UNIVERSITY OF NAIROBI

SCHOOL OF THE BUILT ENVIRONMENT

FACTORS AFFECTING TIME AND COST PERFORMANCE OF CONSTRUCTION PROJECTS IN RWANDA. A Case Study of High-Rise Building Projects in Kigali.

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JULY, 2020

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DECLARATION

I declare that this is the original work of mine and has not been submitted for the award of any other University degree for examination.

Sign……. Date……...

Reg: B53/87683/2016

Tuyishime Pascal

SUPERVISORS' DECLARATION

This project has been submitted and presented for examination with our approval as University Supervisors:

Sign……Date…….

Prof. H. Gichunge, PhD

Sign……Date……

Dr Luke Obala, PhD

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DEDICATION

I wish to dedicate this project to my parents for their support and prayers and to late Glenn Rosen who supported me financially and morally. They always believed in me and took so much pride in my achievements and for their invaluable love and support through this journey of my career development. This research is as well dedicated to my Glenn Rosen and Lynn Rosen for their continued overwhelming support.

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ABBREVIATION AND ACRONYMS

CBPP: Construction Best Practice Program
EOT: Extension of time
EU: European Union
GAO: General Accounting Office
GDP: Gross Domestic Product
ISO: International Organization for Standardization
IT: Information Technology
KPIs: Key Performance Indicators
MINECOFIN: Ministry of Economic and Finance
MININFRA: Ministry of Infrastructure
OGA: Office of the General Auditor
PMI: Project Management Institute
RDB: Rwanda Development Board
RFI: Request for Information
RHA: Rwanda Housing Authority
RIA: Rwanda Institute of Architects
RPPA: Rwanda Public Procurement Authority
RSSB: Rwanda Development Board
SMEs: Small and Medium -sized Enterprises
SPSS: The Statistical Package for Social Science

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ABSTRACT

Highrise building projects are naturally complex due to the involvement of numerous parties from the project owner, professionals, consultants, contractors, stakeholders, suppliers and regulators. Most multistorey projects in Rwanda encounter problems and issues of performance such as extensive schedule and budget overruns. Any project success always rests on the performance which is proven by completion on time within the allocated budget and expected quality that is required by the users of the facility and satisfaction of the client. The research objectives were: To identify factors causing significant delays in Highrise building projects, to find out factors causing significant cost overrun in Highrise building projects and to propose strategy to minimize the causes leading to significant delay and cost overruns in high Highrise building projects.

Questionnaires were distributed to professionals who were involved in the execution of in the execution of Highrise building projects. The number of these building projects were collected from Kigali Construction Urban Planning One Stop Center as this department is assigned the responsibility of approving or disapproving construction project plans before the execution phase starts to ensure that they compliance with regulations. Statistical Package for Social Science (SPSS) was used to analyze the collected data. The findings revealed that variations of design change , late payment to contractors, delay in decision making, delay in receiving clearances through customs for the imported materials, financial difficulties encountered by contractor are the main cause of time overrun in Highrise building while variation in the cost of construction materials, Frequent change in specifications and designs, inaccurate cost estimation , high cost of transport of construction materials and poor contact management were ranked as major cause of cost overrun. The recommendation of this study were: the funding of the project by client should always be adequate and be determined at the planning stage of the building project, The clear rules and regulations on evaluating contractors' bids are needed and they should be used by clients and his agents in awarding contracts, The architects must select the most economical design for basic elements without compromising the quality and safety of the project such as foundations, structural frame, external cladding and roofing, Rwanda Institute of Architects (RIA) (Quantity Surveyors Chapter) should produce semi-annual journal containing cost data of construction materials in different locations of Rwanda because the techniques used to produce estimates vary according to the information available at the time of preparation.

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CHAPTER ONE: INTRODUCTION

1.1 The Study Background

The Rwandan development rate is greatly related to the development of infrastructure ranging from private projects to public infrastructure and the housing industry plays a vital role in the economy of the country. The building sector is still an emerging industry and it is an important foundation in boosting a country's economy (Chia, Skitmore, Runeson, & Bridge, 2011).

According to Sanvido et al. (1992), the building projects are run in a an open and undefined manner where work conditions can easily change due to the location, type of projects and its complexity and economic conditions of the nation and construction projects have an important role in the development of the society and the nation. In developed countries, Construction is considered as the industry that contributes around 10% of the Gross Domestic Product (Navon, 2005). It as well contributes to the people's employment and this why construction industry is considered as the pillar to the development of the country (Olwale & Sung, 2010). In the year 2014, the sector of construction contributed over 7% of Gross Domestic Product in Rwanda. The sector continued to grow up to 9.4%, resulted from the increased private building projects and public works (Rwanda Development Board, 2015). The construction industry is important to the society and economic development of the country (Morris & Hough, 1988). It offers the public, private facilities needed for manufacturing and distribution of manufactured goods and services, shelter etc. The complexity of building sector in its nature is due to the fact that it involves big number of parties from different sectors such as, contractors, clients, consultants, suppliers and regulators among others. The great achievement of construction industry is determined by its good performance which is essentially measured based on its completion date within the planned period, with the allocated budget, good quality as required and the satisfaction of the end user (Omran, 2012). So, the accomplishment of construction projects helps to provide a solid platform for boosting Rwandan economy in terms of infrastructure development.

The fact that Rwanda is a landlocked country, it means materials imported from overseas may delay to reach the construction sites due to customs inspections and it makes its construction industry encounter many challenges including delay in completion of construction project which is among the factors that are behind the poor performance of construction projects in Rwanda.

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Rwanda's construction industry grew rapidly in the recent past due to the great endeavor joined between private and public sector involve in the construction of public and private facilities, roads, schools and hospitals infrastructure among others. This gave a rise in demand of materials for construction including but not limited to steel, glass panels, Clay related products (bricks, tiles, Electric cables and blocks for paving), wooden product, float glass and other mechanicals and electricals products and services among others. In terms of quantity, 503,195 Tons materials for construction were imported by Rwanda which was 28% of total import volume in 2013 (Rwanda Development Board, 2015).

All the six branches of Grand Pension Plaza constructed by the RSSB witnessed time and cost overruns. The report by Office of Auditor General (2017), found that the projects were similar and design had not changed to suit the dissimilar location and customers. These building projects were affected by poor contract management, site selection and improper planning, inappropriate coordination and incompetent of project team (Office of the Auditor General of State Finances, 2017). Smith et al. (2006) illustrated that every building project is unique and has its unique risks and it changes depending on project features. Furthermore, a lack of information on previous completed project to be used as benchmark for the next projects leads to a higher degree of risk associated with quality, time and cost.

The problems related to the construction projects performance occur in various aspects in Rwanda construction industry. Therefore, some projects are failing in cost performance, other in time performance and in other performance indicators. Inadequate finances have also affected many developers, causing building projects take long time to complete (The East African Newspaper, 2015). Vision City Project, a residential project which is the largest housing project in Kigali completed far behind the schedule and the selling price of the units give a strong indication of serious delays. There were various projects in Rwanda that completed with poor performance (Office of the Auditor General of State Finances, 2017).

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1.2 Problem Statement

Construction industry is very important in transforming and developing any country. in addition, it helps in booming the people's needs of any nation into reality by executing various physical facilities. Rwanda, which is among developing countries, witnessed a substantial rise in building development in the recent past, especially in the fields of real estate development. The quantity of housing production is still insufficient and it was estimated that between the year 2012 and 2022, the housing demand in Kigali is 186,163 houses (dwellings) units with an average demand of 16,923 affordable housing units per annum, hence there is a need to increase the number of dwellings each year by government and private developers with the objective of meeting the demand (Rwanda Housing Authority, 2015).

Construction sector is one of the most turbulent and challenging sectors (Clough & Sears, 2005). In Rwanda, construction industry has for long time been experiencing poor record as far as time and cost performance is concerned. Due to risks related to time and cost that the building projects are facing, it is very crucial to find out the factors that are causing the failure of time and cost performance and what can be done to deal with them as a strategy that leads to the successful building projects.

Al-hammad (1995) highlighted that construction projects are facing many challenges in Saudi Arabia and one of them are delays and abandonment and as consequences, the targeted goals are not achieved and not integrated with the economic strategy of the nation. All countries across the world experienced delays in construction projects (Kasimu, 2012). However, the performance level varies depending on the internal and external characteristics of the individual project. There are various completed projects which failed in time performance, in cost performance and others failed in other performance indicators such as quality and client satisfactory. Extensive schedule overruns could be a source of conflicts and disagreements among key participants of the projects and this may be the source of increased costs, and unsatisfactory productivity revenue and productivity, project abandonment as well as termination of contract by either party. For instance, the complexity of the Kigali Convention Center project (dome shaped), which is one of the best hotels where International Conferences take place, delayed for more than four years. The Construction of the project commenced in 2009 and the building was expected to be complete by 2012 unfortunately it was competed in 2016 (The East African Newspaper, 2015).

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The challenges of making improvement in cost and time performance is clearly seen in Rwandan construction sector and the sector has recorded a decline in time and cost performance over the last few years where among the building projects executed in recent years, most of those building projects have not completed within expected period and allocated funds. This problem, as result, is causing difficulties in financing the upcoming projects as most private Highrise building projects are financed through bank loans which have to be repaid within specific period of time. In addition, late completion of construction projects has resulted in losing expected business opportunities due to late utilization of the facility by customers.

The problem and cost overrun and delays as the significant factors that are affecting the performance of building projects in Rwanda have not been given an adequate attention throughout the construction phases from initiation to completion and it has resulted in negative consequences such as disputes, cost overrun, etc. The lack paying attention to major factors causing cost and time overruns has been criticized as the sources of poor performance of projects in Rwanda. Construction sector in Rwanda is also lacking database of performance indicators to be used by practitioners fin the building industry performance (Rwanda National Constrution Policy, 2009). This research found therefore answer to the question: which factors cause significant delays and budget overrun in Highrise building projects in Rwanda and how can they be mitigated?

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1.3 Research gap

The researches that have previously conducted emphasized on what cause poor performance in construction projects in developed and developing nations. A survey of factors affection performance of construction project done by Juliet and Ruth (2014) contains the variables focused on the materials and equipment quality and the compliance with specifications. A study conducted by Mohamed and Abushan (2009) was concentrated on factors that affect construction projects in the Gaza Strip. Findings found that the major cause of delay was delays caused by roads closure and rare raw materials availability and the researcher the further study should look at human resource development in building industry via adequate training of the project team. Takim and Akintoye (2002) conducted a research about indicators of performance for successful building project. The variables of the study focused on three aspects which are: safety, productivity and profitability. The research recommendation for the further study was developing a culture of benchmarking in construction project development that reasonably that prioritizes the aims of the projects and the expectations of the stakeholders including the clients. Chan et al. (2004) also studied factors affecting building projects to excel in term of performance. The study concentrated on five main variables that are: human factors, external environment, factors connected to the project and project management practices.

Most studies conducted on factors causing cost and time overruns in Highrise buildings were done in developed countries and it is important to note that such supportive empirical evidence have been obtained from developed countries. Such concepts might need some changes before they are applied or have no application at all in developing countries like Rwanda where circumstances are quite different. Few researches have been conducted on delays especially by paying special attention ton causes of delays on private funded High-Rise buildings.

Some researches on cost overrun and projects delay consider those factors as sources poor performance of construction projects have been conducted in developing countries. This include a study by Abubakar (2015) on delays of construction projects between the Donor funded and Government construction projects in Ghana, the study findings reveled that significant causes of delay in building projects were inflation, financial problems of the client and price fluctuations. A study by Emeka (2016) on causes of delay in huge construction projects in Nigeria revealed that inexperienced participants and financial predicaments were the major factors causing projects

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delay. Talukhaba (1999) in his study on an investigation into factors triggering the building projects delays in Kenya: Case Study of Multistorey (Highrise) Building Projects in Nairobi, demonstrated that the main causes of delay in construction projects are late payment by the owner popularly known as client and architect's instructions who is the agent of the client. A research by Mohamed (2017) on Influence of time overruns in the Implementation of County construction projects: case study of Lamu county, Kenya found that politics and political favor have substantial influence on the rates of project completion. Even if there is lots of literature in developing countries on delay factors affecting the performance of construction project, most of them focused on public or government projects.

In brief, there are many researchers conducted over time and cost factors affecting building project performance but there is no research were conducted by only considering the private Highrise building projects. However, the results found were different by considering the construction project characteristics. In Rwanda, most researches conducted on causes of delays and cost overruns were done in general without concentrating on specific construction projects. There is no research project conducted in Rwanda on delay and cost factors affecting building projects especially focusing on high rise buildings. Hence, this project focused on the high-rise projects which were privately funded. The purpose of This study is to also enrich literature on budget and time performance of building projects and fill the knowledge gap. The researcher hopes to find answers that contribute to the body knowledge as well as discovering the reasons behind the poor performance in terms of time and cost of construction projects generally in Rwanda and particularly within the City of Kigali.

1.4 Research questions

1. What are factors causing significant delay in Highrise building projects?
2. What are factors causing significant cost overrun in Highrise building projects?
3. What strategy need to be done to minimize significant delay in Highrise building projects?
4. What strategy need to be done to minimize significant cost overrun in Highrise building projects?

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1.5 Objectives of the study

1. To identify factors that cause significant delays in Highrise building projects in Rwanda
2. To find out factors causing significant cost Overrun in Highrise building projects in Rwanda.
3. To propose strategy to minimize the factors causing significant delay in high Highrise building projects.
4. To propose strategy to minimize the factors causing significant cost overrun in high Highrise building projects.

1.6 The Study Limitation

The study of this project was done on the private Highrise buildings in the City Kigali because of the financial and time constraints and the fact that the majority of high-rise buildings and professionals involved in the execution of those project are located in Kigali. The construction of private high-rise building in Kigali has increased in the last five years. One of the drivers of this increase is the investment incentives by investing in Rwanda. According to Rwanda Development Board (2015), there are monetary motivating forces, for example, zero corporate pay for charge for organizations wanting to move central command to Rwanda, Quickened devaluation of 50% for key need areas (the travel industry, development and agro-processing, manufacturing).

Exemption of capital gain tax and 15% preferential corporate income tax for strategic sector e.g.: Affordable Housing, Energy, ICT, financial services and Transport. There are as well notable opportunities in construction sector especially in real estate in the implementation of the master plan of Kigali City that entails a broad vision and guidelines for the whole city helping as the basis for more specific planning at the Central business District the District and the District. Due to the aforesaid study limitation, generalization of findings should be carefully done. It is also possible that the perception and experience of project participants in Kigali may be different from those of other construction sites.

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1.7 Significant of the Study

This study on delays and cost factors affecting the construction projects in Rwanda is relevant because it touches on the very essence of construction projects management which is new discipline and has progressed for purpose of effectiveness and efficiency in construction sector. In order to improve efficiency, it essential to understand what factors that contribute to bad performance in building projects. It ultimately contributes to efficient resource management on construction projects and helps shareholders not forgetting contractors and consultants to resolve issues time and cost performance and make significantly improve as in construction projects. This study also plays a significant role to government, as a key provider of budget on public funded construction projects in which the cost can be used efficiently in order to increase socio-economic development. They will benefit from this study findings and recommendations and learn from this study by understanding the factors affecting performance of construction project in Rwanda.

1.8 Delimitations of the Study

The study delimited itself to construction projects carried out within Kigali City which comprises of three Districts in which this study was conducted in which are: Nyarugenge, Gasabo and Kicukiro District. Nyarugenge district has been identified as financial hub of the City of Kigali while Kicukiro and Gasabo are identified as knowledge and administrative hub respectively. This research targeted completed private building projects within the City of Kigali. The researcher has selected the geographical location for doing the study because it is found to be convenient since it is the residential place and the fact that can make it easier for the researcher to obtain the required data.

1.9 Outline of the Study

The study has the following chapter as outlined below

Chapter One: Introduction

The chapter one contains the following: the study background, problem statement, Research gap, questions of the study, the study objectives, study limitation, significant of the study, delimitation of the study.

Chapter two: Literature review

This part of the research contains the literature related to factors affecting cost and time performance of building projects in Rwanda.

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Chapter Three: Research Methodology

This chapter of the research entails the research design and various methods of used in collecting data.

Chapter Four: Data Findings, Discussions and Analysis.

The chapter of the study contains the actual collected data, details how it was analysed and graphically presented and it also contains discussion made on findings.

Chapter Five: Findings summary, Conclusion and Recommendations

This last chapter of the study and it contains the summary of the study findings, the conclusion of the study, recommendations and areas of further studies.

1.20 Definition of significant terms

The following terms are used in the following terms for the purpose of this research:

Construction: is the process of carrying out of any building structure, infrastructure, and civil engineering work. The process starts with Initiation and Briefing, Concept and Feasibility, Design Development, procurement, Execution and Handover.

Contractor: A contractor is primarily a resource manager whose responsibilities are assembling operations by implementing the construction project, manage resources such as, men, money, materials, equipment, and time.

Client: A client is an individual, a private or public enterprise responsible for initiating and financing the construction project

Performance: The way jobs are done based on their effectiveness and responsiveness.

Project: an effort undertaken to generate a specific product or service.

Project delays: the additional time incurred above the agreed contract period of the project.

High Rise Building: High Rise building is the building with five or more storeys above ground level (Abbott, 1987).

Project time performance: The final time reached at the completion of the project comparing to the planned time.

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CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of Rwanda construction industry

Rwanda National Institute of Statistics (2012) revealed that Rwanda is a land-locked country with 26,338 km^2 in area and a population of 11,689,696 people. It borders in the South, East, North and West with Burundi, Tanzania, Uganda and the Democratic Republic of Congo respectively. It is among densely populated country in African countries and the economy. Rwanda has been growing at an annually average rate of 8.3 (NISR, 2012). Kigali is the capital city of Rwanda with the population slightly over 1.2 million and it covers three districts: Nyarugenge, Gasabo and Kicukiro.

The construction industry, which incorporates the transport infrastructure (Roads and Airport), civil engineering works and Building , contributes a crucial role in boosting the national economy as construction industry serves directly or indirectly fifty percent of non-agriculture employment by creating jobs for different categories of professionals, semi-skilled and unskilled labors and business opportunities for manufacturers , suppliers etc (Rwanda National Constrution Policy, 2009).

Rwanda Development Board (RDB, 2014) emphasized that the sector of construction in Rwanda has been a key driver of economic growth. The Ministry of Finance and Economic Planning (MINECOFIN, 2014), revealed that the development infrastructure projects expense in Rwanda for year 2014-2015 was estimated to be 784.1billion Rwandan francs equivalent to 44.7% of total budget. Portion of this spending was allocated to construction projects as the country the nation its basic infrastructure after many years of underdevelopment. The construction industry in Rwanda especially in the City of Kigali has been rapidly growing at the high level in public and private sectors as both sectors involved in buildings and other infrastructure projects which is triggering the booming in infrastructure development. The construction sector in Rwanda is being transformed from stated funded to private resulting in private building developers coming into the market to develop real estate for commercial use, residential, etc. The construction sector contributes hugely to the GDP of the country which grew from 6.1% in 2006 to 7.4 % in 2010 mainly through incomes and massive employment opportunities generated by various new infrastructure projects, renovation and maintenance. It is estimated the construction sub-sector of the larger industrial sector contributes to the country's industrial sector by 52% followed by

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Manufacturing, Mining and Quarrying, Electrical and Water with percentage of 43%, 3% and 2% respectively (National Industrial Policy, 2011).

2.2 Challenges in Rwandan construction industry

Rwanda National Construction Industry Policy (2009) revealed that the construction industry of the nation is affected by a number of problems which include failure of project continuity; insufficient access to finance and credit; unfavorable requirements to get for donor's credit, lacking database for performance indicators in the country (Rwanda National Constrution Policy, 2009). There are others reasons of time overrun in the construction industry like changing contractors during project execution, change of original design, ineffective communication; incompetent participants, importation of most of materials to be used and economic conditions among others (The East African Newspaper, 2015). According to the study conducted by Cytonn Real Estate (2018), the challenges facing Rwandan construction sector are high cost of building projects because most construction materials are imported from abroad. The study further emphasized that there is also issue of lacking funds for real estate and property developments which has resulted in excessive financing debt ranging from 17% - 19% per year on the Rwandan Franc. The real estate or property market in Kigali has experienced an high supply of commercial office space over five years, changing the Kigali skyline with developments of big High-rise building projects such as, Kigali City Towers, Kigali Convention Center, M-Peace Plaza, Kigali Height among others while many more are in the pipeline. As consequences rental prices decreased along with occupancy rates hence, developers were affected in terms of revenue streams to an extend of having difficulties in payback bank loans (Knight Frank Africa Report , 2017)

2.3 Driving factors for an increase in high-rise buildings in Kigali

2.3.1 Positive Economic growth

Rwanda Gross Domestic Product (GDP) growth recorded an increase 6.2 % in 2017 compared to 5.9% in 2016. Word bank doing business report (2018) illustrated that Rwanda has moved up 11 places and ranked 29th in the World and 2nd country in Africa in the ease of doing business after Mauritius which maintained its place for two consecutive years. Rwanda remains 2nd in the world for ease of registering property after New Zealand. Rwanda's economic increase continues to be strong as in the first half of 2018, its gross domestic product rises 8.6 percent (International

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Monetary Fund, 2018).This was attributed to the fact that the country has made a significant improvement on its land dispute resolution mechanism and it now takes 7 days to transfer property (Rwanda Development Board, 2018)

2.3.2 Government incentives

The Government of Rwanda is heavily investing in expansion of building infrastructure and modernization of rural and urban infrastructure includes the constructing of roads and other utilities such as electricity and water. These infrastructures also reduce development cost for developers.

2.3.3 Growth of SME's

Small and Medium Enterprises Product Clusters in Rwanda report (SMEs Product Clusters in Rwanda , 2017), The contribution of small and macro enterprise is estimated to constitute 98% of the total business and account 41% of all private sector employments. There is also an increase in numbers of SME's due to ease in doing Business (Word bank doing business report , 2018). The demand for office spaces is created because the new companies require new offices.

2.3.4 International players

In the last few years Rwanda has been witnessing an increase of international institutions such Marriot Group establishment in the country with foreign direct investment from 3.9% of the GDP in 2014 to 4.2 % of the GDP in 2015. Hence, the demand for offices around key commercial area such as Nyarugenge CBD and Kimihurura hosting international brands is high, for Example Marriot Hotels, Radisson Blues, Java House, Golden Tulip Hotels, KPMG, Fusion Capital among others.

2.3.5 Housing deficit

According to Rwanda Housing Authority (2015), the estimated housing demand in Kigali for 2012 - 2022 is 186,163 dwelling units with an average demand of 16,923 affordable dwelling units per annum, hence increasing activities by government and private developers with the objective of meeting the demand.

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2.3.6 Master plan

The implementation of zoning regulations is strict and guided by the Kigali City Master Plan introduced in 2013 outlining the plans and conditions for development within the City of Kigali. This is a visionary project which will see planned development in the area and control of urban extension without compromising the environment.

2.3.7 Demographics

Rwanda has a population of 12.4 million people in 2018 and the population is growing at 2.4 % compared to the global average of 1.2 % (RDB, World economic forum, 2013). The urban population counts 30.7% of the total population and growing at an urbanization rate of 4.89% per year hence causing an increased demand of real estate developments (Cytonn Real Estate, 2018).

2.4 Performance Problem in Building Industry.

The poor performance on building projects is largely linked to the challenges and failures that occur in the execution of construction. Furthermore, there are other factors that contribute to such problems. Ogunlana et al (1996) revealed that there are three categories of problems that contribute to poor performance of construction project in developing countries: shortage of infrastructure specifically to be used for materials and resource supply, client and consultant related problems and uncompetitive contractors. The bad performance is related to poor cost along with how time is controlled (Okuwoga, 1998). Long et al (2004) highlighted that performance difficulties arise in big construction projects because due to numerous reasons: incompetency in design and contracting teams. Inaccurate cost estimation, there is also social and technological related issues and not properly use of tools and techniques. Navon (2005) illustrated that the main performance issues can be classified into two categories: target setting which is unrealistic, for instance causes resulting from the actual construction.

Samson and Lema (2002), in the study revealed that the performance's traditional measurement systems have problems due to complex information without methods to help those who make decisions to plan, organize, understand and use such information for managing the performance of the company. Navon (2005) highlighted that controlling the performance of the project in traditional way is normally generic (for example cost control methods). It is highly based on manually collected data and this means that it is not frequently done and q sometime after the

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controlled event has happened. Furthermore, manually collected data usually does not give high good quality of data. Ling et al (2007) found that construction, engineering and architectural companies may face problems in handling performance of building projects in China because of not being familiar of the new environment where projects are operating. According to Kim et al (2008), the international building projects performance is impacted by complexity of factors comparing to local projects; frequent exposure to uncertainties of external factors like, social, economic, political, and cultural risks, as well as internal risks within the project.

According to the survey by Enhassi (2009), the main significant factors causing poor performance of projects are: delays due to materials shortage; resources unavailability, inappropriate leadership skills of the project, escalation of materials price; lack of highly experienced and qualified construction participants and poor quality of available equipment and raw materials among others. Several construction projects have experienced continuing problems such as poor safety, bad working conditions, poor quality and these difficulties have been found to be factors that disturb construction project performance in terms of productivity and affects company's performance (Alwi, 2003).

2.5 Construction Projects and Performance

The building projects successfulness is highly depended on achievement of the project. Many researches done before had been studied performance of building projects. Dissanayaka and Kumaraswamy (1999), revealed that the major causes of bad performance in construction projects is inappropriate selection of procurement method. Reichelt and Lyneis (1999) highlighted three crucial structures of building project performance that are: feedback effects on productivity, plan for the work accomplishment and quality of work and effects from upstream stages to downstream stages. Thomas et al. (2002) found the key performance principles of building projects which are: relationship with clients, financial stability, health and safety, quality standards work progress, resources availability, consultant's relation, subcontractor's relation, management capabilities, contractual disputes, company's reputation. According to Chan and Kumaraswamy (2002), the period required to execute a project very crucial as it often considered as an important benchmarking for analyzing the project performance and efficiency of the organization. Cheung et al (2004) grouped the performance of the project into categories such as quality, Time, cost, people, safety, health, satisfaction of the client, environment and communication. Navon (2005)

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further emphasized that a control method is a vital component to recognize issue affecting building project execution. At least one Porject Performance Indicator is required for each of the construction project's goals. According Pheng and Chuan (2006), Human influences is important in determining the level of performance of a building project. Ugwu and Haupt (2007) stated that early involvement suppliers and contractors would minimize problem of constructability-related performance including delays with associated cost, wastages, reworks and claims, etc. Ling et al (2007) stated that the most important scope management related practices are controlling the quality of contract document, response's quality to incurred variations and extent of the contract chamges. The adaptation of some of the project management practices by foreign companies were recommended to assist them achieve better project performance in China.

2.6 The relationship between time and cost overruns

According to Abdullah et al. (2009), the increase in cost has a close relationship with time overrun. Looking at financial implications side, any delay in building projects generally cost money leading to losses and problems for all project partakers including claims and disputes during project execution (Kaming et al. (1997). If any project's construction period is delayed because of the reasons from the client, contractor will be entitled extension of time and this comes with additional payment for time related cost, like profits and overheads. In addition to this, delays negatively affects income where the interest and interest on interest, keep accumulating. Over delaying of the project may result in projects close up due to what is called interest trap. The increase in interest rate and escalation of construction cost due to delays result in increase of construction project cost. As stated by Ardit *et al*. (1985), prolonged postponement of the project in the inflationary environment tremendously causes cost increase of the building project. According to Sambasivan and Soon (2007) who identified that projects budget overrun is classified as second in the study of effects of delays in the Malaysian construction sector. This is due to the fact that it requires overtime charges in order to carry on the construction activities and any required compensation caused by delay (Hanna, Taylor, & Sullivan, 2004) .Then, additional fund is needed for rework for any construction errors occurred. According to (Sun & Meng, 2009) ,the extra cost of rework could be as high as between 10 to 15% of the originally planned cost. This shows that delays in construction sector are the most common causes of cost increase in of construction projects.

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Shen (1997) stated that delay in the building projects completion might is the main cause for the additional fund and loss in return of investment or other profits from a project. However, delay increases cost on the owner and contractor's side. For the owner point of view, a delay causes loss of expected profits, while to the contractor, a delay means an increased cost of overhead. The cost performance and plan schedule performance are the main measures of the performance of the construction project. A building project is considered successful if it is constructed and completed within the planned timeline and allocated budget as developing nations including Rwanda are facing problems of scarce project financial resources.

2.7 Factors Affecting Budget and Schedule Performance.

According to Chan and Kumaraswamy (1995), the unforeseen problems and original design changes increase during the construction phase, this is one of the sources of difficulties in budget and schedule performance. It was identified that three major significant factors that cause delays and problems in performance of time in local construction activities are unforeseen ground condition, site management which is very poor and delay in making decisions involving all project teams. Budget and time performance have been found as common issues in the building industry across the world (Okuwoga,1998). Dissanayaka and Kumaraswamy (1999) illustrated that communication level and construction team experience are highly correlated with performance in time; while characteristics of contactor and client are highly correlated with the budget performance.

According to Iyer and Jha (2005), there are many factors that affect the budget performance of building projects among others include: coordination of project managers and other participants, support from senior managers, leadership skills, decision making, project managers competitiveness, participant monitoring and feedback, competence of owners. Project participants coordination was found to be the most important factor having maximum influence on cost performance of building projects. Managerial strategies and technological and is important to speed up construction process and to advance time performance of construction project (Chan & Kumaraswamy, 2002). It is stated that quick information transfer among project participants, active communication, the better choice and training of project team and detailed construction schedule with up to date available software help to speed up the performance.

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Construction project is branded not only by its complexity and size but also by numerous activities and interaction wich take place during its life cycle. The working environment is continuously dynamic because of the number of participants taking part in the project, the project period and activities along the away (Sanvido et al.1992).

Project budget is considered as common measures used to measure performance of the project budget. Construction project participants are always trying to find means to complete the project within the planned cost. The capacity of a project participants to complete the project within the allocated budget is not easy as there are always uncertainties and many other problems happening during the execution of the building project. Bubshait and Almohawis (1994) stated that budget can be defined as the degree to which the general conditions promote the completion of a project within the estimated cost. Cost can be measured referring to cost variation calculated by the variance between the planned cost and actual cost of the construction project.

2.8 Project schedule

Project period is defined as the planned timeline for implementing scheduled activities and planned duration of meeting schedule milestone (PMI, 2008). To achieve the project period deadlines which include substantial deliverables and milestones, it is crucial to use creative method of scheduling a construction project. The applications of tools and methods of estimation time such as the use of Three-Bottom-Estimate which originated from the Program Evaluation and Review Technique (PERT), Schedule Performance Measurements (SV, SPI), Project Management Software (MS Project, Primavera, etc.) bring modernizations and innovations to schedule project activities so that delays in construction projects could be minimized.

2.9 Estimation of project time

According to Mbatha (1986) and Bromilow (1971) the estimation of project period is an important factor that has been said to be responsible of the poor time performance in construction projects. There was no generally recognized method of estimation of construction project period in a Kenya (Mbatha, 1986) and (Talukhaba, 1988).The greatest difficulties to period estimation is in the assumption it is based on. The estimation of time must be accurate by correctly evaluating the environment in which the project is to be executed. There are difficulties encountered during time estimation of the project: the first is that the predictions made about the risks that are likely to

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influence project time might be wrong. It means, the risks that are most likely to cause project delays are not accurately quantified due to inaccurate assumptions. Secondly, the technique used to estimate project time may not be accurate such that it doesn't consider the parameters influence time such as method of construction, project breakdown structure, workers productivity and style of management (Talukhaba, 1999).

Client or contractor are supposed to estimate the contract time depending on what client's terms and conditions are. If the client fixes the contract period, he has to be advised by the consultants which means inaccurate time estimation is caused by consultants due to lack of applying the modernized techniques of time estimation, time risk identification and analysis but the client may emphasize on time the project will take due business opportunities that are going to be available. In the situation like this, it is very important that the project is completed within the fixed period of time as planned. However, there are risk associated with it such as allocated time might now be accurately quantified by contractor and consultants (Talukhaba, 1999). Seeking quicker completion time attracts substantial risks if environmental conditions surrounding the project are not well understood (Bromilow, 1974).

2.10 Delays in Construction Projects

Delay is defined as additional period of time beyond initial completion dates stated in the project contract (Kaming et al (1997) . project delay has a negative impact on the project progress. The delays may be caused by natural occurrence of weather conditions, shortage of resources where materials are extracted, delays caused by the architectural plans or designs, and other connected issues. Normally, those projects delays have both internal and external causes and effects (Vidalis & Najafi, 2002).

Delays in construction sector can be experienced in many ways: there are delays relayed t client such as providing payment certificates to the contractor and this delay negatively affect the contractor cash flow (Aibinu & Odeyinka, Construction delays and their causative factors in Nigeria, 2006).The delay can be originated from the design team especially from architect for not giving clear and timely necessary instructions, later provision of drawings to the contractor and however, it affects the contractor's program. Delays can as well be attracted by contractors especially when the works are not going as planned and it is neither the design's team cause nor clients. In Rwanda, the same could be said that there is carelessness of the parties concerned. The

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issues of delays on the part of design team or consultants in terms of providing drawings and giving timely instruction are also evident. There are also issues of clients delaying to payments to the contractors are quite common. it is very important to find can be an improvement in the project performance due to concerned parties by taking their responsibilities very seriously.

Kagiri & Wainaina (2008) found the significant factors that influenced the time overruns in power project such as: poor risk assessment, improper project preparation, contractor's inabilities, poor resource planning, lack clarity of project objectives. Fugar and Agyankwah (2010), conducted a similar survey on time and cost overruns for high-rise construction projects in Ghana and identified that, resource estimates, human resource shortage and breakdown of equipment and plants caused delays while lack environment, lack of cost data and price increase were significant in determining the cost overruns.

2.10.1 Types of delays in building projects

Numerous researchers cited the classification of delays and according to Al- Gahtani and Mohan (2007), there are four types of delay which are: compensable delays Justifiable delays, concurrent delays and critical delays. These types of delay mentioned above are classified in two categories: One are delays caused by internal factors including stakeholders. Second are delays originated from environmental factors which are considered to be outside construction projects and are beyond control by project stakeholders (Vidalis & Najafi, 2002) .

According to Kaming et al. (1997) delays are classified into, inexcusable, excusable and concurrent delays as it is represented by the diagram below:

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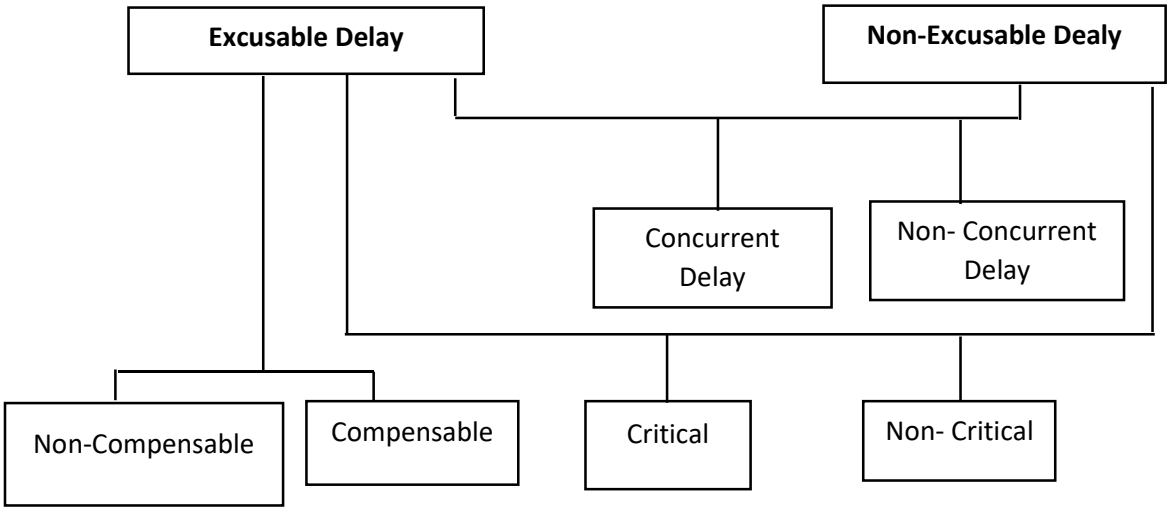
Figure 2. 1: Diagrammatical representation of the different types of delays



Source: Vidalis and Najafi (2002)**.**

2.10.1.1 Excusable Delays

There are delays in building project which are unpredictable or unforeseen and these are delays that are unquestionably beyond the control of the project's practitioners. Some of these delays mostly come with compensation and others are not. The contractors are entitled to be financially compensated as it is stated in some clauses in the Condition of Contract. No party is held accountable if experienced delays are the results of acts of God and Contactor is entitled to enjoy the extension of time in most Conditions of Contract (Alaghbari, et al., 2007)

Compensable delays: Delays that are mostly related or caused by clients or projects consultants are defined as compensable delays. The predominant causes of this type of delays could be poor choice of specification and inaccurate architectural designs. This leads to delays as results of constant request for information (RFI's) by contractor which sometimes become difficult to get response from the client or consultants. The variations mostly introduced by the client disrupt the sequence of the scheduled activities. In this type of delays, the contractor entitled to EOT (extension of Time) and financial compensation (Alaghbari, et al., 2007) .

Non-compensable delays: There are delays that result from unanticipated event or events that are beyond the contractor and the client control. As consequence, client ad contractor can suffer cost related losses. The contractor states that there is cost overrun for taking more time in building

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project while the client absorbs its additional cost in the form of liquidated damages by issuing additional time to the contractor and contract extension. Causes for this type of delay cannot be controlled by any party to take the responsibility of extra cost resulting from it. The main causes of delays are events such as war, acts of God, unanticipated extreme weather, fires, action of Government in its supreme capacity and strike. During this event, the contractor is entitled to an extension of time but there is no additional payment for compensating the delay damages from the client. Liquidated damages are defined as total amount of money specified in the contract agreement to compensate the party for unexcused work or interruption in performing the contract. As stated by Kaming et al. (1997), the purpose of the liquidated damages clause in the contract is to in advance establish a reasonable evaluation of the damages that would be suffered by the party if one party breaches a contract agreement or an unexcused delay.

2.10.1.2 Unforgivable delays

Unforgivable delays are delays that brought by contractors who have control over them. These kind delays are normally not tolerated by the owner. Opposite to compensable delay, there is no compensation for either the monetary or the time impact of the delay in non-excusable. I this kind of delay, there is no extension of time entitlement or delay damage to the contractors or sub-contractors even if the delay causes negative effects to the entire project. The client then could be entitled to liquidate damages. For instance, an unforgivable delay happens in the time when contractor cannot deliver sufficient manpower to timely complete as agreed in the contract. According to Alkass et al. (1996), non-excusable delay is the situation in which the party accepts consequences from the risk brought by delayed project or performance.

2.10.1.3 Concurrent delays

Concurrent delay is defined as a situation in which non- compensable and compensable delays occur at the same time. The issues of concurrent delays go beyond just one factor. There are several factors which culminate to cause delays overruns in projects. These are defined as concurrent delays (Alaghbari, et al., 2007) basically, the responsibilities are shared between client and contractor the concurrent delays occurred. It is difficult to determine where shift responsibilities. Neither the client nor contractor can be held liable to pay damages when it is very hard to ascertain the issue.

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However, there two situations in concurrent delay where one is more crucial than the other one. The contractor is entitled to extension of time for the period of time wasted by the relevant concurrent delay effect. This type of delay creates the complex legal issues in terms assenting the responsibility for overall delayed project.

Critical delays are defined as delays that have a huge impact on the progress of activities, project duration and compensation. However, non-critical delays do not affect the life span of the project in terms time of completion. They affect activities which are not in critical path of the project but this can cause delay if those activities do not have any float in the schedule (Abdul-Rahman, et al., 2006).

2.11 Causes of delays in Building projects

In developing countries like Rwanda, building project delays are very common. Some of causes of delay in building projects can depend on the country the project is being undertaken. the major causes of delays were identified and most are related to project participants or parties that are involved in project design and execution. some of the reason why the construction projects delay is for instance the construction rework, unavailability of construction materials, change in order failure of equipment, poor organization, acts of God, etc. The research conducted by Frimpong et al. (2003) discovered that 33 out 47 of construction projects completed between 1970 and 1999 delayed in Ghana. The study findings showed that the rate of projects that exceeded the initial project schedule and cost is at 75%. Al-Ghafly (1995) demonstrated that exceeding project schedule frequently happens in large and medium size projects and it occurs severely in small project which leads to cash flow challenges, financial, inadequate manpower and poor project management were identified to be main cause of running out of schedule.

The schedule overrun happens when actual period delays beyond the originally agreed completion duration. Time is a crucial part of every project plan of the company's project to be executed and it has to be developed in order to perform well the contract work. There is high correlation between project condition, the scope of work and the schedule. This means any change to any of the three will affect the outcome level and completion period (Ahmed et al., 2002).

Mansfield et al. (1994) demonstrated that the major factors affecting project completion schedules were improper payment for finished works, financing, bad management of contract, change in the construction site conditions, unavailability of construction materials locally and inappropriate

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planning. Many researchers concluded that the substantial causes of schedule overrun are the working drawings approval, delays in interim payments to contractors and as the result, the cash flow difficulties during execution of the project occurs. There are issues of design changes, designs errors inadequate labors skills, labor shortage and slow decision making (Chan & Kumaraswamy, 1997).

The big issues of the construction sector in developing countries are categorized in three groups: shortages of infrastructure, problems brought by clients and consultant and finally incompetent contractors (Ogunlana & Promkuntong,1996). The construction and design issues can as well beresulted from designers who are not competent and produce unworkable designs and lack of standardization in their works, as consequences it brings difficulties to construct, eventually overall cost is increased (Toor & Ogunlana, 2008). It was also found that poor design from incompetent designers cause delays in the approval process (Dissanayaka & Kumaraswamy, 1999).

2.11.1 Client Related Causes

Several conducted researches identified the owner related delay factors to cause time overruns. Owner's cash flow difficulties, variation orders and slowness in making decisions are among critical (Aibinu & Odeyinka, 2006). According to Assaf and Al-Hejji (2006), there are major causes resulting from contractor's performance. For instance, among others there are: difficulties in funding project, improper planning and construction method, poor site management of contractors and supervision are some of the main cause of the project delay. Client of the construction project is the important person who led the project team members and most importantly finances project. They invest their money into a construction project for the purpose of getting a return on investment after the completion of a project. There are a lot of uncertainties that may happen in middle of the construction process and cause deep impact to the client financial status. According the Nahapiet (1983) identified that the experience of the client in construction affects performance of the project. Experience of the client will make all objectives and requirement that need to be achieved in early stage of construction clear. Then they will closely control and monitor project in efficiency and effective way for better accomplish the project goals and objectives. Banwell (1964) found that the public clients impose excessive tough procedures

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on the contractor selection process. However, the study demonstrated that the private clients are more specialized and can achieved improved performance Sidwell (1984).

Some industry players found that the clients in local industry is to blame for delays in issuing project approvals, signing contracts and site possession allowance and that clients were accountable for the largest proportion of variations, all of which have t implications in terms of cost and time. As stated by Wearne and Ninos (1984), proper control of construction project was highly dependent on the owner's decisions on the authority assigned in project team. If the client would like to interrupt everything and interfere in all team members' work, the team members' interest and motivation will reduce and hence affecting the project performance.

According to Abubakar (2015) identified factors that are related to client's responsibilities like lack of technical knowledge to understand the responsibilities of the client, lack of proper coordination with contractor, inability to make timely decision on the project and delays in issuing instructions by his consultants , change of project scope which eventually results in variations and additional works and change in design specifications and financial difficulties which cause delayed payment to contractor. Variation is defined as any deviation from the agreed schedule and scope. It is also referred as a modification or change in quality or quantity of work in the contract agreement given to the contractor by the client or client representative (Hibberd, 1986).This include a change to project specifications, drawings or to a specific contract document. The variations are classified according to types and causes of modification. Ibbs (1997) revealed that the main causes of variations in quality and quantity are grouped into three main categories which are: unforeseen conditions, design changes and design errors and omissions.

Late payment by definition is the failure to pay within the period of issuing a payment certificated as per contract (Harris & McCaffer, 2003). All parties involved in the payment procedures such as stakeholders, contractor, architects, financier and other project participants may be the main cause of delays in payment. According to the Construction Industry Group (2007), showed that the serious cash flow issues down the chain of contracts are caused by difficulties in payment at the higher end of hierarchy. There are identified sources of late payment: withhold of payment by client, inaccuracy for valuation of completed work, contractor's invalid claim. Client poor financial management, insufficient of documentation for valuation, late interim valuation and issuing payment certification by consulting party.

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Late completion of the construction project is constantly resulting in variations during construction phases (Ibbs, 1997). The magnitude of the project program delayed because of variations was reported to have nine percent of the initial program for 71 fixed price projects examined (Zeitoun & Oberlender, 1993). Kumaraswamy *et al.* (1998) studied claims made for extension of completion period because of understandable delays in civil engineering construction projects in Hong Kong and the results revealed that fifty per cent (50%) of the projects studied experienced delays due to projects variations. Construction projects delay happen mainly for the reason of not only enough time is required in assessing and imposing variations but also because variations have increasing impacts on the projects (Reichard & Norwood, 2001). All the possible consequences of variations are also correlated, resulting in delay for completing the construction projects.

A survey conducted by Reichard and Norwood (2001) found that changes that happen during construction phase affect the performance of the project because if there is any change, the contractor must adjust in order work under the contract, be flexible and reallocate the time, labor, equipment and resources of materials. The effects of variation orders are: delays of projects, hiring new professionals, increases in the project cost. Variations lead to quality degradation as variations that are frequently occurring on the projects and they cause the contractors to reimburse the losses by compromising the quality of works. Procurement delays are also sometimes caused by the variations made. A rain and Low (2005) suggested that the most impact of variation in building projects is additional compensation to the contractor. This is due to the fact that variations are taken as the source of extra work for contactors.

2.11.2 Contractors related factors

Incompetent contractors and subcontractors are triggered: the lack of past experience of contractors, deficiency in experienced professionals in the contractor's firms and the lack of competitiveness of administrative personnel in the company (Chan & Tse, 2003). The outdated construction method and technology are mostly used by the incompetent contractors and subcontractors which leads to poor performance as result of time and cost overruns, poor quality work done which leads to demolition of completed section of work and rework (Awakul & Ogunlana, 2002).These incompetent contractors and subcontractors are as well found executing work on many construction sites, where amount of works to be executed are far beyond their

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ability. It is possible that contractors can improve the likelihood of general project achievement by minimizing the project team turnover, executing effective and efficient programs and having regular site meetings as construction project control measures (Jaselskis & Ashley, 1991). Good performance of the project requires better selection of the project team, communication among team's participants, efficient use of resources and construction site review (Wallace & Blumkin, 2007). According to Slough and Sears, (2005). One of the motives of the poor project performance is that the building industry is considered as one of the businesses with many risks. Even if the construction related claims, poorly estimating and controlling cost and poor program schedule performance are unavoidable, it is very possible to minimize their effects on the project performance.

Site management is an important contributor to the project success. According Talukhaba (1999), most of the significant delay factors such as materials and plant are to some extend caused by the contractor's poor site management practices. However, project site management is influenced by the general management and structure of the contractor. Walker (1990) illustrated the excellent site management is influenced by factors like management practice of the contractor on site. The significant causes of delays related to the contractor fall to some extent within issues related to site management.

Financial problems encountered by the client and interim payments delays are all interconnected. The delay of interim payment by client causes the financial difficulties faced to the contractor (Toor & Ogunlana, 2008). It also causes delay in payments by contractors to subcontractors. The interim payments delays might also be caused by the method under which interim payments are done, for instance, payment by time, payment by element of works completed or payment by remeasurement and the payments as per executed works. When a contractor abandons the projects because of delay in delay in payment, it may result in additional cost and extension of time which eventually lead to abandonment of the project.

The management of cash flow by definition is the procedure of controlling, analyzing, monitoring, analyzing and updating the budget of the project (Ward, 2008), he further highlighted that the most important aspects in the cash flow management is to prevent the lengthy cash scarcities resulted from having big gap between and outflows and inflows. The ease of cash flows through fine

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managed cash flow is crucial component as it enables the production of a successful construction project by regularly exercising of cashflow analysis to recognize cash flow difficulties.

It is very central to establish and utilize plans and methods that will sustain a suitable cash flow for the building project. However, the cash flow which is well managed improves the project cash flow and afterward facilitate the good performance of a building project. Contrary, poorly controlled cash flow indicates the different. The primary causes of poor management of cash flow can be branded as contractor execute more than one projects in parallel , unstable financial background of contractor , selection of unqualified contractor, cost of the project, lack of consistent cash flow estimating and poor arrangement of credit with creditors , debtors and capital lock-up.

The survey conducted by Kaming et al (1997) found that one of the major factors triggering time overrun in tall building development in Indonesia is the inadequate funds and resources. Furthermore, Noulmanee et al (1999) conducted a research on the causes of time overrun in big roads construction projects in Thailand and the finding showed that the significant reason of delays is the shortage of company's resources . A research by Ubaid (1991) revealed that the contractor's resources are the main measures of the performance of contractor. Those resources include material capitals, human capitals, financial resources, plant and equipment and plants capital. Insufficient of capital may affect the cash flow of the project and lead to projects delay and delay in possession of the site. The reasons that would lead to inadequate financial resources are among others: problems in obtaining loans from financiers and budget allocation by government b not in place (Abdul-Rahman, et al., 2006). Contract administration describes the functions that are performed after signing of contract by parties (Sherman, 1996). In another words, contract management refers to those activities that are to be undertaken after contract award. Typical contract management activities are objective oriented, targeting the implementation of the contract conditions and terms while paying attention to the accomplishment of the stated agreement of the contract. In other words, contract management is all about the implementation of the contract agreements. It requires the contract administrator to remain attentive on the program goals and objectives.

Poor contract management includes issues such as contract documents which are incomplete (Toor & Ogunlana, 2008), ambiguities or scope of work mistakes, (Chan & Tse, 2003), incomplete

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specifications or drawings (Sweis *et al*. 2008). Ineffective contract management also includes inappropriate dispute resolution techniques which means either no dispute resolution method is included in the contract agreement or the method used to resolve the disputes that arise is not appropriate (Toor & Ogunlana, 2008). it causes time overrun and disputes in building project which might eventually lead to construction project failure and abandoned projects.

2.11.3 Consultant related delays

In construction sector, the consultants team plays a role of protecting the interest of the client and if their responsibilities are poorly performed, it will negatively affect the client interest. Many researchers identified some delays factors that are brought by consultants in delivering construction project. Aibinu and Odeyinka (2006) emphasize that inadequate supervision, late issuance instructions, incomplete drawings and inadequate site inspections are among consultants related delay factors. Among others, there are also delays in performing testing, delays in approving scope related changes, poor coordination and communication between other project parties, late review and approval of design document, involvement of inexperienced consultants. There are issues of design errors, omissions, discrepancies in design documents and change in specifications during execution phase Assaf et al. (1995).

2.11.3 Project Environmental causes

The environment around the project could also be the source of building project delays. These environmental causes are those beyond the project team control and they affect the project performance. These includes: weather conditions which slow down the progress of work, underground conditions, political rules and regulations, delays in issuing license and permits which critically affect the construction schedule (Jackson, 2010). Availability of construction materials, local infrastructure, issues with neighbors, importation policies, natural factors, for instance, landslide, floods and earthquake can also affect the performance of the project. It is very crucial that where projects are being proposed, the environment implications have to be considered through extensive investigation in order to get information on hydrology, geological and topography as well as accessibility to the site, security and transportation among others. All these implications have to be given serious consideration so that their effect on the projects are mitigated. According to the India infrastructure report (2002), the escalation of cost is a big problem in the construction projects. In the research conducted by the General Accounting Office (GAO/RCED,

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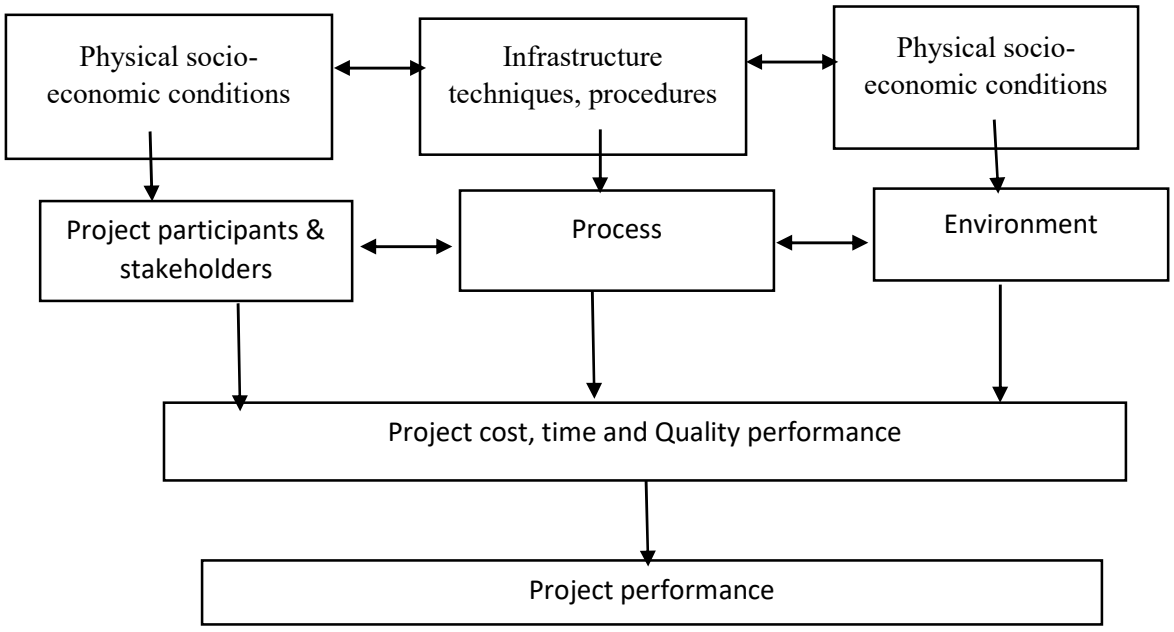
1997) aiming to identify the factors causing the inaccuracy of the project in highway projects demonstrated that Seventy seven percent of highway project witnessed cost escalation. So, three specific factors among those factors leading to cost escalation there is inflation which is the result of economic conditions of the nation. Furthermore, the project cost escalation is also caused by project location, suspension of work, strikes, project conditions, local government regulations and transportation difficulties (Schexnayder *et al*.,2003).

The unavailability of materials might be caused by the transport problems, shortage of materials and poor materials procurement (Elinwa & Joshua, 2001), imported materials or incompetent supplier are also among the causes. Due to the unavailability of equipment, it might also be due to frequently equipment breakdowns which result in more maintenance work for the equipment.

Figure 2. 2: Project Performance Causal Model



Source: Talukhba (1999)

The other potential factors that affect the performance of projects are both physical and socio-economic environment, weather conditions, and the economic situation, among others. These makes the problem of poor performance to be looked at in the context of the participants and stakeholders, the process, and the environment (Talukhaba, 1999).

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2.12 Causes of cost overruns in building projects

The cost overrun refers to the different between the construction project's final cost at the completion of the project and the agreed amount in the contract between two parties (client and contractor). This definition is supported by Avots (1983) who defined budget overrun as the variance between the estimated budget and the actual budget after the completion of the project.

The building industry has special characteristics that are usually not witnessed in the other industries where circumstances that are found at field seem to be more complex than what was expected in the initiation and design phases and it eventually ends which result in additional cost and it is difficult to accurately predict how much in term of cost it will be required to complete building projects. The cost is considered to be one of the one of the main measures of success of the project and cost overruns problems tend to be monumental as far as construction projects are concerned (Gould, 2002). The common standards for success of the project from most researches on building projects are commonly time, cost and quality. According to Songer and Molenaar (1997), any construction project is said to be successful if it is completed on allocated period, within the stated budget, comply with expectations of the users, meet required specifications and attain quality of workmanship and with reduced construction aggravation.

A study by Morris and Hough (1987) revealed that the reasons behind cost overrun in building projects vary: some are not only very hard to anticipate but also to achieve.
Researches have also demonstrated that the large projects are normally more complex and the budget overrun rate is influenced by the size of a building project. some items can be missed out during the initiation, preparation and design stages. therefore, the complication may upsurge the budget overrun rate. The total cost of most construction projects is affected by many factors. This is due to the fact that construction projects involve multiple industries and their works involve many parties for example the client and different professionals, contractors and project suppliers (Chan & Park, 2005). Therefore, the increase of the project cost depends on many factors including collection of variables that are connected to the features of the project, the buiding team as well as the market circumstances.
A study made in Turkey by Arditi et al. (1985) revealed that the causes of building project budget overrun were caused by inflation, problems in obtaining construction materials, increases in

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material prices and wage for workmen, building delays, inaccurate cost estimation and finally the unforeseen sub-soil situations. The budget overruns were due to finance problems, poor contract administration practices, shortages of construction material, variations in site conditions, changes in design, errors and disputes in contract forms, errors during execution, price variations and fraudulent performs and bribes Mansfield et al. (1994).

There is no building that is comparable in terms of cost no matter how the projects are identical. Apart from the basic practical factors, there are a range of institutional and economic circumstances in dissimilar locations that cause variations in terms of cost. The project cost varies according to the factors discussed below:

2.12.1 The specifications of the building project

The specifications define the physical characteristics of a building project. For buildings, the expected occupancy rate and needed function will give an indication of total number of rooms , floor space and size, external and internal finishes, heating, floor ligting and and lighting requirements. The more the specifications are detailed and the larger the building projects, the expensive they will be.

2.12.2 The Building Project Location

The place where a particular project is located affects its cost due its geographical certainties. The location can affect the original project cost in different ways where most of the projects are expected to be different on environmental and ground conditions. In geographical terms, land costs, cost of construction materials and standards of design change a lot across Rwanda due to overall market conditions and the varying distances between suppliers. Furthermore, site can be affected by ground and drainage conditions which can prevent access to site and can affect the initial budget estimates. The foundation and excavation work required are mainly affected by poor ground situations.

2.12.3 Inadequacy of building raw materials

The main cause of construction materials shortage could be the faulty supply of materials occasioned by general shortages in the industry, poor procurement planning and materials coordination (Ogunlana, Krit, & Vithool, 1996).Rwanda currently import 46% of cement to meet the growing demand and the country market leaders are unable to meet the market demand due to

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shortages of raw materials in the country (Mutegi, 2018). Rwanda still imports most construction materials used in which lead to the High cost of construction project.

2.12.4 Contract Administration

Poor contract management might be caused by the method in which contracts are granted. In Generally, the lowermost bidder is awarded the contract (Mansfield, Ugwu, & Doran, 1994) and some of these low bidders may not have required administration skills and have less favor for plans of contract, control of budget, over all site administration and allocation of resources.

2.12.5 Fluctuation of materials price

According to the survey by Omoregie and Radfort (2006) the price variation is the main cause of cost increase of the construction project. This could be caused by the control in exchange rate which eventually affects prices for building materials and the overall price level. Another factor is the unbalanced inflationary trend that is an outcome of demand greater than supply, creating a shortage of goods which in turn causes the increase of the goods.

2.12.6 Procedures of the contracts

The contract document paly important role in the ground rule between contractor, client and consultant. The contract process shows the form of contract, payment method and process constraints and guidelines within the contract as well as conditions of the agreement. The form of contract impacts the project due to of the risk that come with the forms of contract selected (i.e. lump sum). Uncertain in contract procedures result in project delay, disputes and budget overruns (Fisk, 1997).

2.12.7 High transportation cost

The price of fuel in the world market is changing from day to day and this change is affecting the cost of the construction projects especially in developing countries such as Rwanda. It pushes the nation to increase the fee of fuel hence transport firms increase the rate of their services to reimburse the fuel increase and that obviously cause the increase in transportation fee as well as price of materials increase.

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2.13 Strategies for Minimizing Delay and Cost Overruns in Highrise Building Projects

According to, Abdelnaser, et al. (2005)in Malaysia revealed that delays in building projects can be minimized via appropriate project preparation and scheduling of activities while (Aibinu & Jagboro, 2002) in the Nigerian building industry found that provision of adequate contingency resources as the main approaches of minimizing delay in building projects. Studies by (Nguyen, Ogunlana, & Lan, 2004) in huge building projects in Vietnam identified that the determination of accurate project durations, use of accurate cost estimate, employing competent teams to sites, provision of sufficient resources are the substantial factors that can minimize delays in construction projects.

The important mitigation strategies for time overruns in building projects are use of accurate project time and cost estimate, effective strategic planning, obtaining of capable team of consultants and contractors who have a great reputation and experience of executing works to completion, giving job or projects contract based on past experience and capabilities of contractors, providing satisfactory resources at design phase (monetary resources and time), warranting sufficient funding of projects up to completion, carefully read, understand and application of contractual clauses, and timely delivery of materials, comprehensive contractual documentation (Abedi, Fathi, & Mohammad, 2012).

2.13.1 Competence of the Project Team

According to Taylor (1911), systematic management approaches recommend for maximizing the method jobs used to be performed by making tasks easier by training workers in order to achieve their specialized order of motions in a good way. This caused the jobs be easier and gave advantage and benefit to skilled labors. Nevertheless, by 1920s and 1930s, the scientific administration method was doubtful, as it brought problems with relationships of people and their tasks, even if the model worked well. It became so difficult to motivate workers and in addition, changes were not easy to adopt. And after, (Mayo, 1933) discovered that there were some implications from social factors on performance. This significant influence on output made labor groups able to successfully enforce norms, culture, positive or negative to the company. Then after World War II, additional studies were conducted concentrating on labor group. According to Levi (2007), organizing employees into group was one method to develop the operations and function of business company and its efficiency. Between 1960s and 1970s the meaning of team was

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advanced. The operating method of companies in manufacturing sector were changing because for example Japanese firms successfully manufactured good quality goods at low cost. These variations worked within the team perception and after developed the main foundation for companies in the late 1980s. by using team work, a group of workers with inter-dependent connections and mutually-shared tasks (Sundstrom et al.1990), has intensely developed in the previous decade. A survey conducted by Ostermann (1994) showed that more than fifty percent of the seven hundred organizational components reasserted were utilizing teams and more 40% witnessed more than half of their workers working in teams. Lawler et al. (1995) demonstrated that the improvement continues to increase, where sixty percent of the 313 firms investigated said increases in their use of teams over the following decade. Only three percent plan to stop the use of teams. Moreover, 85% of organization with 100 or more staffs use some form of work teams (Cohen & Bailey, 1997).

2.13.2 Effective communication and coordination

Effective communication plays a significant part to the successfulness of building projects. A fruitful construction project administrator ensures that planned construction project and other important information are excellently communicated to all participant of the construction team and on timely manner (Cheng et al.2005). An effective communication method ensures that all information flow and shared amongst all project team members (Fryer, 2004). Communicating the information also refers to keeping of information in a clear form to help communication across the organization at the required time. In construction and building, coordination and communication are very interrelated. Fruitful management often involves effective communication. Issues of coordination and communication consist of aspects like: poor of communication and ineffective communication between project parties and slow response to communication among project team (Toor & Ogunlana, 2008). Instances of the lack of proper communication between project participants include failure of the contractor for information demand or the reply to it on time, the lack of coordination among design team and contractor , the lack of client's consultation , etc. for instance poor communication among building project participants include slow in the progress of contractor's reports to owners or consultants (Dissanayaka & Kumaraswamy, 1999) and failure to use of modern information technology (Toor & Ogunlana, 2008). Delay in reply to communication between construction project participants includes slow response of contractor to

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instructions, client's slow decision making which leads to slow response from consultant's slow response to engineers regarding inspection and testing the contactors inquiries.

2.13.3 Benchmarking

Benchmarking is an instrument used to establish weakness and gaps in the company compared to other similar organization and find necessary strategies according to the objectives of the organization (Kouzmin et al.,1999), it helps to discover chances or opportunities and areas where improvement can be made and monitor the ability of the competitors and performance.

As definition, benchmarking is the continuous process of comparing products, and services practices against the organization's or company's competitors in order to enhance decision making and make an improvement in performance in the organization (Gleich et al., 2008).

Li et al (2001) urged that in order to accomplish success in partnering in construction projects. Benchmarking refers to comparative examination among two or more parties by comparing the present performance gap among them. However, its analysis tool must be kindly considered so that correct and meaningful indicators are achieved and the specific aspects of companies to be referred to must be carefully chosen (Tolosi & Lajtha, 2000).

Through benchmarking most companies are achieving improved profitability, competitive advantage and new markets. These achievements come from integration, improved cycle times, improved quality, cost reductions, customer focus, improved reputation and reduced wastage (Eaton, 2002). Furthermore, benchmarking provides huge benefits such as inspiring involvement of staff to make changes happen, assisting in setting appropriate performance measures and helps to develop a will of constant improvement.

Benchmarking is one of the ways construction companies can realize a significant improved performance. A pilot study conducted in Europe (EU Benchmarking Co-ordination Office, 2000) revealed that various contractors are involved in benchmarking and have achieved commendable performance improvement.

2.14 Literature Review Summary

Numerous literature reviews identified influences that might be affecting building performance around the world. Even if this important body of knowledge exists, available review of the

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literature proposes that there is lack of rigorous hypothetical and experiential examination to create the underlying features of the several factors identified, especially with regard
to the performance of building projects in Rwanda. Each construction project is exceptional and the building procedures differ from one to another since there are differences in factors such as the financial environment, the characteristic of the parties that involve in the project, and the period and location of the construction project. Society and its values are disconnected by big gaps described by societies and principles; these can deter comparisons of building project performances across nations.

There are several factors that influence the performance of construction performance ranging from those within the construction sector and those exterior to the industry. Those factors within the construction industry are associated with the players ranging from characteristics of the clients and their institutions such as the behavior of consultants, and the framework on their operations, the characteristics of the contractors and subcontractors and their operation framework. There are also issues related to contract conditions. There are also external factors that influence the performance of the construction projects such as construction materials, labor force market and furthermore there is natural factors such as acts of God, weather conditions, government institutions for instance educational institution which does not produce skilled educated personnel to the labor market and so on. All these factors bring conditions that affect project performance in one way or another especially they cause delays.

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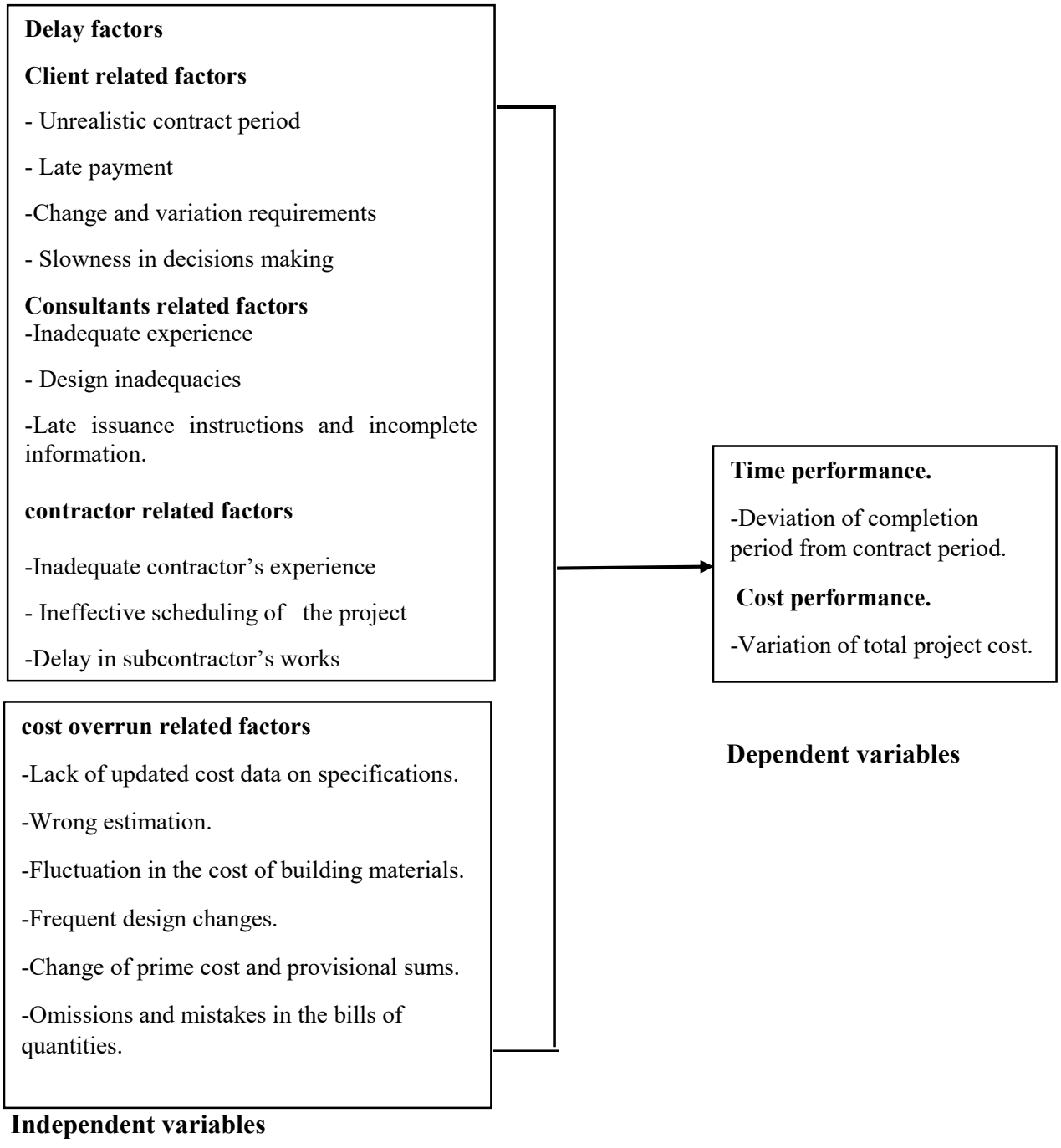
Figure 2. 3: Conceptual framework



Source: Author's Field Survey, 2019.

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CHAPTER THREE: RESEARCH METHODOLOGY

This chapter defines the method applied in this study to achieve the purposes as well as assessing the existing works and literature by different authors on the background viewpoint of study and study methodology. It as well discusses and selects the suitable method for the research such as qualitative, quantitative and triangular methods. This is followed by discussion of the approach in this research. For instance, literature review, questionnaires study, observation then the techniques applied for the data analysis are also presented (Hoe, 2013).

This chapter provided a specific procedure that was used in conducting the study. The study design, sampling technique and procedures of data collection and data analysis were defined in this chapter.

3.1 Research

The study conducted by Ahmed et al. (2006) states a research is defined an as a systematic or organized mean of discovering of confirming existing facts, new facts or disagreeing with previous research findings. It is also referred to the formation of knowledge where it doesn't exist before. Richardson (2005) defined a research as the systematic study or search for information and knowledge by the finding of insights and facts by demonstrating their relevance to existing knowledge. Furthermore, a research must have specific objectives, specific questions vis-à-vis objectives and their answers in order to solve particular problem which is clearly specified at the beginning of the research (Naoum, 2007).

3.2 Research Method

According to Oxford Dictionaries (2010), a methodology is defined as an organization of methods used in specific area of a research. There are different terms that were used as meaning of research methodology by different authors. For instance, Creswell (2009) used the term "Research design" and research strategy (Naoum, 2007). Research methods refer to the approaches or techniques used on collecting and analyzing collected data (Fellows & Liu, 2008). Research design is defined as a plan and procedure for study that extend the conclusions from assumptions to approaches of data gathering and analysis. However, this is why for the objective of this study, the term "research method" is chosen.

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Research methodology is generally divided into two methods which are quantitative and qualitative methods (Creswell, 2009). Additionally, mixed method is considered as the third method and it is basically the combination of the qualitative and quantitative methods was discussed by Creswell (2009) and Fellows & Liu (2008).

3.2.1 Quantitative Approach

The quantitative technique is defined as a mean of testing objectives by examining the relationship between variables. Quantitative method seeks to compile accurate data through asking questions such as how many, what, how much (Fellows & Liu, 2008). Quantitative research comprises of measurement of tangible and the relationship between them. The data found using quantitative approach is quantified data and are measured using scientific methods and instruments (Creswell, 2009). Statistical procedures are used to analyze the data obtained by practicing quantitative approach. The quantitative approach is naturally considered as deductive which is contrary to the inductive nature of the qualitative approach. Quantitative technique uses scientific approach in which original study of literature and philosophy yields precise aims with hypothesizes to be tested (Fellows & Liu, 2008).

There are strategies inquiry related to quantitative research which include: survey research and experimental research. Experimental approach examinations for the occurrence of a distinct outcome and cause by monitoring the probable causes of differences (Salkind, 2009). However, monitoring for the sources of variances for factors affecting the performance of construction projects is unlikely given the magnitude of factors affecting the success of research project and it would be too expensive as well as take long time to conduct even one experiment.

A survey research deals a numeric explanation of attitudes, opinions and trends of a population study by reviewing a sample size of the targeted population (Creswell, 2009). It comprises structured interviews and questionnaires. Questions are shown in the similar order and with the similar wording to the whole interviewees in structured interview. Most questions in questionnaires are closed questions as contrary to the open questions (Naoum, 2007). Questionnaires in this research are more preferable than structured interviews due the fact that structured interviews are time consuming and costly. Therefore, structure interview is not favored

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due to time limitation and resource constraint of the researcher. The researcher used quantitative approach by employing questionnaire to collect data.

3.2.2 Qualitative Method

Qualitative approach is described by Creswell (2009) as exploratory in nature. The author further defined the qualitative process as involving emerging procedures and questions. The qualitative study seeks to go into much details and discover insights and the results of obtained from qualitative research seems to be elaborated and as results they rich in content scope and content(Fellows & Liu, 2008). The qualitative approach is as well inductive. The way the subject is explored is conducted without previous formulation while for the object is to gain to get understanding and collect data and information. The subjects studied in the qualitative researches are variables which are intangible and often behavioral and the subjects studied are considered to be social or human problems (Creswell, 2009). Qualitative approach is very subjective in nature. The objectivity of the of qualitative data is questioned by individuals who have background in the scientific and quantitative tradition (Fellows & Liu, 2008).

Qualitative method includes videotaping, document analysis, direct and participant observation. grounded theory, case studies and interviews, phenomenological research as well as ethnography (Creswell, 2009; Salkind, 2009). In additional, Fellows and Liu (2008) suggested that most external variables are very possible to have an influence on the collected data. The results obtained from qualitative research are likely to be used in all stages of the work in many active ways than generally are suitable in quantitative researches.

Interviews might be divided into three categories: unstructured, semi-structured and structured interviews (Naoum, 2007). Unstructured and Semi-structured interviews are accepted for qualitative approach to get detailed information from the interviewees. Furthermore, questions are not asked in the order which is specific and no schedule is used in semi-structured interview. In addition, the set questions comprise of combination of Open questions and Closed questions. For unstructured set of questions, there is not a set questions warding or order, no schedule and further more interviewers are mostly not looking for similar kind of information from each and every interviewee.

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3.2.3 Mixed Approach

Mixed method is adopted to study a topic by combining both qualitative approach and quantitative approach. The use of a mixed approach in a research project is better than using either quantitative or qualitative (Creswell, 2009) . According to Fellows and Liu (2008) , mixed method is adopted to minimize or eliminate weaknesses of using individual or single approach and it helps to gain the advantages of each through the combination of both approaches. Mixed method may be employed for entire studies. For instance, investigation of a subject from numerous paradigms, another paradigm or and research methods.

3.3 Research Method Choice

According to Saunders et al. (2009), The most researches that are widely chosen are qualitative and qualitative researches and are used in management and business researches to distinguish both data gathering methods and data analysis procedures. The Selection of quantitative, quantitative or mixed method in research design is a very crucial as tit allows investigators to make their studies more effective by choosing the right instrument to use. Saunders et al (2011) had found research selection as the use of Qualitative (Non-Numerical) Quantitative (Numerical) methods to conduct researches. The researcher has to choose between using a mixed approach, mono multi method when conducting a study to answer the study questions Where: Mono Technique is defined as the use of one data collection methods, Multiple methods are described as the use of more data collection methods while Mixed method refer to the use of multiple techniques which employs both quantitative techniques and qualitative techniques and analysis procedures.

In this study, the researcher employed a Mono technique for collecting research data and analysis approaches. As revealed by Saunders et al. (2009) Mono technique employs a single data collection technique and its matching analyzing technique. The researcher selected the use of quantitative method for data gathering as well as statistics analysis to get responses of the research problems. The researcher picked this approach because there was not one to one contact with respondents in the field during data collection and the component of interpretation is solely of statistical data and not opinion grounded or articulated by those who participated in the research. The researcher believes that employing a structured procedure with deductive reasoning provides

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dependable data that is perceived effective. However, questionnaires were employed to find quantitative data from the targeted study population.

In brief, the research design involved the process of collecting data that describe events in a well-ordered, tabulated and defined data. Kothari (2004) revealed that a descriptive design contains planning, organizing, collection and analysis of data so as to give information being sought. The objectives are: to find the important factors triggering delays in construction of construction project, to find out the influence of client on factors which cause project delay and finally to determine the influence of project environment on factors which cause project delays. Therefore, the research study adopted quantitative method in order to identify the factors triggering delays in tall Building projects so that the impact could be minimized by taking proactive measures. Rea (2012), suggested that a survey is the best approach for a quantitative research for collecting information amongst large population. The quantitative data using tables, graphs and figures is supportive to examine and interpret them more effectively.

3.4 Population

Habitant (1982) revealed that the construction activities in developing countries are concentrated in capital cities. The population of the study was within the geographical boundaries of Kigali city and this became essential because Kigali is the capital city of Rwanda. Looking at any other part of Rwanda, Kigali has the highest concentration of private and public high-rise buildings. The Capital City appears to have numerous commercial building projects and the approval for execution of these construction projects are driven by Kigali City regulation and Kigali City Master Plan which recommends the types of buildings and numbers of floors which property developers can erect in particular zones of Kigali City. This is supported by Gahigi (2016) who said that there is a growing number of offices and retails spaces in the city due to the numbers of completed building projects.

The population of the study those high-rise building projects that had completed. The researcher chose to work on Highrise building projects because they are ones that are prone to logistical and technological predicaments. These projects had been collected from Kigali Construction Urban Planning One Stop Center because this department is assigned of approving or disapproving construction project plans before execution phase starts to ensure that they comply with regulations. It is as well assigned of ensuring safety standards in the construction sector and to

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deliver quick service delivery. The population was therefore obtained from Kigali Construction Urban Planning One Stop Center's Project approval records. Among approved construction projects in a period of 5 years from 2014 to 2018, 127 private Highrise buildings approved.

3.5 Sample size, techniques and Procedure

The term "Sample" means the part of whole that is selected to show represent the characteristics of the rest. The aim of sampling is to give a practical way of allowing the collection of data and processing components of study to be carried out while warranting that the sample provides a virtuous representation of the population.

There are three methods of sampling which are: probability sampling or probability sampling, judgmental sampling and non-probability sampling. Non-probability sampling is further systematically separated into systematic sampling which are: cluster, stratified, snowball and convenience samplings while probability sampling is employed by utilizing random numbers from either computer program or tables. Judgmental sampling is referring to the researcher judgement on which part of the population must form the sample. Systematic sampling technique chooses a participant of the population at a specific interval to create the sample by commencing from a random point of the targeted population. Stratified sampling is employed while the study population happens in different sections (Fellows & Liu, 2008).

Cluster sampling is suitable when the population is put into groups and the inter-group variances are small whilst intra-group differences are large. The groups are chosen aimlessly and the total clusters members provide the over-all sample. Convenience sampling might be used where the nature of the study questions and the population don't show any specific form of sample and so, the data are collected from a sample which can be accessed readily. Snowball sampling is employed when it is not easy to access the data, so the researcher commences with a small figure of participants and increasingly forming a adequate sample by requesting the respondent to get additional sources. However, Random (probability) sampling were used to select representative of delayed high-rise building projects. It is only those projects that had experienced delays that were useful to this study.

All projects were selected and analyzed for the period of 2014 to 2018. This period was considered due to the fact that the researcher is likely to find participants who involved directly in the

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execution of projects. The number of 127 classified as Highrise buildings reduced 45 projects because of many reasons such some of them were approved in papers but had not started by the end of year 2018, the researcher could not find information leading to the objectives of the study because those who participated in the projects were not available on some of the targeted projects, there were also projects that did not experience delays and finally, for some projects, the information were kept confidential for security reasons. According to Krejcie & Morgan (1970), when the population is 45, the sample size to be considered is 40. Therefore, the sample size of this study is 40 Highrise Building Projects.

Table 3. 1 Number of respondents

	Description	**Average No. of Staff per project**	**№ of Projects**	**Totals № of respondents**
	Project Manager	1	40	40
	Architect	1	40	40
	Civil Engineer	1	40	40
	Quantity Surveyor	1	40	40
	Total number of respondents			**160**

Source: Author's field Survey, 2019

Since the desired sample size (n) is 40 Highrise buildings with each building having 4 respondents, the researcher involved 160 respondents for the study.

3.6 Data Collection and Instrument

In this part, the form of collected data to respond the study questions should be specified. Mostly, the primary data, secondary data, or a combination of both data can be used by a researcher. According to Saunders et al. (2009), many research questions are responded by using a mixture of secondary and primary data. In order to respond the research question in accordance with the study objectives, the researcher used both secondary and primary data accordingly.

3.6.1 Collection of Secondary Data

The researcher gathered data from literature review such as textbooks, journals and published papers that are related to the title of research to formulate perceptions and develop research

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questions. Saunders et al. (2009) highlighted that the investigator needs to carefully study and analyze the secondary data to make sure that it is relevant to the study objectives. The e-book collection of 'Google Books' and 'Google Scholar Website' were utilized an important role in order to increase free access to books utilized in the growth of this research. Theoretical articles and reports were more employed to gather information on the study topic and to advance the literature review. The past dissertation sample books also contributed in the information of the investigator about the structure and the topic.

3.6.2 Collection of Primary data

Main source of data is the primary source of research without any interpretations and declarations representing an official opinion (Cooper & Schindler, 2003). A self-structured questionnaire asking about the factors affecting the performance of construction projects in Rwanda: A case study of delays in High Rise Building in Kigali. Questionnaires were used for gathering quantitative data by asking prearranged questions and analyzing the data.

The main data for this study were gathered using the questionnaires. Questionnaires
were employed in collecting data and comprised of a combination of open ended and close ended questions and according to Babbie (1998), this permit the strength and richness of individual perceptions in participant responses and for the reason of capturing of the knowledge of the respondent's answers because it is flexible and they also help to promote participant cooperation and allow probing further for clarification of issues. The technique of data collection using questionnaires is considered suitable because it is not difficult to analyze and is cost effective (Andersen & Wrieden, 2004). While Talukhaba (1999), the use of questionnaire is the most suitable way to collect data because of the nature of data.

The primary data collection process was done by approaching participants for permission to collect the required data. The data were collected from construction professionals who involved in the implementation of the selected building projects who specifically are Engineers, Architects Quantity Surveyors and Project Managers. The observation method was also involved by visiting ongoing project sites, examining meeting minutes, site diaries in order to better understand cause of extension of time (EOT), variation change orders, budget change among others for the sake of better understanding the causes of project delays and cost overrun. This method of collecting data

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is quite important because it minimizes the chance of incorrect data being recorded by the respondents (Harper, 1994).

3.7 Data Editing

Data editing is considered as the initial stage of data analysis where the researcher confirms that the data gathered is precise, dependable and relates to the objective of the research questions asked in the instrument of data collection (Cooper & Schindler, 2003). The stage of editing is used to modify and verify data, omissions, prevent errors, progress clearness and consistency to allow the data to be moved to data storage for the purpose of data coding and examination. Editing of the questionnaire can permit the researcher find and correct inconsistent, obscured and unfinished responses from the participants or respondents (Bajpai, 2011).The researcher verified for complete, clear and consistent answers to shorten the coding and analysis procedure.

3.8 Data coding

Collis and Hussey (2014) revealed that assimilating topics and concepts from the study with the objective of formulating new adjusted patterns of thoughts in the data which can be linked to advance theory. The authors further propose giving codes to several heading, words and sections for the aim of assembling the data into groups to allow the researcher to align themes, patterns and relationships between the data to support the research analysis and further collection of data.

3.9 Data Analysis

The collected data was analyzed using SPSS version 22 as the main data analysis tool as well as Microsoft Excel. The units of analysis used in the study were descriptive and inferential data where descriptive statistics included involve mean, standard deviation, frequency and percentages. The inferential statistics used in the study was regression analysis as that was deemed appropriate for the study by the respondents. The study results were then presented in form of charts and tables for easy understanding and interpretation.

The following formulae were used for regression analysis:

$Y = X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + €$

Where: X_1, X_2, X_3 and X_4 = Client related causes, Contractors related causes, Consultant related causes and External environment related causes

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$\beta_1, \beta_2, \beta_3$ and β_4= are the coefficient of Client related causes, Contractors related causes, Consultant related causes and External environment related causes

€ = Standard Error

Y = Time Performance of Construction Projects

Table 3. 1 Operational definitions of variables

Variables	**Types of variables**	**indicators**	**Data collection instrument**	**Data analysis method**	**output**
Client related factors	Independent	-Unrealistic contract period - Late payment - Interference in contractual duties -Change and variation requirements - Slowness in decisions making	Questionnaires & previous documents review	SPSS and human mind to get frequency, mode and percentage	Tables and Bar graphs representing factors affecting construction projects

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Variables	Types of variables	indicators	Data collection instrument	Data analysis method	output
Consultants related factors	Independent	- Late approval of shop drawings - Inadequate experience - Design inadequacies - Mistakes and discrepancies in design documents -Late issuance and incomplete information	Questionnaires & previous documents review	SPSS and human mind to get frequency, mode and percentage	Tables and Bar graphs representing factors affecting construction projects
Contractor related factors.	Independent	- Financial Difficulties encountered by contractor. -Inadequate contractor's experience. - Ineffective scheduling of the project. -Delay in subcontractor's works.	Questionnaires & previous documents review	Tables and Bar graphs representing factors affecting construction projects	Tables and Bar graphs representing factors affecting construction projects

Source: Author's field Survey, 2019

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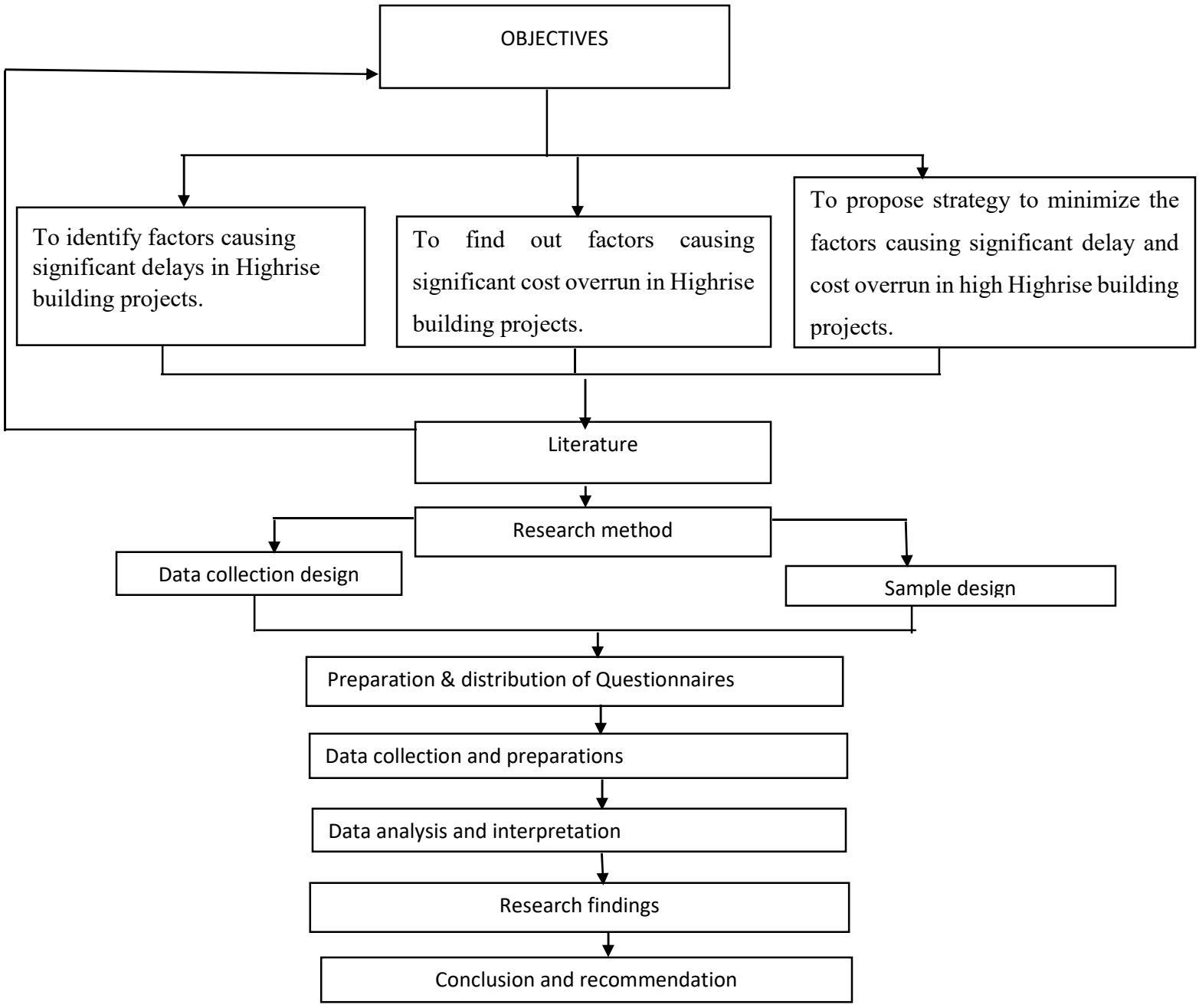
Figure 3. 1: Summary of Methodology used in the Study



Source: Author's field Survey, 2019

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CHAPTER FOUR: DATA FINDINGS, ANALYSIS AND DISCUSSIONS

4.1 Introduction

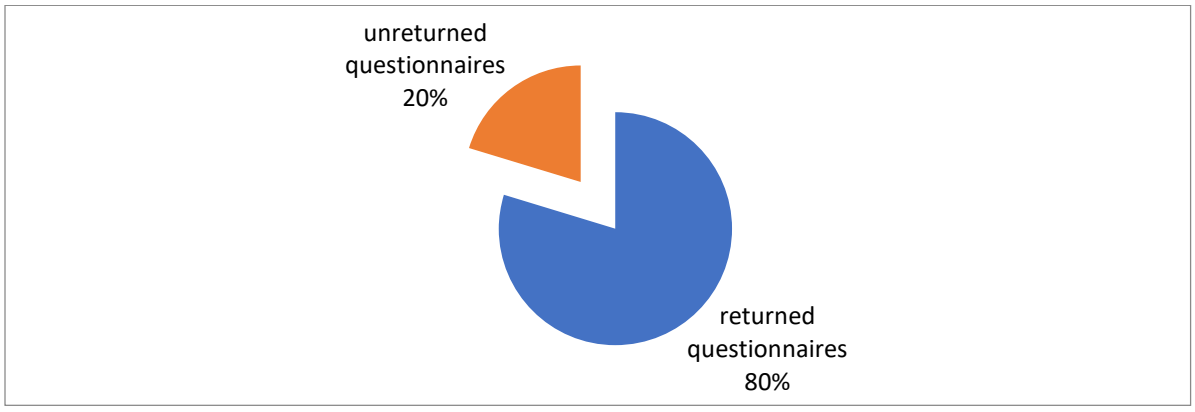
This chapter comprises of data analysis, findings, and interpretation. Results are presented in tables and diagrams. The analyzed data was arranged under themes that reflect the research objectives.

4.2 Response Rate

This section presents the results on the response rate. This is an illustration of how the researcher managed to collect data from the respondents who were sampled as a representative of the target population. The response rate shows the level of achievement the researcher obtained in collecting data for the study.

The research targeted to collect data from a sample of 40 buildings each with 4 professionals making a total of 160 target respondents. However, the study did not achieve a response of 100% as there were some non-response incidences where the researcher could not access all the personnel in a given building project or the information given was found insufficient to be utilized in the study. Therefore, out of the 160 targeted, 128 gave adequate information through answering the questionnaires completely and returned the questionnaires accordingly. However, 32 respondents did not give a response to the study making a non-response of 20%. Thus, the study realized a response rate of 80% as shown in figure 4.1. This response rate is good according to Babbie (2004) who said that return rates of 50% are acceptable to analyse and publish, 60% is good and 70% is very good.

Figure 4. 1: Response Rate



Source: Author's field Survey, 2019

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4.3 Demographic Characteristics

This section analyses the demographic characteristics of the respondents and it presents the descriptions of the respondents in terms of gender, level of education, profession, years of experience and number of projects done. To present the data on these characteristics; pie charts, tables, and figures are used to give a clear picture of the characteristics being reviewed.

4.3.1 Profession of respondents

The respondents were asked to indicate their profession. Results in table 4.1 reveal that majority of the respondents (27% n=34) were architects followed by (26% n=33) who were quantity surveyors, followed by engineers who were (24% n=31), project managers were (23% n=30).

Table 4. 1. Profession of the Respondents

Profession	Frequency	Percentage
Project managers	30	23
Quantity surveyors	33	26
Engineers	31	24
Architects	34	27
Total	**128**	**100**

Source: Author's field Survey, 2019

4.3.2 Highest Level of Education of the Respondents

The respondents were asked to indicate their highest level of education. Results in table 4.2 reveal that majority (50% n=64) of the respondents had attained bachelors' level as their highest education level followed by the masters (32% n=41), doctorate at 16% (n=20) while diploma level was the least with 2% (n=3). Majority of the respondents having bachelor holder's as their highest

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education level indicate that the top personnel in the Rwanda building industry are individuals who are well educated.

Table 4. 2 Highest Level of Education of the Respondents

Level of Education	Frequency	Percentage
Diploma	3	2
Bachelors	64	50
Masters	41	32
Doctorate	20	16
Total	**128**	**100**

Source: Author's field Survey, 2019

4.3.3 Number of Years in Construction Industry

The respondents were asked to indicate the number of years they had worked in the construction industry. Results in table 4.3 reveal that 52% (n=67) of the respondents had worked in the construction industry between 6 to 10 years followed by those who had worked for more than 10 years (25% n=32) and lastly those who had worked for less than 5 years (23% n=28). The results, therefore, indicate that majority of the respondents had proper experience in the building sector as they had worked for more than 5 years.

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Table 4. 3 Number of Years in Construction Industry of the Respondents

Experience	Frequency	Percentage
1 to 5 years	29	23
6 to 10 years	67	52
More than 10 years	32	25
Total	**128**	**100**

Source: Author's field Survey, 2019

4.3.4 Number of Private High-Rise Building Projects Involved In

The respondents were asked to indicate the number of private high-rise building projects they have been involved in. Results in table 4.4 reveal that 49% (n=63) of the respondents had worked in 6 to 10 private high-rise building projects. 39% (n=50) of the respondents noted that they had worked in 1 to 5 private high-rise building projects while only 12% (n=15) of the respondents had worked in more than 10 private high-rise building projects. The results indicate that majority of the respondents had been involved in a number of high-rise building projects as they had completed more than 5 high rise building projects, therefore, the personnel is highly professional with a commendable track record.

Table 4. 4 Number of Private High-Rise Building Projects Involved In from 2014 to 2018

High rise buildings	Frequency	Percentage
1 to 5	50	39
6 to 10	63	49
More than 10	15	12
Total	**128**	**100**

Source: Author's field Survey, 2019

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4.3.5 Type of Private High-Rise Buildings Engaged In

The respondents were asked to indicate the type of private high-rise buildings engaged in. Results in table 4.5 reveal that 32% (n=41) of the respondents had been engaged in 'mixed-use' private high-rise buildings. 24% (n=31) of the respondents indicated that they had worked in residential Highrise buildings followed by 19% (n=24) who worked in institutional high-rise buildings and lastly 15% (n=19) of the respondents noted that they had worked in other types of private high-rise buildings. The study results can then be relied upon as the respondents had proper experience in the major types of private Highrise buildings in Rwanda.

Table 4. 5 Type of Private High-Rise Buildings Engaged In

Type	Frequency	Percentage
Mixed use (Offices, Shops, etc.)	17	42.5
Institution (School, college)	4	10
Hotels	12	30
Residential (Apartments)	6	15
Others	1	2.5
Total	**40**	**100**

Source: Author's field Survey, 2019.

4.4 Diagnostic Tests

As mentioned in Chapter Three, the data was tested for conformity to the assumptions of the classical linear regress Aeron model by performing a reliability test, multicollinearity test and a normality test in both SPSS version 22.

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4.4.1 Reliability Analysis

Reliability of this instrument was evaluated through Cronbach Alpha which measures the internal consistency. Cronbach Alpha value is widely used to verify the reliability of the construct. The study findings in Table 4.6 on the pilot test showed that 'Client related causes' had a Cronbach's reliability alpha of 0.855, 'Contractor related causes' had an Alpha value of 0.792, 'Consultant related causes' had an Alpha value of 0.815, 'External environment related causes' had a reliability value of 0.826 and 'Time performance of construction projects had a reliability value of 0.814. The pilot test showed that the scales measuring the objectives had a very high reliability and therefore no amendment on the objectives was necessary. This implied that the research instruments were adequate, objective and had reasonable internal consistency to give very reliable results. Zinbarg (2005) states that an alpha coefficient of 0.80 or higher indicates that the gathered data are reliable as they have a relatively high internal consistency and can be generalized to reflect opinions of all respondents in the target population about the study problem. The study, therefore, retained the factors in accordance to (Tabachnick & Fidell, 2007) who recommends that using factor loading of 0.7 and above is excellent in determining the factors to be retained.

Table 4. 6 Cronbach's Alpha Test Results

	Cronbach's Alpha	No. of Items
Client related causes	.855	20
Contractor related causes	.792	20
Consultant related causes	.815	20
External environment related causes	.826	20
Time performance of construction projects	.814	20

Source: Author's field Survey, 2019

4.4.2 Pre-Requisite Tests

The study performed tests on statistical assumptions that is test of regression assumption and statistic used. This included test of sampling adequacy, normality, linearity, independence, and homogeneity and multi-co linearity. When the assumptions of the linear regression model are correct, ordinary least squares (OLS) provides efficient and unbiased estimates of the parameters (Kaiser, 1974).

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4.4.3 Sampling Adequacy Tests

According to Cerny and Kaiser (1977), Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited your data is for factor analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. Sampling adequacy test was done to test the relevance and suitability of the factors. Kaiser-Meyer-Olkin Measure (KMO) of sampling adequacy and Bartlett's Test of Sphericity tests were conducted to establish data's sampling adequacy. KMO measure varies between 0 and 1, and values closer to 1 are better with a threshold of 0.5. Williams, Brown and Onsman (2012) stated that KMO of 0.50 is acceptable degree for sampling adequacy. Bartlett's Test of Sphericity tests the null hypothesis that the correlation matrix is an identity matrix; that is, it analyses if the samples are from populations with equal variances. Bartlett's test significance of 0.05 or less indicates an acceptable degree of sampling adequacy. If sample is adequate and factorable then additional analysis beyond descriptive can be done. Table 4.7 presents the results of the sampling adequacy test. The KMO measures of sampling adequacy produced a value of 0.847 while Bartlett's test of sphericity had a consistent significance of $p < .001$ which depicted and confirmed sampling adequacy indicating that the selected sample for the study is appropriate and would yield reasonable results.

Table 4. 7 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.847
Bartlett's Test of Sphericity	Approx. Chi-Square	4520.950
	df	92
	Sig.	.000

Source: Author's field Survey, 2019

4.4.4 Normality Test

Normality tests are done to determine whether the sample data has been drawn from a normally distributed population. Normality assessment can be done by using a graphical or numerical procedure. The numerical procedures include inferential statistics such as Kolmogorov-Smirnov and Shapiro-Wilk. According to Razali and Wah (2011), Shapiro-Wilk test assesses whether data

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is normally distributed against hypothesis whereby if statistic ranges from 0 to 1 and figures higher than 0.05 indicate the data is normally distributed. He further observed that Kolmogorov-Smirnov test is considered appropriate for samples larger than 2000 while Shapiro-Wilk test is deemed appropriate for samples ranging from 50 to 2000. In this study, the usable response rate was 128 and hence Shapiro-Wilk test was used. The normality was tested using the Shapiro-Wilk test, which also has power to detect departure from normality due to either skewness or kurtosis or both. The findings in table 4.8 indicate that since the significance value is less than the alpha value (0.05 testing at 5% one tail test), then one concludes that all the results of the Shapiro-Wilk testare normally distributed (Sig 0.000 <0.05).

Table 4. 8 Shapiro-Wilk Test Results

	Statistic	**Df**	**Sig.**
Client related causes of delay	.969	127	.000
Contractor related causes of delay	.744	127	.009
Consultant related causes of delay	.615	127	.011
External environment related causes of delay	.848	127	.001
Time performance of construction projects	.978	127	.000

*Source: Author's field Survey, 2019***.**

4.5 Construction Projects Performance

4.5.1 Likeliness for the Project to Be Completed Within the Contract Period

The researcher sought to determine the likeliness of a high-rise building project to be completed within the contract period. The results in figure 4.2 show that majority of the respondents 40% (n=51) indicated that it is not likely for a project to be completed within the contract period followed by respondents 31% (n=40) who indicated that it is less likely. 23% (n=29) of the respondents thought that it is likely while the rest of the respondents 6% (n=8) agreed that it is very likely. These findings show that most of the high rises building projects are not likely to be completed within the contract period.

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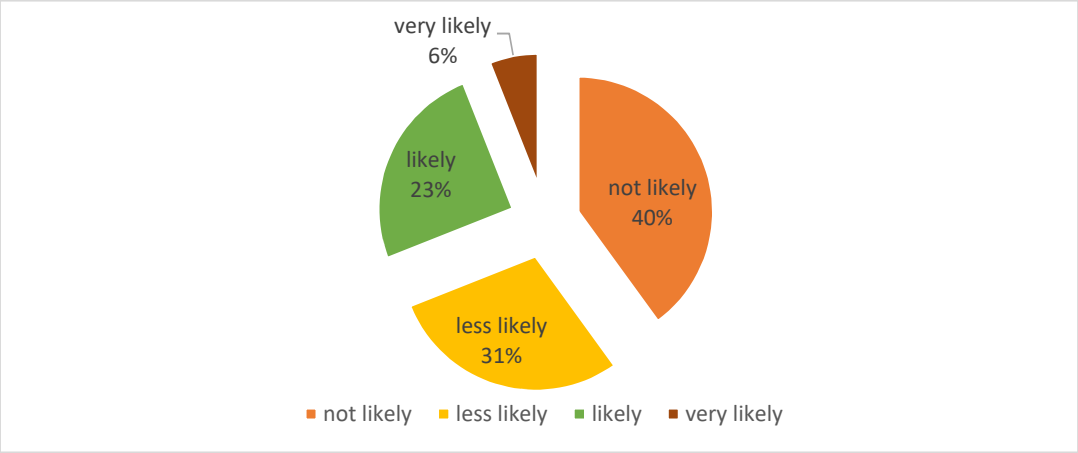
Figure 4. 2: Likeliness of Highrise Building Project to be Completed within the Contract Period



Source: Author's field Survey, 2019

4.5.2 Likeliness of a Highrise Building Project to be Completed Within the Contract Cost

The searcher sought to establish the likelihood of a Highrise building project to be completed within the contract cost. The results in figure 4.3 show that majority of the respondents 39% (n=50) indicated that it is not likely for a project to be completed within the contract cost followed by respondents 37% (n=47) who indicated that it is less likely. 15% (n=19) of the respondents thought that it is likely while the rest of the respondents 9% (n=12) agreed that it is very likely for a high-rise building project to be completed within the contract cost. These findings show that most of the high rises building projects are not likely to be completed within the contract cost.

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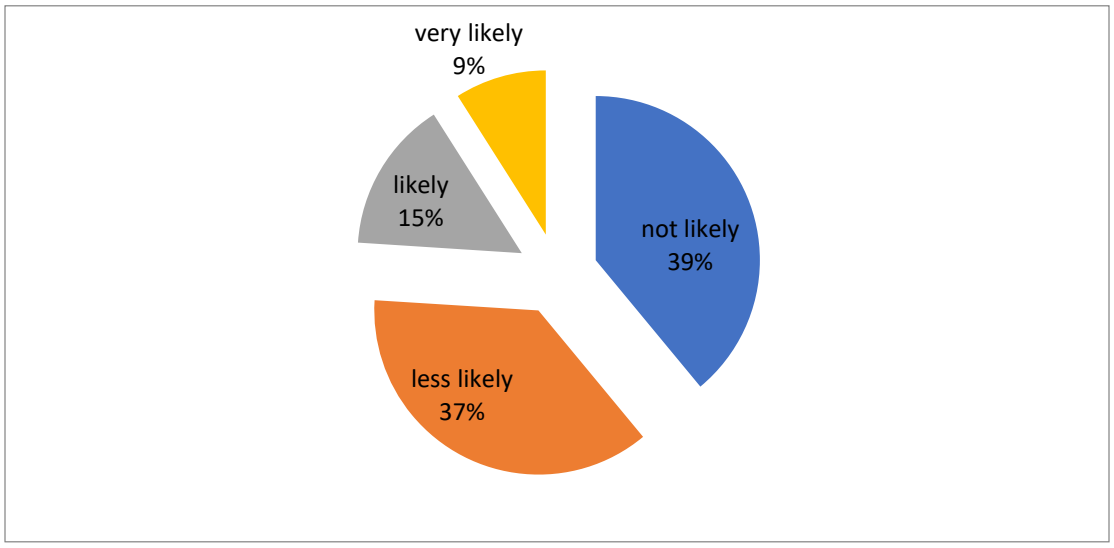
Figure 4. 3: Likeliness of a High Rise Project to Be Completed Within the Contract Cost



Source: Author's field Survey, 2019

4.5.3: Factors Mostly Affecting the Performance of Construction Projects

The findings shown in figure 4.4 indicate that majority of the respondents 59% (n=76) mentioned time overruns as the factor that mostly affects the performance of construction projects followed by 30% (n=38) of the respondents who indicated that cost overrun is the leading factor. The rest of the respondents 11% (n=14) indicated that poor quality of work is the major factor affecting construction performance. The findings show that time overruns and cost overruns are the major factors affecting the performance of construction projects. The table 4.5 bellow shows that the gap between the time and cost performance is huge with time performance being the worst. This is to propose that that time performance in building projects is not being given more attention as cost performance.

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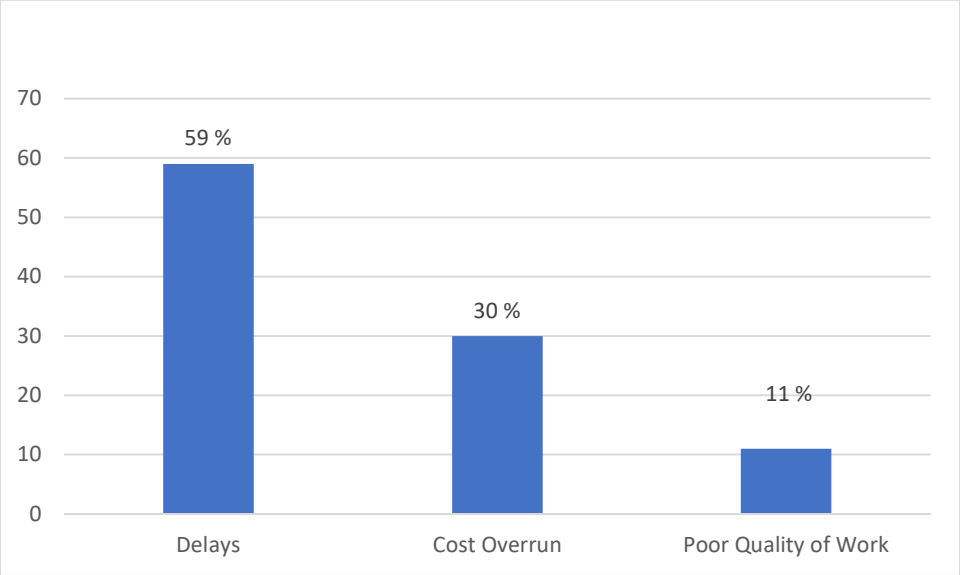
Figure 4. 4: Percentage of Success in Terms of Meeting Time and Cost Performance



Source: Author's field Survey, 2019

4.5.4 Percentage of Success in Terms of Meeting Project Time Goals

The respondents were asked to indicate the percentage of delay in high-rise building projects. The Results in figure 4.5 reveal that 33% (n=42) of the respondents indicated that the projects delayed between 30% to 59% of contract period followed by 30% (n=38) of respondents who said that the project delayed between 15% and 29% of contact period and 7% of respondent agreed that the project they involved in delayed above 60% of contract period. 2% (n=3) of the respondents indicated that the project delayed said the project completed on time while 1% (n=1) said that the project was ahead of schedule. The study results show that most of the projects don't meet stipulated project time goals and that it is very rare for a project to be finished on time or ahead of schedule.

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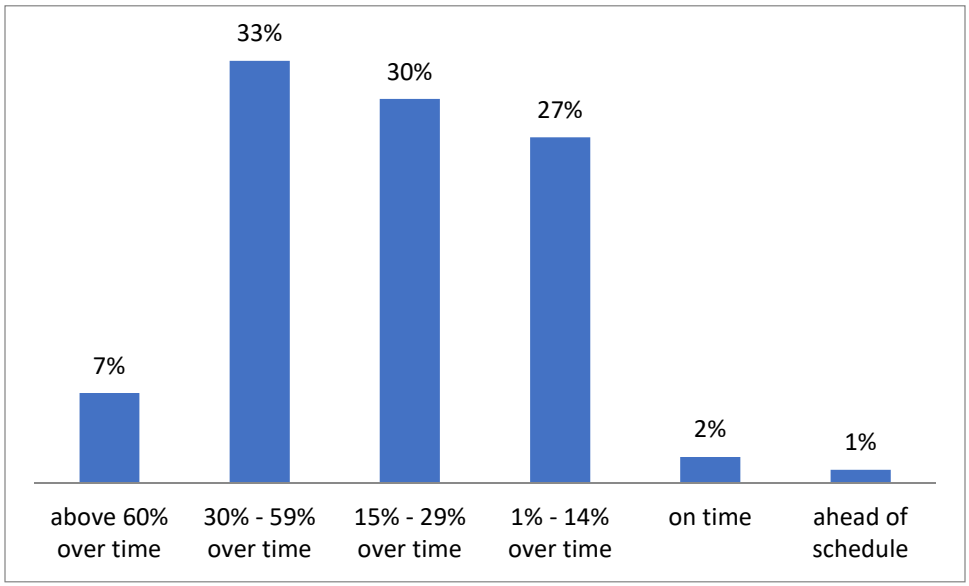
Figure 4. 5: Percentage of Success in Terms of Meeting Project Time Goals



Source: Author's field Survey, 2019

4.5.5 Percentage of Success in terms of Meeting Project Budget Goals

The respondents were asked to indicate the percentage of success the high-rise building project was at when it met project budget goals. Results in figure 4.5 reveal that 32% (n=41) of the respondents indicated that the project cost overrun was between 1% to 14% above the estimated budget followed by 30% (n=38) of respondents who said that the project budget run out between 15% to 29 % of the contract budget .On other side, 3% (n=4) of the respondents indicated that the project was completed on budget while 1% (n=1) said that the project was over the budget. The study results show that most of the projects don't meet stipulated project budget goals and that it is very rare for a project to be finished on the budget or over the budget.

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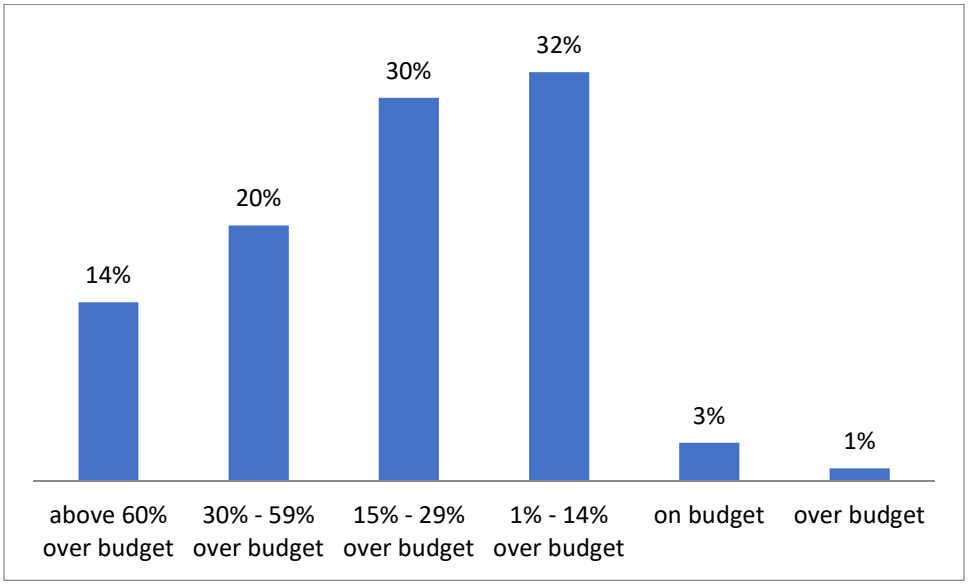
Figure 4. 6: Percentage of Success in Terms of Meeting Project Budget Goals



Source: Author's Field Survey, 2019

4.6 Causes of Delay in Highrise Building Projects

4.6.1 Frequency Distribution on Causes of Delay in Highrise Building Projects

The study sought to determine the delay factors affecting construction projects performance. The findings obtained in table 4.9 show that the majority of the respondents indicated variation and design change requirements during execution stage as the first major cause delay in highrise building projects with 25% (n=19) significant followed by 73% (n=93) very significant. The second significant factor causing delay was late payments during works progress as given by 34% (n=43) significant followed by 55% (n=71) very significant. The third major cause of delay in Highrise building projects was slowness in decision making as given by 35% (n=45) significant followed by 41% (n=52) very significant. The fourth major cause of delay in Highrise building projects was Delay in receiving clearances through customs of the imported materials as given by 44% (n=56) significant followed by 26% (n=33) very significant and the fifth major cause of delay in Highrise building projects was financial difficulties encountered by the contractor as given by 40% (n=52) significant followed by 27% (n=35) very significant. The least cause of delay in Highrise building projects was unfavorable weather conditions as given by 13% (n=17) significant followed by 19% (n=24) very significant and the other least causes of delay in Highrise building projects were : Suspension of work by client as given by 15% (n=19) significant followed by 18%

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(n=23) very significant, Late preparation of tests by contractor as given by 15% (n=20) significant followed by 18% (n=15) very significant, Delay in subcontractor's works contractor as given by 15% (n=20) significant followed by 19% (n=24) very significant

Table 4. 9 Frequency Distribution on Delay Factors Affecting Construction Projects Performance.

Statement Where **(1** = Not significant, **2** = Low Significant, **3** = Uncertain, **4** = Significant and **5** = Very Significant)		**1**	**2**	**3**	**4**	**5**	**Totals**
Late payments during works progress	**n**	5	7	2	43	71	**128**
	%	4	5	2	34	55	**100**
Unrealistic contact period imposed by the owner	**n**	20	26	9	41	32	**128**
	%	16	20	7	32	25	**100**
Late payment to subcontractors by main contractor.	**n**	37	35	11	27	19	**128**
	%	29	27	9	20	15	**100**
Delay in receiving clearances through customs of the imported materials.	**n**	11	18	10	56	33	**128**
	%	9	13	8	44	26	**100**
Slowness in decision making by owner	**n**	15	23	9	45	52	**128**
	%	12	18	7	35	41	**100**
Client's interference in contractual duties	**n**	17	24	8	42	37	**128**
	%	13	19	6	33	29	**100**
Delay in handing over the construction site to the contractor	**n**	18	27	10	36	37	**128**
	%	14	21	8	28	29	**100**

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Statement Where **(1** = Not significant, **2** = Low Significant, **3** = Uncertain, **4** = Significant and **5** = Very Significant)		**1**	**2**	**3**	**4**	**5**	**Totals**
Ambiguities, Mistakes, inconsistency and discrepancies drawings and specifications	**n**	20	28	7	40	33	**128**
	%	16	22	5	31	26	**100**
Suspension of work by client	**n**	27	49	10	19	23	**128**
	%	21	38	8	15	18	**100**
Inadequate experience of the consultant	**n**	17	46	11	22	32	**128**
	%	13	36	9	17	25	**100**
Delay in subcontractor's works	**n**	41	35	10	20	24	**128**
	%	32	27	8	16	17	**100**
Unclear delegation of responsibilities	**n**	22	31	10	32	33	**128**
	%	17	24	8	25	26	**100**
Provision incomplete information	**n**	26	36	11	27	31	**128**
	%	20	28	9	21	24	**100**
Late preparation of tests by contractor	**n**	22	47	11	33	15	**128**
	%	17	37	9	26	12	**100**
Late preparation of shop drawings	**n**	24	33	10	29	31	**128**
	%	19	26	8	23	24	**100**
Inadequate contractor's experience	**n**	22	29	6	38	32	**128**
	%	17	23	5	30	25	**100**
Rework due to mistakes and errors	**n**	19	28	10	35	36	**128**
	%	15	22	8	27	28	**100**
Poor construction site management and supervision	**n**	20	29	10	33	35	**128**
	%	16	23	8	26	27	**100**

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Statement Where **(1** = Not significant, **2** = Low Significant, **3** = Uncertain, **4** = Significant and **5** = Very Significant)		**1**	**2**	**3**	**4**	**5**	**Totals**
Inadequate technical study during the bidding	**n**	36	33	9	17	33	**128**
	%	28	26	7	13	26	**100**
Frequent change of subcontractors	**n**	32	32	9	19	36	**128**
	%	25	25	7	15	28	**100**
Variation and Design change requirements during project execution.	**n**	2	8	0	25	93	**128**
	%	2	6	0	19	73	**100**
Ineffective scheduling of the project	**n**	32	33	11	22	29	**128**
	%	25	26	9	17	23	**100**
Delay in site mobilization	**n**	27	49	10	19	23	**128**
	%	21	38	8	15	18	**100**
Improper construction method / techniques	**n**	35	32	8	28	26	**128**
	%	27	25	6	22	20	**100**
Financial Difficulties encountered by the contractor	**n**	15	20	6	52	35	**128**
	%	12	16	5	40	27	**100**
Poor communication with project parties	**n**	40	33	10	22	23	**128**
	%	31	26	8	17	18	**100**
Late procurement of materials by the contractor	**n**	37	35	12	26	19	**128**
	%	29	27	9	20	15	**100**
Use of low productive equipment	**n**	20	26	9	41	32	**128**
	%	16	20	7	32	25	**100**
Unfavourable Weather conditions	**n**	42	37	8	17	24	**128**
	%	33	29	6	13	19	**100**
Unexpected government regulations	**n**	31	27	10	36	24	**128**
	%	24	21	8	28	19	**100**

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Statement Where **(1** = Not significant, **2** = Low Significant, **3** = Uncertain, **4** = Significant and **5** = Very Significant)		**1**	**2**	**3**	**4**	**5**	**Totals**
Construction materials cannot be procured on the local market and have to be imported.	**n**	19	20	10	35	45	**128**
	%	15	16	8	27	35	**100**

Source: Author's field Survey, 2019.

4.7 Causes of Cost Overrun in Highrise Building Projects

4.7.1 Frequency Distribution on Causes of Cost Overrun in Highrise Building Projects

The study findings in table 4.10 indicate that the fluctuation in the cost of building materials is the most significant cause of cost overrun in Highrise building as indicated by highest respondents rate of 27% (n=35) who said that it is significant followed by those who said it is a very significant factor 49% (n=63).The frequent change in specifications and design is the second leading cause of building cost overruns as indicated by the highest response of 39% (n=50) who said it is significant followed by respondents who said it is very significant 29% (n=37). The study findings also indicated that inaccurate estimation of Highrise building projects is the third significant cause of building cost overrun with a high response rate of 34% (n=43) for significant then 32 % (n=41) for very significant. High transport cost came to the fourth significant cause of building cost overrun with a high response rate of 29% (n=37) and 33% (n=42) the for significant and very significant respectively. the fifth significant cause of cost overrun in Highrise building project was poor contact management with 25% (n=33) of significant rate and 32 % (n=41) of very significant rate.

The least factor causing cost overruns were unexpected government regulations with 30% (n=38) for not significant rate then 43% (n=55) for low significant rate. The other lowest factor causing building cost overruns was political interference with 39%(n=50) for not significant then 26%(n=36) for significant.

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Table 4. 10 Frequency Distribution on Factors Causing Building Cost Overruns

Statement Where (1 = Not significant, 2 = Low Significant, 3 = Uncertain ,4= Significant and 5 = Very Significant)		**1**	**2**	**3**	**4**	**5**	**Totals**
Adjustment of prime cost and provisional sums	**n**	22	46	13	32	15	**128**
	%	17	36	10	25	12	**100**
Frequent change in specifications and designs	**n**	19	22	0	50	37	**128**
	%	15	17	8	39	29	**100**
Fluctuation in materials costs	**n**	9	15	6	35	63	**128**
	%	7	12	5	27	49	**100**
Inadequate review of drawings	**n**	24	38	26	22	18	**128**
	%	19	30	20	17	14	**100**
Omissions and errors in the bills of quantities	**n**	22	40	13	24	29	**128**
	%	17	31	10	19	23	**100**
Government's Unstable economic conditions	**n**	26	30	21	13	38	**128**
	%	20	23	16	10	30	**100**
Lack of local skilled labour	**n**	13	48	6	26	22	**128**
	%	10	38	5	20	17	**100**
Poor contract management	**n**	8	38	8	33	41	**128**
	%	6	30	6	25	32	**100**
The high transport cost	**n**	9	20	6	37	42	**128**
	%	7	16	5	29	33	**100**
Political interference	**n**	50	36	16	19	15	**128**
	%	39	28	6	15	12	**100**
Poor site financial control	**n**	24	27	8	30	39	**128**
	%	19	21	6	23	30	**100**
Inaccurate project estimation	**n**	9	24	11	43	41	**128**
	%	7	19	8	34	32	**100**

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Statement Where (1 = Not significant, 2 = Low Significant, 3 = Uncertain, 4 = Significant and 5 = Very Significant)		1	2	3	4	5	Totals
Lack of updated cost data on specifications	**n**	9	15	14	36	34	**128**
	%	7	12	6	44	31	**100**
Unexpected government regulations	**n**	38	55	6	20	8	**128**
	%	30	43	5	16	6	**100**

Source: Author's field Survey, 2019

4.8 Recommendation to Minimize delays and cost overruns

4. 8.1 Frequency Distribution on How to Minimize delays in Highrise Building Projects

In order to minimize delays in high-rise building projects, The respondents recommended that The client's selection of contractor and consultants should solely be based on experience, financial stability and expertise (25%), funding of the project by client should always be adequate and be determined at the planning stage (20%), The clients especially those who have not experience in construction project need to engage project managers especially in the implementation of the Highrise building projects (17.5%), Efficient and effective procurement method should be established within the construction projects(15%), The project manager should be concerned about how the project will be funded by clearly identifying interested available financiers and their terms and conditions (12.5%) and Clearing guidelines should be developed for client's evaluation regarding their commitment to project execution. the clients' source of finance needs to be disclosed to contactors before the implementation start (10%).

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Table 4.11 Recommendations of how to minimize delays

Recommendation	Frequency	Percentage (Respondents)
The client's selection of contractor and consultants should solely be based on experience, financial stability and expertise.	**32**	**25%**
The funding of the project by client should always be adequate and be determined at the planning stage	**26**	**20%**
The project manager should be concerned about how the project will be funded by clearly identifying interested available financiers and their terms and conditions	**16**	**12.5%**
Efficient and effective procurement method should be established within the construction projects	**19**	**15%**
Clear guidelines should be developed for client's evaluation regarding their commitment to project execution. the clients' source of finance needs to be disclosed to contactors before the implementation phase start.	**13**	**10%**
The clients especially those who have not experience in construction project need to engage project managers especially in the implementation of the Highrise building projects.	**22**	**17.5%**
Total	**128**	**100**

Source: Author's field Survey, 2019

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4.8.2 Frequency Distribution on How to Minimize Cost Overrun in Highrise Building Projects

In order to minimize cost overrun in high-rise building projects, The respondents recommended that the Rwanda Institute of Architects (RIA), Quantity Surveyors Chapter has to produce semi-annual journal containing cost data of construction materials in different locations of Rwanda (30%), The architects must select the most economical designs without compromising the quality as safety of the project 22.5%, a risk analysis which means the identification of the potential risks together with an assessment of their probability, their likely cost consequences and the time of which they may occur (20%), Effective cost control and estimates procedures should be taken into consideration (15%) and Construction managers have to provide sufficient contingency allowance to cover the increase in cost of construction materials originated from inflation (12.5%).

Table 4. 12 Recommendations on how to minimize Cost Overrun

Recommendation	Frequency	Percentage (respondents)
A risk analysis which means the identification of the potential risks together with an assessment of their probability, their likely cost consequences and the time of which they may occur.	**26**	**20%**
The architects must select the most economical designs without compromising the quality as safety of the project.	**29**	**22.5%**
The Rwanda Institute of Architects (RIA), Quantity Surveyors Chapter has to produce semi-annual journal containing cost data of construction materials in different locations of Rwanda.	**38**	**30%**
Effective cost control and estimates procedures should be taken into consideration.	**19**	**15%**
Construction managers have to provide sufficient contingency allowance to cover the increase in cost of construction materials originated from inflation.	**16**	**12.5%**

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Recommendation	Frequency	Percentage (respondents)
Total	**128**	**100**

Source: Author's field Survey, 2019

4.9 Regression Analysis

The regression model used in the study used the following regression model:

$Y = X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + €$

Where: X_1, X_2, X_3 and X_4 = Client related causes, Contractors related causes, Consultant related causes and External environment related causes

β_1, β_2, β_3 and β_4= are the coefficient of Client related causes, Contractors related causes, Consultant related causes and External environment related causes

€ = Standard Error

Y = Time Performance of Construction Projects

The study finding in table 4.11 indicate that the independent variable in the study explained a significant proportion of variance in Time Performance of Construction Projects in Rwanda, R^2= .769 which implies that 76.9% of the proportion in time performance of construction projects in Rwanda can be explained by the independent variables while other variables not covered by this study contributes to 23.1% of the variance as indicated in table 4.8.

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Table 4. 11 Model Summary for All the Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.877[a]	.769	. 752	1.743

Source: Autor's field Survey, 2019

a. Independent variables: (Constant), Client related causes, Contractors related causes, Consultant related causes and External environment related causes.

Table 4. 12 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.654	4	8.654	69.175	.000[b]
	Residual	4.978	9	.365		
	Total	13.632	13			

Source: Autor's field Survey, 2019

a. Dependent Variable: Time Performance of Construction Projects

b. Independent variables: (Constant), Client related causes, Contractors related causes, Consultant related causes and External environment related causes

The findings in table 4.13 indicate that the significance value in testing the reliability of the model for the relationship between independent variable and the dependent variable was $F(1, 13) = 69.175$, $p = 0.00$; therefore, the model is statistically significant in predicting the relationship between the independent and the dependent variables.

Table 4. 13 Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.852	.990	.236	1.256	.000
Client related causes	.302	.198	.252	1.443	.000
Contractor related causes	.289	.569	.147	1.546	.000
Consultant related causes	.296	.479	.175	1.387	.001
External environment causes	.167	.236	.054	1.234	.002

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Based on the linear regression model, $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u$, the model therefore becomes; $Y = 0.852 + 0.302\ X_1 + 0.289 X_2 + 0.296 X_3 + 0.167 X_4 + 0.990$

Testing at 5% significant level, the regression analysis in table 4.14 is significant since all the p-values are less than 0.025 (Sig. $p<0.025$) at 2 tail test. The findings also indicate that every 30.2% change in client related causes, 29.6% change in consultant related causes, 28.9% change in contractors related causes and 16.7% change in external environment together will cause a unit change in time performance of construction projects. These formulae can now be used to predict the time performance of construction projects in Rwanda.

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CHAPTER 5: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENATION

5.1 Introduction

This chapter represents a summary and discussion of major findings as well as conclusion and recommendation of the study. The areas of further studies are also suggested herein. The findings are summarized according to the objectives of the study.

The chapter showed data analysis and interpretation of the results. The rate of respondents for the study was 80% with equal number of answers from four professionals who participated on every selected high-rise building project. Those professionals were: architect (27%), Quantity Surveyors (26%), engineers (24%) and project managers (23%).

Generally, 49% of respondents have been involved in 6 to 10 high rise building projects, 39% for respondents have been involved in 1 to 5 high rise building projects and 12% of respondents worked in more than 10 high rise building projects. Most respondents admitted that the most type of high rise building they worked in was Mixed-Use buildings at the rate of 30%, followed by residential high-rise buildings with 22% of total respondents.

5.1.1 Summary of the five most Significant Factors Causing Delays.

It is very important that clients, project managers and others professionals in construction industry be aware of the factor that mostly contribute to delays and cost overrun in Highrise building projects so that the know where to allocate more endeavors in order to achieve excellent projects performance as far as time and cost are concerned. In fact, there were 39 identified variables under 4 variable categories. The discussions refer to the observed frequency of variables and percentage of rating scale.

5.1.1.1 Variation and Design Change Requirements during Project Execution.

Respondents of this study, revealed that design changes during erection by clients the primary r causes of time overruns in construction of Highrise building projects since project program scope and schedule are estimated based on the designs that are available at that particular time. Such change in the design has a negative impact on the project duration since consultants have to re-work on the designs in the course of implementing the works.

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According to the findings, variation and design change was indicated as the most significant factor causing delays with rate 72% of total respondents and it was revealed that most design changes are caused by clients and architects' instructions. In Highrise building projects especially, the architects frequently making change in their designs during execution stage due to the high demands of technology that was not captured in design stage and there is issue of client interference in project as well as continuous changes in specifications.

5.1.1.2 Late Payments to Contractor

The late payment during work progress was identified as the second most significant factor causing delay in Highrise building projects. The respondents agreed that this variable is among the major cause of delay with significant and very significant rate of 29% and 38% respectively on rate scale. This factor highly affects the project performance as it very difficult for contractor to keep the project work progress without being timely payed by client. Delay in payment attracts contractor's cash flow problems which results in inadequate funds to support construction expense since construction project consume huge amount of money. This in aligned with Oglesby *et al*. (1989) who revealed that client's failure to provide sufficient funding resources to contractors for the completed work is a burden for the contractor to meet project timeline and other objectives.

The cause of late payment to the contractor erecting Highrise building project according to the respondents is also linked to client architect who delays in certifying contractors' payment certificates before forwarding them to clients for payments. This is attracted by lack of coordination between contractual parties and eventually these delayed payments may force the contractor to suspend works while waiting for payment.

5.1.1.3 Slowness in Decision Making

The findings revealed that delays by clients and or his/her consultants to make timely decisions to do with building project implementation results in loss of time which ultimately make it practically impossible for contractors to finish the execution of the works within the required project duration and it ends up with the contractors Requesting Extension of time to cover up for the lost time.

The finding indicated that delay in slowness in decision making is the fifth significant factors causing delay in Highrise building projects with rate of 51% (n=65) of total respondents. Variable include, late nomination of subcontractors. The large construction projects require the involvement

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of different sub-contractors unlike the small projects, the late nomination of some of these sub-contractors was found to be the significant factors causing late completion of construction projects. late approval shop drawings and materials test was also among the sub-variables. All shop drawings and details are prepared by the main contractor or subcontractors and they have to be approved by the architects or client agent. There is testing of materials before they are utilized is very common in construction of Highrise construction projects, materials need to be verified through laboratory test in order to make sure that they meet required standard and specifications. The architect decides on whether to use the materials or not depending on the results from laboratory test and samples. For instance, according to respondents, the majority of finishing designs were not yet concluded during construction stage and as consequences, it entirely delayed the procurement process and it inevitably had impact on the regular progress of work. However, slowness in decision making delays the projects because of the waiting time between submission of sample, request for information (RFIs), request for approval (RFAs) and approval from client or client's representative.

5.1.1.4 Delay in Receiving Clearances Through Customs for the Imported Materials

Construction materials are very important in the implementation of construction projects. Some construction materials are manufactured locally such as cement, tiles, steel, bricks etc. even if there are claims that local materials are expensive and insufficient quantities to meet the market demand while others are imported. Most construction materials used in Highrise buildings in Rwanda are imported materials for instance, Rwanda is still importing cements as the largest cement manufacturer in the country cannot meet the market demands. Among other imported construction materials are: materials for electrical and mechanical services, plumbing and sanitary fitting, tiles. All these materials are delaying to reach the construction sites due to late inspection at different Ports and customs. Delay in receiving clearances through customs for the imported materials come to fourth place with a rate of 52% (n=67) among significant factors causing delays in building project in Rwanda due to clearance from customs and difficulties in ascertaining the time intervals between the placements of order (import placement) and delivery of materials on constructions sites.

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5.1.1.5 Financial Difficulties encountered by contractor.

The financial incapability of the contractor seriously affects the project performance. The issues of insufficient working capital and contractor's financial predicaments were identified the fifth important factor causing delay in the construction of Highrise building projects with total respondents agreed that 28% (n=36) significant followed by 24% (n=31) very significant. This may be caused by to the fact that contractor handling to many construction projects and fail to appropriately allocate the required resource to a specific project, insufficient cash flow to sustain all expenses of the construction activities. This financial difficulty is said to by respondents to be the source of disputes between the main contractors, subcontractors and materials suppliers. It sometimes leads to the abandonment of the projects or termination of contact according to the agreement that binds the two parties.

5.1.2 Five most Significant Factors Causing Cost Overrun

By combining those who agreed with significant and very significant, the fluctuation in the cost of construction materials was ranked number first (**1st**) significant factor causing cost overrun in Highrise building project in Rwanda as it was indicated by 76% of total respondents. Fluctuation is related to the increase or decrease costs of materials and labor arising after the contractor's tender is submitted. In private Highrise building project, inflation risks are always the problem and is often bought up in post tender negotiation. This fluctuation was attributed by unstable exchange rate inflationary trend in Rwanda which in turn bring negative effect to the construction materials. The second (**2nd**) significant factor causing cost overruns in Highrise building projects is the Frequent change in specifications and designs as it was indicated by 68% of total respondents. This is attributed to the fact that client and consultants are constantly changing their mind against the specification in design drawings. The third (**3rd**) significant factor causing cost overrun is inaccurate cost estimation according to 66% of total respondents. This was due to the lack of updated cost data incomplete information provided on design drawings. The fourth (**4th**) significant factor causing cost overruns was high transport cost of construction materials according to 62 % of total respondents while the fifth (**5th**) is poor contact management according to 57% of the total respondents.

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5.2 CONCLUSION

The erection Highrise buildings are having serious problems as far as time and cost performance is concerned. the issue projects completing beyond the contract period and budget overrun are the most predicament the construction of high-rise building is facing. In this study, it was found that there are five most significant factors causing schedule overrun.

From the study, the findings show that delay and cost overruns are the major factors affecting the performance of construction projects. Most of the high-rise building projects delayed between 30% to 59% of contract period followed by 30% (n=38) of respondents who said that the project delayed between 15% and 29% of contact period. This indicates that it is very rare for Highrise building to be finished on time.

It was found that the major significant factors causing of delay in Highrise buildings are related to both client and consultant who is the architect and they are also considered as the key participants of the construction projects. this is due to the fact that that these are the ones who are responsible for project planning, design and funding. Late payment to the contractor, change in variation and design requirements, slowness in decision making, delay in receiving clearances Through Customs for the imported materials**,** and Financial difficulties encountered by contractor were ranked as top five significant factors causing delay in Highrise building projects. So, the first objective of this study is achieved as the significant factors causing delays were identified. Then, the five most significant factors causing cost overrun in in the construction of Highrise building projects are fluctuation in the cost of construction materials, the Frequent change in specifications and designs, inaccurate cost estimation, transport cost of construction materials and poor contact management.

In order to minimize the delays, the respondents recommended the The client's selection of contractor and consultants should solely be based on experience, financial stability and expertise, The funding of the project by client should always be adequate and be determined at the planning stage while in order to cost overrun, the respondent recommended that The Rwanda Institute of Architects (RIA), Quantity Surveyors Chapter has to produce semi-annual journal containing cost data of construction materials in different locations of Rwanda and the architects must select the most economical designs without compromising the quality as safety of the project.

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5.3 RECOMMENDATION

The issues of cost overrun and delays are seriously affecting the building projects especially Highrise building projects in Rwanda. It is important for all key participants (clients, consultants and contractors) and should work side by side in order to achieve successful project within the stipulated budget and time. The stakeholders should pay more attention on schedule and budget since these are critical factors the mostly affect building projects.

5.3.1 Recommendations on how to Minimize Delay in Highrise Building Project

In order to minimize delays in Highrise building projects, more endeavor must be used towards the key participants in project execution. This is due to the fact that all five major causes of delays specifically Late payment to the contractor, change in variation and design requirements, slowness in decision making, delay in receiving clearances Through Customs for the imported materials**,** and Financial difficulties encountered by contractor all are categorized in the execution stage of the project. In order to minimize delays in Highrise building projects to engage key participants with advanced skills and experience and capability to deliver construction projects on time. The recommendations highlighted by author and respondents of this study to minimize delays are as follow:

1. Clear guidelines should be developed for client's evaluation regarding their commitment to project execution. the clients' source of finance needs to be disclosed to contactors before the implementation phase start. The history of client nonpayment to contractors can have to be easily identified at the execution stage. Clause 2.4 [Employer's financial Arrangement] of Fidic Conditions of Contracts which states that employer shall submit within 28 days after receiving any request from the contractor a reasonable evidence that that financial arrangements have been made and are being maintained which will enable the employer to pay the contractor. In most case, this clause is deleted by the employer in the contract. however, this have to be addressed before contract is signed.
2. The clients especially those who have not experience in construction project need to engage project managers especially in the implementation of the Highrise building projects since they are professionals who engaged in the overall planning of the project, team coordination , risks monitoring and control the project from the beginning to completion in order to ensure that the projects are efficiently and effectively completed.

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3. The clear rules and regulations on evaluating contractors' bids are needed and they should be used by clients and his agents in awarding contracts. These rules must include but not limited to health and safety policy, financial stability, managerial capability, quality assurance and quality control, work force, equipment and material procurement capability. The culture of selecting the lowest bidder has to come with the accuracy of the priced tender and time estimation.

4. There is a need for use of up to date technology such as 3D CAD and Building Information Modelling (BIM) because the use this modern technology will minimize design errors, omission and inaccuracy in cost estimation. BIM software is integrated with cost data which is extracted and updated automatically. The upgraded visualization trough 4D prototyping may assist professionals to better understand the sequence of construction activities and reduce. It helps in development of schedule on timely basis.

5.3.2 Recommendation on how to Minimize Cost Overrun in Highrise Building Projects

1. Inflation is a very serious issues in Rwanda construction industry, effective cost control and estimates procedures should take this into consideration. For instance, the increase in construction cost between the date of the estimate and the date construction activity is carried out.
2. Construction managers have to provide sufficient contingency allowance to cover the increase in cost of construction materials originated from inflation.

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5.4 AREA OF FURTHER STUDIES

The findings of this study were limited to its case study of factors affecting time and cost performance Highrise building in Kigali and d the study focused on Completed private funded Highrise building projects. However, Therefore, there is a need for further study such as:

1. The future studies that need to be undertaken are studies on various public and civil construction project in Kigali and other areas of Rwanda in order to find countrywide strategies to minimize delays and cost overrun in the Rwanda construction industry.
2. There is a need to investigate the sources of finance and their impact on the construction of Highrise building projects in Rwanda.

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BIBLIOGRAPHY

Abbott, D. (1987). *Encyclopedia of Real Estate Terms* (p.413 ed.). Hants: Gower Technical Press Ltd.

Abdelnaser, O., Peter, J., Mahmood, A., & Hussin, A. A. (2005). *Causes of construction delays: case studies in Langkagwi Island, Malaysia. Kuala Lumpar, University of Malaya.*

Abdullah, M., Abdul, A., & Abdul, R. (2009). Causes of delay and its effects in large MARA construction projects. *International journal of Integrated Engineering, 1*(2).

Abdul-Rahman, H. .., Berawi, M. .., Berawi, A. .., Mohamed, O. .., Othman, M. .., & Yahya, I. .. (2006). Delay mitigation in the Malaysian construction industry. *Journal of Construction Engineering and Management, 132* (2), 125 – 133.

Abedi, M., Fathi, M., & Mohammad, M. (2012). *Major Mitigation Measures for Delays in Construction Projects. s.l.,Universiti Teknologi Malaysia (UTM).*

Abubakar, S. A. (2015). Schedule Overruns of constrution projects between government and Donor funded project in MMDAS in Ghana: a case study of Bekwai Municipal Assembly.

Abudul-Rahman, H., Berawi, A., Mohamed, O., Othman, M., & Yahya, I. (2006). Delay mitigation in the Malaysian construction industry. *Journal of Construction Engineering and Management, 132*(2), pp.125 -133.

Ahmed, O., Rahim, A., & Hanif, A. (2006). *Some essentials of good scientific research.* Universiti Putra Malaysia Press.

Ahmed, S., Azher, S., Castillo, M., & Kappagantula, P. (2002). Construction delays in Florida; an empirical study, Florida.

Aibinu, A. A., & Odeyinka, H. A. (2006). Construction delays and their causative factors in Nigeria. *Journal of Construction Engineering and Management*, pp. 667–677.

Aibinu, A. A., & Odeyinka, H. A. (2006). Construction delays and their causative factors in Nigeria. *Journal of Construction Engineering and Management*, 667–677.

Aibinu, A., & Jagboro, G. (2002). The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management, Volume 20*, pp. 593-599.

Al- Gahtani, K., & Mohan, S. (2007). Total float management for delay analysis. *Journal of Cost Engineering, 49* (2), pp. 32-37.

Alaghbari, M., Razali, A., Khadir, Azizah, Salim, & Ernawati. (2007). The significant factors causing delay of building construction projects in Malaysia. *Journal of Engineering, Construction and Architectural Management, Vol.14, No.2*.

Al-Ghafly, M. (1995). Delays in the construction of public utility projects in Saudi Arabia, Masters Thesis, CEM Dept.

Al-Hammad, A.-M. (1995). Interface Problems between Owners and Maintenance Contractors in Saudi Arabia. *Journal of Performance of Constructed Facilities, 9*(3), 194-205.

`

Alkass, S., Mazerolle, M., & Harris, F. (1996). Construction Delay Analysis Technique. *Construction Management and Economics Routladge, 14*(5), 375–394.

Alreck, L., & Settle, B. (1985). *The Survey Research Handbook Homewood.* Illinois: IRWIN INC.

Alwi, A. (2003). Factors influencing construction productivity in the Indonesian context. *Proceeding of the Eastern Asia Society for Transportation studies, vol. 4*, pp. 1557-1570.

Andersen, A., & Wrieden, W. (2004). Validity and Reliability of a short questionnaire for assessing the impact of cooking skills interventions. *Journal of Human Nutrition and Dietetics, Centre for Public Health Nutrition Research,University of Dundee, Dundee, UK*.

Anumba, C., Baugh, C., & Khalfan, M. (2002). Organisational structures to support concurrent engineering in construction. *Industrial Management Data System, 102*(5), 260–270.

Arain, F. M., & Low, S. P. (2005). The potential effects of variation orders on insititutional building project. 496-510.

Ardit, D., Akan, G., & Gurdamar, S. (1985). Reasons for Delays in Public Projects in Turkey. *Construction Management and Economics, 3*(2), 171-181.

Arditi, D., Akan, G., & Gurdamar, S. (1985). Reasons for delays in public projects in Turkey. *Construction Management and Economics, 3*, 171-181.

Armstrong, M. (2001). *A Handbook of Human Resource Management Practice,* (8th ed.). Kogan Page, London.

Assaf, S. A., Al-Khalil, M., & Al-Hazmi, M. (1995). Causes of delays in large building construction projects. *Journal of Management in Engineering, 11*, 45–50.

Assaf, S. A., Bubshait, A. A., Atiyah, S., & Al-Shahri, M. (2001). The Management of construction company overhead costs. *International Journal of project Management, Vol. 19*, PP. 295-303.

Augusto, M., Lisboa, J., Yasin, M., & Figueira, J. R. (2006). Benchmarking in a multiple criteria performance context: An application and a conceptual framework. *European Journal of Operational Research, Vol. 184,*, PP. 244 -254.

Avots, I. (1983). Cost-Relevance Analysis for Overrun Control. *International Journal of Project Management, 1* (3), 142-148.

Awakul, P., & Ogunlana, S. (2002). The effect of attitudinal differences on interface conflicts in large scale construction projects: a case study. *Construction Management and Economics, 20*, pp.365–377.

Babbie, E. (1998). *The Practice of Social Research (8th ed).* Belmont,CA: Wadsworth Publishing.

Baguley, P. (1994). *Effective Communication for Modern Businesses.* London: McGraw-Hill.

Bajpai, N. (2011). *Business Research Methods.* India: Pearson Education. pp. 194-195.

Beatham, S., Anumba, C., & Thorpe, T. (2004). KPIs: a critical appraisal of their use in construction. *Benchmarking: An International Journal, 11*(1), 93-117.

`

Bing, L., Tiong, R. L., Wong, W. F., & Chow, D. (1999). Risk management of international construction joint ventures. *J. Constr. Engrg., and Mgmt* , pp. 277-284.

Bromilow, F. J. (1971). Contracts as Waste Generators. *Building Forum*, pp.5-11.

Bromilow, F. J. (1974). Measurement and Scheduling of Construction Time Performance in the Construction Industry. *Official Journal of the Australian Institute of Building*, pp.57-65.

Bufaied, A. S. (1987). *Risks in the Construction Industry: their Causes and their Effects at the Project Level.* University of Manchester: UK.

Camp, R. (1989). *Benchmarking, ASQC Quality press.*

Carey, A. (2001). Effective risk management in financial institutions. *Communication Management, Vol. 1*(1), pp.67-79.

Carmines, E. G., & Zeller, A. R. (1979). *Reliability and validity Assessment.* Beverly Hills,CA: Sage.

Chan, A. P., & Chan, A. P. (2004). Key Performance Indicators for Measuring Construction Success. *Benchmarking: An International Journal, 11*(2), 203-221.

Chan, D. W., & Kumaraswamy, M. M. (1995). A Study of Factors Affecting Construction Durations in Hong Kong. *Construction Management and Economics, 13*, pp.319-333.

Chan, D. W., & Kumaraswamy, M. M. (1997). A comparative study of causes of time overruns in Hong Kong construction projects. *International Journal of Project Management, 15*(1), pp 55 – 63.

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

Chan, E., & Tse, R. (2003). Cultural Considerations in International Construction contracts. *Journal of Construction Engineering and Management, 129*(4), pp.375–381.

Chan, E., & Tse, R. (2003). Cultural Considerations in International Construction Contracts. *Journal of Construction Engineering and Management, 129*, pp.375–381.

Chan, P., Scott, D., & Chan, P. L. (2004). Factors Affecting the Success of a Construction Project. *Journal of Construction Engineering and Management, 130* (1), 153-155.

Chan, S., & Park, M. (2005). Project coast estimation using principal component regression. *Construction Management and Economics, 23*, 295-304.

Cheng, E., Li, H., Love, P., & Irani, Z. (2001). Network communication in the construction industry. Corporate Communications. *An International Journal*.

Cheung, S. O., Suen, H. C., & Cheung, K. K. (2004). PPMS: a Web-based construction Project Performance Monitoring System, Automation in Construction. *Vol.13*, PP. 361-376.

Chia, F. C., Skitmore, M., Runeson, G., & Bridge, A. (2011). *Property investment, construction and economic growth.* Johor Bahru, Malaysia.

`

Choge, K. J., & & Muturi, W. M. (2014). Factors affecting adherence to cost estimates:A survey of construction projects of Kenya National Highways Authority. *International Journal of Social Sciences and Entrepreneurship, 1*, 689-705.

Cleland, D. I., & Gareis, R. (2006). *Global Project Management Handbook: Planning, Organizing, and Controlling International Projects* (2nd Edition ed.). New York: McGraw-Hill.

Cohen, S. G., & Bailey, D. E. (1997). "What Makes Teams Work: Group Effectiveness Research from the Shop Floor to the Executive Suite.". *Journal of Management, Vol. 23*(3), Pp.239-290.

Collis, J., & Hussey, R. (2014). *"Identifying your Paradigm". PALGRAVE MACMILLAN Business Research: A Practical Guide for Undergraduate and Postgraduate Students* (4th ed.). London: PALGRAVE MACMILLAN. p. 42-57.

Cooper, D. R., & Schindler, P. (2003). *Business Research Methods* (8th ed.). New York: McGraw-Hill.

Cooper, D. R., & Schindler, P. S. (2011). *Business Research Methods* (10th ed.). New York: McGraw-Hill.

Cooper, D., Grey, S., Raymond, G., & Walker, P. (2005). *Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements.* Chichester: John Wiley & Sons, Ltd.

Cornick, T., & Mather, J. (1999). *Construction Project Teams: Making Them Work Profitable.* Thomas Telford, London.

Creswell, J. (2009). *Research design : qualitative, quantitative and mixed method approaches* (3rd ed.). Thousand Oaks: Sage Publications.

Cytonn Real Estate. (2018). Kigali Real Estate Investment Opportunity.

Dainty, A., Ison, S., & Root, D. (2004). *'Bridging the skills gap: a regionally driven strategy for resolving the construction labour market crisis'. Engineering, Construction and Architectural Management.*

Darnall, R., & Preston, J. (2010). *Project Management from Simple to Complex.* Flat World Knowledge, Inc.

Demkin, J. A. (2008). *The architect's handbook of professional practice. John Wiley and Sons,1027.*

Dissanayaka, S. M., & Kumaraswamy, M. M. (1999). Comparing contributors to time and cost performance in building projects, Building and Environment. *Vol. 34*, PP. 31- 42.

Dissanayaka, S., & Kumaraswamy, M. (1999). Evaluation of factors affecting time and cost performance in Hong Kong building projects. *Engineering, Construction and Architectural Management, 6*(3), pp.287–298.

Duckett, W. (2005). Risk Analysis and the Acceptable Probability of Failure. *The Structural Engineer*, pp. 25-26.

Egan, J. (2002). *Accelerating change.* London.

Elinwa, A., & Joshua, M. (2001). Time Overrun Factors in Nigerian Construction industry. *Journal of Construction Engineering and Management, 127*(5), pp.419–425.

`

Emeka, O. J. (2016). Causes of delay in large construction project in Nigeria construction indusrty.(Dissertation).

Enhassi, A. (2009). Factors affecting the performance of construction projects in the Gaza Strip. *Journal of Civil Engineering and Management, vol. 15*(8), pp. 269-280.

Enoma, A., & Allen, S. (2007). Developing key performance indicators for airport safety and security. *Facilities, 25*(7), 296-315.

EU Benchmarking Co-ordination Office. (2000). *Final Report of the Benchmarking Pilot Study, available from http:/www.benchmarking-in-europe.com.*

Evbuomwan, N., & Anumba, C. (1998). An integrated framework for concurrent life-cycle design and construction. *Advance Engineering Software, 29*(6-7), 587–597.

Factors affecting cost performance: evidence from Indian construction projects. (2005). *International Journal of Project Management, 23*(4), 283–295.

Fellows, R., & Liu, A. (2008). *Research methods for construction* (3rd ed.). Wiley-Blackwell.

Fisk, E. (1997). *Construction Project Administration, 5th Edition.* Prentice Hall, New Jersey.

Flynn, N. (1997). *Public sector management.* London.: Prentice-Hall.

Frimpong, Y., Oluwoye, J., & Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in developing countries: Ghana as a case study. *International journal of project management,, 21*(5), 321-326.

Fryer, B. (2004). *The Practice of Construction Management Fourth Edition .* Blackwell Publishing.

Fugar, F. D., & Agyakwah, B. A. (2010). Delays in Building Construction Projects in Ghana. *Australasian Journal of Construction Economics Building,, 10*(1), 103-116.

Gahigi, M. (2016, November 26). *Kigali developers panic as supply for rental space tops demand*. Retrieved from The East African: https://www.theeastafrican.co.ke/rwanda/Business/Kigali-developers-panic-as-supply-for-rental-space-tops-demand/1433224-3465306-fpf94r/index.html

GAO/RCED. (1997). *Transportation Infrastructure Managing the Costs of Large-dollar Highway Projects.* Washington, D.C.

Gayeski, D. (1993). *Corporate Communications Management: The Renaissance Communicator in Information-Age Organizations.* Focal Press/Heinneman ,Boston, MA.

Gichunge, H. (2000). *Risk Management in the Building Industry in Kenya: "An Analysis of Time and Cost Risks". Unpublished MA Thesis, University of Nairobi.*

Gould. (2002). *Managing the Construction Process: Estimating, Scheduling, and Project Control.* Upper Saddle River, NJ: Prentice Hall.

Gould, F., & Joyce, N. (2002). *Construction project management.* Upper Saddle River: Prentice Hall.

`

Greuning, H., & Iqbal, Z. (2007). Telecommunication and Risk Environment in Archer, S. and Karim, R. A. A. 2007. *Finance: The Regulatory Challenge John Wiley & Son (Asia) Pte Ltd*.

Grigoroudis, E., Litos, C., Moustakis, V. A., Politis, Y., & Tsironis, L. (2006). The assessment of user-perceived web quality: Application of a satisfaction benchmarking approach. *European Journal of Operational Research*.

Habitat. (1982). *Role and Contribution of the Construction Industry to Socio-economic Growth of Developing Economies.* Cambridge: GMT, inc.

Hampton, D. (1994). Procurement Issues. *Journal of Management in Engineering, 10*(6), pp.45-49.

Hanna, A., Taylor, C., & Sullivan, K. (2004). Impact of extended overtime on construction labour productivity. *Journal of Construction Engineering Management, 131*(6), 734-739.

Haponava, T., & Al-Jibouri, S. (2009). Proposed System for Measuring Project Performance Using Process-Based Key Performance Indicators. *Journal of Management in Engineering, 28* (2), 140–149.

Harper, W. (1994). *Statistics, sixth edition, M&E Handbook Series.* London: Pitman Publishing.

Harris, F., & McCaffer, R. (2003). *Modern Construction Management* (5th edn ed.). UK: Blackwell Science.

Heerkens, G. R. (2002). *Project Management.* McGraw-Hill.

Hibberd, P. (1986). *Variations on construction contracts.* Collins, London.

Hoe, Y. (2013). Causes of Abandoned Construction Projects in Malaysia. p.64.

Ibbs, C. W. (1997). Quantitative impacts of project change: size issues. *Journal of Construction Management and Engineering, 123*(3), 308-311.

Ibrahim, A., Jing, W., & Wenge, D. (2010). Key Performance Indicators Supporting Decision-Making Affecting Malaysian Enterprise' Project Performance in China. *American Journal of Applied Sciences, 7*(2), 241-247.

Ifinedo, P. (2008). Impacts of business vision, top management support and external expertise on ERP success. *Business Process Management Journal, Vol. 14*(4), pp.551-568.

International Monetary Fund. (2018). *Rwanda's economic growth to remain strong in 2018.*

Israel, G. D. (2003). *Determining sample size, Agricaultural Education and Communication Department, Florida Coorperative Extension Service, Institute.*

Iyer, K., & Jha, K. (2005). Factors affecting cost performance: evidence from Indian construction projects. *International Journal of Project Management, Vol. 23*, PP. 283-295.

Jackson, B. (2010). *Construction Management JumpStart: The Best First Step Toward a Career in Construction Management* (2nd ed.). Indianapolis, Indiana: Wiley Publishing.

Jarra, Y. F., & Zairi, M. (2001). Total Quality Managemen. *12*(7& 8), 906-91.

`

Jaselskis, E., & Ashley, D. (1991). Optimal allocation of project management resources for achieving success. *Journal of Construction Engineering and Management, 117*(2), pp.321–340.

Johnson, & Scholes. (2004). Risk Identification – basic stage in risk management. *Environmental Management and Health, Vol 13*(No. 3), pp 290-297.

Juliet, M., & Ruth, O. (2014). An Evaluation of Factors Affecting the Performance of Construction Projects in Niger State. *Journal of Environmental Sciences and Resources Mnagement, 6*(1), 34-43.

Kagiri, D., & Wainaina, G. (2008). *Time and Cost Overruns in Power Projects in Kenya: A Case Study of Kenya Electricity Generating Company Limited, Nairobi.*

Kaming, P., Olomolaiye, P., Holt, G., & Harris, F. (1997). Factors infl uencing construction time and cost overruns on high-rise projects in Indonesia. *Construction Management and Economics*, 83 – 94 .

Kaming, P., Olomolaiye, P., Holt, G., & Harris, F. (1997). Factors influencing construction schedule and cost overruns on high-rise projects in Indonesia. *Journal of Construction Management and Economic, Vol. 15*(No.1).

Kaming, P., Olomolaiye, P., Holt, G., & Harris, F. (1997). Factors influencing construction time and cost overruns on high-rise projects in Indonesia. *Construct Manage Economics*, 83–94.

Kaming, P., Olomolaiye, P., Holt, g., & Harris, F. C. (1997). Factors influencing construction schedule and cost overruns on high-rise projects in Indonesia. *Journal of Construction Management and Economic, 15*(1), pp. 83-94.

Karim, K., & Marosszeky, M. (1999). Process monitoring for process re- engineering- using key performance indicators. *International conference on construction,process reengineering*.

Kasimu, M. A. (2012). Significant Factors That Causes Cost Overruns in Building Construction Project in Nigeria. *Interdisciplinary Journal of Contemporary Research in Business, Vol.3* (11), pp.775-780.

Kerzner, H. (1992). *Project Management: A systems approach to planning, scheduling and controlling.Van Nostrand Reinhold. New York.*

Kim, D. Y., Han, S. H., Kim, H., & Park, H. (2008). *Structuring the prediction model of project performance for international construction projects:A comparative analysis, Expert Systems with Applications.*

Kish, L. (1965). *Suryey Sampling.* New York: John Wiley and Sons, Inc.

Knight Frank Africa Report . (2017). *REAL ESTATE MARKETS IN A CONTINENT OF GROWTH AND OPPORTUNITY.*

Krejcie, R., & Morgan, D. (1970). *Determining Sample Size for Research Activities.Educational and Psychological Measurement.*

Kumaraswamy, M., Miller, D., & Yogeswaran, K. (1998). Claims for extension of time in civil engineering projects. *Journal of Construction management and Economics, 16*(2), 283-294.

`

Lawler, E. E., Mohrman, S. A., & Ledford, G. E. (1995). *Creating high performance organizations: practices and results of employee involvement and Total Quality Management in Fortune 1000 companies.* Jossey-Bass, 186.

Leavitt, D., Ennis, S., & McGovern, P. (1993). The Cost Escalation of Rail Projects:Using Previous Experience to Re-Evaluate the Cal Speed Estimates, California High Speed Rail Series, April working paper.

Lester, A. (2007). *Project management, planning and control* (5th edition. ed.). Oxford: Elsevier Ltd.

Levi, D. (2007). *Group Dynamics For Teams. SAGE, 359.*

Li, H., Cheng, E., Love, P., & Irani, Z. (2001). Co-operative benchmarking a tool for partnering excellence in construction. *International Journal of Project management, Vol. 19*, PP. 171-179.

Ling, F. Y., Low, S. P., Wang, S. Q., & Lim, H. H. (2007). Key project management practices affecting Singaporean firm's'project performance in China. *International Journal of Project Management*.

Long, N. D., Ogunlana, S., Quang, T., & Lam, K. C. (2004). large construction projects in developing countries: a case study from Vietnam. *International Journal of Project Management, Vol. 22*, PP. 553-561.

Luu, D., Thomas, S., & Chen, S. (2003). Parameters governing the selection of procurement system - An empirical survey. *Engineering, Construction and Architectural Management*, pp. 209-218.

Maizon, H., Li, M., Yin, N., Hooi, N., Heng, S., & Yong, T. (2006). *Factors influencing the selection of procurement systems by clients. Faculty of Built Environment, University Technology Malaysia.*

Mansfiel, d. N., Ugwu, O. O., & Doran, T. (1994). Causes of delay and cost overruns in Nigerian construction projects. *International Journal of Project Management, 12*(4), pp. 254 – 260.

Mansfield, N., Ugwu, O. O., & Doran, T. (1994). Causes of delay and cost overruns in Nigeria construction projects. *International Journal of Project Management, 12*(4), 254-60.

Mansfield, N., Ugwu, O., & Doran, T. (1994). Causes of delay and cost overruns in Nigeria construction Projects. *International Journal of Project management*, 12 (4) 254 – 260.

Marosszeky, M., & Karim, K. (1997). *Benchmarking - A Tool for Lean Construction.* University of South Wales, Sydney, Australia.

Mayo, E. (1933). *The human problems of an industrial civilization.* The Macmillan company,194.

Mbatha, C. M. (1986). *Building Contract Performance, A Case Study of Government Projects, Kenya.* Unpublished MA Thesis, University of Nairobi.

Merewitz, L. (1973). Cost Overruns in Public Works. *Benefit Cost and Policy Analysis Chicago, Aldine*, pp. 227-297.

Mohamed, A. (2017). *Influence of time overruns in the implementation of county construction projects: case study of Lamu county,Kenya. unpublished M.A Thesis .University of Nairobi.*

`

Mohamed, S. (1996). Benchmarking and improving construction productivity. *Benchmarking for Quality Management & Technology, 3*(3), 50-58.

Mohrman, S. A., Cohen, S. G., & Mohrman, A. M. (1995). *Designing team-based organizations: new forms for knowledge work.* Jossey-Bass, San Francisco, 389.

Moore, P. G. (1983). *Project investment risk. The business of risk. Cambridge University Press.Cambridge.*

Morris, P., & Hough, G. H. (1987). *The Anatomy of Major Projects: A Study of the Reality of Project Management .* New York: John Wiley and Sons.

Morris, P., & Hough, G. H. (1988). *The Anatomy of Major Projects: A Study of the Reality of Project Management* ((1st ed.) ed.). New York: Wiley.

Mutegi, J. (2018, March 12). *East African cement firms angling for Rwandan Market*. Retrieved from Constructionkenya.com: Constructionkenya.com

N., B. (2011). *Business Research Methods.* India: Pearson Education. pp. 194-195.

Naoum, S. (2007). *Dissertation research and writing for construction students* (2nd ed.). Oxford: Butterworth-Heinemann.

National Industrial Policy. (2011).

Navon, R. (2005). Automated project performance control of construction projects. *Automation in Construction, Vol. 14*, PP. 467- 476.

Neely, A., Gregory, M., & Platts, K. (2005). Performance measurement system design: A literature review and research agenda. *International Journal of Operations & Production Management, 25* (12), 1228-1263.

Nguyen, L., Ogunlana, S., & Lan, D. (2004). A Study on Project Success Factors in Large Construction Projects in Vietnam. *Journal of Engineering Construction and Mangement, 11* (6), pp. 404-413.

NISR. (2012). *General population census.* Kigali.

NISR(National Institute of Statistics of Rwanda). (2012). *General population census.* KIGALI.

Noulmanee, A. .., Wachirathamrojn, J., Tantichattanont, P. .., & Sittivijian, P. .. (1999). Internal causes of delays in highway construction projects in Thailand.

Office of the Auditor General of State Finances. (2017). *Challenges with Rehabilitation and expansion of Kigali King Faisal Hospital.* Kigali.

Oglesby, C., Parker, H., & Howell, G. (1989). *Productivity Improvement in Construction.* McGraw-Hill, New York.

Ogunlana, S., Krit, P., & Vithool, J. (1996). Construction delays in a fast growing economy; comparing Thailand with other economies. *International Journal of Project Management*, 14 (1) 37 – 45.

`

Ogunlana, S., Promkuntong, K., & Jearkjirm, V. (1996). Construction delays in a fast-growing economy: comparing Thailand with other economies. *International Journal of Project Management, Vol. 14*(No.1), PP. 37-45.

Okuwoga, A. A. (1998). Cost - time performance of public sector housing projects in Nigeria. *Habital Intl., Vol. 22*(No. 4), PP. 389 - 395.

Olwale, Y. A., & Sung, M. (2010). Inhibiting factors and mitigating measures in practice. *Construction Management and Economics, 28*, 509-526.

Omoregie, A., & Radford, D. (2006). *Infrastructure Delay and Cost Escalations: Causes and Effects in Nigeria, School Of Architecture.* De Montford University, Leicester,: LE 1 9BH England.

Omran, A. (2012). Project performance in Sudanconstruction industry l. *Academic Research Journal, Vol.1*, pp. 55-78.

Orodho, J. (2003). *Access and Participation in Secondary School Education in Kenya: Emerging Issues and Policy Implications. Institute of Policy Analysis & Research.*

Oxford Dictionaries. (2010a). *"methodology". Oxford Dictionaries. April 2010. Available at: http://oxforddictionaries.com/view/entry/m_en_gb0515210.*

Payment, E. o. (2007). *The Importance of Payment in the Construction Industry.Report on Enactment of Construction Industry Payment.*

Perry, J. (1986). *Risk management – an approach for project managers* (Vol. Vol. 4). Butterworth & Co.

Pheng, L. S., & Chuan, Q. T. (2006). Environmental factors and work performance of project managers in the construction industry. *International Journal of Project Management, Vol. 24*, PP. 24-37.

Pheng, S., & Chuan, T. (2006). Environmental factors and work performance of project managers in the construction industry. *International Journal of Project Management, 24*, 24-37.

PMI. (2004). *A Guide to the Project Management Body of.* 3rd Ed. Newtown Square, USA: Project Management Inc.

PMI, (. I. (2004). *A guide to the project management body of knowledge: PMBOK* (3rd edition ed.). Pennsylvania: Project Management Institute, Inc.

Potts, K. (2008). *Construction cost management, learning from case studies.* Abingdon: Taylor Francis.

Quirke, B. (1996). Putting communication on management's Agenda. *Journal of Communication Management, Vol 1*(1), pp.67-79.

Raymond, N. (1995). Construction time- influencing factors: the contractor's perspective. *Journal of Construction Management Economic, 13* (1), 81-89.

Rea, L. M. (2012). *Designing and Conducting Survey Research* (3rd ed.).

Reichard, D., & Norwood, C. (2001). *Analyzing the cumulative impact of changes. AACE International Transactions.*

`

Reichelt, K., & Lyneis, J. (1999). The dynamic of project performance:Benchmarking the drivers of cost and schedule overrun. *European management journal, Vol.17*(No.2), PP. 135-150.

Richardson. (2005). *How to research: a guide for undergraduate & graduate students, Thomson Learning.*

Rwanda Development Board. (2015). *Investment Opportunities in Rwanda: Construction Materials.*

Rwanda Development Board. (2018).

Rwanda Housing Authority. (2015). Kigali, Rwanda.

Rwanda National Constrution Policy. (2009). *Mistry of Infrastructure: Rwanda National Constrution industry Policy.* Kigali.

Salkind, N. (2009). *Exploring research* (7th ed.). Upper Saddle River N.J.: Pearson/Prentice Hall.

Sambasivan, M., & Soon, Y. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management, 25*(5), 517-526.

Samson, M., & Lema, N. (2002). Development of construction contractors performance measurement framework.

Sanvido, V., Grobler, F., Parfitt, K., Guvenis, M., & Coyle, M. (1992). Critical Success Factors for Construction Projects. *Journal of Construction Engineering and Management, Vol. 118*(No. 1), pp. 94-111.

Sanvido, V., Grobler, F., Parfitt, K., Guvenis, M., & Coyle, M. (1992). Critical Success Factors for Construction Projects. *Journal of Construction Engineering and Management, Vol. 118* (1), pp. 94-11.

Saunders, M. (2009). *Research Methods for Business Students..* (5th ed.). Essex, England: Pearson Education Limited.

Saunders, M., Lewis, A., & Thornhill, A. (2009). Research Methods for Business Students.5th Edition. *Saunders, M.,*, p. 66-398.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students* (5th ed.). Essex, England: Pearson Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2011). *Research Methods for Business Students* (6th ed.). London: Pearson Education Limited.

Schexnayder, C., C., F., & Weber, S. (2003). Project Cost Estimating; A Synthesis of Highway Practice, Arizona. Retrieved from available online: http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+20-7

Sears, S., Sears, G., & Clough, R. (2008). *Construction Project Management, a practical guide to field construction management* (5th edition ed.). New Jersey: John Wiley & Sons.

Sherman, S. N. (1996). *Government Procurement Management.* Germantown, MD: Wordcrafters Publications.

`

Shiyamini, R., & Rameezdeen, R. (2006). *Multiple decisive factor model for construction procurement system selection.* Proceedings of the COBRA 2006 Conference, UK.

Sidwell, A. C. (1984). The Time Performance of Construction Projects. *Architectural Science Review , Vol. 27*(No. 4,), pp.85-87.

Sidwell, A. C. (1984). The Time Performance of Construction Projects. *Architectural Science Review, 27*(4), 85-87.

Singh, S. A. (1984). *Rational approach for stipulating completion time for high rise commercia lbuildings. Paper presented at the Fourth International Symposium on Organization and Management of Construction, CIB W-65 .*

Slack, N., Chambers, S., Harland, C., & Johnson, R. (1998). *Operations Management* (2nd Ed. ed.). England: Pearson Education Limited.

SMEs Product Clusters in Rwanda . (2017). *SMEs Product Clusters in Rwanda report.*

Smith, N., Merna, T., & Jobbling, P. (2006). *Managing Risk in Construction Projects* (2nd edition ed.). Oxford: Blackwell Publishing.

Sohail, M., & Baldwin, A. (2004). Performance indicators for micro-projects in developing countries. *Construction Management and Economics, 1*, 11-23.

Songer, A., & Molenaar, K. (1997). Project characteristics for successful public-sector design-build. *Journal of Construction Engineering and Management,, 123*(1), 34-40.

Spittler, J. R., & McCracken, C. J. (1996). *Effective project management in bureaucracies.* Vancouver, Canada.: Int. Trans Annual Meeting.

Sun, M., & Meng, X. (2009). Taxonomy for change causes and effects in construction projects. *International Journal of Project Management*, 560-572.

Sundstrom, E., Demeuse, K., & Futrell, D. (1990). Work Teams: Applications and effectiveness. *American Psychologist, Vol.45*, pp.120-133.

Sweis, G. e. (2008). Delays in construction projects: The case of Jordan. *International Journal of Project Management, 26*, pp.665–674.

Takim, R., & Akintoye, A. (2002). Performance Indicators for Successful Construction Project Performance. *Association of Researchers in Construction Management, 2*(2), 545-555.

Talukhaba. (1988). *"Time and Cost Performance of Construction Projects", Unpublished MA Thesis, University of Nairobi.*

Talukhaba. (1999). *An investigation into factors causing construction project delays in Kenya: Case Study of High Rise Building Projects in Nairobi, (PhD. Thesis), University of Nairobi.* unpublished (Thesis).

Taylor, F. W. (1911). *The Principles of Scientific Management. Harper and Brothers. University of Wisconsin - Madison, 77.*

`

The East African Newspaper. (2015, March 28). *Rwanda could sever links with convention centre contractor*. Retrieved from http://www.theeastafrican.co.ke/news/ea/Rwanda-could-sever-links-with-convention-centre-contractor/4552908-2668324-ptv2kd/index.html

TheEastAfrican. (2017). Rwanda's construction sector on the rise in 2017.

Thomas, A. (2010). *Research methodology: Code: ONB01X8. Course hand-out- University of Johannesburg.* Johannesburg, South Africa.

Thomas, P. (2009). Strategic Management. *Course at Chalmers University of Technology*.

Thomas, S. N., Palaneeswaran, E., & Kumaraswamy, M. M. (2002). A dynamic e-Reporting system for contractor's performance appraisal, Advances in Engineering Software. *Vol. 33*, PP. 339-349.

Thompson, P. A., & Perry, J. G. (1983). *Engineering construction risks-A guide to project risk analysis and risk management.* London: Thomas Telford.

Toakley, A. (1989). Risk, uncertainty and subjectivity in the building procurement. *process-acritical review. School of Building*, p. 144.

Tolosi, P., & Lajtha, G. (2000). Toward improved benchmarking indicators. *Telecommunications Policy, Vol. 24*, PP. 347-357.

Toor, S., & Ogunlana, S. (2008). Problems causing delays in major construction projects in Thailand. *Construction Management and Economics, 26*(4), pp.395–408.

Toor, S., & Ogunlana, S. (2008). Problems causing delays in major construction projects in Thailand. *Construction Management and Economics, 26*(4), pp.395–408.

Torrington, D., & Hall, L. (1998). *Human Resource Management* (4th ed.). Prentice Hall,London.

Tummala, V. R., & Burchett. (1999). Applying a Risk Management Process (RMP) to manage cost risk for an EHV transmission line project. *International Journal of Project Management, Vol. 17*(No. 4), pp. 223-235.

Ubaid, A. (1991). Factors affecting contractor performance . Master thesis, CEM Department, KFUPM, Dhahran, Saudi Arabia.

Ugwu, O., & Haupt, T. (2007). Key performance indicators and assessment methods for infrastructure sustainability -a South African construction industry. *Building and Environment, Vol. 42*, PP. 665-680.

Vidalis, & Najafi, T. (2002). Cost and time overruns in highway construction 4th transportation specially conference of the Canadian Society for civil Engineering,Engineering, Montreal, Quebec, Canada June 5-8 (2002).

Vidalis, M., & Najafi, T. (2002). *Cost and time overruns in highway construction4th transportation specially conference of the Canadian Society for civil Engineering, Montreal, Quebec, Canada June 5-8 (2002).170.*

`

Vidalis, M., & Najafi, T. (2002). Cost and time overruns in highway construction 4th transportation specially conference of the Canadian Society for civil Engineering., (p. 170). Montreal, Quebec, Canada. Retrieved June 5-8, (2002

Wallace, P., & Blumkin, M. (2007). Major Construction Projects. *Improving Governance and Managing Risks*. Retrieved from www.deloitte.com

Ward, S. (2008). *Cash flow analysis,http://sbinfocanada.about.com/cs/management/g/cashfl owanal.htm , accessed 4 February .*

Winch, G. (2002). *Managing construction projects, an information processing approach.* Oxford: Blackwell Publishing.

Winch, G. (2002). *Managing construction projects, an information processing approach.* Oxford: Blackwell Publishing.

Word bank doing business report . (2018).

Yakubu, O., & Sun, M. (2009). Cost and time control of construction projects: a survey of contractors and consultants in the UK. *Construction Information Quarterly*, 11(2), 53–9.

Yogeswaran, K., Kumaraswamy, M. M., & Miller Douglas, R. (1998). Claims for Extensions of Time in Civil Engineering Projects. *Construction Management and Economics, 16*(3), 283–293.

Zeitoun, A., & Oberlender, G. (1993). *Early warning signs of project changes.* Oklahoma State University, Stillwater.

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QUESTIONNAIRE ON THE STUDY OF THE FACTORS AFFECTING TIME AND COST PERFORMANCE OF CONSTRUCTION PROJECT IN RWANDA.

Dear Respondent,

RE: Requesting to complete the Questionnaire for the Research Project.

The holder of this letter is a Postgraduate student at University of Nairobi and is conducting a research on **Factors affecting Time and Cost Performance of Construction Projects in Rwanda: A Case Study of High-Rise Building Projects in Kigali**, for the purpose of partial fulfillment for the award of the degree of Master of Arts in Construction Management of the University of Nairobi.

You have been selected to provide the information needed in this study. Kindly provide the information required by completing the accompanying questionnaire. The information provided will exclusively and solely only be used for research purposes with an assurance of confidentiality and anonymity. Upon request, you will be equipped with a copy of the research findings.

Your cooperation and assistance in facilitating this research will be highly appreciated.

Yours Faithfully,

Pascal Tuyishime

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QUESTIONNAIRE

DECLARATION

Answers to questions contained in this questionnaire will be kept confidential and the information will be used for research purposes only and your identity will remain confidential**.**

SECTION A: GENERAL INFORMATION

N.B: High Rise Building: High Rise building is the building with five or more storeys above ground level (Abbott, 1987).

"Kindly tick the collect answer"

1. Which of the following profession best describes you?

A. Architect ☐
B. Quantity Surveyor ☐
C. Project Manager ☐
D. Engineer ☐
E. Other (Kindly specify) …….

2. Level of Education

A. Diploma ☐
B. Bachelor's Degree ☐
C. Master's Degree ☐
D. Doctorate ☐

3. How many years do you have in construction industry?

A. 1-5 years ☐
B. 6-10 years ☐
C. more than 10 years ☐

4. How many private Highrise building projects have you been involved in?

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A. 1-5 ☐

B. 6-10 ☐

C. More than 10 ☐

5. What type of private Highrise buildings have you been engaged in?

A. Mixed use (Offices, Shops, etc.) ☐

B. Institution (School, college) ☐

C. Industrial (Factories, Warehouse) ☐

D. Residential (Apartment, single standing houses) ☐

E. Other, Specify……

SECTION: CONSTRUCTION PROJECTS PERFORMANCE.

6. How is it likely for the Highrise building project to be completed within the contract period?

A. Very Likely ☐

B. Likely ☐

C. Less Likely ☐

D. Not Likely ☐

7. How is it likely for Highrise building project to be completed within the contract cost?

A. Very Likely ☐

B. Likely ☐

C. Less Likely ☐

D. Not Likely ☐

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8.Please tick from the following the one you think mostly affects the performance of construction projects (Kindly tick one).

A. Time overruns ☐
B. Cost overruns ☐
C. Poor quality of work ☐

9. At what percentage was the Highrise building project success in terms of meeting project **time goals**? Kindly tick the appropriate answer.

		Tick	Numbers of projects
A.	> 60% over time	☐	☐
B.	30% - 59% over time	☐	☐
C.	15% - 29% over time	☐	☐
D.	1% -14% over time	☐	☐
E.	On time	☐	☐
F.	Ahead of schedule	☐	☐

10. At what percentage was the Highrise building project success in terms of meeting project **budget goals**? Kindly tick the appropriate answer.

		Tick	Number of projects
A.	> 60% over budget	☐	☐
B.	30% - 59% over budget	☐	☐
C.	15% - 29% over budget	☐	☐
D.	1% -14% over budget	☐	☐
E.	On budget	☐	☐
F.	Under budget	☐	☐

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11. At what percentage was the Highrise building project success in terms of meeting project scope and requirements goals? Kindly tick the appropriate answer.

	Tick	Number of projects
A. > 60% requirements missed		
B. 30% - 59% requirements missed		
C. 15% - 29% requirements missed		
D. 1% -14% requirements missed		
E. Requirements met		
F. Requirements exceeded		

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SECTION B: DELAY FACTORS AFFECTING CONSTRUCTION PROJECTS PERFORMANCE.

12. Please tick the extent to which you believe the following factors contribute to the building project **delays**. The time overruns are considered to be factors affecting performance of construction projects. Please express your opinion on the significance of the following delay factors on construction projects performance in Rwanda. Factors are ranked in order of their effect on the performance of projects on 5-points scale: **1** = Not significant, **2** = Low Significant, **3** = Uncertain ,**4** = Significant and **5** = Very Significant (Kindly tick the appropriate box each raw).

	DELAYS FACTORS SIGNIFICANCE	Not Significant (1)	Low Significant (2)	Uncertain (3)	Significant (4)	Very Significant (5)
	Client related causes of delays					
1.	Late payments during works progress					
2.	Unrealistic contact period imposed by owner					
3.	Variation and change requirements during execution stage					
4.	Delay in receiving clearances through customs of the imported materials.					
5.	Delay in handing over the construction site to the contractor					
6.	Client's interference in contractual duties					
7.	Slowness in decision making by owner					
8	Late provision of instructions					
9.	Late approval of design documents					
10.	Suspension of work by client					

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DELAYS FACTORS / SIGNIFICANCE		Not Significant (1)	Low Significant (2)	Uncertain (3)	Significant (4)	Very Significant (5)
	Consultant related causes of delay					
11.	Inadequate experience of the consultant					
12.	Ambiguities, Mistakes, inconsistency and discrepancies drawings and specifications					
13.	Late approval of shop drawings					
14.	Unclear delegation of responsibilities					
15.	late issuance and incomplete information					
16.	Late approval of tests and site inspections					
17.	Lack of coordination with project participants					
	Contractors related causes of delay					
18.	Financial Difficulties encountered by contractor					
19.	Inadequate contractor's experience					
20.	Rework due to mistakes and errors					
21.	Poor construction site management and supervision					
22.	Late preparation of Request for Information (RFIs) by contractor					

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	DELAYS FACTORS SIGNIFICANCE	Not Significant (1)	Low Significant (2)	Uncertain (3)	Significant (4)	Very Significant (5)
23.	Inadequate technical study during bidding					
24.	Frequent change of subcontractors					
25.	Late payment to subcontractors by main contractor.					
26.	Ineffective scheduling of the project					
27.	Delay in site mobilization					
28.	Improper construction method / techniques					
29.	Delay in subcontractor's works					
30.	Poor communication with project parties					
31.	Late procurement of materials and delivery by contractor					
32.	Use of low productive equipment					
33.	Delay in preparation of shop drawings and materials samples.					
	Any other? please specify……. …… ……					
	External environment related causes of delay					
34.	Unfavorable Weather conditions					
35.	Unexpected government regulations					
36.	Construction materials cannot be procured on local market and have to be imported.					

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DELAYS FACTORS / SIGNIFICANCE		Not Significant (1)	Low Significant (2)	Uncertain (3)	Significant (4)	Very Significant (5)
37.	Late inspection of imported material at the ports					
38.	Fluctuation materials price					
39.	Specific expertise that cannot be gotten within locally available labor, which forces client to employ labor from outside the country or continent which can delay service delivery.					
	Any other? please specify …… ……... ……..					

SECTION C: FACTORS CAUSING BUIDING COST OVERRUNS.

13. Please tick the extent to which you believe the following factors contribute to the building project **cost overruns**.The cost overruns are considered to be factors affecting performance of construction projects. Please express your opinion on the significance of the following cost overruns factors on construction projects performance in Rwanda. Factors are ranked in order of their effect on the performance of projects on 5-points: 1 = Not significant, 2 = Low Significant, 3 = Uncertain ,4= Significant and 5 = Very Significant (Kindly tick the appropriate box

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COST OVERRUN FACTORS / SIGNIFICANCE		Not Significant (1)	Low Significant (2)	Uncertain (3)	Significant (4)	Very Significant (5)
1.	Lack of updated cost data on specifications					
2.	Frequent design changes					
3.	Fluctuation in the cost of building materials.					
4.	Inadequate review of drawings and others contract documents.					
5.	Omissions and errors in the bills of quantities					
6.	Government's Unstable economic conditions.					
7.	Poor contract management					
8.	High cost of transport					
9.	Lack of local skilled labor					
10.	Political interference					
11.	Poor site financial control					
13.	Duration of Contract period					
14.	Adjustment of prime cost and provisional sums.					
15	Unexpected government regulations					
16.	Construction materials cannot be procured on local market and have to be imported.					

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	Any other? please specify…… …… …….					

Mitigation strategies

15. Please highlight your possible mitigation strategies to minimize delay problem encountered in high rise building construction projects in Kigali.

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16. Please highlight your possible mitigation strategies to minimize cost overrun problem encountered in Highrise building construction projects in Kigali.

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