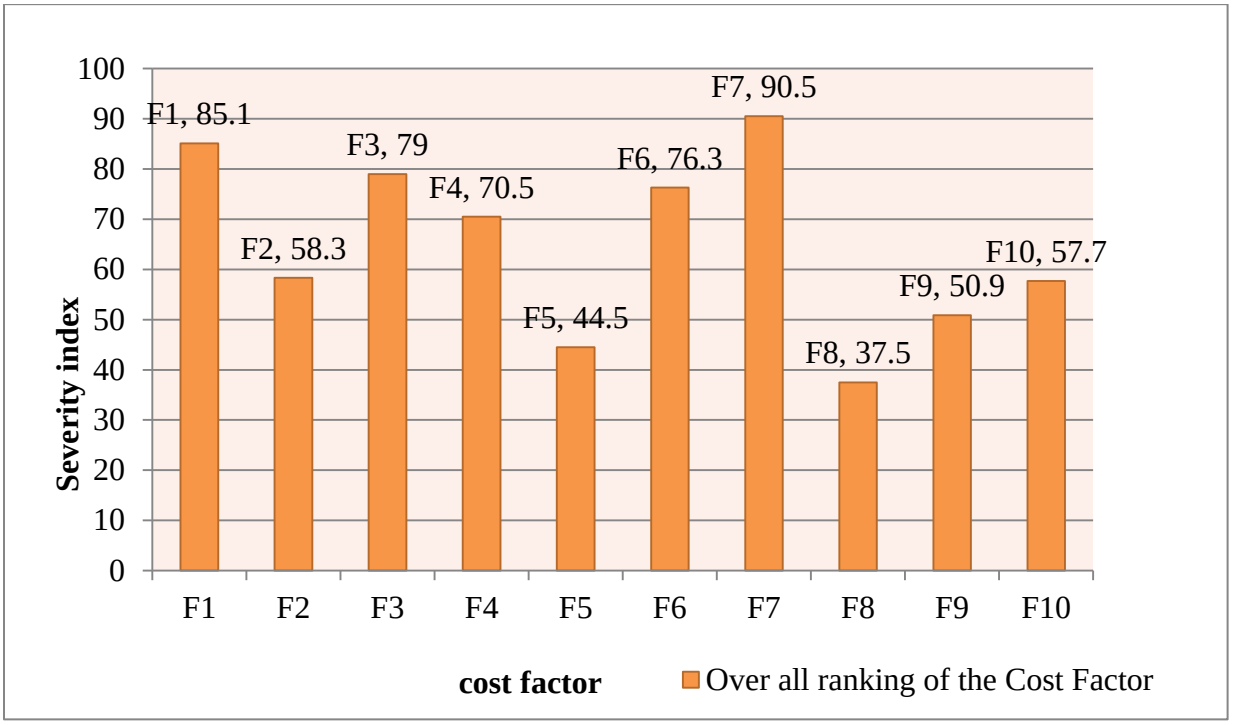

Figure 4. 5.Overall ranking of the cost factor

Summary of overall cost factor

In the summary of the overall ranking of cost factors, as it is shown in the table 4.11, inadequate project preparation, planning and implementation delay in construction was ranked first among the 10 factors. And the other five factors as shown in the chart below are those factors with severity index of greater than threshold index (67%).

To mean that, factors those have significant impacts on the cost performance of the construction project according to their level of importance. All the findings listed in the above (AbubekerJemal, 2015), who conduct a study to identify factors affecting time and cost over run on road projects in Addis Abeba.

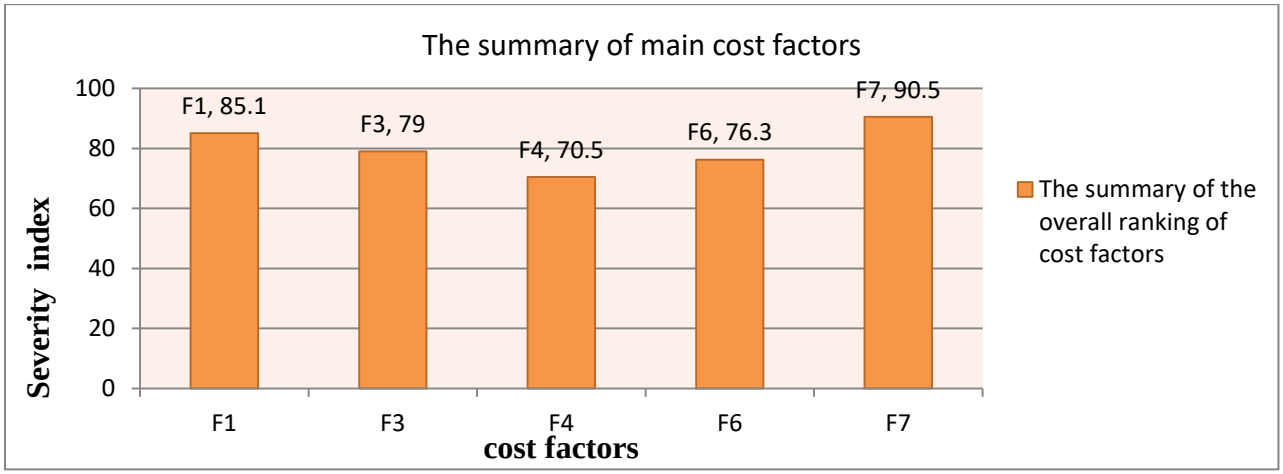

Figure 4. 6.The summary of main cost factors

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

Time overrun and cost overrun are critical consequences that are usually occurred due to poor project performance functions in construction projects. A number of researchers found that, the time and cost performance of construction projects are affected due to different factors. So that, there researcher why stand to conduct this kind of research is to assess performance of public construction projects in Abi Adi town. The main objective of this study was to evaluate the performance of public construction projects in relation to project time and cost, to identify the challenging factors in time and cost performance of the projects. The questioner survey used to evaluate time and cost performance of public construction projects and to identify the factor that challenges time and cost performance of the public construction projects in Abi Adi town was analyzed using, statistical analysis methods.

Performance index calculation was used to evaluate time and cost performances of public construction projects in Abi Adi town. As the result of the analysis for 24 public construction projects shows that, most percent of the projects time and cost were performed poorly and below target. The results for schedule performance of 24 projects shows that 6 (25%) Projects were at the interval of poor performance, 14 (58.33%) Projects were at the interval of below target performance and 4 (16.67%) Projects were at the interval of within target performance. In addition to this, Results obtained for cost performance of 24 projects shows that, 3 (12.5%) Projects were at the interval of poor performance, 13 (54.167%) Projects were at the interval of below target performance, 6 (25%) Projects were at the interval of within target performance, 1 (4.167%) Projects were at the interval of exceeds target performance, 1 (4.167%) Projects were at the interval of outstanding performance. Therefore: the time and cost performance of public construction projects in Abi-Adi town was under poor and below target performance due to the following factors listed below.

- The study has identified client, consultant, contractor and external environment related factors that resulted on time overrun. Weak performance of the projects is due to weak performance of the client, consultant, and contractors. The factors related to performance of

the client include delay to payment and financial problem, delay to deliver the site (right of way problem), poor communication and coordination. The consultant related factors that increased time delay of the projects include absence of consultant site staff. The third group of factors related to contractors that caused time overrun was financial problems, poor skills and experience of labor, Poor site management and lack of site contractors' staff. Finally, the environmental factors that caused time overrun in the projects were lack of equipment and tools on the market, poor economic condition, Lack of materials on the market and Delay in obtaining permits from municipality.

- The following are the cost factors with high relative importance index: Inadequate project preparation, planning and implementation and delay in construction, technical incompetence and poor organizational structure, delays in decisions making by government, failure of specific coordinating bodies, supply of raw materials and equipment by contractors, and resources constraint such as: funds, foreign exchange, power associated auxiliaries not ready.

5.2. Recommendation

Based on the conclusions the study provides the following recommendations for stakeholders of the construction projects.

- To improve performance of the construction projects, client should solve problems associated with delivery of the site (right of way problem), improve strong coordination and communication, improve weakness in payment and financial problems and must assign qualified manpower.
- Consultants should be qualified technically to supervise the projects correctly, and must overcome and control any poor project performance efficiently and effectively.
- Contractors should be employee experienced sub-contractors, improve the construction methodologies they follow, develop strong site management, use quality materials, and use the resources such as; manpower, equipment, time and finance in efficient and effective way in order to meet project objectives.
- Contractors are recommended to use advance payment properly to avoid the financial problems. Planning and scheduling must continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and delay. Site management and supervision: administrative and technical staff should be assigned as soon

as project is awarded to make arrangements to achieve completion within specified time with the required quality, and estimated cost.

- Government should give capacity building for professionals and firms on the construction sector so as to develop the performance of the professionals and must be initiate intellectuals to do researches on the general view of construction projects.

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APPENDIX A: QUESTIONERS

Date: _____

Dear Sir/ Madam

This is a questionnaire designed for a research purpose in Mekelle University, MSc Program in construction technology and management. The main objective of this study is to assess the performance of public construction projects in relation to their time and cost, Cause of cost and time overrun. Thus, your responses to these questions would be kept confidential and be used only as academic purpose.

Yours Sincerely,

Ms. Lemlem Desalegn

Tel: 0914261408

- **Typical questioners for owners, contractors and consultants**

Part I. back ground information

- Please mark your choice on the blanks provided for each questions below.

1. Type of responsibility in the organization

Client/owner ☐ consultant ☐ contractor ☐

2. Age of the respondent_____

3. Sex of the respondent

Male ☐ Female☐

4. Education

Diploma ☐ first degree ☐ Master's degree, ☐ PHD and above ☐

5. Working experience in public construction project (year)

Below 5 ☐ 5-10☐ above 10 ☐

Part II. Project performance data.

- Please mark your choice on the blanks provided for each questions latter.

1. Have you participated in managing process of public construction projects?

A, Yes_____ B, No_____

2. If your answer for question No.1 is **yes**, how many projects do you supervise?

A, 1-5_____ B, 5-10_____ C, 10-15_____ D, >15_____

3. How many projects were accomplished within scheduled time?

A, < 25%_____ B, 25% - 50%____ C, 50%-75%_____ D, 100%____

4. How many projects were accomplished within project cost?

A, < 25%_____ B, 25% - 50%_____ C, 50%-75%_____ D, 100%___

Part III. Data related to Factors that challenge time and cost performance of the construction projects.

A. Time factors

The factors listed in the table below are considered potential factors which influence time performance of the projects. There are five columns: 1, extremely significant (ES), 2, very significant (VS), 3 moderately significant (MS), 4, slightly significant (SS) and 5, not significant (NS). Please mark in the box under the column of your choice.

NO	Factors	E.S	V.S	M.S	S.S	N.S
A	**Owners Responsibility**					
1	Financial problems					
2	Slowness in decision making process					
3	Poor communication and coordination					
4	Change orders by owner during construction					
5	Lack of coordination with contractors					
6	Lack of working knowledge					
7	Delay to furnish and deliver the site					
B	**Contractors Responsibility**					
1	Low productivity of labor					
2	Shortage of site labor					
3	Poor skills and experience of labor;					
4	Construction mistakes and defective work					
5	Shortage of materials on site					
6	Poor qualification of the contractor's technical staff					
7	Delays in site mobilization					
8	Poor site management					
9	Lack of site contractor’s staff					
10	Conflicts in sub-contractor’s schedule in execution of project					

11	Coordination problems with others;					
12	Financial problems;					
C	**Consultants Responsibility**					
1	Inadequate experience of consultant					
2	Delay in approving major changes in the scope of work					
3	Mistakes and discrepancies in design documents.					
4	lack of experience on the part of the consultant					
5	absence of consultant's site staff					
D	**External Factor**					
1	Lack of equipment and tools on the market;					
2	Poor weather conditions; poor site conditions					
3	Poor economic conditions					
4	Delay in obtaining permits from municipality					
5	Lack of materials on the market					

B. Cost Factors

The factors listed in the table below are considered potential factors which are influence cost performance of the projects. There are five columns: 1, extremely significant (ES), 2, very significant (VS), 3 moderately significant (MS), 4, slightly significant (SS) and 5, not significant (NS). Please mark in the box under the column of your choice.

N.o	**Factors**	**E.S**	**V. S**	**M.S**	**S.S**	**N.S**
1	Technical incompetence and poor organizational structure					
2	Wrong /inappropriate choice of site.					
3	Delays in decisions making by government, failure of specific coordinating bodies.					
4	Resources constraint: funds, foreign exchange, power associated auxiliaries not ready.					
5	Change in the scope of the project					
6	Supply of raw materials and equipment by contractors.					
7	Inadequate project preparation, planning and implementation, delay in construction.					

8	Lack of experience of technical consultants, inadequacy of foreign collaboration agreements, monopoly of technology					
9	Natural calamities					
10	Labor unrest					

1. If you have any comment on my study, please write it her_____

Additional questioners structure only for Contractors

I. Background of the Company

1. Type of project _____

2. Commencement date of the project_____

3. Total cost of the project_____

4. Financial status of the projects_____

5. Percent of work performed (PWP) _____

6. Scheduled percent of work performance (PWPP) _____

7. Actual cost of work performed (ACWP) _____

8. Budgeted cost of work performed (BCWP)

9. Budgeted cost of work scheduled (BCWS) _____

10. Site visit date_____

11. Contract day_____

THANK YOU!

APPENDEX B: Tables for performance evaluation and ranking factors affect time and cost performance of construction projects.

B1.data about theconstruction projectstime and cost performance status

No	Type of project	Commencement Date	Site visit date	Contract day	Pwp (%)	Pwpp (%)	Total project cost
1	School	27/03/16	2/10/2016	210	58	90	179,259,849.94
2	Bridge	9/4/2016	27/09/16	180	75	100	13,894,140.43
3	Gabion	18/3/16	25/9/16	120	98	100	2,023,223.90
4	Kobilstone1	4/6/2016	25/9/16	119	95	100	4,454,358.78
5	Kobilstone2	4/6/2016	26/9/16	119	95	100	4,454,340.23
6	Kobilstone3	4/6/2016	26/9/16	119	95	100	4,454,300.28
7	Kobilstone4	4/6/2016	26/9/16	119	95	100	4,454,225.51
8	Kobilstone5	4/6/2016	4/10/2016	119	95	100	4,454,403.60
9	Kobilstone6	4/6/2016	6/10/2016	119	95	100	4,454,356.03
10	Kobilstone7	4/6/2016	6/10/2016	119	95	100	4,454,412.94
11	Kobilstone8	4/6/2016	9/10/2016	119	95	100	4,454,369.44
12	Kobilstone9	4/6/2016	13/10/2016	119	95	100	4,454,426.54
13	Kobilstone10	4/6/2016	16/10/16	119	95	100	4,454,316.54
14	Kobilstone11	4/6/2016	12/10/2016	119	95	100	4,454,306.01
15	Retaining wall	2/5/2016	24/9/16	164	87	100	12,762,880.78
16	Retaining wall	18/03/16	24/9/16	90	99	100	493094.29
17	Gabion	18/03/16	28/9/16	120	70	100	5,007,433.78
18	Rolled road	15/3/16	29/09//16	122	80	90	2,485,622.97
19	Rolled road	14/05/16	29/09/16	120	87	95	4,999,885.18
20	Manhole	2/5/2016	4/10/2016	150	85	99	2,982,442.20
21	Toilet &shower	25/04/16	5/10/2016	120	98	100	1,961,991.89
22	Store	14/03/16	6/10/2016	150	67	98	3,172,147.37
23	Toilet	14/3/16	6/10/2016	150	80	99	1,829,411.03
24	Store	3/5/2016	7/10/2016	120	82	98	1,389,701.08

B2.Data about time factor obtained from owner, consultant and contractor

S .No	Factors	owners response						contractor response						consultant response					
		(5)Extremely significant	(4)very significant	(3)moderately significant	(2)slightly significant	(1)not significant	*total respondents*	(5)Extremely significant	(4)very significant	(3)moderately significant	(2)slightly significant	(1)not significant	total respondents	(5)Extremely significant	(4)very significant	(3)moderately significant	(2)slightly significant	(1)not significant	total respondents
A	Owner Responsibility																		
F1	Financial problems	4	3	2			9	15	7	3			25	4	2	2			8
F2	Slowness in decision making process	5	4				9	7	9	9			25	6	2				8
F3	Poor communication and coordination		6	3			9	10	12	3			25	3	4	1			8
F4	Change orders by owner during construction			3	3	3	9	4	11	10			25			2	2	4	8
F5	lack of coordination with contractors		4	4	1		9	11	9	5			25	5	3				8
F6	Lack of working knowledge			2	4	3	9			2	18	5	25				6	2	8
F8	Low productivity of labor	5	3	1			9	13	9	3			25	5	3				8
F9	Shortage of site labor		5	3	1		9	14	8	3			25	5	2	1			8
F10	Poor skills and experience of labor;	4	3	2			9	2	11	3	3	6	25	6	2				8
F11	Construction mistakes and defective work		5	2		2	9	5	10	7	3		25		6	1	1		8
F12	Shortage of materials on site	4	5				9	10	13	2			25	6	1	1			8
F13	Poor qualification of the contractor's technical staff		6	3			9	5	11	9			25	7	1				8
F14	Delays in site mobilization	2	5	2			9	6	12	5	2		25	1	5	2			8
F15	Poor site management	4	3	2			9	4	8	9	4		25	3	5				8
F16	Lack of site contractor's staff	5	4				9	3	10	7	5		25	5	2	1			8
F17	Conflicts in sub-contractor's schedule in execution of project	1	5	2	1		9	6	12	3	4		25	3	5				8
F18	Coordination problems with others		4	5			9	2	9	10	4		25	6	1	1			8
F19	Financial problems	3	5	1			9	14	7	4			25	4	2	2			8
C	Consultants Responsibility																		
F20	Inadequate experience of consultant		2	4	3		9		9	13	3		25				4	4	8
F21	Delay in approving major changes in the scope of work		3	4	2		9	8	10	5	2		25		2	6			8
F22	Mistakes and discrepancies in design documents.		2	4	3		9		15	8	2	5	25	2	5	4	2		8
F23	lack of experience on the part of the consultant			4	3	2	9		4	16	5		25		3	4	1		8
F24	absence of consultant's site staff	7	2				9	18	5	2			25	6	2				8
D	External Factor																		
F25	Lackof equipment and tools on the market;			4	3	2	9		7	9	5	4	25		5	3			8
F26	Poor weather conditions; poor site conditions			3	2	4	9			10	6	9	25				5	3	8
F27	Poor economic conditions	2	4	3			9		13	10	2		25		2	5	2		8
F28	Delay in obtaining permits from municipality		3	4	2		9	8	16	1		5	25		2	2	4		8
F29	Lack of materials on the market	2	2	5			9	5	14	6	4	1	25	4	4				8

B3.Data obtained about cost factor from owner, contractor and consultant

S.No	FACTORS	owners response						contractor response						consultant response				
		(5)extremely significant	(4) very significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondents	(5)extremely significant	(4) very significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondents	(5)extremely significant	(3) moderately significant	(2)slightly significant	(1) not significant	Total respondents
F1	Technical incompetence and poor organizational structure	5	4				9	7	10	8			25	4	2			8
F2	Wrong /inappropriate choice of site.			2	5	2	9	6	13	6			25		6	2		8
F3	Delays in decisions making by government, failure of specific	2	4	3			9	8	11	3	3		25	2	2			8
F4	Resources constraint: funds, foreign exchange, power associ	2	5	2			9		9	13	3		25	5				8
F5	Change in the scope of the project			3	4	2	9		2	12	6	5	25	3	2			8
F6	Supply of raw materials and equipment by contractors.	4	2	3			9		12	8	1	4	25	3	1			8
F7	Lack of experience of technical consultants	6	2	1			9	13	6	6			25	6				8
F8	Lack of experience of technical consultants		2	3	3	1	9			6	6	#	25			2	6	8
F9	Natural calamities			2	3	4	9	6	10	9			25		2	2	4	8
F10	Labor unrest			4	3	2	9	2	7	10	6		25		6			8