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DEPARTMENT OF CIVIL ENGINEERING

OPTION: CONSTRUCTION TECHNOLOGY

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**EFFECTS OF TIMELY DELIVERY OF CONSTRUCTION PROJECT
ON ECONOMIC DEVELOPMENT OF RWANDA.
CASE STUDY: GASABO DISTRICT**

Dissertation submitted to the Department of Civil Engineering in partial fulfillment of the requirements for the award of an Advanced Diploma A1 in Construction Technology.

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Kigali, October 2024

DECLARATION

I declare that this work titled “**Effects of timely delivery of construction project on economic development of Rwanda**” is my own work, that it has not been submitted for any degree or examination in any other higher learning institution, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full name: TUYIZERE Elyse

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Signature:..... Date:.....

CERTIFICATION

This is to certify that this work titled “**Effects of timely delivery of construction project on economic development of Rwanda**” is a study carried out by TUYIZERE Elyse under my guidance and supervision.

Supervisor: HABINEZA Valens

Date.....

Signature.....

DEDICATION

This project is dedicated to almighty God who enables me during my daily activities. Without his incomparable love, I would have not successfully completed this project. Special thanks to my family for help directly or indirectly during my study period. I dedicate this report to all informers who gives all information's in this project, my supervisor and all lecturers in school of Civil Engineering. They all helped me and followed with kindness for me accomplish this project well.

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Finally, my deepest thanks go to my lecturers for their unwavering encouragement, support, love, understanding, and care, especially during the time I was away from home for the study.

ABSTRACT

The presented work entitled “Effects of timely delivery of construction project on economic development of Rwanda”. This project carries out the identification of the factors influencing the timely delivery of construction projects, examination of the economic environment factors that affect the delivery of construction projects, assessment of the economic development benefits resulting from the timely delivery of construction projects and the effects of timely delivery of construction projects on the economic development of Rwanda.

The aim of this project is to assess the factors causing construction project delay and its impact to the economic development of Rwanda. To achieve the intended goals, an appropriate methodology has been followed and suitable method of data collection and analysis related to this study, Qualitative data through content analysis was used to interpret data in the form of texts, tabular form and chart form. The methods of presentation have been determined according to the data format and the information to be emphasized. In this study, the tables were used to present a large amount of data such as project details while the graphs used to make easy comparison between different sets of data, such as contribution factor affecting timely delivery of construction project. The research highlights the importance of ensuring timely delivery in the construction sector as a means to raise sustainable economic development in Rwanda. Also to encourage the construction sector to improve project planning, enhance regulatory frameworks, and promote better coordination between its stakeholders to minimize delays and boost the sector’s contribution to the economy.

Keywords: Timely Delivery, Construction Project Management, Economic Development, Project Delays.

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LIST OF ABBREVIATION, ACRONYMS AND SIGNS

GDP – Gross Domestic Product

RWF – Rwandan Francs

CPM: Critical Path Method

HRM: Human Resource Management

PERT: Program Evaluation Review Technique

IER: Institute of Engineers Rwanda

RIA: Rwanda Institute of Architects

SPSS: Statistical Package for the Social Sciences

CPM – Critical Path Method

RFI – Request for Information (not directly mentioned, but "RFI" usually refers to this in construction contexts)

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CHAPTER ONE: INTRODUCTION

1.1. Background of study

Over the past two decades, Rwanda has been one of the fastest growing economies in Africa. Between 2000 and 2017 the Rwandan economy grew by 7.8 per cent annually and GDP per capita growth rate was 7 per cent per annum. The country has also made important strides in poverty reduction and economic transformation. The poverty headcount has been reduced from 78 per cent in 1995 to 39 per cent in 2014, and extreme poverty has been reduced from 24 per cent in 2011 to 16 per cent in 2014 (Malunda & Musana, 2012).

Additionally, the construction sector plays an important role in Rwanda's economy both in its contribution to the national economy and employment creation. As one of the key sectors of the economy, data from the past five years shows that it contributes around 7 per cent to national GDP, and 8 percent to national employment. According to the Business Monitor International forecast, the construction sector was expected to grow by 9 per cent per annum until 2021, which is the second fastest growth rate in Sub-Saharan Africa (Rwigema, n.d.).

Furthermore, Infrastructure is one of the key outputs of the construction sector. As one of the five pillars of the Rwanda Vision 2050 is Urbanization and Agglomeration, the government plays an important role in creating demand for the construction sector. As such, the infrastructure and construction sectors are expected to continue their vital contribution to both the country's economic transformation and employment creation (Matseke, 2023).

Lastly, this study aims to explore the impact of timely delivery of construction projects on Rwanda's economic development. By employing a qualitative research approach, it seeks to discover the complexities and relationships between project delays and their economic implications. The study will gather insights through a combination of questionnaires, historical data, and case studies of delayed projects. Through this research, the findings will shed light on how efficient project management and timely delivery can contribute to Rwanda's continued economic growth and transformation.

1.2.Problem statement

Delays to complete projects under construction on schedule had become habitual and persistent in the industry which made many construction firms in Rwanda inefficient. Not only did it pose a bad reputation of the construction companies, in most cases it imposed very high financial costs and heavy losses. Delays further affect all the stakeholders in the construction project leading to various losses ranging from financial, credibility, and poor performance arising from not achieving their financial performance targets. Because of the unexpected delay to complete construction projects on time, it compelled one to incur costs which would have been otherwise avoided(Ofori, 2012).

So, it is important to address the issue of timely delivery of construction projects to ensure that the economic development goals of Rwanda are met. Timely completion not only enhances the efficiency and reputation of construction firms but also ensures that projects contribute positively to the economy by avoiding cost overruns, improving resource management, and enhancing investor confidence. This study is necessary to explore the underlying causes of delays, assess their economic impact, and propose strategies to promote on-time project completion, ultimately contributing to the sustainable development of the country's infrastructure and economy.

1.3.The objectives of the study

1.3.1. Main objectives

The main objective of this study is to assess the impact of the timely delivery of construction projects on the economic development of Rwanda.

1.3.2. Specific Objectives

- To identify the key factors affecting the timely delivery of construction projects.
- To evaluate the influence of timely delivery on infrastructure development.
- To assess the effects of timely delivery on economic development.
- To analyze strategies for improving the timely delivery of construction projects.

1.4. Research Questions

- What are the key factors affecting the timely delivery of construction projects?
- How does the timely delivery of construction projects influence infrastructure development?
- What are the effects of timely delivery of construction projects on economic development?
- What strategies can be implemented to improve the timely delivery of construction projects?

1.5. Scope and limitation

1.5.1. Scope

This study focuses on assessing the effects of the timely delivery of construction projects on the economic development of Rwanda. The research will:

- Investigate the factors that influence the timely completion of construction projects.
- Explore how economic environment factors, such as inflation, interest rates, and government policies, affect the delivery of construction projects.
- Evaluate the economic benefits that arise from timely project completion, including increased employment, enhanced infrastructure, and improved economic productivity.
- Analyze the specific impacts of timely project delivery on Rwanda's overall economic development, with a focus on sectors such as housing, transportation, and public infrastructure.

The study will primarily collect data from stakeholders in the Rwandan construction industry, including project managers, contractors, government officials, and economists. It will focus on projects completed within the last five years to ensure relevance and accuracy in assessing the current economic environment.

1.5.2. limitations

Time constraints and financial resources may restrict the study to a limited number of construction projects, which may not capture the full complexity of the factors affecting project delivery across Rwanda.

Furthermore, the study may not fully account for external factors that affect economic development, such as global economic trends, political changes, or unforeseen disruptions (e.g.,

pandemics, natural disasters) that could tilt the analysis of how timely delivery affects Rwanda's economic growth.

1.6. Significance of the study

1.6.1. Academic significance

- This study will contribute to understanding the relationship between construction project delivery and economic development in Rwanda.
- This study will encourage further research, potentially leading to more comprehensive studies and policy recommendations.

1.6.2. Socioeconomic significance

- This study will identify the key factors that impact the timely delivery of construction projects.
- This study led to a better understanding and implementation of strategies that reduce unnecessary costs associated with project delays, thereby making construction projects more affordable for developers, governments, and the general public

1.6.3. Personal Benefits

- Working on the study of the effects of timely delivery of construction projects on the economic development of Rwanda will enable me to enhance various skills, such as project management, time management, and critical analysis of construction processes

1.7. Structure or organization of the study

The research project format is just as important as the research itself. Without a clear structure, it should be difficult to present your findings concisely. My research report is made up of six sections: general introduction, literature review, Materials and methods, findings and results, conclusion and recommendations, references and appendices are also given for a clear explanation of my research(Keele, 2007).

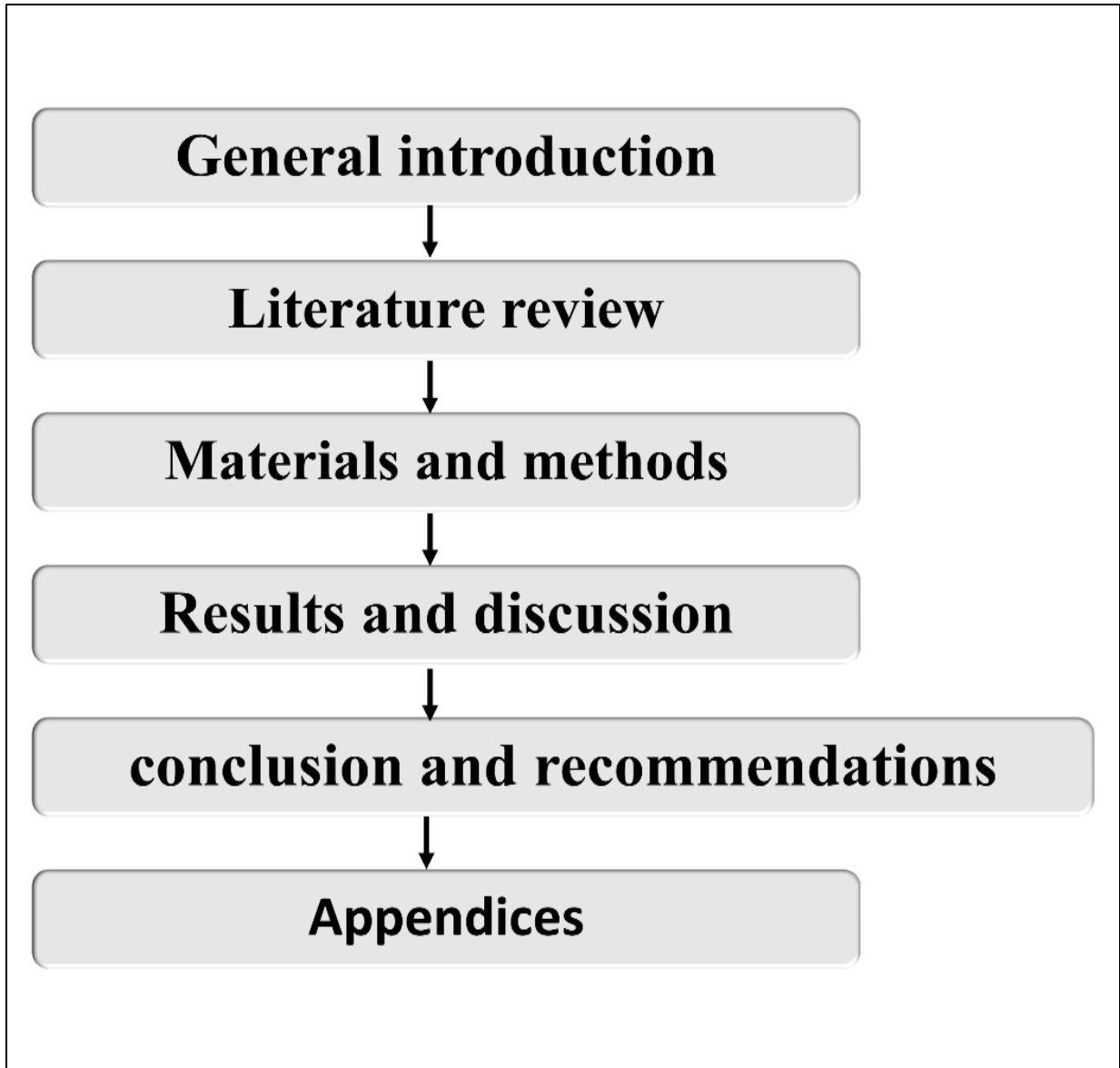


Figure 1.1: Project report structure

CHAPTER TWO: LITERATURE REVIEW

This chapter discusses the importance of time management, previous studies on delay and develops a framework for the study.

2.1. Time management of projects

The unique nature of the construction process presents complexities, uncertainties and changing circumstances, which must be accommodated within the planning and control system used. Small and large projects comprise a large number of interdependent items of work and involve many participants. For this reason reliable plans and accurate progress-recording mechanisms become all the more essential to project success (Levitt et al., 1999). The mismanagement of time could have an adverse effect on the outcome of the project with respect to cost and quality. The time taken to execute the project tasks from inception of site to delivery of the project is known as project duration. There are techniques employed in the management of time called construction planning tools. Some of these tools include the bar chart, the critical path method (CPM), the flow chart, and the line of balance. All of these are used to monitor the progress of the work and measure the amount of work done. Time control concerns the effort made in adhering to the initial specified time of project. The various aspects of projects to be controlled are human resources, materials, machine control and maintenance, and the various actions of parties to a contract who are the client, consultant, and contractor (Winch, 2012).

2.2. Importance of timeous completion of projects

A project is said to be successful when it is completed within budgeted cost, specified quality, stipulated time and delivered safely (Lester, 2006). There has been much dispute and conflict arising from projects not being completed within the specified time span. Delays arise owing to detrimental actions of parties in a contract. Contributions to delays emanating from the client can include late decision-making, late release of funds and changing of the scope. Factors contributed by consultants include late instructions, poor dimensional coordination, late approval of work, late preparation of interim valuations and certificates for the contractor, as well as late inspection and approval of work. On the part of the contractor lack of proper planning of work, lack of materials and skilled human resources, poor construction techniques, weather influences as well as labor strikes are potential sources of delay.

The possible consequences of all these actions are increased project cost, late delivery of projects and, sometimes, termination of contract. Therefore, every effort should be made to ensure that parties do not unnecessarily hamper the timeous execution of projects.

2.3. Construction in the economy

There has been a profound change in the construction industry and practice of management by organizations over the past years. The customer-focused marketplace and fierce competitive service positioning have demanded attention to performance improvement and value addition in delivery. Business process re-engineering has highlighted the need for dedicated strategic considerations coupled with efficient and effective management of organizations. Change appears to have become synonymous with emotive exercises in outsourcing, downsizing and ubiquitous application of re-engineering. Based on the above assertion the following two needs emerged: greater focus on business operations and the drive for quality, as well as greater cohesiveness in management, which is needed to accommodate more demanding customers in the market place(Cole, 1999).

In order to ensure that quality is paramount, and customers are therefore satisfied, personnel must be carefully placed and managed. Human resources management (HRM) fulfills this role. It has taken over from the traditional personnel management. It advocates a holistic approach where personnel matters are given greater attention by line managers and are considered with direct reference to the core business planning of the organization. Emphasis is placed on the business objectives and on relating these to the performance management of teams and individuals. Bringing the efforts of the different business strands together forms the basis of organizational systems management. However, as (Flanagan et al., 2007) observe, for many years the construction industry has been criticized for its perceived inability to innovate and its slow adoption of new technology and modern management methods.

2.4. Previous studies

Several research studies have been conducted in different parts of the world prior to the year 2000 with respect to construction delays. Some examined the causes as well as the effects of delays in construction project delivery, while others used a predictive model to ascertain construction period estimation. A total of ten problems causing delays were are presented in Table 2.1.

Table 2.2: Top 10 problems causing construction delays in previous studies(Toor & Ogunlana, 2008)

Code	Construction Delay Factors	AI	SD	Ranking
F26	Difficulties in financing project by contractor	3.98	1.223	1
F17	Poor coordination between parties	3.83	1.025	2
F33	Shortage of manpower	3.80	1.110	3
F6	Delays in producing design documents	3.75	0.989	4
F3	Improper planning and scheduling of the project	3.72	1.215	5
F27	Delay in progress payments	3.70	1.202	6
F35	Low productivity level of labour	3.67	1.045	7
F18	Poor communication between parties	3.66	0.997	8
F34	Unqualified workforce	3.59	1.147	9
F2	Poor contract management	3.56	1.157	10

2.5. Discussion of theoretical framework

2.5.1. Stakeholders' influences on project time

Based on the survey of the literature the theoretical framework of this study was established (Table 2.1), the writer has identified the factors influencing construction project delivery time either positively or negatively:

- The client's understanding of the design, procurement, and construction processes;
- Quality management during design;
- Quality management during construction;
- Management techniques used for planning and control;
- Economic policy;
- Constructability of design;
- Site ground conditions;
- Motivation of staff;
- Management style;

- Site access;
- Physical environment considerations, and
- Socio-political considerations.

1. Client understanding of the design, procurement, and construction processes

A client is considered as the initiator of a project, responsible for the production of the project. There are two types of clients; public and private clients. Private clients could further be divided into private (home dwellings) and private commercial. It is important that private clients understand the design, procurement, and construction processes. The clients provide valuable information which may help various participants to improve their performance on a project. Clients are either experienced or inexperienced.

The client's attributes and their project management approach can have a significant effect upon the attainment of project objectives. The enormous importance of clients influence in project performance can be accessed from factors identified by (Deep et al., 2022) given in summary as the clients understanding of the project constraints; ability to effectively brief the design team; ability to contribute ideas to the design and construction processes; and finally, ability to make authoritative decisions quickly, and the stability of these decisions.

2. Quality of management during design

Project success is dependent on; inter alia, the performance of the design team. The designers are the key players in the construction industry whose services are needed from the conception stage of the project to its completion. The performance of the designers is therefore important because any decision made at the inception of the project will affect project success. Defective designs adversely impact on project performance and the participants and are responsible for many construction failures (Meng, 2012).

Failure at the conceptual planning and design stages may lead to significant problems in successive stages of the project. Design inefficiencies could lead to redesign and rework or poor quality of products. (Poelman & Keyson, 2008) provide a listing of clients ranking of designer's performance criteria among which were those that relate to quality of design coordination, smooth flow of work,

vis-à-vis conflicting design information, timeliness of issuing of revised drawings, missing information, dimensional inaccuracies as well as delay of release of shop drawings.

3. Quality of management during construction

(Ekrot et al., 2016) Declare that project management competence represents only one of many criteria upon which project performance is contingent. It is also arguably the most significant as it is people who deliver projects, and not processes and systems. According to (Khoshgoftar et al., 2010), problems such as schedule delays, budget overruns, low quality work, as well as a large number of claims and litigation result largely from not selecting the best contractor to construct the facility. Quality of management during construction concerns the steps taken to ensure that products are in accordance with the quality standards and measure the competency of consultants and contractors. Supervision during construction is critical to ensure quality products and timely delivery of project. On the part of the consultants the assessment of the following will determine the speed of construction and ensure quality of the product: timely inspection procedure; adequate quality management inspection resources; quality management information processing requirements; materials or work rejection rate, and clean / dry working environment requirements. On the part of the contractor, the effectiveness of construction management will affect the speed of construction. The factors to be considered here are forecasted planning data such as analysis of construction methods; analysis of resource movement to and within site; analysis of work sequencing to achieve and maintain workflow; monitoring and updating of plans to appropriately reflect work status; responding to, and recovering from problems or taking advantage of opportunities present; effective coordination of resources, and finally, the development of appropriate organizational structure to maintain workflow.

4. Motivation of staff

Productivity in the construction industry has been steadily declining. Labor efficiency has been cited as poor, resulting in delays. Several techniques can be used to positively influence workers' behavior. Two of these techniques are the behavioral and economic approach. The former, the behavioral approach, views motivation from the workers psychological requirements and the second views it from the economic approach and places emphasis on monetary rewards (Camerer et al., 2006).

Construction productivity is influenced by many factors, including material, equipment, tools, construction methods and management skills in terms of adequacy and accurate application. However, these resources are inanimate and meaningless if not transformed into productive tools by the human element. The quality of human performance depends largely upon motivation. Motivation variables that could impact on construction time are pay and allowances; job security; a sense of belonging and identification with the project team; recognition of contribution made; opportunity to extend skills and experience through learning; equitable rewards relative to others input into the project, and the exercise of power and opportunity for career advancement for future benefit.

5. Site ground conditions

The inherent site conditions of a project affect the speed of delivery(Olatunji, 2010). This is often due to a lack of or poor investigation of site ground conditions to obtain data regarding site soil conditions. Site conditions refer to the features on a site, whether there are existing structures or not; the condition of the subsoil; the firmness of the earth beneath the surface; the distance of the water table to the surface; underground service ducts and similar features. Other ground factors that impact on the speed of construction include the nature of demolition of work; the nature of restoration work; the structural stability of ground; the extent of ground contamination; the extent of archaeological finds; the impact of the water table; the impact of underground services, and the impact of underpinning existing structures.

6. Site access

The condition of site access to a project will determine the rate of flow of materials, machines and people to the project site (Ameen & Safawizadeh, 2017). Where there is difficulty in getting to the site, in the form of bad road surfacing, the narrowness of the road or a long distance between storage space and entry point, these factors will negatively affect construction speed and cause construction delays.

7. Constructability of design

(Singhaputtangkul et al., 2014) Define the extent to which a building design facilitates the ease of construction as buildability: a British term, or constructability: an American term which is defined as the grouping of similar work components and the use of modular dimensions in design to reduce construction cost.

The constructability requirement is, however, one of the major factors necessitating the integration of construction experience into building designs. (Lam et al., 2007) Provide a list of factors that could be used to assess constructability: flexibility of design to changes; dimensional coordination of elements; knowledge of performance of materials and components; effective constructability review of design, and effective participation in site inspection and control. The following factors are employed in the assessment of design constructability: the scope of off-site fabrication; complexity of offsite fabrication components; appropriateness of design tolerances; appropriateness of working space; implication upon trade coordination; impact of materials storage and movement, and impact on smooth activity workflow and activity sequencing.

8. Management style

The management style employed in the execution of a project has a significant effect on the productivity outcome. Machines and systems are operated by human beings. Humans tend to require coercion to work. This is evidenced by the low productivity of some laborers. Supervision is required to push workers to meet scheduled targets. (Fiaz et al., 2017) Discuss three types of leaders, namely autocratic, democratic, and laissez-faire leaders. The following factors could be used in assessing the management style of those in positions of authority: setting specific goals employees are to accomplish; organizing the work environment for people; setting timelines; providing specific direction; conducting regular updates on progress; providing support and encouragement; involving team members through discussion of work, and seeking people's opinions and concerns.

9. Management techniques used for planning and control

Project controlling techniques indicate the direction of the project at each time and reveal progress. According to (Punmia & Khandelwal, 2002) there are various types of planning tools, namely the Gantt (Bar) chart; network diagrams; the CPM and the Program Evaluation Review Technique (PERT). They are utilized in the construction industry for the planning and control of materials, labor, and plant, machinery and equipment. (Seppänen & Aalto, 2005) State that the line of balance planning tool is used for repetitive works. However, two types of planning tools are generally used on any kind of project, namely the CPM and the bar chart. There are others which are used for specific types of projects, such as heavy engineering projects.

10. Physical environmental conditions

Physical environmental conditions are factors over which no party to a contract has control (Luo, 2005). (Ntawiniga, 2024) Contend that social cultural issues and unforeseen circumstances constitute these factors and they constrain successful construction projects delivery in Rwanda. Though their effect is minimal, they constitute a problem, negatively affecting the smooth flow of activities on sites. Some authors refer to them as external factors, and by definition, these are occurrences that are seen to adversely impact on the smooth flow of work. They include the impact of natural hazards (fire, flood and many others), adverse local weather conditions (rainfall and high temperature), ambient noise (beyond tolerance level) and the condition of light.

11. Economic policy

Economic environmental considerations refer to the level of general economic activity and resources available to carry out construction work. (Olatunji, 2010) Identify twenty-five such factors that could impact on construction time. Those applicable to this study include the availability of materials; the availability of equipment; the availability of trades and operatives, the availability of supervision and management staff, as well as the indirect impact of interest rates, inflation, insolvency and bankruptcy.

12. Socio-political conditions

The social environment concerns needs for projects or individuals while the political environment is concerned with government policy and the effect of political decisions on projects. Political sociology is defined as the study of power and the intersection of personality, social structure, and politics. Factors which constitute this are civil strife or riots; the influence of civil action-groups and disruptions due to environmental concerns(Juntti et al., 2009).

CHAPTER III: RESEARCH METHODOLOGY

3.0.Introduction

This chapter provides an explanation regarding the methodologies and procedures employed for the study. These include data collection, sampling (populations used), questionnaire design, and data analysis.

3.1.Research design

Research design is the framework that outlines the methods and procedures for collecting and analyzing data, ensuring that the research questions are addressed systematically. One of the essential components of research design is data collection—the process of gathering and measuring information on variables of interest in an organized and methodical manner. This process allows researchers to answer stated research questions, test hypotheses, and evaluate outcomes effectively.

Data collection is fundamental across all fields of research, whether in the physical or social sciences. The ultimate goal is to capture high-quality evidence that leads to meaningful data analysis and credible conclusions(Tracy, 2024).

According to the(Tracy, 2024), there are three types of data collection and they are

- **Surveys:** Standardized paper-and-pencil or phone questionnaires that ask predetermined questions.
- **Interviews:** Structured or unstructured one-on-one directed conversations with key individuals or leaders in a community.
- **Focus groups:** Structured interviews with small groups of like individuals using standardized questions, follow-up questions, and exploration of other topics that arise to better understand participants.

In my project research I have used survey and interview

- List of respondents who have helped me to get information In data collection for getting information
1. I asked the clients

2. The contractors of construction project
3. Site engineers
4. consultants

3.2.Sources of data

There are two types of data. These include:

- Primary, and
- Secondary data.

3.2.1. Primary data

Primary data for this study was obtained through a systematic field data collection process involving surveys and interviews. Two well-structured questionnaires were developed based on the conceptual framework formulated from the literature. These questionnaires were used to collect data directly from key stakeholders, including the construction permit engineer at the City of Kigali, contractors involved in various construction projects, and site engineers overseeing project execution.

Interviews were conducted with these stakeholders to gather firsthand information, identifying nine main factors and twenty-seven sub-factors contributing to project delays. This primary data serves as the foundation for the subsequent analysis and evaluation in the study.

3.2.2. Secondary data

Secondary data used in this research were obtained from various Rwandan and international sources, including journal and conference papers, articles, books, theses, and online resources. Additional relevant data was extracted from official reports and publications, such as government documents and industry reports related to Rwanda's construction sector. These sources provided context and background information that supported the analysis and interpretation of the primary data collected.

3.3. Description of study area

The project of Effects of Timely Delivery of Construction Projects on Economic Development of Rwanda has been conducted at Gasabo District. The Gasabo District is located with latitude and longitude coordinates of $1^{\circ}53'23.14''$ S, $30^{\circ}06'45.85''$ E and is situated in the city of Kigali. The headquarter of Gasabo is located in Remera Sector. The district also includes large areas of the city itself, including Kacyiru, Kimironko, Remera, Nyarutarama and Kimihurura.



Figure 3.1: Location of Gasabo district

3.4. Research Population

The research population for this study was identified following interviews with engineers from the City of Kigali. According to the data gathered in 2023, there were 127 construction projects that have requested and granted an extension permits in GASABO District, having exceeded their initial construction timelines due to delays. The inclusion of these delayed projects helped us to get the sample for analyzing the factors contributing to delays and their subsequent impact on Rwanda's economic development.

3.5. Sample size

In this research, the sample size refers to a subset of the population under study, selected for analysis to represent the entire population. By examining this smaller, manageable group, the researcher can conclude and make generalizations about the overall population. For these generalizations to be valid, the sample must accurately reflect the characteristics and diversity of the entire population, ensuring that the findings are both reliable and applicable to broader contexts.

3.5.1. Sample size calculation

What is the formula for sample size?

There are many formulas used for calculating sample size. One of the most common formulas used is Yamane's formula (Umar & Wachiko, 2021):

$$n = N / (1 + N(e)^2)$$

The variables in this formula are:

n = the sample size

N = the population of the study

e = the margin error in the calculation

The **margin of error (e)** in this sample size calculation was a measure of the maximum expected difference between the true population parameter and a sample estimate. It reflected how much error I was willing to accept in my results, and it was typically determined by the following factors:

Confidence Level: The margin of error is closely tied to the confidence level, which indicates how certain you are that the true population parameter falls within your estimated range. Common confidence levels are:

My confidence level was 95% which gave me a margin of error of 5%.

$$n = N / (1 + N(e)^2)$$

$$n = 127 / (1 + 127(0.05)^2)$$

$$n=127/(1+12.7)$$

$$n=127/13.7$$

$$n=9.27$$

approximately sample size of this research will be 9 construction projects

3.6.Questionnaire design

The study used three questionnaire types for data gathering, those questionnaires used for the city of Kigali engineers, contractors and site engineers

3.6.1. Questionnaire survey

Based on the problem categorization outlined in the questionnaire, the associated problems were identified and classified into specific categories related to project delays. The questionnaire was designed to capture insights from key stakeholders, including engineers, contractors, and project managers, regarding the root causes of these delays. Respondents were asked to evaluate the severity and frequency of each problem, allowing for a comprehensive analysis of the most critical factors affecting timely project delivery. The responses were then systematically analyzed to provide a clear understanding of how these issues impact the overall performance of construction projects as well as the economic development of Rwanda.

The following are the main factors and each has three sub-factors as shown on the questionnaires:

- Poor Planning and Scheduling
- Financial Constraints
- Material Shortages
- Inefficient Project Management
- Contract Disputes
- Frequent Design Changes
- Inadequate Equipment Availability
- Poor Risk Management
- Inflation and Cost Escalation

3.7.Data Analysis and Interpretation

This section outlines the process through which the data collected for the study was analyzed and interpreted. A combination of qualitative and quantitative methods was employed to ensure a comprehensive understanding of the factors affecting the timely delivery of construction projects and their impact on the economic development of Rwanda.

3.7.1. Qualitative Data Analysis

The qualitative data, collected through interviews with key stakeholders such as engineers, contractors, and site managers, was analyzed using **content analysis**. The qualitative data was presented in the form of **text**, which was thematically organized to highlight key issues such as:

- Delays in securing project approvals
- Financial constraints affecting project flow
- Regulatory and environmental challenges impacting timely project delivery

3.7.2. Quantitative Data Analysis

For the quantitative data, a combination of **tabular** and **chart presentations** was utilized to facilitate clear interpretation. This approach helped us to present some data such as project details and the frequency of delay factors. The following methods were employed:

1. Tabular Analysis:

Tables were used to organize and present data related to project characteristics, including project size, initial duration, extended duration, and specific delay factors. This allowed for the systematic comparison of multiple variables and provided a clear overview of the study population.

2. Graphical Analysis:

Bar charts were used to compare different categories of delay factors. The contribution factors affecting the timely delivery of construction projects were presented graphically to allow for easy comparison between different sets of data.

3.8. Interpretation of Findings

The data analysis revealed several critical factors that affect the timely delivery of construction projects in Rwanda. The use of tables enabled the identification of common trends in project delays, while the graphical analysis made it easy to compare the significance of different delay factors across multiple projects.

CHAPTER IV: RESULTS AND DISCUSSION

4.0.Introduction

This chapter focuses on the analysis, interpretation, and presentation of the findings from the study. It compiles responses to the questionnaire from the different construction professionals to answer the research questions. It compares different professions' awareness, compliance and views on the challenges and solutions associated with the evaluation of quality management on construction industry in Rwanda. This chapter also discusses the findings by showing their relationship to the literature review.

4.1.Testing of questionnaires

The sampling method adopted in this research was cluster sampling, where the population was divided into clusters or sub-groups as listed in the below

- Client organization
- Civil engineering contractor
- Engineering consultants, / professionals or project managers
- Consultants organization

4.2.Target population organizations

To assess the factors contributing to construction project delays, data was collected from key stakeholders involved in construction projects at various organizational levels. The table below outlines the targeted client organizations and respondents who provided critical insights based on their roles in the construction process.

The research study targeted contractors who are registered and fully paid off with Rwanda Contractors Association (RCA), particularly those construction companies that have had experience in various civil works. The targeted respondents were site engineers, project managers and contractors who have a good knowledge of contract management. The table below summarizes the number of construction projects that helped us to collect the information.

Table4.1: target population

Targeted Group	Targeted Respondents
Client organization	Client
Civil engineering sectors	Contractor, Site engineers, project manager
Engineering consultants, / professionals or project managers	Consultants

4.3.Overview of visited Construction Projects in Gasabo District

This table provides a summary of the nine construction projects in Gasabo District, Rwanda, from which data on project delays were collected. The information includes project names, client organizations, locations, types of construction, start and completion dates, as well as the original and actual budgets.

Table 4.2: status of construction project in Gasabo district

S/N	Project Location	PERMIT NO	Project Type	Start Date	End Date	Original Budget (RWF)	Actual Budget (RWF)	Status
1	Bumbogo sector	COK/BP/2023/AAJ 525	G+1 residential building	1/7/2023	1/12/2023	145,000,000	160,000,000	Delayed
2	Bumbogo sector	COK/BP/2023/AAJ 853	G+1 residential building	15/04/2023	30/11/2023	120,000,000	122,000,000	On-time
3	Kinyinya sector	COK/BP/2023/AA H774	G+2 commercial building	10/1/2023	10/11/2023	520,000,000	565,000,000	Delayed

4	Kinyinya sector	COK/BP/2023/AA K077	G+1 residential building	1/6/2023	1/10/2023	95,000,000	98,000,000	On-time
5	Jali sector	COK/BP/2023/AAI 622	G+1 commercial building	1/7/2023	1/12/2023	112,000,000	121,000,000	Delayed
6	Jali sector	COK/BP/2023/AAI 378	G+2 commercial building	15-02-2023	15-11-2023	620,000,000	635,000,000	On-time
7	Kimironko sector	COK/BP/2023/AAI 622	G+2 commercial building	1/1/2023	1/11/2023	840,000,000	951,000,000	Delayed
8	Kimironko sector	COK/BP/2023/AAJ 481	G+3 commercial building	5/2/2023	5/12/2023	1,200,000,000	1,240,000,000	On-time
9	Kimironko sector	COK/BP/2023/AAL 057	G+3 commercial building	1/3/2023	1/3/2024	970,000,000	1,087,000,000	Delayed

Table 4.3: Detail Breakdown of sampling

S/N	Type of Sample	Sent	Returned	% of response
1	Client Organizations	9	8	88.9
2	Site engineers & project managers	9	9	100.0
3	General Contractors	9	9	100.0
4	Consultants	9	8	88.9
	Total	36	34	94.4

Out of the 36 questionnaires sent, only 34 were received back, which represents 94.4% response. The compositions: Client organization (88.9%), General contractors (100%), Site engineers & project managers (100%) and consultants (88.9%).

The rate of response rate was attributed to the fact that the time sent to respond to the questionnaires was short, and some recipients asked for more time which was not possible due to the limit to finalize with the project. Data summary was a very important step to provide data for analysis. To achieve the study objectives, the data collected from the questionnaire survey was summarized into three categories, namely;

- Clients' point of view
- Site engineers & project managers
- Contractors' point of view
- Consultants' point of view

In responding to the questionnaires, the following concerns were raised in each of the categories.

- More causes of project delay in this category were added
- Additional impacts of the effect of construction project delay were identified

4.4.Data analysis

By using the questionnaire, respondents were asked to rate the degree of factors contributing to project delays, specifically focusing on their **likelihood** and **severity** in the context of construction projects in Rwanda. After determining the likelihood and severity of each factor, the degree of impact was expressed numerically and as a percentage, as outlined in the tables below. This approach allowed for a clearer understanding of which factors are most probable to cause delays and how severe their impact is on timely project delivery, also it gave us a view into mitigating delays to support Rwanda's economic development.

Table 4.4: Evaluation Criteria for Delay Severity(Assaf & Al-Hejji, 2006)

Assigned Value	Description
1	Minor impact – no significant effect on the project schedule
2	Small delay – project timeline slightly adjusted, no cost impact
3	Moderate delay – requires timeline extension, but no major financial impact
4	Significant delay – impacts critical path and project delivery time
5	Major delay – substantial effect on both timeline and budget
6	Severe delay – halts the project and significantly disrupts schedule and costs




Table 4.5: Evaluation Criteria for Likelihood of Occurrence of Delay(Assaf & Al-Hejji, 2006)

Assigned Value	Description
1	Remote – almost certain not to occur
2	Unlikely – occurrence only in exceptional cases
3	Possible – some circumstances may influence the occurrence
4	Likely – could occur under ordinary conditions
5	Probably – high chance of occurrence
6	Highly probable – almost certain to occur

Severity of delay	6	6 (16%)	12 (33%)	18 (50%)	24 (67%)	30 (83%)	36 (100%)
	5	5 (14%)	10 (28%)	15 (42%)	20 (56%)	25 (69%)	30 (83%)
	4	4 (11%)	8 (22%)	12 (33%)	16 (44%)	20 (56%)	24 (67%)
	3	3 (8%)	6 (16%)	9 (25%)	12 (33%)	15 (42%)	18 (50%)
	2	2 (6%)	4 (11%)	6 (16%)	8 (22%)	10 (28%)	12 (33%)
	1	1 (3%)	2 (6%)	3 (8%)	4 (11%)	5 (14%)	6 (16%)
		1	2	3	4	5	6
		Likelihood of delay occurrence					

Figure 4.1: project delay rating matrix

LEGEND







High risk of project delay	
Moderate risk of project delay	
Low risk of project delay	

4.5.Key factors affecting timely delivery of construction project

4.5.1. Key factors investigated under clients

The overall questionnaires returned from clients were 8 out of 9 sent representing 88.9 percent of the response. Responses from various sections of the questionnaires are summarized in tables below.

Table 4.6: Responses from clients

S/N	Main factors	Sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)	Risk Degree (Severity × Likelihood)	Mean of percentage of risk of project delay
1	Poor Planning and Scheduling	 Inadequate project planning leads to ineffective scheduling	3.875	4.625	17.9	49.8%
		 Lack of contingency planning for unforeseen events	4.625	4.25	19.7	54.6%
		 Misalignment between project schedule and resource availability	3.375	4.875	16.5	45.7%
2	Financial Constraints	 Insufficient funding at project initiation or during execution	4.75	5.5	26.1	72.6%
		 Budget mismanagement affecting project scope	4.125	4.375	18.0	50.1%
		 Cash flow issues impacting timely payment to contractors	5.5	5	27.5	76.4%

3	Material Shortages	✚ Unavailability of required materials due to procurement issues	4.125	5.875	24.2	67.3%
		✚ Ineffective supply chain management leading to material shortages	3.5	4.875	17.1	47.4%
		✚ Inability to source alternative materials when needed	4.125	4	16.5	45.8%
4	Contract Disputes	✚ Misunderstandings related to contractual obligations	3.625	4.5	16.3	45.3%
		✚ Conflicts over payment terms and project deliverables	4.25	4.375	18.6	51.6%
		✚ Disagreements affecting cooperation between client and contractor	4.75	4.125	19.6	54.4%
5	Frequent Design Changes	✚ Modifications to project design after construction has started	4.125	4.875	20.1	55.9%
		✚ Inadequate communication of design revisions leading to confusion	3.75	4.625	17.3	48.2%
		✚ Changes in project specifications requiring rework and adjustments	4.75	4.125	19.6	54.4%
6	Delays in Payment to Contractors	✚ Late processing of payments impacting contractor performance	5.375	5.125	27.5	76.5%
		✚ Payment disputes resulting in work stoppages	4.375	4.375	19.1	53.2%
		✚ Insufficient financial incentives for timely completion of work	4.375	4.25	18.6	51.6%
7	Poor Risk Management	✚ Inadequate identification of potential risks affecting project timeline	4	4.25	17.0	47.2%
		✚ Lack of contingency strategies for unforeseen circumstances	4.25	4.25	18.1	50.2%
		✚ Insufficient risk assessment leading to	3.75	4.625	17.3	48.2%

		unexpected project impacts				
8	Inflation and Cost Escalation	✚ Rising costs of materials and labour impacting project budget	4.75	4.125	19.6	54.4%
		✚ Unanticipated price increases leading to adjustments in project scope	3.5	4.875	17.1	47.4%
		✚ Budget constraints caused by economic fluctuations affecting project viability	4.125	4	16.5	45.8%

According to the analysis of the data presented in the table 4.6, clients identified **financial constraints** as the most significant factor contributing to construction project delays, with a calculated risk rate of **66.4%**. This highlights the critical impact that financial challenges can have on project timelines. The relative risk levels associated with other contributing factors are demonstrated in the below chart, which provides an overview of the various elements influencing project delays.

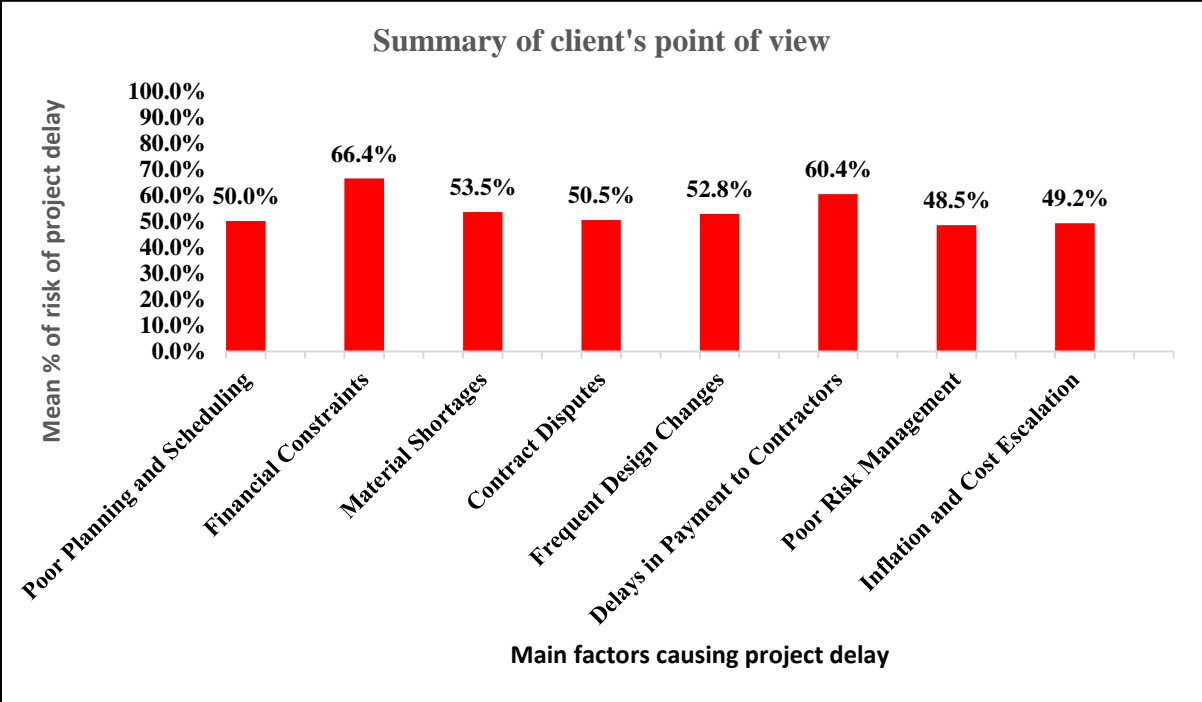


Figure 4.2: Summary of client’s responses

4.5.2. Key factors investigated under Site engineers/ project managers

The overall questionnaires returned from clients were 9 out of 9 sent representing 100 percent of the response. Responses from various sections of the questionnaires are summarized in tables below

Table 4.7: Response from site engineers/ project managers

S/ N	Main factors	sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)	Risk Degree (Severity × Likelihood)	Mean of percentage of risk of project delay
1	Poor Planning and Scheduling	✚ Inadequate project timelines and milestones	4.2	5.0	21.1	58.6%
		✚ Insufficient resource allocation for tasks	4.3	4.7	20.2	56.2%
		✚ Lack of contingency plans for unforeseen circumstances	4.6	4.6	20.8	57.6%
2	Material Shortages	✚ Inadequate procurement processes leading to unavailable materials	4.6	4.9	22.3	61.9%
		✚ Poor communication with suppliers regarding material delivery schedules	4.4	4.1	18.3	50.8%
		✚ Ineffective inventory management	4.4	4.6	20.2	56.2%

		affecting material availability				
3	Inefficient Project Management	✚ Lack of effective oversight and supervision of project activities	4.7	4.7	21.8	60.5%
		✚ Insufficient coordination among team members and subcontractors	4.7	4.3	20.2	56.2%
		✚ Poor decision-making processes impacting project execution	4.3	5.1	22.1	61.5%
4	Contract Disputes	✚ Misunderstandings regarding project scope and deliverables	4.8	4.7	22.3	61.9%
		✚ Conflicts over contract terms and conditions affecting work progress	4.4	4.1	18.3	50.8%
		✚ Inadequate communication of contractual expectations among stakeholders	4.4	4.6	20.2	56.2%
5	Frequent Design Changes	✚ Changes in project design leading to rework and adjustment of resources	4.8	4.8	22.8	63.4%
		Insufficient review and approval	4.6	4.1	18.7	52.0%

		processes for design modifications				
		Lack of stakeholder engagement in the design phase causing misalignment with project goals	4.3	5.1	22.1	61.5%
6	Inadequate Equipment Availability	Shortage of necessary tools and equipment for construction activities	4.7	4.7	21.8	60.5%
		Ineffective maintenance schedules for equipment affecting availability	4.7	4.3	20.2	56.2%
		Delays in equipment mobilization impacting project timelines	4.3	5.1	22.1	61.5%
7	Poor Risk Management	Lack of identification and assessment of potential risks impacting project timelines and costs	4.8	4.8	22.8	63.4%
		Inadequate response strategies for unforeseen issues affecting project execution	4.6	4.1	18.7	52.0%
		Insufficient communication of risk factors among project stakeholders	4.4	4.6	20.2	56.2%
8		Rising costs of materials and labor	4.8	4.9	23.4	64.9%

	Inflation and Cost Escalation	impacting project budgets				
		Unanticipated price increases affecting procurement decisions	4.8	4.3	20.7	57.5%
		Insufficient budget adjustments to accommodate inflationary pressures	4.4	4.7	20.7	57.6%

Based on the analysis of the data presented in the table 4.7, site engineers and project managers have identified **inflation and cost escalation** as the most critical factor contributing to delays in construction projects. This factor was assigned a calculated risk rate of **60%**, which highlights a significant impact on project timelines and budgets. Inflation and cost escalation are considered as a major challenge faced by the construction industry in managing rising material and labour costs, which in turn disrupt project schedules and increase initial budget estimates.

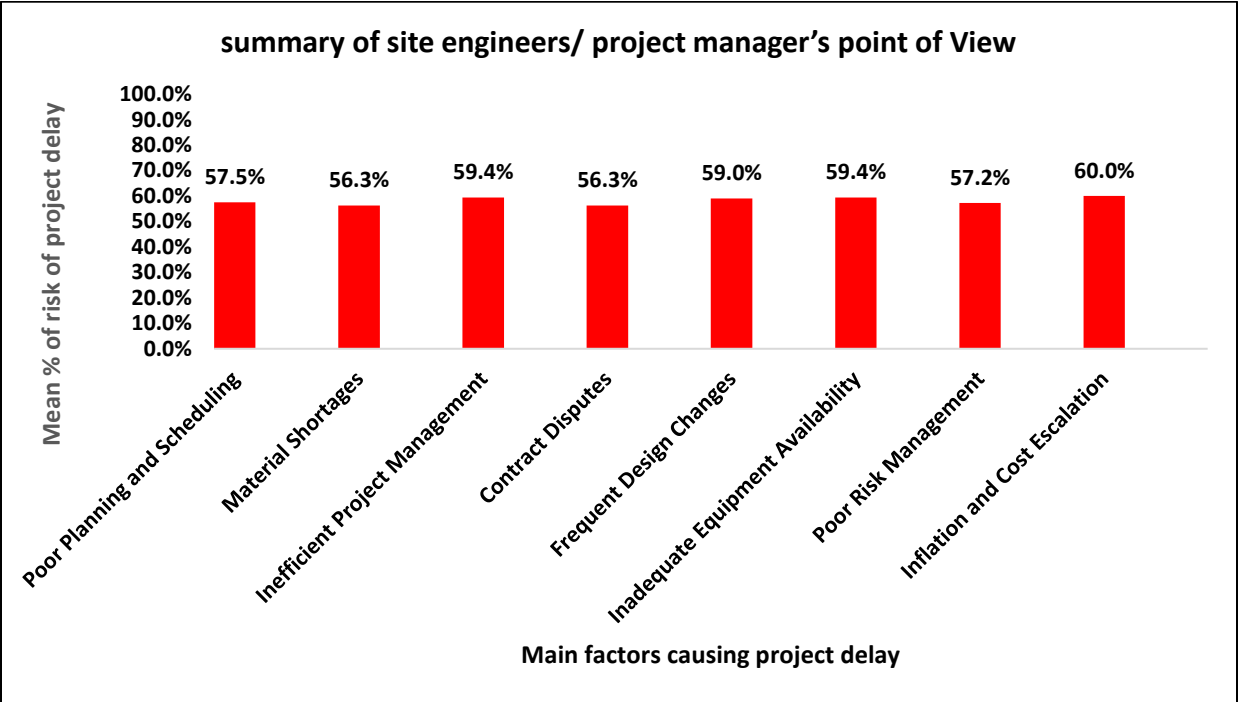


Figure 4.3: Summary of site engineers/ project managers responses

4.5.3. Key factors investigated under Contractors



The overall questionnaires returned from clients were 9 out of 9 sent representing 100 percent of the response. Responses from various sections of the questionnaires are summarized in tables below

Table 4.8: Response from contractors

S/N	Main factors	Sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)	Risk Degree (Severity × Likelihood)	Mean of percentage of risk of project delay
1	Poor Planning and Scheduling	Inadequate initial project planning and scheduling processes	4.4	4.3	19.3	53.5%
		Misalignment of project timelines with resource availability	4.2	4.2	17.8	49.5%
		Lack of contingency plans to address unforeseen scheduling issues	4.3	4.8	20.7	57.5%
2	Financial Constraints	Insufficient funding during critical project phases	4.3	4.1	17.8	49.5%
		Inadequate budget management and financial allocation	4.3	4.8	20.7	57.5%
		Challenges in maintaining cash flow impacting project progression	4.3	4.2	18.3	50.8%
3	Material Shortages	Shortages of essential materials required for construction	4.3	4.6	19.7	54.8%

		✚ Inadequate procurement planning for timely delivery of materials	4.4	4.4	19.8	54.9%
		✚ Increased lead times for material sourcing affecting project schedules	4.3	4.2	18.3	50.8%
4	Contract Disputes	✚ Conflicts regarding contractual obligations between parties	4.3	4.6	19.7	54.8%
		✚ Misunderstandings related to payment terms and performance expectations	4.3	4.3	18.8	52.2%
		✚ Escalation of disputes requiring renegotiation and contract modifications	4.3	4.6	19.7	54.8%
5	Frequent Design Changes	✚ Frequent modifications to project design specifications	5	4.6	23	64.1%
		✚ Lack of clarity in design documents leading to rework	4.9	4.6	22.7	63.2%
		✚ Challenges in managing client expectations related to design adjustments	4.8	4.8	23.04	64%
6	Inadequate Project Supervision	✚ Insufficient oversight of construction activities	4.4	4.2	18.8	52.1%

		✚ Lack of effective communication between site management and field workers	4.4	4.3	19.3	53.5%
		✚ Inadequate response to on-site issues affecting workflow	4.3	4.3	18.8	52.2%
7	Delays in Payment to Contractors	✚ Late payments impacting contractor performance and resource allocation	4.9	4.7	23.2	64.6%
		✚ Financial strain due to slow processing of payments affecting project resources	4.6	4.7	21.9	61.7%
		✚ Impact of payment terms on contractor's ability to maintain project momentum	4.7	4.6	21.9	60.1%
8	Poor Risk Management	✚ Lack of identification and mitigation of potential risks impacting project execution	4.2	4.4	18.8	52.1%
		✚ Inadequate strategies to manage unforeseen site conditions	4.3	4.4	19.3	53.5%
		✚ Insufficient planning for risk factors leading to cost increases	4.3	4.3	18.8	52.2%
9	Inflation and Cost Escalation	✚ Rising material and labor costs impacting the overall project budget	4.4	4.6	20.2	56.2%

		 Increased costs of construction due to market fluctuations	4.4	4.6	20.2	56.2%
		 Challenges in adjusting project budgets to accommodate inflationary pressures	4.4	4.6	20.2	56.2%

Based on the comprehensive analysis of the data presented in the table 4.8, contractors have identified **frequent design changes** as the most significant factor contributing to delays in construction projects. This issue has been attributed to a calculated risk rate of **64%**. Those changes include rework, adjustments to project specifications, and challenges in managing client expectations. Consequently, addressing this factor is essential for improving project efficiency and mitigating delays in the construction industry.

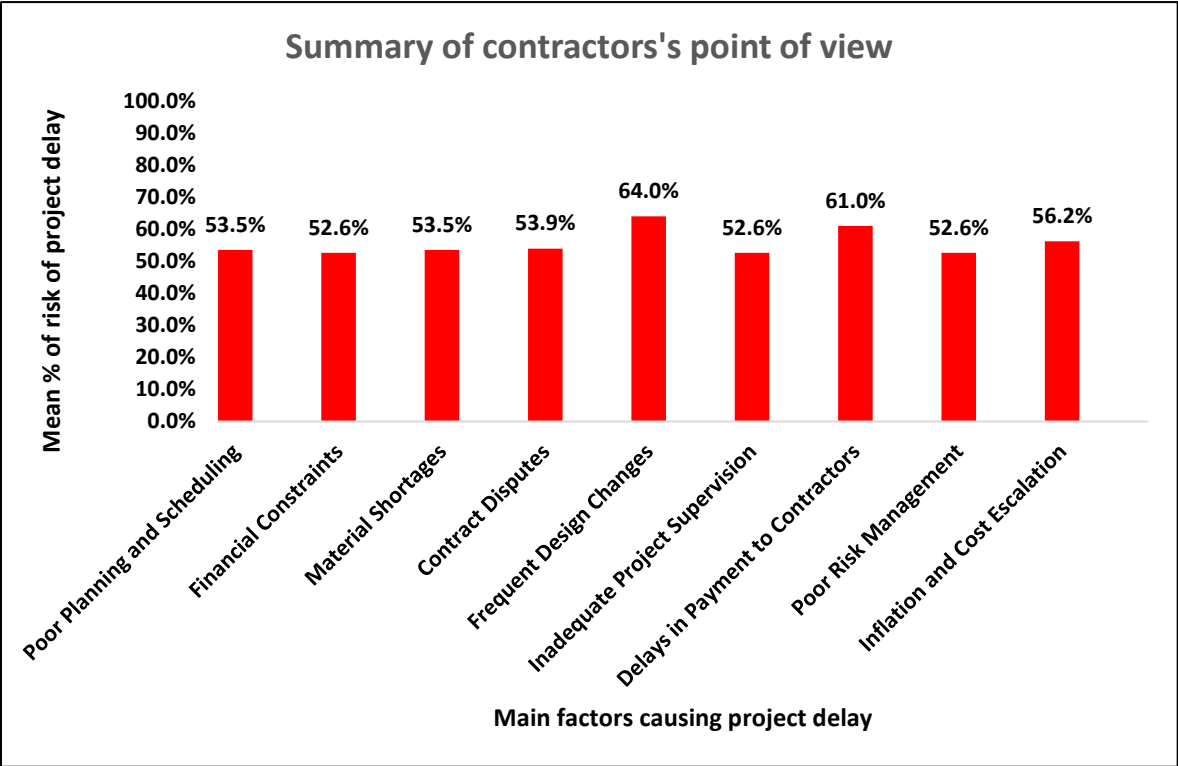


Figure 4.4: Summary of contractor’s response

4.5.4. Key factors investigated under consultants

The overall questionnaires returned from clients were 8 out of 9 sent representing 88.9 percent of the response. Responses from various sections of the questionnaires are summarized in tables below

Table 4.9: Responses from consultants

S/N	Factors	sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)	Risk Degree (Severity × Likelihood)	Mean of percentage of risk of project delay
1	Poor Planning and Scheduling	✚ Poor project planning leading to misaligned timelines and resource allocation.	4.0	3.8	15.1	42.0%
		✚ Inadequate scheduling affecting the execution of project phases.	3.9	4.2	16.4	45.6%
		✚ Insufficient contingency plans for unexpected challenges impacting project progress.	4.2	4.4	18.8	52.1%
2	Financial Constraints	✚ Limited funding affecting the project's scope and execution.	4.0	3.8	15.1	42.0%
		✚ Budget overruns impacting the overall financial management of the project.	3.8	4.1	15.5	43.1%
		✚ Financial management issues leading to reallocation of resources and timeline adjustments.	4.0	4.1	16.4	45.7%
3	Material Shortages	✚ Procurement challenges leading to a lack of	4.0	3.9	15.6	43.2%

		essential materials for construction.				
		✚ Delays in material delivery causing interruptions in the construction process.	4.0	4.9	19.6	54.3%
		✚ Unavailability of specific materials impacting the project schedule and budget.	4.1	4.0	16.4	45.7%
4	Contract Disputes	✚ Conflicts between contractual obligations affecting project flow.	4.0	3.8	15.1	42.0%
		✚ Disagreements on payment terms, performance expectations, or deliverables impacting project timelines.	3.8	4.3	16.4	45.5%
		✚ Protracted resolution of contractual disputes affecting project progression.	4.1	4.2	17.4	48.2%
5	Frequent Design Changes	✚ Design modifications leading to revisions in project scope and timelines.	4.0	3.8	15.1	42.0%
		✚ Late-stage design changes requiring rework of completed tasks affecting project milestones.	4.0	5.1	20.4	56.8%
		✚ Delays in approvals for design alterations impacting project execution.	4.0	4.1	16.4	45.7%
6		✚ Insufficient oversight affecting the quality of	4.0	3.9	15.6	43.2%

	Inadequate Project Supervision	work and adherence to the project schedule.				
		✚ Lack of qualified personnel overseeing project progress leading to mismanagement.	4.0	5.2	20.9	58.0%
		✚ Inconsistent monitoring of project milestones impacting overall execution.	4.1	4.2	17.4	48.2%
7	Poor Risk Management	✚ Failure to identify and mitigate potential risks affecting project execution.	4.0	3.8	15.1	42.0%
		✚ Inadequate contingency measures for unforeseen circumstances impacting project timelines and costs.	3.8	4.7	17.6	49.0%
		✚ Lack of effective communication regarding risk factors between stakeholders.	4.1	4.2	17.4	48.2%

Based on a comprehensive analysis of the data presented in the table 4.9, it has been determined that consultants have identified **contract disputes** as the most significant factor contributing to delays in construction projects. This factor was assessed with a calculated risk rate of **65.7%**. contract disputes in the analysis reflect on issues such as conflicts regarding contractual obligations, misunderstandings related to payment terms, and disputes over performance expectations, all of which can lead to significant delays and disruptions in project execution.

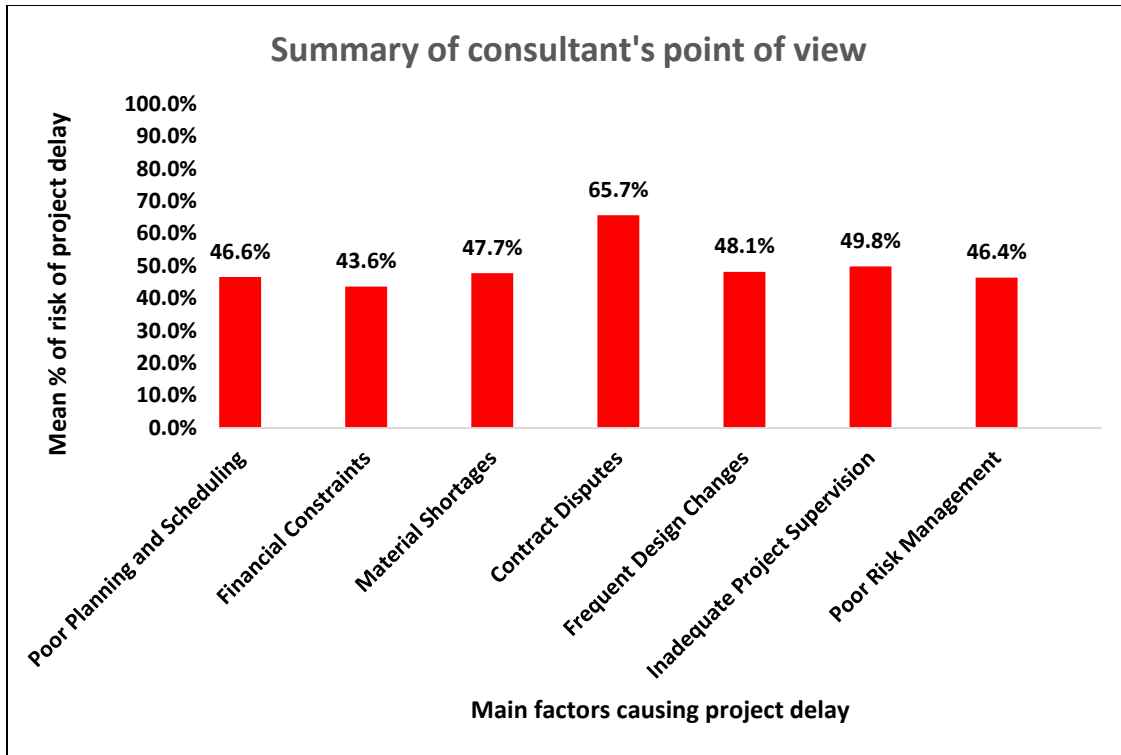


Figure 4.5: Summary of consultant’s responses

4.6. The overall point of view of key factors investigated for all stakeholders

After presenting the perspectives of each stakeholder regarding the factors contributing to delays in construction projects, the chart below provides a consolidated analysis of how these factors have been assessed by the various stakeholders. However certain stakeholders are not represented in relation to specific factors. This is due to the fact that these factors were deemed irrelevant to their respective roles or areas of responsibility within the construction project.

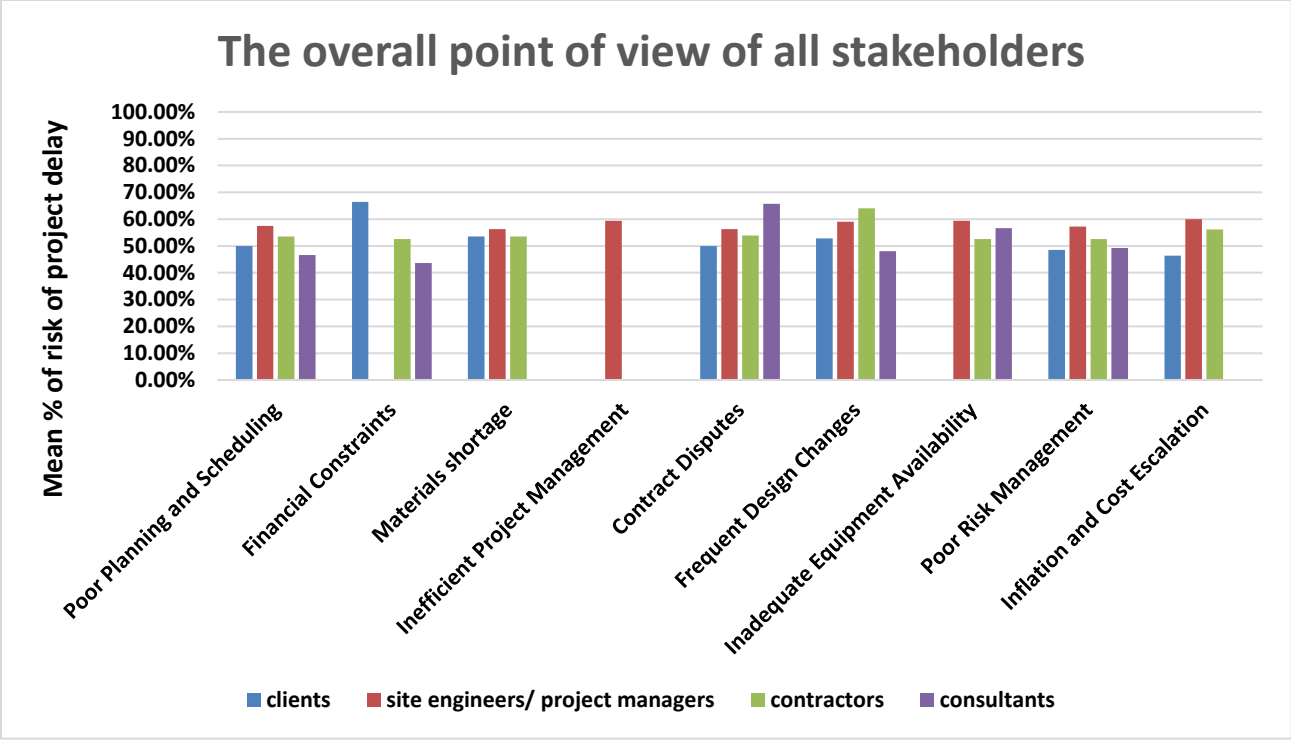


Figure 4.6: summary of responses from all stakeholders

4.7. Influence of timely delivery on infrastructure and economic development

Upon analyzing the data presented in Table 4.1 and after conducting site visits to various buildings constructed by different companies in the Gasabo District, several key observations were made. It was found that when a project experiences delays, there is a direct and significant increase in the initial cost of the project. This is largely due to factors such as extended labor costs, additional material expenses due to inflation, and the need for revised project management strategies to mitigate delays. Conversely, for projects that adhered to their planned schedule, the initial cost remained stable, with only minimal fluctuations observed, typically attributable to normal market variations or small scope adjustments.

This survey provides a view of the impacts of project delays on the construction sector and the national economy. When construction projects are delayed, the ripple effect extends beyond the immediate increase in costs. Delays disrupt the supply chain, affect the timely completion of public and private infrastructure, and create inefficiencies that slow down the pace of economic development. Infrastructure is a key driver of Rwanda’s economic growth, and delays in

construction projects hinder essential services, reduce investor confidence, and delay the return on investments for both the private and public sectors.

Moreover, timely project delivery is crucial in the context of Rwanda's ambitious development goals, particularly those outlined in the Vision 2050 strategy. Delays not only increase financial burdens but also negatively impact the overall economic development of the country by delaying projects that are meant to support critical sectors such as transportation, housing, and industrialization. The findings of this survey highlight the importance of strong project management practices and strict faithfulness to timelines as essential factors in contributing to the sustainable development of infrastructure and the economy as a whole.

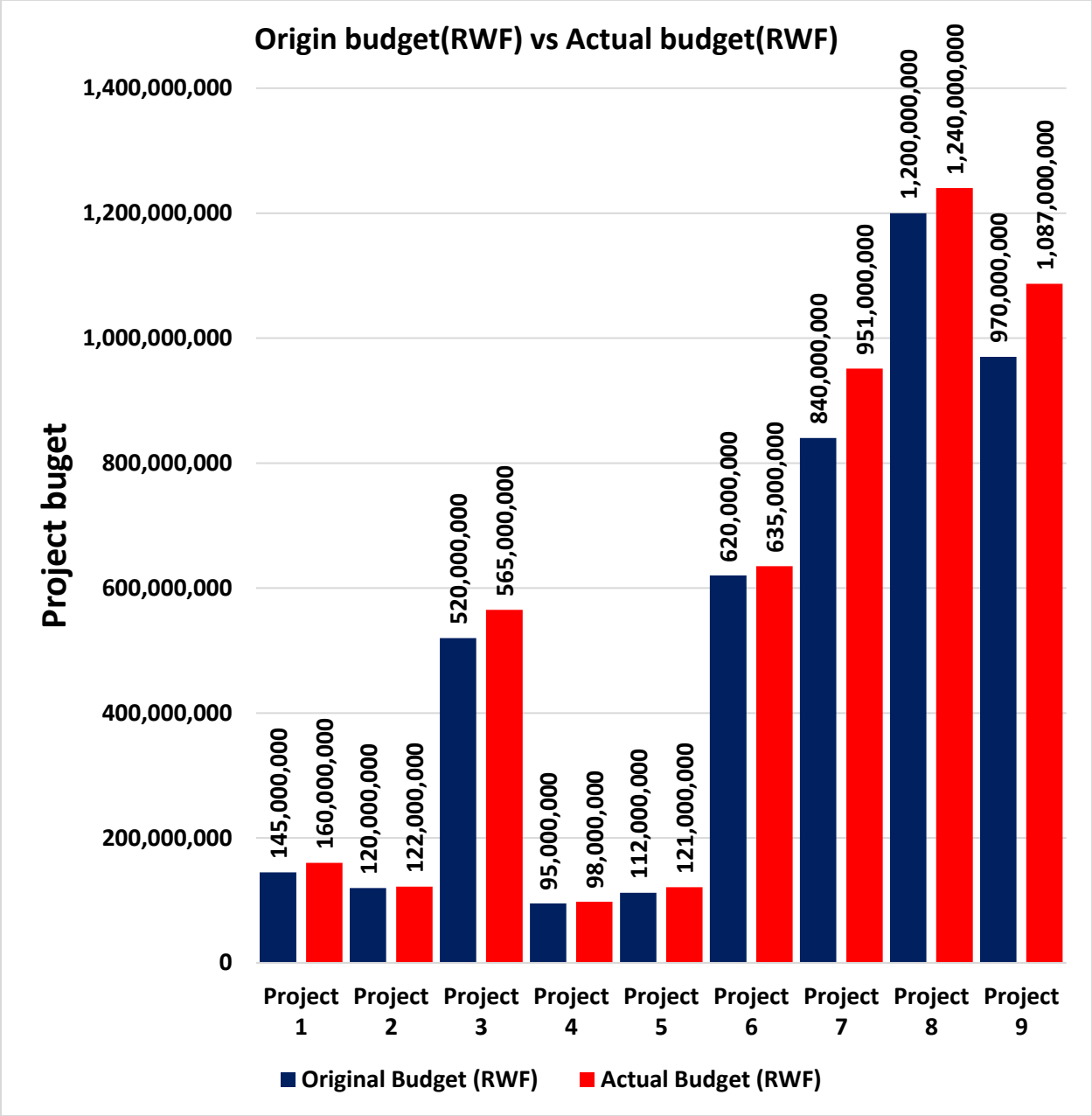


Figure 4.7: Origin budget (RWF) vs Actual budget (RWF)

As indicated in the above chart, out of the nine construction projects that were visited, five experienced delays, which had a significant impact on the increase of the initial project costs. The total original budget for these projects was **2,587,000,000 RWF**, while the actual expenditure, due to the delays, amounted to **2,884,000,000 RWF**. This represents an **11%** increase in costs as a direct result of the delays.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

The document presents in full detail an investigation about the possible reasons why there tend to be delays on construction projects in Rwanda and how that impacts the economic growth of the country with a special attention on the Gasabo District. Below are the conclusions and recommendations that arise from the analysis.

5.1. Conclusion

The findings from this research on the **Effects of Timely Delivery of Construction Projects on the Economic Development of Rwanda** clearly demonstrate the critical role that timely project completion plays in the overall economic growth and infrastructure development of the country. The study identified several key factors contributing to construction project delays, including poor planning and scheduling, financial constraints, material shortages, inefficient project management, contract disputes, frequent design changes, inadequate equipment availability, poor risk management, and inflation and cost escalation.

These delays not only lead to cost overruns but also delay the timely development of essential infrastructure, which in turn negatively impacts Rwanda's economic progress. The direct correlation between delayed construction projects and the increased financial burden highlights the importance of efficient project management, proper resource allocation, and robust planning to avoid unnecessary delays.

Moreover, the economic implications of these delays extend beyond individual projects, affecting national productivity, job creation, and investor confidence. Timely delivery of construction projects fosters a positive environment for economic growth by ensuring infrastructure is developed efficiently.

Therefore, this research highlights the importance of addressing the root causes of project delays to promote sustainable economic development. By adopting strategic improvements in project management practices, resource planning, and risk mitigation, Rwanda can minimize project delays, reduce costs, and accelerate its path toward infrastructure modernization and economic prosperity.

5.2. Recommendations

Based on the findings of this research, it is obvious that the timely delivery of construction projects plays a crucial role in the economic development of Rwanda. The major factors causing project delays such as poor planning and scheduling, financial constraints, material shortages, inefficient project management, contract disputes, frequent design changes, inadequate equipment availability, poor risk management, and inflation—must be addressed comprehensively. To mitigate in the construction sector, the following recommendations are proposed:

- Construction stakeholders must adopt more advanced planning tools, such as project management software, to improve accuracy in scheduling and resource allocation. Contingency plans should be incorporated from the outset to address potential delays effectively.
- Financial constraints can be minimized by ensuring that sufficient funding is secured before the project starts. Proper budget management, regular financial reviews, and effective cash flow management will help ensure that projects remain within budget.
- To mitigate material shortages, construction companies should improve their procurement processes by establishing strong relationships with reliable suppliers to ensure timely delivery of materials.
- Continuous training in project management for engineers, contractors, and site supervisors is essential to reduce inefficiencies and improve overall project performance.
- Contract disputes must be minimized through clear, well-defined contracts that are enforced through efficient legal frameworks.
- Construction companies must implement comprehensive risk management plans to identify and mitigate potential risks before they cause project delays or cost escalations.

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APPENDICES

1. Questionnaire for Project Clients

S/N	Main factors	Sub factors	Severity (1-6)	Likelihood (1-6)
1	Poor Planning and Scheduling	Inadequate project planning leading to ineffective scheduling		
		Lack of contingency planning for unforeseen events		
		Misalignment between project schedule and resource availability		
2	Financial Constraints	Insufficient funding at project initiation or during execution		
		Budget mismanagement affecting project scope		
		Cash flow issues impacting timely payment to contractors		
3	Material Shortages	Unavailability of required materials due to procurement issues		
		Ineffective supply chain management leading to material shortages		

		Inability to source alternative materials when needed		
4	Contract Disputes	Misunderstandings related to contractual obligations		
		Conflicts over payment terms and project deliverables		
		Disagreements affecting cooperation between client and contractor		
5	Frequent Design Changes	Modifications to project design after construction has started		
		Inadequate communication of design revisions leading to confusion		
		Changes in project specifications requiring rework and adjustments		
6	Delays in Payment to Contractors	Late processing of payments impacting contractor performance		
		Payment disputes resulting in work stoppages		
		Insufficient financial incentives		

		for timely completion of work		
8	Poor Risk Management	Inadequate identification of potential risks affecting project timeline		
		Lack of contingency strategies for unforeseen circumstances		
		Insufficient risk assessment leading to unexpected project impacts		
9	Inflation and Cost Escalation	Rising costs of materials and labor impacting project budget		
		Unanticipated price increases leading to adjustments in project scope		
		Budget constraints caused by economic fluctuations affecting project viability		
Any other relevant question:				

2. Questionnaire to collect data for site engineers/project managers

S/N	Main factors	sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)
1	Poor Planning and Scheduling	Inadequate project timelines and milestones		
		Insufficient resource allocation for tasks		
		Lack of contingency plans for unforeseen circumstances		
2	Material Shortages	Inadequate procurement processes leading to unavailable materials		
		Poor communication with suppliers regarding material delivery schedules		
		Ineffective inventory management affecting material availability		
3	Inefficient Project Management	Lack of effective oversight and supervision of project activities		
		Insufficient coordination among team members and subcontractors		
		Poor decision-making processes impacting project execution		
4	Contract Disputes	Misunderstandings regarding project scope and deliverables		

		Conflicts over contract terms and conditions affecting work progress		
		Inadequate communication of contractual expectations among stakeholders		
5	Frequent Design Changes	Changes in project design leading to rework and adjustment of resources		
		Insufficient review and approval processes for design modifications		
		Lack of stakeholder engagement in the design phase causing misalignment with project goals		
6	Inadequate Equipment Availability	Shortage of necessary tools and equipment for construction activities		
		Ineffective maintenance schedules for equipment affecting availability		
		Delays in equipment mobilization impacting project timelines		
7	Poor Risk Management	Lack of identification and assessment of potential risks impacting project timelines and costs		

		Inadequate response strategies for unforeseen issues affecting project execution		
		Insufficient communication of risk factors among project stakeholders		
8	Inflation and Cost Escalation	Rising costs of materials and labor impacting project budgets		
		Unanticipated price increases affecting procurement decisions		
		Insufficient budget adjustments to accommodate inflationary pressures		
Any other relevant question:				

3. Questionnaires to collect data for contractors

S/N	Main factors	Sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)
1	Poor Planning and Scheduling	Inadequate initial project planning and scheduling processes		
		Misalignment of project timelines with resource availability		
		Lack of contingency plans to address unforeseen scheduling issues		

2	Financial Constraints	Insufficient funding during critical project phases		
		Inadequate budget management and financial allocation		
		Challenges in maintaining cash flow impacting project progression		
3	Material Shortages	Shortages of essential materials required for construction		
		Inadequate procurement planning for timely delivery of materials		
		Increased lead times for material sourcing affecting project schedules		
4	Contract Disputes	Conflicts regarding contractual obligations between parties		
		Misunderstandings related to payment terms and performance expectations		
		Escalation of disputes requiring renegotiation and contract modifications		
5	Frequent Design Changes	Frequent modifications to project design specifications		

		Lack of clarity in design documents leading to rework		
		Challenges in managing client expectations related to design adjustments		
6	Inadequate Project Supervision	Insufficient oversight of construction activities		
		Lack of effective communication between site management and field workers		
		Inadequate response to on-site issues affecting workflow		
7	Poor Risk Management	Lack of identification and mitigation of potential risks impacting project execution		
		Inadequate strategies to manage unforeseen site conditions		
		Insufficient planning for risk factors leading to cost increases		
8	Inflation and Cost Escalation	Rising material and labor costs impacting the overall project budget		
		Increased costs of construction due to market fluctuations		

		Challenges in adjusting project budgets to accommodate inflationary pressures		
Any other relevant question:				

4. Questionnaires used to collect data for consultants

S/N	Factors	sub factors	Mean Severity (1-6)	Mean Likelihood (1-6)
1	Poor Planning and Scheduling	Poor project planning leading to misaligned timelines and resource allocation.		
		Inadequate scheduling affecting the execution of project phases.		
		Insufficient contingency plans for unexpected challenges impacting project progress.		
2	Financial Constraints	Limited funding affecting the project's scope and execution.		
		Budget overruns impacting the overall financial management of the project.		

		Financial management issues leading to reallocation of resources and timeline adjustments.		
3	Material Shortages	Procurement challenges leading to a lack of essential materials for construction.		
		Delays in material delivery causing interruptions in the construction process.		
		Unavailability of specific materials impacting the project schedule and budget.		
4	Contract Disputes	Conflicts between contractual obligations affecting project flow.		
		Disagreements on payment terms, performance expectations, or deliverables impacting project timelines.		
		Protracted resolution of contractual disputes affecting project progression.		

5	Frequent Design Changes	Design modifications leading to revisions in project scope and timelines.		
		Late-stage design changes requiring rework of completed tasks affecting project milestones.		
		Delays in approvals for design alterations impacting project execution.		
6	Inadequate Project Supervision	Insufficient oversight affecting the quality of work and adherence to the project schedule.		
		Lack of qualified personnel overseeing project progress leading to mismanagement.		
		Inconsistent monitoring of project milestones impacting overall execution.		
7	Poor Risk Management	Failure to identify and mitigate potential risks affecting project execution.		

		Inadequate contingency measures for unforeseen circumstances impacting project timelines and costs.		
		Lack of effective communication regarding risk factors between stakeholders.		

Any other relevant question:

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5. Letter requesting to collect data in construction companies

TUYIZERE ELYSE

Reg no: 202150026

Tel: 0783163655

Email: tuyizereelyse92@gmail.com

Kigali, 07th October 2024

To: *MANAGING DIRECTOR OF G.E.M.T*

Dear Sir/Madam

Subject: Request for Permission to Collect Data in Your Construction Company

I am TUYIZERE Elyse, a final-year student at ULK Polytechnic Institute. I am currently working on my final year project titled *"Effects of Timely Delivery of Construction Projects on the Economic Development of Rwanda: Case Study of Gasabo District."* As part of my research, I am focusing on assessing construction projects in Gasabo District that have experienced delays.

To obtain accurate and relevant data for my research, I kindly request permission from your company to collect information on your construction projects. This data will be instrumental in helping me identify factors contributing to these delays and evaluate their effects on the economic development of Rwanda.

I would greatly appreciate your company's support in facilitating access to this data, as it will enable me to complete my research effectively. I assure you that all information gathered will be used solely for academic purposes and handled with the utmost confidentiality.

Yours faithfully,

TUYIZERE Elyse
Student at ULK Polytechnic Institute



6. Some pictures of visited construction site

Picture 1: construction of G+2 commercial building at Kimironko sector



Picture 2: construction of G+1: Commercial building at Jali sector

