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DEPARTMENT OF CIVIL ENGINEERING

OPTION: CONSTRUCTION TECHNOLOGY

**INVESTIGATING THE CAUSES OF DELAYS IN THE BUILDING
INDUSTRY AND EXPLORING EFFECTIVE REMEDIAL MEASURES**

CASE STUDY: KIGALI-RWANDA

Submitted in partial fulfillment of the requirement for the advanced diploma
in construction technology

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Kigali , October 2024

DECLARATION

I **MUYOMBANO Derrick (202150321)**, declare that this research study is my original work and has not been presented for a Degree or any other academic award in any University or Institution of Learning". No part of this research should be reproduced without the authors' consent or that of ULK Polytechnic Institute.

Student name: MUYOMBANO Derrick (202150321)

Signature:

Date.....

CERTIFICATION

This is to certify the project work known as **“Investigating the causes of delays in the building industry and exploring effective remedial measure”** is a recorded of the original work done by **MUYOMBANO Derrick (202150321)**.The project was carried out under my supervision, and to the best of my knowledge, it has not in any part been submitted to any other academic institution.

Supervisor: Eng.Bonaventure NKIRANUYE

Date:/...../.....

Signature.....

Head of department

Eng.Bonaventure NKIRANUYE

Date:/...../.....

Signature.....

DEDICATION

I would gladly dedicate this project work to:

Almighty God who never leaves me in my daily life, all my educators; for their inspiration and for shaping us in accomplished people and all friends and relatives who contributed in my studies and strong life.

ACKNOWLEDGEMENTS

Above all, I owe much thanks to God the Almighty who create and control the universe, for protecting and guiding each and every step of our lives. May these simple words express our respect to him.

I deeply recognize again the warm welcome and facilitation of Kicukiro district while I have been collecting the data on site.

My sincere gratitude goes to my supervisor, **Eng. Bonaventure NKIRANUYE** for having given me an opportunity to work under his guidance and provided his technical and wise advice, suggestions and corrections that made this project fruitful.

I then send my most sincere thanks to my family for their invaluable care, encouragement and support throughout my studies.

ABSTRACT

The main aim and objective of this dissertation is to investigate the causes of project delay of building industry and their remedial measures in Rwanda.

Actually the arrangement of this project work in this book is divided into six major groups such as introduction, literature review, materials and methods and results, discussion of results and conclusion and recommendations.

All the chapters and other main points in this book are numbered to help those who may need to use it, to easily reach an interesting section by omitting others.

Abandoned construction projects can pose considerable challenges both to client, contractors and the economy at large. Using both primary and secondary sources of data, the research determines the causes and effects of abandonment of construction projects in Rwanda. The research obtains data on some abandoned projects, cutting across five cities.

This research was conducted to investigate the problems. Firstly the issues surrounding the problem and existing literature on the causes of abandonment of construction projects are reviewed. Then, potential causes of abandonment of construction projects are also reviewed and summarized into 41 items to be rated in an industry wide questionnaire survey. The questionnaire also includes an open-ended question on suggestions to solve abandonment of construction projects. 350 questionnaire responses were received.

Discussions include interpreting the underlying factors extracted from factor analysis in light of the qualitative results. The results show the owner to be mainly responsible for abandonment of construction projects followed by the role of government regulations.

The research recommends that fund related causative factors of abandonment (adequate funding/capital budgeting) be given due consideration at the conceptual stage of projects; this will invariably minimize incidence of abandonment.

Keywords: Project delays, construction industry, abandonment, remedial measures, failure project

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LIST OF ACRONYMS AND ABBREVIATIONS

RBC	: Rwanda Building Code
D	: Disagree
CI	: Construction industry
FOMCA	: Federated Association of Consumer
RPPA	: Rwanda Public Procurement Authority
RII	: Relative Importance Index
IST	: Institut Supérieur de Technologies
USA	: United State of America

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CHAPTER 1.GENERAL INTRODUCTION

1.1. Background of study

The building industry like other effective industry experienced and to various socio-economic and political situations prevalent in Kigali city over the years back. Rwanda building code (RBC), which was introduced in May 2015 shows that delayed and delayed projects always come with a cost as it involves continuing to pay the entrepreneur and incurring extra payment caused by the rise in price. It resulted to a very slow place of National socio-economic, Technological and industrial Development.

Over years the completion of projects beyond the planned budgets continues to be a constant problem in construction industry worldwide with the differing stage in construction process that the overrun occurs due to different part of a microeconomic cost function (cantarelli2012).

According to Otim and Alinaitwe (2013), the construction industry is large enough and keeps on expanding generally. When the construction industry scope continues to widen, planning and budgeting problems considerably increase as well. Consequently, it attracts subcontracting as an option of reducing the mounting workload generally. However, it remains noticeable that most projects are not completed within the initial project budget more so when they are subcontracted.

Subcontracting refers to the practice of assigning part of the obligations and tasks under a contract to another party known as a subcontractor (Ankrah, 2015)

This research works, examine in a clear sense, the causes of building project delayed and its consequences and their remedial measures in Kigali city Building industry and society. Abandon projects works includes: buildings, civil engineering and heavy engineering projects like the Houses, church, schools, Roads, Bridges, Construction of Dams, Tunes, Airports, etc.

1.2. Problem statement

Construction is now one of the most booming sectors in the country with new building springing up across the city attention is shifting on how environmentally friendly the buildings have said **Eng. SAGASHYA** during a past press conference in (2017)

Building which has been delayed in society, cities have caused a lot of economic meltdown which turns to affect the individuals, nations, and the entire society.

These normally occurs when the building contractors do not have a good knowledge of their project type estimations which leads to projects delayed through low costing for contracts.

1.3. Objectives of the study

1.3.1. Main objective

The main objective of this study is to investigate the causes of project delay of building industry and their remedial measures

1.3.2. Specific objectives

The specific objectives of this research to achieve main objectives are as follows:

- ❖ To identify the major causes of delays in construction project;
- ❖ To identify the root sources of construction delay in construction projects in Rwanda;
- ❖ To identify the effects of delays in construction project

This study is significant because elimination or reduction of the rate of delayed shall improve provision of housing for all especially low-income earners, creation of employment opportunity for professionals in the construction industry, reduction of waste of fund, human and materials on the part of the client, as well as, enhanced physical and socio-economic development of the country amongst others.

1.4. Scope and limitation of the study

1.4.1. Subjected scope

The study mainly focused on the causes of project delayed of various construction projects in Rwanda with a view of providing remedial measures to solve the problem

1.4.2. Geographical scope

The research was carried out in Rwanda Housing Authority, scope of this research work is limited to Kigali city (Gasabo and kicukiro district) in particular; a good number of buildings have been delayed there. This research also covers the effect and the remedial measures on the socio-economic and technological values in Kigali city (Gasabo and kicukiro district).

1.5. Research questions

- ❖ What are the causes of project delays in construction industry?
- ❖ What are the remedial measures to reduce project delays?
- ❖ What are the effects of delays in construction industry ?

1.6. Hypothesis of the research

H0: The causes of construction project delays are not assessed

H1: The causes of construction project delays are assessed

H0: Remedial measures for reducing construction project delays are not mentioned

H1: Remedial measures for reducing construction project delays are mentioned

1.7. Organization of the research

This research project will be organized as follow:

Chapter 1: General Introduction: It presents and brief history of construction projects delaying. This chapter will explain to the reader about the research objectives, problem and the scope of this research.

Chapter 2: Literature Review: It presents the definitions and Advantage of recycled concrete and masonry and will provide a wide literature study on construction projects delaying and remedial measures.

Chapter 3: Materials and Methods: This deals with the methods, procedures, the definitions of the instruments that will be used for the investigations and, the methods and techniques used to collect all the data required.

Chapter 4: Results and discussions which deals with the presentation of the findings.

Chapter 5 :Conclusion and recommendations: This is the last, presents conclusions, recommendation to state the output of the research.

CHAPTER 2.LITERATURE REVIEW

2.1. Historical background of delayed building

The numbers of housing project delayed are far greater than the number of commercial project. Furthermore, delayed housing project gives more impact to the public and government. According to most literature, five main factors are the most that contributes to project's delayed, which are financial, economics, policies, mismanagement and delivery system.

The following text in this section is outlined by a number of subtopics that will be discussed further along in this research. They have been attempted with some reading but have not been answered completely as of yet.

2.2. A review of the causes of delayed construction projects in the world

It is found that existing literature on this subject is limited to the types of sources such as unpublished thesis, conference papers, and particularly news articles. The types of project discussed in these sources are mainly housing projects. This may be due to the greater number of delayed housing project and the fact that it has greater immediate impact to the general public than commercial (e.g. office building) and government projects. Generally, the majority of the causes of delayed construction projects identified from existing literature can be categorized into four groups, i.e. 1) mismanagement, 2) unfavourable government policies, 3) inefficient public delivery system, and 4) unfavourable economic conditions. Mismanagement is one of the causes of delayed housing projects. Examples of mismanagement that may lead to delayed housing projects are 1) lack of proper feasibility studies (Ibrahim, 2006) particularly inaccurate market research and study (Kong, 2009), 2) unattractive marketing strategies (Ibrahim, 2006), and 3) incompetent and poor financial management by the developers (Ibrahim, 2006). The first two of these examples are particularly concerned with the sales of house units as important source of cash flow for housing developers. The lack of proper feasibility studies and inaccurate market research and study may result in unsuitable project scheme to be undertaken for the prevailing

market. Therefore, a wrong decision might be made to undertake a project which is in fact less feasible than expected. Unattractive marketing strategies may further exacerbate a less attractive scheme of project already undertaken by a developer. Ibrahim (2006) also points out that mismanagement may happen due to the lack of experience of developers. Causes of delayed housing projects related to unfavourable government policies are 1) the sell-then-build system (Chang, 2009), 2) unavailability of Home Indemnity Insurance (Ibrahim, 2006), 3) limitation of the jurisdiction of the Tribunal for Homebuyer Claims (Ibrahim, 2006), and 4) unfavourable planning and land policy (Khalid, 2005). The sell-then-build system is intended to enable more houses to be built at a faster rate and a lower price (Chen, 2007). As the name implies, houses can be sold before the houses are being built, therefore more cash flow from the start of the construction phase and less requirement for the developer's own capital. This has enabled more developers of smaller capital to be involved in the business. However, according to Chang (2009) having smaller developers in the housing industry is the main cause of the delayed of housing projects. Being small, these developers have to rely critically on their sales to meet their cash flow. The sell-then build system as a cause of delayed housing projects is also supported by Former Prime Minister Abdullah Ahmad Badawi (HBA, 2006) and the President of Federated Association of Consumer Malaysia (FOMCA) (as cited in Khalid, 2005). Home Indemnity Insurance, as practiced in Western Australia, Australia is an insurance policy which a builder is required by law to take out on behalf of the homeowner to assist to ensure that the house can be finished in the event that the builder dies, disappears or becomes insolvent (Government of Western Australia, 2008). The Tribunal for Homebuyer Claims is a channel for aggrieved homeowner to seek redress against developers without having to go through a lengthy legal process (Chen, 2007). Contrary to Ibrahim's (2006) finding, Chen (2007) claimed that the Tribunal for Homebuyer Claims has proven to be very effective. It is however believed that how limited the jurisdiction of the Tribunal or how effective it is to help homeowners seek redress do not cause the delayed of housing projects as it is only relevant after housing projects have been delayed. In other words, it is believed that Ibrahim (2006) and Chen's (2007) arguments only serve to reflect the effectiveness of the Tribunal as a remedy to already delayed housing projects rather than

being the cause of the delayed. As for unfavourable planning and land policy, the specific planning and land policy which is unfavourable was not given by Khalid (2005). Chen (2007) however argues that it is inefficient public delivery system rather than unfavourable government policies that causes the delayed project problem. Lack of enforcement of control and monitoring by the government as a cause of delayed housing projects is also mentioned by Ibrahim (2006). Ibrahim (2006) states, among others, that there should be stricter licensing for developers, better system to detect delayed of projects, harsher punishment for errant developers, and less bureaucracy in the approval process of housing plans. Many sources give economic crisis or financial crisis as a cause of delayed construction projects (e.g. Khalid, 2005; Ng, 2009b; Lim, 2009; Fernandez, 2009). Other unfavourable economic conditions that may lead to the problem include 1) the rise of the prices of raw material such as steel and cement in 2008 (Cheah, 2008), 2) “selfish” financial system, i.e. one that “lends an umbrella on a fine day and takes it away when it rains” (Chen, 2007), 3) higher interest charge that discourages potential home buyers to buy residential properties and reduces the profitability of a project (Ibrahim, 2006), and 4) competition of new residential projects (Ibrahim, 2006) that affects the sales and hence the cash flow of a project. Apart from that, a number of sources cited financial problems as a cause of delayed construction projects (Khalid, 2005; Kong, 2009; Rajan, 2005; Ibrahim, 2006; Rusli, 2006; Bavani, 2009). However, it is felt that financial problem is the combined effect of the aforementioned four groups of causes prior to being delayed. For instance, the lack of proper feasibility study to determine the right type of development and unattractive marketing strategy which ultimately affects the sales and hence lead to financial problem. It is noticed that a big proportion of the available literature (which is mainly news articles) lacks credibility and cannot be held as conclusive findings to represent the causes of delayed construction projects in Malaysia. In addition, almost all of the literature available is concerning delayed housing projects rather than a fair mix of housing, commercial and government projects. Therefore, a more detailed research concerning delayed construction projects in Rwanda is necessary

2.2.1. Financial Problems

Few sources indicate that financial problems are the causes for delayed housing project (Rusli, 2006). But sometimes for housing projects, the financial problems only came after the projects are delayed. The increases in project cost may due to other factors such as mismanagement, economic condition, lacks of study or marketing problems can also lead to project delayed. This all causes can lead to financial problems and disturb the development of constructions (Rusli, 2006).

2.2.2. Economic conditions

This factor also can affect the development of constructions and leads to delayed of projects as noted in few literatures. Economic conditions such as the rise of price for raw materials such as cement also contribute to the unfavourable economic condition. The financial system also can be put to blame in this factor when the system ‘betray’ the user of the system. For example, the system that only covers the use of the system when the economic conditions are in better conditions, but refuse to help when the condition go bad (Yap & Tan, 2009).

High interest charge also one of the poor economic conditions as potential buyers are discouraged from buying residential properties and thus decrease the profit for the projects (Yap & Tan, 2009).

2.2.3. Lack of information

Discussion

The result of the study with Relative Importance Index of 0.947 affirms the notion that one of the root causes of project delayed in Tertiary Institutions in Rwanda the lack of clear and well defined vision and objective by the successive managements of the Institutions. Projects are conceived based on extraneous pecuniary reasons (El-Ruffian, 2012) and (RPPA, 2011)

2.3. Effects of project delays on buyers

The bottom line is that the buyers are the innocent victims in these unfortunate incidents. The buyers have put their faith into the legislation and authorities to protect their accountability during the journey towards owning a new home. However, evidently in many cases this protection is defective seeing as thousands of buyers are left in the lurch or helpless rather during the negligence of the developers they once trusted. It is a very frustrating and unfortunate recurring turn of events, but somehow inevitably still happens. Part of this research aims to find a way to take the burden off these innocent victims upon the occurrence of this issue, apart from preventing the issue from happening as a whole, which would then take the burden off everyone period.

2.4. Reasons behind construction projects delay in Rwanda

The Government has put a lot of effort and money into preventing this issue from occurring, but is the effort that has been put in enough? Or rather, has the effort been implemented effectively and in the right way?

There are many theories as to why this issue erupts around the world. Some researchers have proposed the BTS (Build Then Sell) approach concept for housing developments in Rwanda.

The government of Rwanda targets to increase urbanization rate from 18% to 35% in 2024 to support economic growth. An urbanization of 35% by 2024 is the expression of an increase of urban population by about 2.7 Million people.

This proposal insinuates the fast growing trend of homebuyers purchasing housing before construction even commences. It is always a risk when putting money forth along with trust in another party. Another theory as explained by Yap consists of a list of reasons:

- Mismanagement
- Inefficient public delivery system
- Flawed council policies
- Financial issues
- Disapproving economic conditions

While those reasons are accurate from a broader standpoint, different areas if looked into, could showcase different trends, and the trends that lead to delayed residential building projects can presumably differ to those of delayed commercial building projects. Therefore, this research will look into a specific building type and location to analyze the trend that leads to the delayed, in search of methods of prevention. This research will also explore options of recovery, as there are numerous building projects that have been on hold for years, even decades with no contribution other than the negative impacts during the tenure of delayed.

2.5.Types of project delays

Before determining the impact of a delay on the project, one must determine whether the delay is critical or non-critical. Additionally, all delays are either excusable or non-excusable. Both excusable and non-excusable delays can be defined as either concurrent or non-concurrent. Delays can be further broken down into compensable or non-compensable delays.

2.5.1. Critical delays and Non critical delays

Delays can be analyzed based on the criticality of activities in the program. The baseline master program prepared in line with the conditions of contract has a critical path.

The critical path is the longest path in the network. The delay to the project occurs when an activity on the critical path is delayed and they have an impact on the successor activities and the overall project. Such activities known as critical activities are important and it should be ensured that the activities on the critical path are not delayed(Koo et al 2007).

When the activities on the critical path are delayed, the delay is reflected on the entire project. Hence, it is required to review the critical activities and analyze whether the resequencing of works can be done for effective project control “resequencing construction activities is a critical task for project planners for effective project control. Resequencing activities require planners to determine the impact or "role" an activity has on successor

activities. They also need to determine the status of activities, i.e., which activities may or may not be delayed” (Koo et al 2007).

It is required to distinguish the function and status of activities which would mean that the planners have to understand the logic and sequence of activities. The critical path method (CPM) identifies the sequence of works based on the precedence logic and relationships and identifies the activities based on the criticality in relation to time. Thus for complex and large projects it is difficult to monitor individual activity logic and sequence and this cannot be done manually.

These limitations of the CPM frameworks are addressed “by formalizing a constraint ontology and classification mechanism. The ontology allows planners to describe their rationale for activity sequences in a consistent and intuitive way, whereas the classification mechanism leverages the ontology to automatically infer the role and status of activities. The ontology and mechanisms were implemented in a prototype tool. With this tool, users can quickly verify which activities to delay to expedite critical milestone or bottleneck activities, thus making it possible to quickly evaluate and generate sequencing alternatives in CPM-based schedules.” (Koo et al.2007).

The critical path guides the overall duration of the project. However in certain cases there are delays to activities which are not on the critical path and have a float. During the progress of the project these activities which were initially not critical get delayed and become critical and form part of the new critical path for the project. There is a debate regarding the issue of float utilization “Under current scheduling practices, total float time is considered "free" and does not belong exclusively to any specific party in the construction process; rather, it belongs to the project and can be used by both owners and contractors to mitigate the potentially negative impact of delays. Utilization of float is, hence, on a "first come, first-served" basis (De La Garza et al 2007).

The protocol and the principle of first come first served basis utilization of float means that any delay in the later stages of the project will make the party responsible for that delay and the overall delay to the project. Due to these factors, the ownership of the float and its utilization has become a source of disputes when the delays to projects occur.

The concept of pre allocation of float and its management in the project having schedules based on the critical path method is to be introduced. Also, the principles of pre allocation and management of “total float” need to be agreed contractually including the responsibility of any ensuring delay to the project. The concept needs recognition from all parties that the total float is an asset for both the parties (De La Garza et al 2007).

The process of quantifying the risks associated with delays in construction projects and minimizing them is a major challenge for all the key stakeholders of the project. The float consumed by the non-critical activities is a complicated and disputable delay factor while analyzing the delays to the project schedule, duration and cost (Sakka, 2007).

“Float loss impact in non-critical activities is one of the complicated delays to assess on a project's duration and cost. This is due to the fact that the deterministic critical path method cannot cope with such delays unless they exceed the total float values. Further, stochastic analysis, which is used in this research to assess the impact of such delays, is perceived by many planners to be complicated and time consuming. This paper presents a method to control the risks associated with float loss in construction projects.

The method uses a recently developed multiple simulation analysis technique that combines the results of cost range estimates and stochastic scheduling, using Monte Carlo simulation. The proposed method quantifies the float loss impact on project duration and cost. Least-squares nonlinear regression is used to convert the stochastic results into a polynomial function that quantifies the float loss impact by relating directly the float loss value to project duration and cost at a specified confidence level.” (Sakka, 2007).

The management of projects by the critical path method of scheduling has become a widely accepted method. This method of programming the schedules is also widely utilized for claiming extension of time and analyzing the delays with impact programs. It is required by some contracts to demonstrate the critical and non-critical activities after updating the critical path method schedules.

Sometimes the owners try to utilize the float available for non-critical activities with the intention to maximize the advantage available. “Owners sometimes appropriate the float

time of noncritical activities to further their own interests. In doing so, they risk causing unforeseen costs. If the contract is a cost-plus agreement, these extra costs are usually absorbed by the owner. If the contract is a fixed-price agreement, the contractor will incur the extra costs. In the latter case, these costs may be justifiable delay or impact claims (Householder, 1990).

In certain cases if the tender documents clearly allocated the ownership of float to the owner then it may result in a higher bid by the contractors as they may feel the need to allow for these unforeseen conditions.

The allocation of responsibility between the owner and the contractor for any delays to the project is an important factor in delay claims and its analysis. The project program which is made utilizing the critical path method indicates the critical and non-critical activities. It indicates the total float for each activity which the amount of time an activity can be delayed without affecting the end date of the project. The ownership of the float is a contentious issue which can be resolved by allocating the responsibility to any or all the parties and agreeing to its utilization (Householder, 1990)

“Ownership of total float can belong to; 1) owner, 2) contractor, 3) whoever uses it first, 4) contractor and owner on unequal basis, or 5) contractor and owner on equal basis. Ownership of float allocates risk to the parties and affects the control and flexibility of construction. The apportionment methods are different ways of calculating delays.” (Chehayeb, 1995).

2.5.2. Non Excusable (Contractor Caused) Delays & Excusable Delays.

Any delay to the project which is solely due to the contractor is regarded as a non-excusable delay. It becomes the responsibility of the contractor and entirely his risk for the delay and the owner is entitled to claim any delays to the project in line with the terms and conditions as stipulated in the contract. The claim by the owner in such cases of delay by the contractor is normally related to penalty and or liquidated damages. The owners claim for the contractors delay usually range from delayed commencement of work at site, failure in proper coordination affecting progress of works, inability to finalize, order and procure

in time and insufficient manpower to carry out the works in line with the program of works.

Also, in such cases where there is a delay by the contractor and the client also delays his decisions concurrent delay comes into the picture.

“Both owners and contractors often use concurrent delay as a defense to delay claims. On nearly all projects that are delayed, there is more than one cause of the delay. Where there are two or more independently causes of delays during the same time period, the delay is termed “concurrent.” In these situations, the owner and contractor may have dueling claims for delay, each of which will be difficult to prove. As a general rule, the party seeking damages must isolate the causes and periods of delay in order to recover damages for the delay (Householder, 1990)

Delays occur in most kind of projects that range from simple building projects to complex projects such as nuclear power plants. It is important to classify the main causes of non-excusable delays and highlight the factors that contribute to those causes. The delays by the client are the compensable delays on which the client can take necessary timely action as he has more control over it. The delays by the contractor are no excusable or non-compensable and the contractor has more control and is expected to do whatever is appropriate to prevent them.

Even though a lot of studies have been done regarding the issues of these delays, it is important to note that no major study has been carried to evaluate the reasons of non-excusable delays. “Understanding the underlying factors that contribute to causes of non-excusable delays would help in identifying and overcoming the problems faced by contractors during the construction process. To assist in identifying the factors contributing to causes of non-excusable delays, the Ishikawa or fish bone diagram has been used as an analytical tool, and a ranking methodology has been devised. As a report of initial findings of the study,...identifies materials-, equipment-, and labor-related delays as major causes of contractors' performance delays (Majid et al 1998).

There are new trends and bad results in construction contracting which offer a review of the problems that occur in the construction industry. These include uncertain site conditions which are covered as part of the contract as the contractor has visited the site, he

is aware of the site conditions. The important factor of any embedded power or water lines not visible at the surface shifts the risk to the contractor and any delay resulting from the same is the sole and absolute responsibility of the contractor in line with terms and conditions of the contract. The consequential damages in terms of liquidate damages or penalty or both would eat into the profit margins of the contractor. "Clauses that give away the contractor's claims and rights to lien the job from the outset. The pressures leading to these trends are primarily economic and have resulted in (among other things) more risk for the contractor. This paper discusses areas of increased risk found in today's construction contracts, the reasons why they have appeared and what a contractor should do to mitigate these "new" risks (Shumway et al 2004).

There are some contaminated site remediation projects having certain characteristics that separate them from conventional construction projects including oversight related to authority regulatory processes and lack of information related to underground services and soil conditions. The remedial measure that is proposed for the conditions identified may not be effective to the desired level. The features which unconventional for remedial projects indicates that the innovative methods implemented by contractors may turn out to be more beneficial and successful.

A study of sixty completed remedial projects was done to identify and document the impact of various project management modules and the contracting strategies on project outcomes. The study revealed that the scope variations, delays by various stakeholders, budget overruns, disputes and change orders are frequent in case of remediation projects (Majid et al 1998).

"Flexible project management strategies, such as turnkey and partnering arrangements, and flexible contracting schemes, such as cost plus fee, were found to be better suited to accommodate such changes. Turnkey and design/construct project structures had the best performance overall of the management structures reported. Mechanisms to promote partnering and team building contributed significantly to project success as defined by budget and schedule (Ruff et al 1996).

The contractor has control over the non-excusable delays and these delays expose the contractor to claims by the owner or the subcontractors. "Non-excusable, non

-compensable delays are within the control of the contractor; examples include delay caused by late mobilization, late equipment deliveries, or an inadequate project work force. Non excusable delays are not only non-compensable but they expose a contractor to delay claims of its subcontractors and liquidated damages (or actual damages if there is no liquidated damages clause) by the owner.” (Schumacher, 1995)

2.5.3. Compensable (Owner Caused) Delay & Non-Compensable Delays.

Here, the owner is responsible for both the time and cost effect of the delay. The contractor may claim the owner interfered with the work, did not deliver owner-purchased equipment or supplies on site as promised, or that the owner’s actions or inaction caused other delays. An owner cannot contract out of its obligation to pay for compensable delay, although it may be able to limit its liability for such delay (Carl, 2005).

“Any clause in a construction contract, which purports to waive, release, or extinguish the rights of a contractor, subcontractor, or supplier to damages or an equitable adjustment arising out of unreasonable delay in performance which delay is caused by the acts or omissions of the contractor or persons acting for the contractor is against public policy and is void and unenforceable (Carl, 2005).

The issue of change order by the client is the most common factor that is responsible for causing a delay to a project. The issuance of the change order affects the work that has been already done. This requires new work to be done, modification to the existing work and /or the removal and the works and installation of the works as per the change order. The delay has to be demonstrated by an impact analysis on the critical path network to claim for additional time and cost due to the delays caused by the changes.

Another factor which comes into the focus due to changes is the delay due to inefficiency damages. As there is no direct method of measuring inefficiency due to its qualitative nature and the difficulty of linking the cause of the productivity loss to the damage. The data available from contractors was the source of information and it appears that there are discrepancies between the claims made by the contractor and the entitlement as per the owner. The study also addresses that a statistical model be developed to quantify the productivity loss from the client sources as daily reports, drawings, specifications and

change orders. Also, a model is developed to quantify and validate the loss of productivity due to changes.

“The productivity loss study analyzed two sets of data that include: (1) variables that predict which of the two parties, the owner and the contractor, contributed to the productivity loss; and (2) variables that predict, from the legal viewpoint, productivity losses which only the owner is responsible for.

The study showed the difference between what the contractor asked for and what he/she is actually entitled to. This model can be used by both the owner and the contractor to quantify the productivity loss due to change orders, and to offer an objective approach to reconcile their differences.” (Serag, 2008).

The process of nominations involves the client and consultant and the process of nominations is identified at the commencement of the project. The clients are required to finalize the nominations of contractors which are allocated a provisional sum in the contract as the entire scope of works is not finalized. During the period when the nomination is required to be done the client and consultant are engaged in finalizing the scope of works, tenders, selections and approvals which sometimes leads to delay in finalization of the nomination.

The traditional construction procurement contains no special features and it is good for projects having a well-established scope of works. In such methods the progress of work is logical and sequential as each activity is required to be completed before the next activity commences. Changes that are done after the project has commenced and during the construction creates problems and it turns out be expensive (Chritamara et al 2001).

The method of design and build gives the flexibility to the client to sequentially allow the contractors design to be incorporated at any stage with the possibility of scope definition being done at different levels. In such an arrangement the project is benefited due the integration of design and construction done at the appropriate time. The client selects the design and build option for procurement in projects is to reduce the time and cost through a single point of responsibility. The performance related to time and cost relate to factors ranging from scope definition by the client, changes implemented and stages and manner in which those changes are reflected, complexity of the project and effective coordination

of the project with key stakeholders. The cost and time performance for the project is affected at the initial stages by the above factors, but the extent of the impact is yet to be done in details. It can be summarized that design and build with traditional method is best for cost saving and D/B fast track construction with finalized design and other parameters is best for saving time (Chritamara et al 2001).

“Experimentation with the model developed also shows that D/B fast track construction with fixed design, procurement and construction schedule is most effective in saving time, whereas D/B with traditional method is best for cost saving (Chritamara et al 2001).

For the delayed nominations due to late finalization of design, the input required for specialized works at the design stage by specialist contractors will be very advantageous.

Contractors in specialized fields have the technical knowhow and can offer valuable input to the preliminary design and engineering process. However, their involvement in the design process at an early stage is seldom but it has been noticed that this trend is changing and their involvement is increasing at the early stages of the project. According to Gil (2001) “Lean construction theory advocates such involvement. The practice of involving suppliers in product development efforts and manufacturing has proven to be highly successful.” Reports on the research that highlighted the contributions of the specialty contractor’s early design indicated gains in process efficiency and improvement in product quality. These contributions are characterized with examples and their potential opportunities for improvement (Gil, 2001)

It is becoming apparent that organizations are increasing the interaction between the designers and the subcontractors.

Also, specialized subcontractors can be deployed to ensure that the delay to the project is mitigated. The specialized contractors with their vast experience are of problems that can be anticipated and work by taking into consideration that those problems do not occur. “Project risk management requires assessments of project duration and activity criticality. The assessments, however, can be strongly influenced by the dependence between task durations (Yang, 2007).

The flexibility in providing duration for the activities is required when practical data is not available and planners have to rely on subjective estimation.

The selection of the most appropriate contractor is the important to ensure that the best value for money is obtained. "Construction clients are becoming more aware of the fact that selection of a contractor based on tender price alone is quite risky and may lead to the failure of the project in terms of time delay and poor quality standards. Evaluation of contractors based on multiple criteria is, therefore, becoming more popular (Singh, 2005).

The selection of the contractor in a multi criteria environment is heavily dependent on the uncertain nature of construction projects and the personal decision of the owners.

The author presents a systematic procedure based on fuzzy set theory to assess the potential of the contractor whether it is in line with the owner's requirement. "The notion of Shapley value is used to determine the global value or relative importance of each criterion in accomplishing the overall objective of the decision-making process (Singh, 2005).

The research forms part of a study to develop a fuzzy decision model for construction contractor selection which involves various criteria's and the tendencies of the client. This helps in making the system more systematic and realistic as the assessment of the contractor is done in terms of linguistic rather than as crisp values (Singh, 2005).

The delays to the construction projects are common and the "most frequent mentioned causes of delays as "unforeseen ground condition", "weather condition", "change by owner", "shortage of technical personnel", "slow purchase of materials and equipment", and "insufficient numbers of equipment(Zhao , 2007).

To evaluate the reasons for the delay, a three dimensional model of causes of delay factors was adopted. The conclusion indicates that delay occurs during the important period of construction stage. The contractor and the client are the main party responsible and the main party injured to the delays. The overall ranking provides useful indicators that can be adopted to mitigate or prevent the delays by the most common contributors (Zhao, 2007).

2.5.4. Concurrent delay & Non concurrent delay

In these situations neither party is responsible to the other for any costs associated with the delay. These delays are those that are typically included in force majeure clauses – abnormal weather, labor strikes, acts of God, acts of war, etc

The delays that occur in a project are either due to the owner such as additions, alterations, modifications and changes to plans and specifications. The delays where the owner may still be responsible are site conditions which are differing and suspension of works. The delays by the contractor which occur in the same period as the owner will be regarded as concurrent delays. “Delays considered will include those caused by changes in the plans or specifications, occurrence of differing site conditions, holds on the work due to owner-initiated suspensions of work, and so-called 'excusable' delays, all when taking place concurrently with contractor-caused delays.” (Ponce de Leon , 1987).

The most important factor for the owner and the contractor in any construction project is the time frame of the project. Still, it is found that many of the construction projects get delayed. “Delays may be caused by the owner (compensable delay), by the contractor (nonexcusable delay), by acts of god, or a third party (excusable delay), or several different kinds of delays may happen concurrently. Because of the many sources and causes of construction delays, it is often difficult to analyze the ultimate liability in delay claims.” (Zaki et al 1987).

The delays caused by the owner are compensable delays and can be utilized by the contractor whose delays are non excusable and liable for further action by the owner.

There is a third type of delay which can be attributed to neither the owner nor the contractor. These delays are referred to as force majeure or act of god or third party delay.

In projects where there is delay where more than one party is involved it is difficult to analyze the responsibility of the delay. In such cases it is required to analyze on the basis of the baseline master program of works which is referred to as the as planned schedule and compare it with the actual updated program which is referred to as the as-built

schedule. What has to be evaluated in this scenario of analysis is the appropriate schedule which can be done by considering all allowable adjustments to the schedule and then what can be concluded is an as-adjusted schedule which will allow for the analysis of the delay and acceleration.

Warrender (2008) addresses the topic of concurrency of delay by referring to a court case in the Outer House of the Court of Session in Scotland. The judge awarded the contractor nine weeks of extension of time against the claim of eleven weeks. “In so deciding, the judge held that the delay in completion was the result of concurrent causes, the majority of which were caused by late instructions or variations issued by the architect and two causes were the result of the fault of the contractor (Warrender,2008)

In the opinion of the judge it was immaterial as to which party was the first to delay the works as long as both the parties were causing delays simultaneously. It was considered that as the delay was caused by both the parties and there was no cause by either party which could be considered as a dominant cause and both the parties had failed in their commitment to complete the project in time.

According to Ostrowski (2006), the most discussed topic an attorney and a scheduling expert discuss is the topic of delay as it is a widely used term and in most cases it is often misunderstood. Coming to an agreement, as to what the term actually means is difficult even though the project participants use the term of concurrent delay as and when they feel and this is primarily due to confusion caused as there is no consistency in its determination. It seems like an easy task to decipher or analyzing two or more delay events occurring simultaneously but ends up being more complex than a Gordian's Knot (Warrender,2008)

Hence it is crucial while evaluating and analyzing the concurrency of delays that all the relevant factors like the critical path, total float and non compensable delays are taken into consideration.

The problem of concurrent delay as a common but complex problem as it has to deal with an important issue of float management. The analysis of the concurrent delay has to take into consideration all aspects of the delay that have occurred in the project. “All events

causing schedule delays and potentially impacting the schedule or causing disruption on productivity, must be tracked, documented and related to specific work package and activity(Massimoluigi et al 2007).

The analysis of the delays cannot be done unless a suitable critical path scheduling system which is effectively utilized on site and is governed by the relevant clauses of the conditions of contract.A slightly different perspective is presented by Huot (1991) ,“Designing and building major projects at the same time to accelerate their completion is known as concurrency.” In such an environment it is important to understand the term of concurrency and the effect of this on the cost of the project due to the fact that the various factors that would come into play due to the design and construction happening at the same time. The impact of such factors on the technology that would required to be deployed and the people that would be required to achieve the targets and the environment o be conducive for all the interaction that will take place between the parties (Huot,1991)

With the systems in place it will be possible to control the impact of the concurrency and its related costs in fast track projects. A confirmation regarding the owners requirements need to be frozen and the project scope needs to be clearly defined and agreed prior to the commencement of construction. This will help in preventing changes, delays and cost overruns and thus improve the quality (Huot,1991)

CHAPTER 3.MATERIALS AND METHODS

3.1. Preamble

This chapter describes the methods used in this research to accomplish the aim and objectives. It reviews existing literature on the meaning and background philosophy of research and research methodology. It also reviews the quantitative, and qualitative methods, with discussions on the selection of a suitable method for this research. This is followed by discussions on the methods used in this research, i.e. literature review, questionnaire survey, and semi-structured interviews. Then, the techniques used for analysis of data are also presented.

3.2. Project area description and baseline data

This chapter gives background information of the project area as a whole then narrows down to project specific site in terms of its location, administrative set-up, climate, settlement patterns, and the major environment attributes, which will play a crucial role in the identification and development of the project. This section begins with the relevant information pertinent to this project in terms of Gasabo and kicukiro District which is where this project was conducted specifically and lines were visited.

3.3. Geographical location Gasabo and kicukiro district

Is one of three districts of Kigali City and forms one of 30 such entities that are in Rwanda after the administrative reform of February 2006. With 15 sectors, 73 cells and 501 villages (imidugudu), it follows from the merger of the former districts of Gasabo and kicukiro, Kacyiru, Gisozi, Kabuga (3 six sectors namely Gasogi, and Ndera Rusororo) Kanombe (Masoro sector) Buliza (Cyunga sectors, Jabana, Kabuye and Ngiryi) Gasabo and kicukiro (Bumbogo sectors, Gasabo and kicukiro, Gacaca I & II, Gikomero, Gishaka, Jurwe Karama, Kayanga, Nduba, Sha, Shango, and Rubungo, Rutunga). It is located northeast of the City of Kigali, the Rwandan capital. It is bounded on the south by the district Kicukiro; to the north by the district and Rulindo Gicumbi; to the east by the districts of Rwamagana and west by the district Gasabo and kicukiro. It has an area of 429.2066 km ², and currently has 410 485 inhabitants. Due to this configuration, the

District is a duality between rural and urban areas. The rural area accounts for more than 90% of the District, with a population representing 66%, which involves more effort in the field of urbanization and land use. New Administrative Map of Gasabo and kicukiro District 23 3.2 Relief The terrain of Gasabo and kicukiro district is dominated by mountains of altitude (1800 m), especially in rural areas. Gasabo and kicukiro District is also surrounded by watersheds and valleys. The District has small rivers in the valleys of areas with high hills.

3.4. Data types

3.4.1. Primary data

Primary data for the study includes information from direct sources such as:

- ❖ Direct interviews and enquiries from professionals as well as the organization where they work, the contractors and clients
- ❖ Carrying out site visits for on the spot observations and direct observation on major construction sites.
- ❖ Taking photographs of such visited existing facilities and producing diagrams for illustrative purposes of such.

3.4.2. Secondary data

Secondary data is generated through the following:

- ❖ Use of existing literature from textbooks, publications, magazines, and unpublished materials.
- ❖ Use of the internet for further information and data collection.
- ❖ Internationally recognized and accepted research encyclopedia
- ❖ Policy documents.

3.5. Data sources

The sources of data for this research include both primary and secondary sources. Using the data obtained from the (reviews on related literature, questionnaire survey, and

interviews) as well as visitation of abandoned projects sites and analysis on the various identified factors that caused abandonment were undertaken.

3.6. Data collection

Data was collected from building clients, consultants, contractors and the work-force within the Port-Harcourt, Owerri and Enugu all cities in Nigeria. The feedback from the questionnaires that were distributed formed the basis for analysis.

3.7. Methodology

The methodology that was used for this research is a mix between Quantitative Research and Qualitative Research. This is due to the fact that although the data available is plenty, it is not comprehensive. Therefore this research will collect, tabulate and analyses the data, and present it in a comprehensive way for the readers and future researchers.

3.7.1. Quantitative method

Quantitative approaches tend to relate to positivism and seek to gather factual data, addressing questions such as what, how much, and how many (Fellows & Liu 2008). According to Richardson et al. (2005) quantitative research involves the measurement of tangible variables and their interrelationships. Therefore, the data obtained using the quantitative method is quantified data, measurable using scientific techniques (Fellows & Liu 2008) and instruments (Creswell 2009).

Data from the quantitative method are normally analysed using statistical procedures (Creswell 2009). Analyses of the data yield quantified results and conclusions derived from evaluation of the results in the light of the theory and literature (Fellows & Liu 2008).

The quantitative method is also deductive in nature (Creswell 2009), as opposed to the inductive nature of the qualitative method. According to Fellows and Liu (2008), quantitative approaches adopt „scientific method“ in which initial study of the theory and literature yields precise aims and objectives with propositions and hypotheses to be tested.

The strategies of inquiry associated with quantitative research are survey research and experimental research (Creswell 2009). According to Salkind (2009), experimental method tests for the presence of a distinct cause and effect by controlling the potential sources of differences. However, controlling for the sources of differences for an abandoned construction project is not possible given the multitude of factors influencing the success of projects and it would be too costly and too time consuming to conduct even a single experiment.

According to Creswell (2009) survey research provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. It includes questionnaires and structured interviews. In a structured interview, questions are presented in the same order and with the same wording to all interviewees, and the questions are dominated by „closed“ questions as oppose to „open“ questions (Naoum 2007). Questionnaire is seen as more suitable than structured interviews because structured interviews are more costly and time consuming. Therefore it is not preferred due to resource constraint.

3.7.2. Qualitative method

Fellows and Liu (2008) explains that qualitative studies seek to go deep and to gain insights. Therefore, the results of qualitative studies tend to be detailed and hence rich in content and scope (Fellows & Liu 2008), and complex (Creswell 2009).

The qualitative method is also inductive in nature. According to Fellows and Liu (2008), the exploration of the subject is undertaken without prior formulations, the object is to gain understanding and collect information and data such that theories will emerge. Creswell (2009) states that the data analysis process is inductively building from particulars to general themes.

According to Richardson et al. (2005), the subjects studied in a qualitative research are intangible variables and phenomena (often behaviour). The subjects studied are described as complex situation, and social or human problem (Creswell 2009). Fellows and Liu (2008) state the subjects studied as the reason things happen as they do; events, processes

and structures; aspects of people's social world; people's assumptions, prejudices, etc., and the impact of these on behaviour and, thence, (organisational/project) performance.

The participant giving information on the subject studied may be an individual or a group (Creswell 2009; Fellows & Liu 2008). Different authors give various descriptions of the information given by the participant, i.e. verbal description or explanation (Richardson et al. 2005); meanings, experiences (often verbally described), and description (Naoum 2007); meaning the individuals or groups ascribe to a social or human problem (Creswell 2009); meaning which people attribute to events, processes and structures, people's perceptions of the world, people's assumptions and prejudices, and beliefs, understandings, opinions, views etc. of people (Fellows & Liu 2008).

Analysis of qualitative data involves the researcher making interpretations of the meaning of the data (Creswell 2009). Also, analyses of qualitative data requires a lot of filtering, sorting and other „manipulations“ to make them suitable for analytic techniques (Fellows & Liu 2008). For example, transcribing interviews and analysing the content of conversations.

Qualitative methods include direct and participant observation, videotaping of subjects, and document analysis (Richardson et al. 2005), historical methods (Salkind 2009), grounded theory, phenomenological research, and narrative research (Creswell 2009), case studies (Creswell 2009; Richardson et al. 2005; Salkind 2009), interviews (Richardson et al. 2005; Salkind 2009), and ethnography (Creswell 2009; Salkind 2009).

Interviews can be divided into structured, semi-structured and unstructured interviews (Naoum 2007), of which semi-structured and unstructured interviews conforms with the qualitative method in that subjectivity is allowed during questioning in order to gain emerging details from the interviewee. In a semi-structured interview, questions are not asked in a specific order and no schedule is used. The questions consist of a mixture of „closed“ and „open“ questions. In an unstructured interview, there is no set order or wording of questions, no schedule and the interviewer is not looking for the same information from each interviewee. Questions asked are mainly „open“ questions.

3.8. Questionnaire survey

After the potential causes of abandoned construction projects have been identified through literature review, it is followed by the questionnaire survey.

3.8.1. Questionnaire design

The questionnaire consists of 3 pages. The first page consists of a section for the respondents to fill out their contact details, and a section containing the researcher's contact details.

The questionnaire contains questions related to the respondent, i.e. whether the respondent has been involved in an abandoned construction project, the role of the respondent in the project, how many years of experience the respondent has in the project, the type of the project, and how the project was funded.

It also contains the questions about causes of abandoned construction projects identified through literature review. The respondents are asked to indicate in the appropriate place what he thinks could cause the abandonment of project. The questionnaire is included in Appendix 1.

3.8.2. Sample Procedure/Sample Size

Fellows and Liu (2008) classify the means of sampling into random sampling, judgmental sampling, and non-random sampling. Non-random sampling is further divided into systematic sampling, stratified sampling, cluster sampling, convenience sampling, and snowball sampling. Random sampling is carried out using random numbers, either from tables or from computer programs. Judgmental sampling is based on the judgement of the researcher which items of the population should form the sample.

The targeted respondents are from different areas of the construction industry, i.e. clients/developers, consultants, and contractors to ensure a comprehensive view will be obtained. A total of 1800 questionnaires were sent out by courier with a response rate of 10 %. Additionally, the researcher also sent out questionnaires to 300 personal contacts of which 200 were returned. A detailed breakdown of the respondents is given in the next

chapter on analysis of data. Generally, the 350 samples returned are sufficient. This is evident in factor analysis, whereby the 350 samples yield 160 samples from respondents with experience in abandoned projects which are used in the analysis.

3.9. Data analysis

The analysis of data involved both qualitative as well as quantitative method. The responses to the outlined questions on the causative and the impacts of abandonment adopted a qualitative approach.

The results of the open ended question and the transcript of the interviews were analysed using the methods for analysing open ended data (Creswell 2009). The data were grouped into themes/categories by means of assigning categories/labels/codes to segments of the data. This is followed by studying the interrelationship between the themes/categories.

3.10. Preliminary data

3.10.1. Issues about delayed construction projects

The delayed of construction projects has resulted in many adverse consequences to the economy, society and environment. Economically, it is a waste of useful resources. The consequences of delayed projects are far reaching as the construction industry plays a major role in the economy of a developing country like Rwanda. A typical construction project involves many trades and participants, who are linked with other upstream and downstream industries (Ng, 2009a). These include suppliers of construction materials, transportation companies, manufacturers of plant and machinery, etc. If a public project is being delayed, the economic impacts are never directly felt by the general public as they are absorbed by the government's reserves. However, very often there will be loss of opportunity for the public to benefit from the intended purposes of the projects (Bavani, 2009). **For private non-housing projects**, the consequences are mainly limited to a few project players, i.e. client, contractors, consultants, etc. Nevertheless, the affected parties may suffer devastating losses such as monetary losses, bad reputation, and even bankruptcies. For private housing projects, however, tens of thousands of house buyers are immediately victimised every year. The impacts on the house buyers are twofold: They

also suffer losses for being unable to reap the benefit from potential property value appreciation and rental collection (Chow, 2009).). Having been blacklisted, they are unable to buy another property unless they pay back their loans (Yip, 2009b). House buyers of delayed projects have often been left without any assistance from the developer and have to resort to the tedious process of forming a committee to deal with the developers and the authorities (Chan, 2009; Chow, 2009). There are some cases which have been dragged on for so long that some owners have even passed away before plan to revive the project is in place (Chan, 2009). Although occasionally settlements were reached between the developers and the house buyers, the settlement amount might be disproportionate to the actual losses suffered by the house buyers (Lim, 2009; Yip, 2009b). The buyers are often left with no choice but to reluctantly accept the settlement offered as they become financially stressed. For some revived projects on leasehold land, owners are left with less years remaining on the lease after many years of delayed (The Star Online, 2009a). All these have negative effects on the image of the country in the eyes of foreign property investors (Chang, 2009). Apart from house buyers, developers, banks, land owners and government may also be the victim. For instance, developers may suffer bad reputation and financial losses (Perumal, 2009a), banks suffer because of bad debts (Kong, 2009), while land owners suffer because their lands are stranded (Tan and Rajendra, 2009). Government may have to step in and public fund has to be utilised to revive delayed construction projects (Chang, 2009). The MHLG has to be burdened with the task of mediating between all the parties involved (Kong, 2009).

3.10.2. Causes of delayed of building projects.

Delayed building projects can be described as the project that has started at an earlier date, but which the construction work for one reason or the other has stopped and such are not limited to buildings alone; roads, industrial structures, bridges, factories, dams, electricity, communication projects and so on are equally on the list.

Studies have shown that a good number of building project initiated with good intentions are delayed at different stages of the design and construction process. Some reasons advanced by the Rwanda housing authority for failed construction projects are: incorrect

estimation; lack of available skilled personnel; inadequate planning; poor risk management; misunderstanding of the work requirement; poor quality control by regulatory agencies; corruption and communication gap among the personnel. Other factors are cost; the developer and the contractors; inability of clients to engage contractors or designers capability to do the work; failure on the part of contractors to obtain vital inputs such as materials, manpower and machines. Sees delayed projects as a project in which all activities are totally suspended.

Inconsistent government policies, lack of accountability, high level of corruption, incompetent contractors, non-availability of building materials, and lack of utilities or infrastructural facilities, wrong location and so on has been advanced as remote causes of delayed of building project by the Rwanda infrastructure ministry. Hence the ROKO construction, advocated that construction firms should inculcate operational, strategic, personal, technological, marketing and environmental strategies in order cushion the effect of financial predicament associated with project delayed.

The socio-economic effect of delayed projects is overwhelming when considering the huge amount of money and resources on the part of the client has been invested in building project.

3.10.3. Protection of buyers' welfare

One way is by helping themselves. There is no guarantee that doing some thorough background search on the developer before buying a property would help, but it definitely would not hurt. Buyers should try their best to minimize the probability of them falling victim to a delayed building project. When buying from a fairly new developer, the buyer must be very careful as the data shows that many projects that fail are by new developers.

The more secure way is having tighter enforcement and legislation. Through further investigation, this research will identify where the issue generally occurs in the process of development, and provide a possible solution for the matter.

3.11. Case studies

Projects are conceptualized and implemented with the primary aim of completion in time. Delay to the project is a failure to implement project management principles. However in certain cases the delay is from the primary stakeholder himself (refer case study 1). The aim of the case study approach is to evaluate live and/or completed projects which are undertaken in the Kigali city and understand the types of delay, reasons for the delays and measure to mitigate and eliminate the delays.

There are various types of delays to projects and having numerous reasons for every project. Also, every project is unique in its characteristics, priorities and value and benefits. Delay to projects is also a result of various factors related to that project and every delay in a particular project also has various factors and elements which require a detailed study and analysis.

A survey with some people may provide some insight into some types of delays for some type of projects and the reasons for those delays. It may not give the entire picture of delays and its reasons, implications and measures taken to mitigate delays for a particular delay or many delays for a specific project. Also, complete information related to the delays may not be available for various reasons which may again affect the analysis and the results.

Also, a survey is basically gathering information from various sources carrying out a theoretical analysis and deriving results and conclusions. A case based study is done on a live and/or completed project which evaluates the entire project and all factors that were responsible to the delay and all the mitigation or acceleration methods adopted to recover from those delays.

Since, these delays have actually taken place, the reactions and solutions would provide a clear idea as which of the theoretical solutions have been implemented or which of the theoretical solutions have failed to succeed.

3.11.1. Case study 1: Failure

The project Case study 1 illustrates the delays that affected the project and even after the planned completion of the project, the project ended up being on hold with a new stake holder and thus resulting in a failure as none of the objectives could be accomplished.

Case Study 1 is a project comprising of 3 multi storeyed buildings for medical sciences and all associated external and internal works in ULK/Kigali campus.

The client has appointed a project design and supervision consultant, a project management consultancy firm, an interior design firm and a contractor.

The delay due to the following which have resulted in the failure of the project to complete in line with the contract duration.

- 1) Delay in design finalization,
- 2) Delay in nominations of subcontractors
- 3) Delay due to lack of agreement between parties.
- 4) Delay due increase in cost due to late decisions
- 5) Delay due to abortive works as per the new requirements.
- 6) Delay due to change of the primary stake holder.

The contractor was interacting with the client, a number of design and supervision consultants. Also, the design for the project is not frozen, client is still making changes and have not frozen the project requirement details. This is an important reason and the project may be affected due to late finalization of design and requirements. Also, the inputs from a range of specialists ranging from interior designers and many others are required to allow the works to be done without any delay.

3.11.1.1. Delay in design finalization.

The finalization of the design for the hotel was kept pending till the hotel operator was finalized to incorporate their requirements. This delay in design finalization affected all the works including the shell and core finishes like the blockwork as the layout of the rooms in the hotel was itself pending finalization.

3.11.1.2. Delay due to new requirements

The owner of the project wanted new requirements as per their hospital specifications. Thus, the preliminary design prepared by the lead consultant and the subsequent design prepared by the interior designer were required to be modified as per this new requirement.

This resulted in a major delay as all the design works ,concept drawings and detailed drawings done till date was to be redone and this will involve additional time and cause an irrevocable delay.

3.11.1.3. Delay in nominations of sub consultants

The nominations of sub consultants was delayed as the design itself was delayed and any design sub consultants were subject to preliminary finalization of design. Also, sub consultants were not being finalized as their scope was not defined.

3.11.1.4. Delay due to lack of agreement between the client, consultant, sub consultants, designer and suppliers.

As the revised design was being prepared, the requirements of the client conflicting with the design of the lead consultant and the interior designer. The new requirements also required major changes to the structure of the building itself. This was strongly opposed by the lead consultant and the interior designer.

3.11.1.5. Delay due increase in cost compared to the budget due to late decisions.

As decisions regarding the structure were being made in line with the new design ,it was observed that these works were part of a provisional sum which was allocated to be utilized for these works.

The quotes received for the works were much higher than the budget. The late decisions resulted in an increase in cost and delay in taking the decisions affected the progress of the works.

3.11.1.6. Delay due to abortive works as per the new requirements.

The changes to the design resulted in abortive works. These abortive works required additional time for removal of existing works and redoing the same as per the new design. This resulted in further delay to the works as well as additional cost.

3.11.2. Case study 2: Success

This project is a success case study. This project succeeded in all its objectives even though there was a strict timeline, initial delay and other constraints. The recovery parameters of acceleration and mitigation of delays were widely deployed to eliminate all the delays and ensure the success of the project.

Case Study 2 is construction of hostels in Lycée Notre Dame de Citeaux: A project that has been successfully completed in spite of all delays encountered by successfully applying the mitigation and accelerations techniques.

The project milestones and objectives are listed down for a clear understanding of the various elements of the project.

The assessment of the project at the planning stage is done through risk analysis by identifying the major constraints that may arise in the project. Then the major success factors are enlisted to analyze the success rate of the project. Also, risks associated with constraints evaluated along with the risks associated with success factors to have a balanced view of all the probabilities Value planning is done by identifying stakeholders for the project. Then, the possible outcomes each stakeholder can want or get is identified and value added by all outcomes and rank the stakeholders.

3.11.2.1. Major objectives

The major objectives of the project were

1. Completion of 8 building blocks to allow fit out works by respective clients.
2. The completion of landscaping works by a nominated subcontractor.
3. The supply of permanent power to the project was an important objective.

3.11.2.2. Major constraints

- 1) The first major constraint was the limited time of 13.5 months from the start date to complete all blocks
- 2) Another major constraint was the dewatering problem due to close proximity to the sea and the areas to be dewatered.
- 3) The supply of power for the project including testing & commissioning.
- 4) Any changes required by the client/customer affecting the completion.

3.11.2.3. Major success factors

- 1) The major success factor is the commitment from the client to ensure that the project completes on time
- 2) The nominations and approvals by the client have been promised to be as per the program of works.
- 3) The major factor of the success is due to the expertise of the consultant and contractor in similar projects.
- 4) The contractor has the manpower and resources to achieve the required rate of progress.

3.11.2.4. Risk associated with constraints.

- 1) Due to the fast track nature of the project, unavailability of materials and equipment on time may affect the completion.
- 2) Massive requirements of resources from various contractors and their management would be a real challenge for coordination.
- 3) Any changes in power requirements from client / customer will affect the power on as procedures to be followed to provide additional requirement will have to go through the entire process again.
- 4) Any structural changes to the project during the construction will affect the project completion.
- 5) Any changes made for any long delivery items will adversely affect the project completion.

3.11.2.5. Risk associated with success factors

- 1) The commitment by the client to go slow on the project due to less than expected response may affect the project.
- 2) Any delay in nominations by the client due to increase in cost w.r.t the budget will affect the completion of the project.
- 3) The contractor may be having multiple projects and may not be in a position to deploy additional workers as per the requirement.
- 4) Any additional works or changes may not be agreed by the contractor in the same time duration and as per the same BOQ rates.
- 5) Price fluctuation in the market will make it difficult for the client & consultant to get a better deal when they would require changes.

CHAPTER 4.RESULTS AND DISCUSSIONS

This chapter covers the analysis of both the quantitative data obtained from the questionnaire survey and the qualitative data obtained from the questionnaire survey as well as the semi-structured interviews. Quantitative analyses cover the general characteristics of questionnaire respondents, ranking of the causes of abandoned construction projects. Qualitative analyses cover the results of the open ended question on solving abandonment of construction projects, which include the characteristics of the respondents, the suggested solutions, and also cause of abandoned construction projects voluntarily provided.

4.1. General characteristics of questionnaire respondents

A total of 1500 questionnaires were sent out by courier in two batches whereas 300 questionnaires were delivered personally (see Table 4.1). The first batch of 800 questionnaires was sent out on 25th of July 2019, and the second batch of 700 questionnaires was sent out on 09th of October 2019.

The total responses received for the first batch, second batch, and questionnaires delivered personally are 80, 70, and 200 respectively. The response rate for the courier questionnaires is 10%, while the response rate for the questionnaires delivered personally is 66.7%. Overall, there are 1800 questionnaires issued with 350 responses, giving an overall response rate of 19.4%. The following sections will describe the breakdown of the 350 questionnaire responses in terms of:

- 1) The experience of respondents in abandoned construction projects,
- 2) The roles of respondents in the projects,
- 3) The types of the projects, and
- 4) How the projects were funded.

Table 4.1: Response rates of questionnaire survey

	Total sent	Total responded	Response rate
First batch sent on 25 th of July 2019	700	70	10
Second batch sent on 09 th of October 2019	800	80	10
Total courier questionnaire sent out	1500	150	10
Questionnaire delivered personally	300	200	66.7
Overall questionnaire issued	1800	350	19.4

4.1.1. Experience of respondents in abandoned construction projects

The experience of the 350 respondents in abandoned construction projects are summarised in Table 4.2. The proportions of respondents who have experience in abandoned projects, almost abandoned projects, no experience, and those who have not provided information are 32.9%, 12.9%, 52.9%, and 1.3% respectively.

Table 4.2 Experience of respondents in abandoned construction projects

Experience of respondents	Number of respondents	Proportion
Abandoned project	115	32.9
Almost abandoned project	45	12.9
No experience	185	52.9
Not provided	5	1.3
Total	350	100.0

4.1.2. Roles of respondents in the projects

The roles of the 350 respondents in the projects are summarised in Table 4.3. The proportions of clients/owner, consultants, contractor/supplier, government officials, and others are 28.9%, 37.8%, 23.1%, 0.9%, and 9.3% respectively. The others group consists of one who bought over an abandoned project and revive it, one who is involved in project financing, one who is involved in project management, one house buyer, one estate agent, one who chose „others“ but did not provide additional details, two who are client/owner and consultant, four who are client/owner and contractor/supplier, one who is consultant and contractor/supplier, and eight who did not provide any information.

Table 4.3: Roles of respondents in the projects

Roles of respondents	Number of respondents	Proportion (%)
Client / owner	101	28.9
Consultant	132	37.8
Contractor / supplier	81	23.1
Government official	3	0.9
Others	33	9.3
Total	350	100.0

4.1.3. Types of the projects

The types of the projects of the 350 respondents are summarised in Table 4.4. The proportions of types of projects, i.e. residential, non-residential, civil work, special trades and others are 44.4%, 16.0%, 6.7%, 3.1%, and 29.8% respectively. The others groups consists of two mixed developments, 29 which comprise residential and non-residential, 10 which comprise residential, non-residential and civil work, four which comprise residential, non-residential, civil work and special trades, one which comprises residential, non-residential and special trades, nine which comprise residential and civil work, two which comprise non-residential, civil work and special trades, one which comprises civil work and special trades, and nine which information were not provided.

Table 4.4: Types of the projects

Types of the projects	Number of respondents	Proportion (%)
Residential	155	44.4
Non-residential	56	16.0
Civil work	24	6.7
Special trades	11	3.1
Others	104	29.8
Total	350	100.0

4.1.4. How the projects were funded

How the projects of the 350 respondents were funded are summarised in Table 4.5. The proportions of projects which were funded privately, publicly, jointly funded using private and public funds, and those which information are not provided are 71.6%, 7.6%, 16.4%, and 4.4% respectively.

Table 4.5 How the projects were funded

How the projects were funded	Number of respondents	Proportion (%)
Privately	161	71.6
Publicly	17	7.6
Jointly funded using private and public funds	37	16.4
Not provided	10	4.4
Total	225	100.0

4.2. Ranking of Causes of Abandoned Construction Projects

The ranking of the causes of abandoned construction projects shows the relative importance of each of the 41 potential causes identified from the literature, whereas Spearman's ranking correlations examine the general similarities of rankings of the causes of abandoned construction projects between different groups of respondents. These different groups of respondents are within five broader categories in terms of 1) the experience of respondents in abandoned construction projects, 2) the roles of respondents in the projects, 3) the types of the projects, and 4) how the projects were funded. The associations among rankings of different groups of respondents are verified at the 5% significance level.

4.2.1 Ranking

The causes of abandoned construction projects ranked by 350 respondents are depicted in Table 4.6. The causes ranked 1 to 5 seem to focus on financial issues, i.e. financial difficulties faced by the owner, financial difficulties faced by the contractor, unexpected bad economic conditions, inappropriate mode of financing project, and delays in interim payments. This is followed by causes ranked 6 and 7, i.e. inadequate project feasibility studies and incompetent contractors or subcontractors respectively. Subsequently, causes ranked 8 to 11 appear to focus on project management and administration problems, i.e. project control problems, inappropriate project planning and scheduling, bureaucracy and red tape within the project, and poor contract administration. Then this is followed by the cause ranked 12, i.e. inexperienced client/owner. Causes ranked 13 and 19 seem related to ineffective authorities, i.e. unfavourable government policy, and lack of cooperation from local authorities. Causes ranked 14, 15, 17, 18 and 20 appear to focus on legal and contractual matters, i.e. fraudulent practices and briberies, litigation, lack of appropriate dispute resolution method, faulty tender process, and inappropriate contract arrangements (traditional design-bid-build/design and build/management contracting/etc.). Cause ranked 16 is inappropriate pricing/incentives of services rendered by contractors or consultants.

Table 4.6 Causes of abandoned construction projects ranked by 350 respondents

Causes	Mean	Ranks
Financial difficulties faced by the owner	4.311	1
Financial difficulties faced by the contractor	4.004	2
Unexpected bad economic conditions	3.982	3
Inappropriate mode of financing project	3.778	4
Delays in interim payments	3.773	5
Inadequate project feasibility studies	3.680	6
Incompetent contractors or subcontractors	3.484	7
Project control problems	3.467	8
Inappropriate project planning and scheduling	3.431	9

Bureaucracy and red tape within the project	3.427	10
Poor contract administration	3.404	11
Inexperienced client/owner	3.373	12
Unfavorable government policy	3.338	13
Fraudulent practices and briberies	3.200	14
Litigation	3.196	15
Inappropriate pricing/incentives of services rendered by contractors or consultants	3.191	16
Lack of appropriate dispute resolution method	3.164	17
Faulty tender process	3.138	18
Lack of cooperation from local authorities	3.133	19
Inappropriate contract arrangements (traditional design-bid-build/design & build/management contracting/etc.)	3.053	20
Unclear lines of responsibility and authority	3.027	21
Problems of communication and coordination	2.982	22
Incompetent consultants	2.960	23
Poor quality control	2.956	24
Site acquisition problems	2.947	25
Negative impact of project towards society or environment	2.929	26
Inappropriate risk allocation among project team members	2.916	27
Shortage of site workers	2.880	28
Poor relationship among project team members	2.871	29
Unskilled/incompetent site workers	2.862	30
Ambiguities or mistakes in scope of work, specifications or drawings	2.822	31
Problems related to change orders/variation orders	2.809	32
Involvement of large number of participants of project	2.689	33

Lack of motivation of site workers	2.676	34
Relationship between contractor and labour (industrial relation)	2.649	35
Unavailability of materials and equipments	2.636	36.5
Poor safety management on site	2.636	36.5
Cultural clash among parties involved in project	2.609	38
Unexpected location difficulty	2.573	39
Adverse weather or acts of God	2.471	40
Difficulty of design and construction	2.120	41

4.3. Results of open ended question on solving abandonment of construction projects

Among the questions in the questionnaire sent out is an open ended question on how to solve the problems of abandoned construction projects. One hundred and twenty three responses have been received for this question, of which 69 respondents have experience in abandoned or almost abandoned projects, 51 respondents have no experience, and 3 respondents have not provided information.

The respondents have provided answers that can be classified into three categories:

- 1) General answers,
- 2) Answers specific to resolving already abandoned projects, and
- 3) Causes of abandoned construction projects. The detailed breakdown of number of responses for each of these categories is shown in Table 4.7 below.

Table 4.7: Experience of respondents and type of answers provided

Experience of respondents	Total responded to the open ended question	Types of answers		
		General	Specific to resolving already abandoned projects	Causes of abandoned construction projects
Abandoned or almost abandoned project	69	52	18	9
No experience	51	43	8	3
Not provided	3	None	3	None
Total	123	95	29	12

4.3.1. General answers

General answers are suggestions applicable both for the prevention and during the revival of abandoned projects. The answers can be broadly grouped into themes such as those concerning feasibility studies, finance, client/owner/developer, consultant, contractor, project team, contract, authorities, and others.

4.3.1.1 Feasibility studies

It is suggested that project feasibility studies must be carried out properly. They include economic and technical feasibilities. For economic feasibilities, there must be good cash flow projection. Economic feasibilities involve market survey on the pricing and type of products to suit market demands before launching a particular project. The developer should avoid inferior locality/land, which is crucial in resolving an already abandoned project. In conducting economic feasibility studies, allowance should be given for less favorable economic conditions. For resolving an already abandoned project, the cost worthiness should include the expenditure to settle disputes with parties concerned.

For technical feasibilities, there must be adequate geological survey of the development site. Also, the project must be receptive to changes due to site condition.

4.3.1.2. Finance

It is recommended that there must be proper financing of project both at the owner/client and contractor level. Construction companies must be financially strong and not rely too much on bank financing, such as bridging loan at the initial stage. There must be appropriate proportion of bridging and end financing. Over leveraging should be avoided.

Financial institution should be more careful in approving loans. Financial institution should help to resolve funding issues arising from unexpected circumstances. Financial institutions should be more vigilant in monitoring their financed project by engaging chartered surveyors to conduct audit for them.

There must be no delays in interim claims as well as interim payments. Interim payments not only include the client/owner paying the main contractor, but also contractors paying their subcontractors and suppliers, workers, and payments to all services rendered. It is also recommended that consultants should be paid reasonable fees and non-payment to consultants should be prevented.

4.3.1.3 Client/owner/developer

The client/owner must be competent and have experience. In particular the housing developer must be familiar with housing development. Besides it is also suggested that the developer must be trustful, sincere, responsible, and fully abide by all the guidelines spelt out in the Housing Development Act (HDA). In dealings with the consultants, clients without technical knowledge should refrain from giving unreasonable recommendations and ideas. Instead clients should pay more attention to advice given by consultants. Client/developer must focus on the project and be decisive, and must not keep on postponing decisions on the design and finishing. The need statement must be made clear to the consultants prior to designing.

4.3.1.4. Consultant

The consultants must be competent and committed, particularly the architect. The consultants should be honest with the client on whether a project is technically feasible, i.e. on the technical difficulties and risks. The consultants must ensure that all requirements for statutory approvals and achieving Certificate of Fitness (CF) are in place. Statutory requirements include the Uniform Building Bylaws (UBBL) requirements. Besides, the consultants should conduct more site visits in addition to the visits during site meetings.

4.3.1.5. Contractor

The contractor must be competent, have good track record, financially sound and know how to control their finance during construction. Contractors should make sure that materials and labour are sufficient for the project to finish on time. This includes both skilled and unskilled labour. Besides, contractors must possess equipment to carry out their work. In addition, there must be adequate technical knowledge among the subcontractors and site workers such as the ability to read and understand technical drawings. Contractors must also be honest and not cut corners. The contractor must also properly select good client/owner to work for.

4.3.1.6. Project team

The project team must be competent and motivated. A competent project team includes a strong and experienced management team. Good project management includes proper project planning, scheduling, monitoring, coordination and control. Project coordination involves coordination of all parties such as the owner, contractors, site workers, consultants and authorities. Therefore, an experienced site coordinator is very important. Project control includes tight financial control, cost control, quality control, and schedule control. Tight financial control involves strict monitoring of the project cash flow. There must also be safety awareness and good site management. Besides, the project management team must be technically sound as well as good at managing the sale of their products.

4.3.1.7. Contract

There must be good contract administration. Transparent contract administration is suggested. The contract must be clear and determined in terms of the scope of work so as to prevent variations. In other words, contract documents and drawings must be comprehensive. Besides, there must be proper tender and evaluation processes. There must be reasonable tender prices and tender must not be awarded to the lowest bidder. For public projects, the tendering process must be transparent, such as in an open tender. All in all, just and fair deals are emphasised. With regard to purchasers, it is also suggested that the sales and purchase agreement must be more protective of the purchaser's interest.

4.3.1.8. Authorities

First of all, there must be political will both at preventing and resolving abandoned projects. There must be cooperation from the authorities instead of corruption. There must be more government involvement through legislation. In particular, there must be more legislation to protect purchasers. For this, the government can implement the Build Then Sell concept of housing development.

There must also be proper enforcement by the authorities. The authorities should make sure that developers are competent and financially sound. This could be achieved through more stringent issuance of license to developers. The authorities must strictly enforce to blacklist developers or any parties who are responsible for the abandonment of projects. The government should prosecute those who intentionally abandon projects for personal gains.

Also, there must be efficient dispute resolution, such as a quick arbitration process. Any financial dispute must be overcome to ensure smooth progress of the project. In resolving an abandoned project, the arbitration process must aim for a win-win situation for all parties concerned.

4.3.2. Answers specific to resolving already abandoned projects

Answers specific to resolving already abandoned projects can largely be grouped into those involving the role of the authorities, those involving restructuring and refinancing, and others comprised of general and specific suggestions.

4.3.2.1. The role of authorities

It is suggested that the government should take over abandoned projects or take the lead to solve the problems. It is pointed out that all parties involved in an abandoned project must provide a clear history of the project. One suggestion for this is for the government to engage liquidator / legal team to assess each project and identify the original consultant team responsible for the design and supervision of work. The consultant team is to submit a report on the status of the project inclusive of scope of remaining work with cost estimate. Then, the project should be retendered to good contractors.

The government should provide financial assistance to revive abandoned projects. The government should also provide incentives and benefits to the company reviving the project. Local authorities should assist by extending any expired building plans and waive any fees incurred. Authorities may also need to waive certain other requirements to assist. Also, the government should advertise the abandoned projects via internet, newspapers, etc. so that interested parties can know and get involved.

4.3.2.2. Restructuring and refinancing

It is urged that the project team should be restructured. This may involve seizure/divesting. The original developer should sell off the project to a more competent and financially strong developer. Alternatively, the developer could joint venture with other developer to revive the project. Another suggestion is to invite new investors to refinance the project. The developer must not be too greedy when forming a joint venture with an investor to revive the project. If the project is to be tendered out it should be at a big discount. It is also recommended that banks should take over an abandoned project. However, one respondent cautioned that re-tendering of the project must be avoided because it will incur more cost.

An abandoned project should be adequately funded in order to be revived. The developer should seek financial assistance. The developer can apply for the working loan from a special government fund for abandoned housing projects. An abandoned project should also be refinanced and financial institutions should allow for this. The interest charges from bank loans should be capped.

4.3.2.3. Others

There must be a steering committee formed to handle an already abandoned project. A public accounting firm can be appointed to act as project manager for the purpose of the rehabilitation work, assisted by the other related parties of a project. There must be renegotiation with house/retail buyers to seek new solutions. Purchasers may have to foot out extra money to complete a project. Any legal issues should be resolved. In resolving an already abandoned project, the development mix of the project can be changed to better suit the prevailing market demands. Building use can also be changed.

4.3.3. Causes of abandoned construction projects

Among the causes of abandoned construction projects suggested are financial difficulties faced by the client/owner and contractor. This may be related to mismatch of funding versus cash flow for housing project. One respondent suggested poor cash flow planning by contractor in the private sector. Non-payment by contractor to sub trades and suppliers result in delay, shoddy works and defaults. Financial difficulties may also be related to other causes suggested like economic crisis, sudden rise in the price of materials such as during 2008 when there were intense constructions in China in preparation for the Olympics, and poor market feasibility for institutional and public projects. It is also pointed out that the authorities are not strict enough in approving construction projects to ensure that the projects are financially sound.

Also highlighted is fraud by developer of housing project and abuse of government incentives for small contractors. Weaker contractors will default and cause projects to be abandoned. Related to fraud, abandoned government.

Projects are also the result of excessive layers of subcontracting, lack of transparency and incompetency of contractor. The scenario could be the subcontracting of the main works, i.e. the main contractor does not do the main works of the contract, and the payment given to main contractor does not go to the work contractor. One respondent gave an example whereby a state government project was awarded to a main contractor that wholly sub-let the project with a lower price to another contractor which was inexperienced. This resulted in the project being abandoned.

Others mentioned include mismanagement and inefficient management team. Particularly, unrealistic expectation of client is given. Another related cause given is undecided client which results in change of scope and subsequently variations, and abandonment. Two examples of abandoned public project are also given. Mega project like the “scenic bridge” (The Star Online 2006) is abandoned due to international politics, and the Broga incinerator plant is abandoned due to public perception and opinion.

4.4. Discussion of results

This chapter starts with the discussion on the general adequacy of both the quantitative and qualitative data in complementing the lack of available literature. This is followed by the discussion on the ranking of potential causes of abandoned construction projects. Then, the comparison of causes of abandoned construction projects between results of literature review, open-ended question of questionnaire and semi-structured interviews is presented. Lastly this chapter presents the interpretation of the underlying factors extracted from factor analysis with the results of literature review, open-ended question of questionnaire and semi-structured interviews.

4.4.1. General adequacy of data in complementing the lack of available literature

Now that the data has been obtained, analysed and presented, first of all it is important to discuss how well the data obtained complement the lack of the available literature. At the onset of this research, literature review on the causes of abandoned construction projects found that the available literature on the subject matter is lacking because they focused mainly on housing projects; the sources of literature consisted of mostly news article, a few unpublished theses and conference papers; the methodologies of the unpublished theses lack the ability to generalise the findings to represent the whole construction industry.

4.4.2. General adequacy of quantitative data

In terms of the general characteristics of the questionnaire respondents, there are 350 useful responses received which turns out to have fair representation of different groups within the construction industry. Almost half of the respondents, 160 have experience in an abandoned or almost abandoned project, while 185 others have no experience. While those who have experience may base their answers on true experience, it is believed that the opinions of those who have no experience are not less important. Those with no experience may be very good in construction so much so that they have successfully avoided abandonment of construction projects they were involved, and their opinions may consist aspects of project management that is important to avoid abandonment of projects. In terms of the roles of respondents in the projects, there is a fair mix of client/owner,

consultant and contractor/supplier at 28.9%, 37.8%, and 23.1% respectively, though it is slightly dominated by consultant. The percentages of non-residential, civil work, special trades and others are 16.0%, 6.7%, 3.1%, and 29.8% respectively. It should be noted here that the others group comprise a large proportion at 29.8%, and a high percentage of projects within this group are a mix of residential and non-residential projects. Therefore, this also increases the representation of non-residential projects. In terms of funding of project, the majority are privately funded at 71.6%.

4.4.3. General adequacy of qualitative data

The qualitative data in this research also seems to be adequate judging by the respondents of the open-ended question in the questionnaire survey as well as the semi-structured interviews. There are 350 respondents to the open-ended question on suggesting solutions to the problems of abandoned construction projects, of which 160 have experience in abandoned or almost abandoned projects. Even though the question is on suggesting solutions to the problems, twelve of the respondents have provided opinions on the causes of abandoned construction projects, of which nine have experience in abandoned or almost abandoned projects. As for the semi-structured interviews, the ten interviewees comprised architects, developers and property consultants. Most of the qualitative data obtained applies for both residential and non-residential projects as the questions asked are non-specific, i.e. on construction projects in general. Therefore this also complements the available literature that focused mainly on residential projects.

4.4.4. Comparing causes of abandoned construction projects between results of literature review and open-ended question of questionnaire

Qualitative results on the causes of abandoned construction projects have been obtained through three methods, i.e. literature review, open-ended question of questionnaire and semi-structured interviews. The data obtained from the open-ended question of questionnaire was unexpected as the question was on suggestions to solve abandonment of construction projects but twelve of the respondents were voluntary. This section seeks to

examine the similarities and differences between the causes of abandoned construction projects obtained through the three methods.

Even though the results are qualitative in nature, a rough idea of the contribution of each method could be obtained by comparing the quantities of text between the results from each method.

The causes of abandoned construction projects from the literature review are categorised into

- 1) Mismanagement,
- 2) Unfavourable government policies,
- 3) Inefficient public delivery system, and
- 4) Unfavourable economic conditions. The causes of abandoned construction projects from the open-ended question of questionnaire are organised into paragraphs according to themes related to

- 1) Financial matters,
- 2) Fraud, and
- 3) Others.

On the other hand, the themes that have emerged from the open-ended question of questionnaire show a marked increase of internal issues, i.e. more than two thirds of the issues are related to financial matters as well as fraud. The reasons for this may be the lack of previous research and that most of the sources of information prior to this research are news articles that could only discuss what is apparent and superficial, and the methods used in this research have been successful in discovering many points which are hidden from the non-professionals.

Beneath the themes that have emerged from the three methods lies detailed information characteristic of the qualitative method. Due to the subjective nature of qualitative results,

the results obtained from each method does not exactly equal or differ from the others in terms of the level of detail as well as the points. In terms of the level of detail, the results of the semi-structured interviews are the most detailed, followed by the results of the literature review and the open-ended question of questionnaire. In terms of the points, it is found that there are common points and exclusive points among the results of the three methods. The common points may have higher credibility than the exclusive points as they are the same points discovered from different methods.

4.4.5. Common points

Having common points found from the different methods does to a certain extent lend credibility to the common points. Therefore, this section provides a summary of the common points. Common reason for tight budget is inadequate funding. Common reason for unhelpful financial institution is the difficulty of obtaining bridging loan from financial institution when a project fails to meet a certain sales percentage, which according to various sources, ranges from 50 to 80% of sales. Bridging loan is supposed to help a contractor continue with construction when the sales percentage is less than expected, but financial institutions are not keen in taking more risk by imposing a high criterion.

In fraudulent practices, common point is found related to siphoning of money out of a project. Whereas, in the role of government, some of the common points are found related to the lack of control and monitoring by the government in general, while others are specifically related to

- 1) Burdensome requirement to build affordable housing,
- 2) Ineffective and lack of legal remedy against errant developers, and
- 3) The sell then build system.

Common problem of burdensome requirement to build affordable housing is the low number of purchasers within a certain lower income category that the affordable housing can only be sold to. Common problem of ineffective and lack of legal remedy against errant developers is the inability to prevent errant developers who have been blacklisted to use proxies to start new developments. The sell then build system as a cause from the

interviews is implied from a few recommending the opposite system, i.e. the build then sell system.

4.4.6. Exclusive points

The exclusive points are far more detailed than the common points. In order to avoid the redundancy of restating most of the results of the qualitative methods, perhaps it is sufficient to state here that the exclusive points are found related to all the three main themes of the results, i.e. 1) problems affecting cash flow and viability, 2) fraudulent practices, and 3) the role of government.

4.4.7. Interpreting the underlying factors extracted from factor analysis with the results of literature review and open-ended question of questionnaire

The seven underlying factors extracted are

- 1) Site worker and related problem with contractor,
- 2) Project teamwork and ethical issues,
- 3) Design, sourcing of resources and acts of God,
- 4) Project planning, monitoring and controlling,
- 5) Contract administration,
- 6) Financial management, and

7) Inexperienced client/owner. However it has been found in the process of interpreting the underlying factors with qualitative results that the initial apparent name of the factors number 1 and 3 could be further refined into underpricing of contract and disruption of payments to contractor" and uncertainties respectively. For factor number 1, this results in the shift of the blame from site worker and contractor to the developer. This again justifies the triangulation method chosen for this research. Consequently, five of the factors are directly attributed to the owner, i.e. factors number 1, 4, 5, 6 and 7, while the remainders are partially related to the owner, i.e. factors number 2 and 3.

4.4.8. Summary

In terms of general adequacy, the quantitative and qualitative data are found to be adequate in complementing the lack of available literature. For example, both the quantitative and qualitative data now have representation of non-residential projects. The ranking of the causes of abandoned construction projects has helped to shed some light onto the causes of abandoned construction projects as a significant proportion of the top 20 causes either weakly correspond with or are not found in the literature.. In comparing causes of abandoned construction projects between results of literature review, open-ended question of questionnaire and semi-structured interviews, the results from semi-structured interviews and open-ended question of questionnaire show a marked increase of internal issues. Common points have been discovered from the different qualitative methods. The commons points may have higher credibility, and they are found related to:

- 1) Poor estimation of sales,
- 2) Cost overrun,
- 3) Tight budget,
- 4) Unhelpful financial institution,
- 5) Siphoning of money out of a project,
- 6) lack of control and monitoring by the government,
- 7) Burdensome requirement to build affordable housing,
- 8) Ineffective and lack of legal remedy against errant developers, and
- 9) The sell then build system. The underlying factors extracted from factor analysis have been interpreted with the results of literature review and open-ended question of questionnaire. All in all, the owner has been found to be mainly responsible for the abandonment of construction projects, followed by the role of government regulations, and that the triangulation method of crossing the results of quantitative methods with the results of qualitative methods has produced synergistic results.

CHAPTER 5.CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The aim of this work has been to investigate the causes of project delay of building industry and their remedial measures. To achieve this aim, three objectives have been outlined, i.e.

1. To identify the major causes of delays in construction project.
2. To identify the root sources of construction delay in construction projects in Rwanda.
3. To identify the effects of delays in construction project

The issues surrounding the problems have been reviewed in Chapter 1. The issues cover adverse consequences to the economy, society and environment. Perhaps, the most severely affected victim is house buyers, followed by contractors. Despite the issues, there has been lack of research on the subject matter. Existing literature focused mainly on housing projects; the sources of literature consisted of mostly news article, a few unpublished theses and conference papers; the methodologies of the unpublished theses lack the ability to generalize the findings to represent the whole construction industry.

Existing research on the causes of the problems have been reviewed in Chapter 2.

Based on the review of related literature, the factors which influence projects abandonment can be categorized as follows: Economic, financial, legal, managerial, system based factors. Other variables/factors are unforeseen risks, inexperienced client/owner, fraud and corruption, develop misuse of deposits, oversupply, developers winding up the business, conflicts and squabbles among stakeholders and nonconformance with construction specifications. Legal issues such as obtaining development approvals and licenses have been recognized as major contributors to abandoned housing projects. Bad reputation and lack of confidence on developers in the housing sector. The identified factors have socio-economic and environmental implications

The causes of abandoned construction projects have been investigated via the quantitative and qualitative methods together to achieve synergy. The qualitative method has produced the following results:

1. The causes of abandoned construction projects from the open-ended question of questionnaire as presented in Chapter 4. This is a short, unexpected but informative result. The themes that have emerged are

1) Financial matters,

3. The common causes of abandoned construction projects discovered by comparing the results of literature review and open-ended question of questionnaire. The results are presented in Chapter 5. The common points may have higher credibility, and briefly they are found related to:

1) Poor estimation of sales,

2) Cost overrun,

3) Tight budget,

4) Unhelpful financial institution,

5) Siphoning of money out of a project,

6) Lack of control and monitoring by the government,

7) Burdensome requirement to build affordable housing,

8) Ineffective and lack of legal remedy against errant developers, and

9) The sell then build system

5.2.Recommendations

The following recommendations are advocated based on conclusions drawn from the analyzed factors. In the management of potential sources of abandonment, due consideration should be given to all the issues raised in the research questions without prejudice to the above statement, consideration and weighting of causative factors of abandonment should be skewed more towards fund related and environmental issues. Weighting the factors of issues on lack of organized work program, failure of members of the construction/development team to delivery could be assigned less in an analytic equation of the causative consequences of abandonment of project in the research locations.

REFERENCES

Adeleke S.A,2005 “Abandonment of Federal Government Low-CostHousing Estate”, Anunpublished HND project submitted to Departmentof Building Technology, Federal Polytechnic, Offa,.

Adebisi, Ojo and Alao (2018) have reported that cost overturn remain a major problem in both developed and developing countries.

Bavani, M. (2009, June 2).Delayed Jelatek fire station now an eyesore. The Star Online. Retrieved December 2010.

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

Ibrahim’s (2006) study is based on literature review, interviews and case studies; Whereas, Rusli’s (2006) study is based on literature review and interview with the Ministry of Housing and Local Government

Khalid (2005), Ibrahim (2006) and Rusli (2006) have done similar researches, but they have only focused on housing projects. Khalid (2005) has proposed to investigate the causes from an institutional perspective.

APPENDICES

Appendix 1) Questionnaire

Dear Respondent,

I, IRYUMUGABE Vincent de Paul a student at Institut Supérieur de Technologies, department of civil engineering and management. As part of my requirement for the Degree award, we have to present a dissertation. The study is all about, *“Causes of project delays of building industry and their remedial measures”* a case study of Kigali city Rwanda.

I am now on field to collect information for this dissertation and you are kindly requested to respond to the various questions in the questionnaire attached. Your responses will be treated with great confidentiality. I would be grateful for your cooperation in this regard.

Thank you.

INSTRUCTIONS

- ✓ Please provide information about yourself by completing the following questions.
You can pick more than one box where appropriate
- ✓ Where you are going to formulate the answer in your own words, please use the reserved space.

a. Identification of respondents

1. Gender: Male Female

2. Marital status: single Married widow

3. Level of education:

- Secondary year
- Bachelor's degree
- Master's degree:
- PhD degree:

- Other (Please specify): _____

4. Age: 18-25 26-35 36-45 46 -55 56-65 Above

B. Questions concerning the above topic

1. Have you been involved in a project that was :

- Abandoned
- Almost abandoned
- I have never been involved in an abandoned or almost abandoned project

2. What are the causes of building delayed? Give two(2) or three(3) reasons

.....
.....
.....
.....

3. What was your role in the project

- Client/owner
- Consultant
- Contractor/Supplier
- Governmental official
- Others/Please specify

4. How many years of experience do you have in construction industry?

.....Years

5. What was the type of project

- Residential
- Non- residential
- Civil work
- Special trades

6. How was the project funded?

- Privately
- Publicly
- Jointly funded using private and public funds

7. What are the effects that constitute building delayed?

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8. How the occurrence of cans delayed building projects in Rwanda and in world be prevented and the buyers welfare protected?

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.....
.....

Thanks for your cooperation