ASSESSMENT OF CAUSES OF CONSTRUCTION PROJECTS DELAYS AND THEIR IMPACTS ON COSTS IN RWANDAN PUBLIC INSTITUTIONS. A CASE STUDY OF RTDA, EWSA AND GICUMBI DISTRICT

A Dissertation submitted to the University of Rwanda, College of Business and Economics in Partial Fulfillment of the Requirements for the Award of a Master Degree of Business Administration (Project Management option)

SIBOMANA Emmanuel

REG NO: 215032102

OCTOBER 2018

ABSTRACT

Construction industry in Rwanda is facing challenge of delay during executing construction work, this has attracted many researchers and different practitioners to investigate the causes of delay and analyze the overall effects on construction project. The aim of this research was to assess the causes of construction projects delay and their impacts on cost in Rwandan Public institutions in Rwanda where researcher selected three construction projects from three different public institutions which had delayed for long period and these construction projects were construction of water supply system and reservoir (EWSA) that had delayed for 496 days, construction of maternity ward at Rutare health center (Gicumbi district) that had delayed for 721 days and construction of access road to Rusizi III hydropower that had delayed for over 700 days (RTDA), The information of these delayed projects researcher gathered them from Auditor General report 2016. The information gathered from these 3 institutions has shown that 115 Consultants, owners and contractors were involved on these delayed projects and researcher has taken them as population of the study where sample has been determined by using Yamane formula and the 89 respondents have been determined as sample size. Researcher developed questionnaire contained 38 causes of construction project delays and their impacts on cost in Rwandan public institutions, that were grouped into 4 categories (Owner related causes, contractors related causes, consultants related causes and external factors related causes) and to knew the views of respondents about cost increase when delays occur, researcher has included section of effects on questionnaire containing 6 effects of delays. 71 respondents (79.7%) have returned questionnaires and 20.3% have failed to do so. The data collected have been analyzed by using statistical methods and the findings of research show that the 8 most important causes of delay that impacts the cost of projects are lack of fund by owner to finance project, poor planning, controlling , scheduling and monitoring of the project by owner, increase of material cost, choosing contractors who bid at lower price, inflation, experience of consultants not enough compared to the scope of construction projects, lack of experience by contractors and lack of skilled workers for project implementation. Respondents revealed that when these delay occur, they affect costs of the projects and they bring conflicts between owners of the projects and contractors. Based on the findings of research, recommendations have been given to minimize the causes and effects of delays in construction projects delays in Rwandan Public institutions and room for future research have been suggested by researcher.

DECLARATION BY THE CANDIDATE

I, SIBOMANA Emmanuel, declare that this research project entitled ‘’ the assessment of causes of construction projects delays and their impacts on costs in Rwandan public institutions case study of RTDA, EWSA and GICUMBI DISTRICT’’ is my original work and it has not presented or submitted to any other University

Signature……..

Date……/……/2018

SIBOMANA Emmanuel

APPROVAL SHEEET

The research project entitled ‘’ the assessment of causes of construction projects delays and their impacts on costs in Rwandan public institutions. A case study of RTDA, EWSA and GICUMBI DISTRICT” written and submitted by SIBOMANA Emmanuel in partial fulfillment of the requirements for the degree of Masters in Business Administration in Project Management is hereby approved

Signed ……

Dr. MUSEKURA Celestin

Supervisor

Date ……../October/2018

DEDICATIONS

With great pleasure, I dedicate this research project

To my wife IYAKAREMYE Josiane

To everyone who support me during research period.

Table of Contents

LIST OF TABLES

LIST OF ABREVIATIONS

EWSA: Energy Water Sanitation Authority

RTDA: Rwanda Transport Development Agency

PAC: Public Accounts Committee

SPPS: Statistical Package for Social Sciences

UR: University of Rwanda

ACKNOWLEDGEMENT

This work would not have been done without the assistance and contribution of hard working people who assisted and contributed to my research and solve problem related to the research. First of all, I would like to thank the Almighty God for giving me a healthy life and the determination to do hard work. I thank the staff and Lecturer of University of Rwanda for all they have done for me.

I would like to thank my supervisor Dr. MUSEKURA Celestin for his advice and help in the guidance and supervision of work despite difficulties of work

Thank you very much indeed, may God almighty bless you all

I. BACKGRAUND OF THE STUDY

Construction industry is one of the main sectors that contribute to the economic development of the country. Many construction projects experience extensive delay by exceeding planned time and cost. The success of construction project is measured in term of time, cost, quality and safety.

According to (Muhammed, January, 2015), countries are involved in construction of roads, dams, airport runways but in developing countries, government invests more in road construction and according to him, developing countries spend more on their national budget to the road construction.

To (Wells.J, 1984) construction is defined as an activity of creating physical infrastructure and its related facilities. This means that it encompasses all civil engineering works such as housing, as well as maintenance and repair of existing infrastructures.

For (Culas, 25th June 2014) , construction project delay is the late completion of project work compared to the planned schedule or to the time agreed in the contract.

According to (Nabil Al-Hazim and Z. A.Salem, 2015) cost overrun is an increase of the cost caused by unexpected events during construction process which may causes the actual cost of construction project being greater than planned cost.

Many scholars have conducted research about the causes and effects of government construction project delay, (Nabil Al-Hazim and Z. A.Salem, 2015) conducted research on delay and cost overrun in road construction projects in Jordan, the study was carried to the road constructed from 2000-2008 , researchers developed questionnaires containing 19 causes of delay which affects cost of project and findings show that the two main reasons of cost increase in Jordan road construction was terrain condition and weather conditions. Also (Muhammed, January, 2015) conducted research about causes of delay and their effects in construction project in Kurdistan region, and the findings of his research showed that the main causes of delay in Kurdistan construction project was material price increases and weather condition, his research show that delay of these construction projects lead to the increase in cost of project and to the total abandonment of some project.

Research conducted by (Owolabi James D and Lekan M, 2014) on causes and effects of delay on project construction delivery time in Nigeria, this research was carried in Nigeria, the sample was selected from 150 professionals who have experiences of 10 years and above in construction projects , questionnaires were developed containing 15 major causes of delay, and the findings of this research show that three main causes of delay were lack of fund for project financing, change in drawings and lack of communication among parties of the project and these delays have affected the project in different ways but the major effects of causes of delay in construction project in Nigeria were Time overrun, cost overrun and wastage and under-utilization of project resources.

The study conducted by (Luu Truong Van, N. Minh Sang , February, 2015) on a conceptual model of delay factors affecting government construction projects in Vietnam, where researchers identified 31 causes of delay for government construction projects and the findings show that three main causes of delay for government construction projects in Vietnam were lack of information exchange between the parties of the project, incompetent owner of the project and incompetent supervision of consultant, the findings of this research also have mentioned two causes which does not contribute more in the delay of construction project in Vietnam and these were price fluctuation of construction materials and natural disasters.

A study conducted by (Mohammadsoroush & LEED AP, March 2017) to Investigate the causes of delay in United State construction projects where 30 factors causing delays were developed and the findings show that among these 30 factors, the most 5 factors causing delay in construction projects in United State were Excessive change orders by owners during construction process, Time consuming during decision making by the owner, design error, delay in approving design documents by the owner and errors in contract documents, according to this findings from this research, the main delay factors were associated to the owner of the project.

Research conducted by (Le- Hoai, Lee & Y.D, 2008) on the causes of delay in construction project in Vietnam which lead to the cost overruns and the findings of his research show that there are three factors which lead to the cost overruns and these factors were the increase in cost of materials due to the inflation, inaccurate quantity take-off and increase in labor cost due to the environmental restriction.

Research conducted by (Olomalaiye, Holt and Harris, 1997) on the factors influencing construction projects cost overrun in Indonesia, this study was carried on 31 construction projects in Indonesia and the findings show the majors factors contributing to the cost overruns were from contractors' point of views, inaccuracy material take–off and cost increase due to the environmental restriction.

The study carried out by (Kaliba,C ,Muya,M&Mumba ,K , 2009) on cost escalation and schedule delays in road construction project in Indonesia and the findings show that there were eight factors of delay that contribute to the cost overrun of the project and these factors are weather condition, change in scope of the project, environmental protection, mitigation of cost, schedule delay, strikes, technical challenges and inflation.

By looking on the research conducted by different researchers, factors contributing to the construction project delay differ from one country to another and their effects on project cost are not homogeneous, causes of construction project delay in developing countries differs from those of developed countries and even in developing countries causes of construction project delay are not the same, the aim of this research is to assess the causes of construction project delay and their effects on cost in Rwandan public institutions. This study will be conducted in three different delayed projects reported by Auditor General of state Finance in his finance report of 2016 and these project are construction of maternity ward at Rutare Health center that had delayed for 721 days (Byumba District), at RTDA, construction of access road to Rusizi III hydropower dam that had delayed for over 700 days and at EWSA, contract for construction of water supply system and reservoir that had delayed for 496 days. The reasons which pushes researcher to choose these projects is because the report of Auditor general 2016 has mentioned these projects as projects which had delayed for long period and another reason is because these projects are most important projects for economic development of country.

I.1 PROBLEM STATEMENT

Construction industry in Rwanda has significant importance to the social – economic development of country since it is source of employment to the skilled, semi- skilled and unskilled people. Road

construction facilitate the easy access to the markets, stimulating agricultural production, hospital construction, schools' construction, airport construction and hydropower construction contribute to the improvement of population welfare. Construction activities consist of creating new infrastructure, rehabilitation and maintenance. Construction industry contributes significantly towards the country's gross domestic production and the sector also provide employment to the country's work force more than 50% of the employment so created are in the unskilled labor market, resulting in capacity building. (MININFRA, August,2009)

In the mid of 1980 and 1990, the government of Rwanda in its construction policy have adopted some measures to solve problem encountered by construction project in both public and private institutions and these measures are training of contractors before and in- the- job training, making contract available when is needed, introducing quick payment methods to solve problem of lack of funds, to promote labor based contracting, to equip contractors through plant hire arrangement by the public sector, improving the supervision capacity of contracted work by ministry staff and increasing recognition of interest in the national construction project by financial institution and insurance companies. (MININFRA, August,2009)

(Musirikare M.& Julius Warren Kule , 2016) conducted research about the delay and cost overrun risk in construction projects undertaken by Gasabo District from 2009- 2012, the objective of their studies was to assess the effects of time to the cost of the project and the findings of their research showed that 65.7% of public construction projects implemented during the period of 2009-2012 delayed at rate of 58% of their expected completion time and 52% of these projects suffered cost increase of 15.9%. In their study, they assess the effects of delay on cost overrun but they didn't assess the causes of delay and it would be better to access the causes of construction project time overrun before the assessment of the effects of time overrun on the cost of construction project.

Ministry of Justice said that those who were responsible for delayed and abandoned projects should prepare a report showing the causes of such losses to the government (NTIRENGANYA, 2017)

Permanent secretary at the Minister of Justice said that "Delayed and abandoned projects always are associated with additional cost and money used for project are from taxpayer and there is no value of money when project are delayed or abandoned'' (NTIRENGANYA, 2017)

The government of Rwanda has put more effort to punish those who uses government funds in wrong way by establish PAC (Public Account Committee) to investigate those who contribute in wastage of government resources as mentioned on the report of Auditor General (Musoni, 2011) but still the problem of misuses of government resources remain there and even the government of Rwanda introduces e-procurement to avoid any mistake which can take place in public procurement (NTIRENGANYA, 2017) , but the report shows that there are still some contractors who abandoned their project after being paid and requires government to reinvest to perform the project . (Auditor General, 2017).

Despite the effort of government of Rwanda of establishing construction policy, its effort on dealing with some leaders in public institutions who misuse government funds during project implementation (construction project or others project) and the study conducted by different researchers, the Government of Rwanda is still facing the problem of delayed and abandoned projects. According to the report of Auditor General of State Finance of 2016, from 2013/2014, 2014/2015 and 2015/2016, the government of Rwanda faced the problem of 99 Projects worth of 95 billion Rwandan Francs which has been either delayed or abandoned, This report shows some construction project which have been delayed for long period and these are construction of maternity ward at Rutare Health center delayed for 721 days, at RTDA, construction of access road to Rusizi III hydropower dam had delayed for over 700 days, at EWSA , contract for construction of water supply system and reservoir was delayed for 496 days (NTIRENGANYA, 2017)

Based on the above measures and policies initiated by Government of Rwanda to solve all problems which can take place in construction industry in public and based on the report of Auditor General State Finance of 2016 Showing that there are still delayed and abandoned construction projects in public institutions in Rwanda, a researcher wants to conduct a deep study about the causes of construction project delays in Rwanda and to assess its impacts on cost of the projects and case study will be 3 construction projects from public institutions in Rwanda mentioned in Auditor General Report of 2016 as construction project delayed for long period.

I.3 RESEARCH OBJECTIVES

This research has both general and specific objectives

I.3. 1 GENERAL OBJECTIVE

The general objective of this study is to assess the causes of construction project delays and its impacts on cost in public institutions in Rwanda.

I.3.2 SPECIFIC OBJECTIVES

I. To assess the causes of construction project delays in RTDA, EWSA and GICUMBI DISTRICT

II. To assess the impacts of construction project delay on cost in RTDA, EWSA and GICUMBI DISTRICT

III. To formulate necessaries recommendations to avoid or minimize causes of construction project delays and their effects on cost in Rwandan public institutions.

I.3.3 RESEARCH QUESTIONS

I. What are the causes of construction project delays in RTDA, EWSA and GICUMBI DISTRICT

II. How does construction project delays affects the cost of the project in RTDA, EWSA and GICUMBI DISTRICT

III. What are the necessaries recommendations that should be formulate in public institutions to avoid or minimize the causes of construction projects delay in Rwanda?

1.4 IMPORTANCE OF THE STUDY

The research findings of this study of assessment of causes of construction project delays and its effects on cost I public institutions in Rwanda will be useful to different bodies such as government institutions, policymakers and academicians.

1.4.1 GOVERNMENT INSTITUTIONS

This research is being conducted in public institutions to investigate the causes of construction project delay and its effects on cost in public institutions in Rwanda, findings from this research will assist government of Rwanda to improve planning process, contracting terms, supervision of

its constructions projects to minimize the risk of delay which can lead to the cost increase.

1.4.2 TO THE POLICYMAKERS

The findings from this study of assessment of causes of construction project delay and its impacts on cost in public institutions will help policy makers especially policymakers of construction projects in Rwanda to formulate policies that enhances the effective operations of construction project in Rwanda which will avoid delay of construction project which may lead to the cost overrun of the project.

1.4.3 TO THE ACADEMICIANS

The study can be used as a reference material to scholars who would wish to do a research in related areas and provide foundation for further research suggestions. it can also be used as tool to contribute to existing stock of knowledge on factors Causing delay in construction projects.

CHAPTER II: LITERATURE REVIEW

.

This chapter is devoted to discuss what many others scholars have said about causes of construction project delay and its impacts on cost in public institutions in different countries (developed and developing countries), identification of the limitation of previous researchers, the review covers the researches done on the topic, the reference volumes and reports concerned to the causes of construction project delays and its impacts on cost in public institutions.

2. 1 DEFINITION OF KEY TERMS

The aim of this section in this research is to make topic understudy more clear and understandable, this section will cover definition of construction project, definition of delay in construction projects, different types of delay in construction project and construction project cost definition.

2.1 .1 DEFINITION OF CONSTRUCTION PROJECT

Construction work is defined as any work carried out in connection with the construction, alteration, conversion, fitting-out, commissioning, renovation, repair, maintenance, refurbishment, demolition, decommissioning or dismantling of a structure (Australia, 2012).

According to (safety, 2012), construction project is defined as a high risk activity which should be managed from procurement through the process of design to the end of construction project. Every parties involves in construction work is most important and must perform their duties accordingly to contribute to the success of the project from clients, project designer, project supervisor, project contractor and employees.

According to (Dr Patrick. X.W. Zou, 2014), construction projects have their uniqueness features which distinguish them from other projects and these are nature, time and size.

Some construction projects last for long periods to be completed and some of construction projects require much money to be executed, construction projects also require good working environment to be performed according, any disturbance can cause project delay which will requires financial capacity to deal with such delay.

Construction project is regarded as successfully one when it meets some characteristics such as being managed well, completed at scheduled time, at planned cost, fulfill the needs of project stakeholders and with the gain of contractor without any financial complain. (Takim R, 2002)

(Frimpong Y.Oluwoye, 2003) said that construction project is considered as succeeded project when it is completed within scheduled time, planned cost and within required performance and these success is achieved through effective planning, monitoring and control.

Construction industry faces the problem of delay during construction project implementation and the most weakness faces by this industry is to deal with this delay. In construction industry, time means money because any delay will cost money to the project implementation team or to the owner of the project.

2.1.2 DEFINITION OF CONSTRUCTION PROJECT DELAY

(Abbas, 2006) defines delay as the late completion of the projects compared to the planned schedule or contract schedule. Delay occurs when the progress of the project is falling behind the schedule. The cause of delay in project can be either one party in project or other circumstances such as weather condition, government regulations, change of market condition etc.

(Assaf SA, 2006) defined delay as the time overrun due to the later completion date compared to the planned time or expected time specified in the contract or beyond the agreed time between parties of the contract for project delivery. The reasons some construction projects are not completed within scheduled time are many, construction process is too much complex and need the effort of every parties in construction process, some conditions and unpredictable events which results from different sources such the willingness and performance of contractors, material procurement process, site condition and site management, coordination between parties and financial capabilities of the owner of the project have greater implication in the timely completion of construction project.

To (Al- Kharashi A., 2009), parties of construction project have different views about construction project delay, to the owner of the project , delay of construction project means the waste of yield and revenue while to the contractors, delay of construction project means the increase of overhead cost and the increase of expenses.

(.T, 2009) classifies project delays into two categories, first delay caused by clients and the second caused by contractors. Delays caused by the client such as late submission of drawings and specifications, frequent change orders, and incorrect site information generates claims from both the main contractors and sub-contractors which many times entail lengthy court battles with huge financial repercussions Delays caused by contractors can generally be attributed to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfalls.

2.1.3 CONSTRUCTION PROJECT COST

When the owner of the project wants to perform construction project, he should first determine the amount by which project will cost and the amount determined by the owner of the project is called planned cost and those cost is the total sum of consultant fee, contracting fee and project implementation fee.

There is also what we call actual cost, and this is the total cost of the project calculated at the end of the project, actual cost may exceed planned cost because of different reasons such as poor planning of the project, change in design which may requires additional cost, weather conditions, raw material price fluctuation due to the inflation, delay of the project which may requires additional cost in terms of labor etc. When the actual cost exceeds planned cost we say that the project has suffered cost overrun. (Hazim N. A., 2015)

2.1.4 MAIN TYPES OF DELAY

The main goals and objectives in the project management is the completion of the project by using planed cost within specified time and at planned quality of work. Project delay has negative effect to the contractor and the owner of the project because any delay is associated with additional cost. (Jammaz,2010)

(Vidals, 2002) said that delay in construction project is divided into the followings:

- Excusable and non –excusable delays
- Compensable- non compensable delays
- Concurrent delays and non – concurrent delays

- Critical and non-critical delays

All these types of delays are the effects of both internal and external factors that are surrounding the project, the internal sources of delay take place from the designers, contractors and the owner of the project while the external sources of delay comes from the government, labor unions, climate change and law and regulations of the country (Vidals, 2002)

2.1.4.1 Excusable and non- excusable delays

2.1.4.1.1 Excusable delays

These are delays which are beyond the control of the contractors, this means that when delay is excusable, the contractors will not be liable. When delay is excusable, contractor can get extension of the period which may be fully paid or not based on the basis of contract between both contractor and the owner of the project.

Delays caused by the following elements will be considered as excusable delay:

- Delay resulting from labor strikes
- Delay resulting from floods
- Delay resulting from acct of God
- Delay resulting from intervention of outside agencies
- Delay resulting from bad weather conditions and any delay caused by any factor which are beyond the control of project contractors

2.1.4.1.2 Non- excusable delays

delays which are caused by poor management of the contractors, this means that contractor will be liable for such delay. The main source of this delay is contractor and his suppliers, in this case contractor may receive compensation from the owner of the project and the extension of time to complete the remaining work but the money received from the owner of the project will be charged on his dues of the contractor at the end of the work (Fugar, 2010).

To (Majid, 2006) , the main source of this delay (inexcusable delay) is poor planning of the project manager. Poor management of the materials on the site, non-proper way of building, poor communication between contractor and suppliers and non-skilled man power

2.1.4.2 Compensable and non- compensable delays

2.1.4.2.1 Non- compensable delays:

(Fugar, 2010) said that non compensable delay is delay which is beyond the control of both owner of the project and its contractor, this delay occurs due to the force majeure such as climate change (heavy or snow rain depends on project), earth quake, war, etc. In this case, it is normal to extend project duration period but none will receive compensation because the causes of delay results from uncontrollable event.

2.1.4.2.2 Compensable delays

(Fugar, 2010) said that this is delay caused by the owner of the project or his representative. The most common of compensable delay in construction project is insufficient specifications and drawings. When delays are caused by the owner of the project or his agent, contractor is allowed to claim for compensation of both financial and time.

.

2.1.4.3 Critical and non- critical delays

2.1.4.3.1 Critical delay

Is the one which affects the progress of the project, the time of project implementation and the compensation of the project contractors. The study conducted by Henry Alinaitwe & Ruth Apolot (2003) to investigate the causes of delays and cost overruns in Uganda's public sector construction projects have proved that delays on payment to the contractors has affected the completion period of the project.

2.1.4.3.2 Non- critical delay

Is the one which does not affect the completion of the project. This affect the succession of the activities which are not on the critical path of the scheduled activities (Audul -Rahman, 2006). The study conducted by Mohammad Tafazzoli (2017) to investigate the causes of delay in U.S. construction projects, the study revealed that financial difficulties with the designer does not affect the period of project completion.

2.1.4.4 Types of delay according to occurrence

In construction projects, the ways delays occur could be divided into two categories concurrent delay and non- concurrent delay.

2.1.4.4.1 Concurrent delays

This delay occurs when two or more either independent or parallel delays occurs at the same time (Rider, 2013). Each party in construction project should prepare a document showing its daily construction activities in order to determine the party which has caused delay so that he will take responsibility of such delay. For example, project may result into delay because contractors have failed to fulfill their obligations due to the delay of payment of owners of the project, in such case, the owner of the project will be liable for such delay.

2.1.4.4.2 Solo Delays or non- concurrent delay

This delay happens when one of construction activities need additional time to what planned to be completed. To evaluate the delay time, the cost of such delay, its impacts to the other activities, the project personnel uses critical path model. After the assessment and the identification of the party caused delay, the party will take the responsibility and cost of such delay (S., 1997).

At the end of the study, researcher will identify the type of delay by which delayed construction project understudy have suffered and who should be responsible for the cost of such delays.

2.2 CONDITIONS WHICH CAUSES CONSTRUCTION PROJECT DELAYS

Construction project delay is result of different conditions which may take place before or during project implementation process. (Rashed, 2008) discussed three major conditions which contribute to the delay of constructions projects and there are conditions related to the owner of the project or his representative, conditions related to the contractor of the project and condition beyond the control of both parties (owner of the project or contractor).

2.2.1 Conditions related to the owner of the project or his representative

These are conditions which causes delays and come from the owner of the project or his representative and these conditions are beyond the control of the contractors. and are concerned with change of design, financial difficulties of the owner of the project, poor payment system, poor communication with the contractor of the project, etc. In such case any additional cost which will be added to complete construction work will be paid by the owner of the project, and if the

extension period is long period, the owner of the project will pay for such period based on contract terms signed between him and contractor regarding construction work process.

2.2.2 Conditions related to the contractor of the project

These are conditions which causes delay in construction project and came from contractors. These conditions are poor site management, poor implementation of project plan, poor management of subcontractors, change of project design without consent from the owner of the project, misuses of funds, etc. If the delay of constructions project results contractor's conditions, contractor is required to pay financial indemnity to the owner based on contractual terms and he is required to complete the project with addition cost free from the owner of the project.

2.2.3 Conditions beyond the control of both parties (either owner or contractors of the project)

These conditions are beyond the control of both and nothing they can do to minimize these conditions. These conditions are bad weather condition, natural disasters such as earthquake and war. When delay is a result of such conditions, owner is not allowed to complain for financial compensation from contractor due to the delay and contractor will not ask any additional payment for additional time for project implementation. Additional cost will be paid by insurance company if the owner of the project took insurance of his construction work and if not, the owner of the project will pay any additional cost to complete the project.

This part of conditions which causes of delay of construction project will help researcher during questionnaire design and this will be used to investigate which conditions caused construction project delay in public institutions in relation to our case study, if such delay causes additional cost who should be liable for such cost.

2.3 CAUSES OF CONSTRUCTION PROJECT DELAY AND THEIR EFFECTS ON COSTOVER RUN IN PUBLIC INSTISTUTIONS

The aim of this part is to analyze the studies related to the topic under study assessment of causes of construction project delays and its impacts on cost in public institutions in Rwanda, tis part will analyze different views of scholars who conducted research related to the topic under study, their methodologies used and conclusion of their study and will enable researcher to identify the gap which causes delay in construction project in public institutions in Rwanda and its impacts on cost.

The analysis is going to be carried out from the study conducted in both developing and developed countries.

1. (Shahid Hussen&Fangwei Zhu, 3 January 2018) conducted research about critical delaying factors in public sector building projects in Gilgit- Baltistan, Pakistan, the objectives of their research was to identify the critical delaying factors in building construction project in public sector in Pakistan, the study was conducted to the 15 public construction projects which were exceeded scheduled period, researchers selected 120 respondents and where 70 respondents were projects owners and 50 were respondents where questionnaires containing of 52 causes were distributed and the findings of their research has ranked the 8 major causes of building project in public institutions as follows: Difficulties in financing the project by the owner is the first cause, the second cause was delay in progress payment, the third cause was dispute in land usage, the fourth cause was improper project feasibility study, the fifth cause was award project to the lowest bid price, the sixth cause was the extreme weather conditions, the seventh cause was inadequate contractor experience, the eighth cause was insufficient data collection and survey before design of the project. After ranking the major 8 causes of delay of building construction project in public institution in Pakistan, they ranked major causes in group and the findings show that the first important causes of building projects delay in Pakistan was related to the project its self, the second causes of delay were related to the external factors, the second causes of delay were related to the external environment factors, the third causes of delay were related to the owner of the project and the fourth causes of delay were related to the contractors.

Based on the findings provided by this research, the study was conducted to the owner of the project and contractors but it would be better if they included employees of the project because projects were still in progress and they could also contribute to this research, the findings of this research shows the causes of delay of building project in public institution in Pakistan but researcher can't confirm if these causes are the same as causes of delay in construction project in public institution in Rwanda because weather conditions in Rwanda can be differ from that of Pakistan, land management policy can differ from one country to another, etc. This study was about causes of delay but did not evaluate impact of that delay on cost. Researcher is going to conduct research to assess the causes of construction project delays and its impacts on cost in public institutions in Rwanda because it is not true to confirm without conducting research that the

causes of building project delay in public sector in Pakistan is the same as the causes of construction project delay in public sector in Rwanda

2. (Luu Truong Van&Nguyen M.Sang, 2015) Conducted research of conceptual model of delay factors affecting government construction project in Vietnam, the study was carried on road construction, civil works, infrastructure works and irrigation works. Questionnaires containing 31causes of delays were distributed among contractors, consultants and owners of the project selected by researchers and sample was selected based on the experience of the these people in construction field (only those from 5 to 10 years were having chance of being selected) , the findings of the study proved 3 major causes of delay affecting construction project in Vietnam were lack of information between parties of the project, the incompetence of the owner of the project and incompetence supervision of consultants. In their study, they also identified two factors which contribute less to the causes of construction delay in Vietnam and these were price fluctuations of construction materials and natural disasters.

From the review of these studies, one can see that they did not identify the sample size, the research didn't show case study (government institutions) and didn't cover any thing about the effects of delay to the government institutions in Vietnam and by comparing the causes of construction project delay in Pakistan with the causes of construction project delay in Vietnam, there is a big different between causes of delay that is why researcher wants to conduct research about the causes of construction project delay and its effects on cost in public institutions in Rwanda.

3. (A.Bekr, 2015) conducted study of causes of delay in public construction projects in Iraq, to assess the causes of delay, researcher developed questionnaire of 65 factors which may causes delay, the target population was clients, contractors and consultants where researcher selected sample of 300 of respondents 100 per each group, questionnaires were distributed and only 134 respondents have returned questionnaires, the findings of this research revealed that 5 major causes of construction project delay in Iraq were low performance of the lowest bidder contractors in the Iraq government tendering system, change in design by the owner of the project, Lack of experience in construction project, poor qualification of supervision staff of the owner's engineer, the ranking of causes of delay based on the responses gathered from all respondents showed that the major causes of construction project in government of Iraq were external causes, clients related causes, consultants related causes, contractors related causes and the results of his research showed

that these causes of delay had 7 major effects and these effects were time overrun, cost overrun, disputes, arbitration, and abandonment of the project.

Based on the findings of this result, it has a little contribution to the research because it has investigated causes of construction project delay and its effects, but by comparing the sample size and the total number of respondents who participated in research, research could not rely more on the findings of this research, also this research didn't show how much delay affects cost of the project , that is why it is still important to conduct research about causes of construction project delay and its impacts on cost in public institution in Rwanda and this research will establish causes construction project delay and its effects relationship on cost .

4. (Dr. Ashraf Samarah & Dr. Ghanim A.Bekr, 2016) conducted research about the causes and effects of delay in public construction projects in Jordan, the population of the study was clients, consultants and owners, 55 causes were developed and questionnaires were distributed to 210 respondents and only 146 questionnaires were returned (70%) and the findings released that the 5 majors causes of public construction project delay in Jordan were inadequate management and supervision by the contractor (68.45%), the owners change in design (64.99%), inadequate planning and control by the contractor of the project(64.67%), using lowest bid that causes poor performance(63.99), change in the context of the project (62.38%), the findings also has proved that those delays causes time overrun at 94.62%, cost overrun at 88.5%, disputes at 73.37%, arbitration at 64.33%, total abandonment at 58.21% and litigation at 55.67%.

This study carried out in Jordan can contribute to the research but the problem is that it didn't mention what was planned cost of the project to determine cost escalation by comparing the actual cost and planned cost.

5. (Henry Alinaitwe & Ruth Apolo , 2013) investigate the causes of delays and cost overruns in Uganda's public sector construction projects, the sample selection was carried out to the contractors, government ministry officials, to the consultants and to the people working in public sector to investigate the causes and effects of cost overrun which occur during project implementation phase, the sample of 247 was selected and 22 factors were developed and the results proved that the causes of delay and cost overruns in Uganda public construction project were change in the work scope of the project, delayed payments to contractors of the project, poor

monitoring and control of the project by the owner and high inflation and interest rate. This study conducted I Uganda didn't mentioned how the delay affect cost but it identified causes of delay and cost overrun, it is better to evaluate causes of delay and its impacts on cost.

6. (Nabil Ali-Hazim & Zayidoun Abu Salem , 2015) conducted research about the causes of delay and cost overrun in road construction in Jordan from 2000-2008, the study has been conducted in nine roads in Jordan, and research determine cost overrun by comparing the planned cost and actual cost of the project and did the same on time overrun where they compared the scheduled time and the actual time taken by project, the causes were investigated by developing 19 causes and questionnaires were distributed to the owners and contractors of the project and the findings have proved that the major causes of delay of road construction in Jordan were terrain conditions which contribute at 21.9%, weather condition which contribute at 15.5%, variations orders which contribute at 9.1% and mistake in design which contribute at rate of 7.1%.

The way this research has been conducted was better because researcher can't know the cost overrun without comparing both planned and actual cost. This research tool used by in assessment of causes of delay and cost overrun in road construction projects in Jordan will be used in assessment of causes construction project delays and its impacts on cost in public institutions in Rwanda.

7. (Mohammad soroush& Pramen P., 2017), investigate the causes of construction project delay in United States, the survey was carried out in all 50 states where respondents were selected using database of LinkedIn, the online questionnaires were distributed to 219 experts of construction project from all states and questionnaire was having 30 causes of construction project delay. Among these 30 causes, research has revealed that the most important 10 causes of construction project delay in United states were excessive change by orders by the owner during construction process, delay in decision making by the owner of the project, errors in design of the project, delay in the approval of design documents by the owners of the project, errors in contracts documents, unrealistic schedule, delay to get permit and acquisition, complexities and ambiguities of project design, poor communication of the owners of the project with other parties within project and delay in approving of design document by the owner which has led to the increase of cost of the projects.

By comparing the causes of construction project in developing countries and that of developed counties, there is difference between causes of construction delay because most developing countries suffer problem of financial difficulties while developed countries does not, the causes of delay differ from one country to another that is why it is necessary to investigate the causes of construction project delay in Rwanda.

2.4 CONSTRCUTION INDUSTRY IN RWANDA

Today, construction is one among others industries with immense positive impact on any country's economy. Construction industry contribute in the development of infrastructures such as energy, water, transport, digital communications, as well as waste disposal networks and facilities and these facilities contribute more to the success of competitive modern economy. We can say that the quality of life of every Rwandan partly relies on the products of the country's construction industry — houses, office buildings, factories, shopping centers, hospitals, airports, refineries, roads, bridges, water service lines, etc. Products of the construction industry not only provide shelter, water and electricity but also support commerce, education, recreation, mobility and connectivity.

As industries go, construction is particularly diverse. It has various players such as property builders, property developers, material suppliers, investors and contractors. Looking at the infrastructure segment of the construction industry alone, there are strong evidence that well-designed infrastructure investments have long-term economic benefits that can spur economic growth, productivity and land and home values while providing significant positive spillovers. (Energy and Infrastrucure Forum, 2016)

According to IDAP (Integrated Data Analytics Platform) Rwanda reports of 2016, construction industry contributes more to the economic growth of Rwanda because it offers job to the millions of unskilled, semi – skilled and skilled peoples, also construction industry in Rwanda contribute more to the balance of trade due to the export of construction material and engineering services. Construction industry before and soon after 1994, the industry was weak due to the lack of skilled workforce who well able to perform construction works like planning, designing, constructing and maintaining governmental construction projects.

Due to the political stability, good governance and good economic development policies adopted by government of Rwanda after genocide against Tutsi of 1994, the national construction companies have developed their ability of construction and the political stability have attracted the foreign construction companies. Construction industry is growing industry based on the report of National Institute of Statistics Rwanda of 2016, construction industry grows at 5% in 2016 following a very high growth of 15% in 2015 and production of construction materials which are included under non-metallic minerals such as cement increased by 21% in 2016 (Mwizerwa, March, 15 , 2017).The report of National Institute of Statistics Rwanda shows that in 2015-2016, construction industry has contributed 7% to the Gross Domestic Product and during the year 2016-2107 it has contributed 6% to the Gross Domestic Product of Rwanda.

Despite its contribution the socio- economic of country, construction industry in Rwanda is still facing the problem of delay. The report of Auditor General of 2016 show that government of Rwanda faced the challenge 99 projects valued at Rwf 95 billion or US $ 115million were either delayed or abandoned and these projects, the aim of this research is to assess the causes of construction project and its impacts on cost in public institutions in Rwanda. After the identification of causes of construction projects delay, researcher will provide some recommendation that can help in avoiding or minimizing cost of delay of construction project especially in public institutions in Rwanda.

2.5 ESSENTIAL PARTIES OF CONSTRUCTION PROJECT

Construction project to be performed requires three major parties and these parties have different responsibilities but construction project to be completed accordingly, all parties should work as a team.

2.5.1 Owner of the project.

This is the main party in construction project because is the one who have three main roles in the project, his is the one who owns, manage and fund construction projects. Owner of the project has responsibility of choosing contractor and consultants who will implement construction project work, he is also responsible for decision making throughout project implementation, the owner of the project is in charge of setting operational criteria and estimating the total cost of the project (Oberlender, 2000)

2.5.2 Contractor

This is the party that sign the agreement with the owner of the project to implement one, more or all phases of construction work. Sometimes, contractor engages sub-contractors to perform different tasks of the project but under control of contractor of the project. Contractors perform tasks as agreed in contract document from the designer and he is responsible for furnishing labors, hiring equipment, materials and to acquire necessary knowledge for building the project (Oberlender, 2000).

2.5. 3 Consultant

According to (Bosneneh, 2010) this party is hired by the owner of the project to perform Three main activities:

- ✓ To prepare study of the project
- ✓ To perform design of the project
- ✓ To prepare the document for the project

The work of the consultant could be extended during implementation phase if some deviations occur and there is need for adjustment in the design of the project.

This section will contribute to the research because, researcher will investigate which party has contributed more to the delay of construction project in Rwanda and recommendations will be given for improving the way of operation where findings of research will reveal as contributor of construction project delay in Public sector in Rwanda

2.6 FACTORS CONTRIBUTING TO THE SUCCESS OF CONSTRUCTION PROJECTS

(Baker, 1988) Said that to complete project within scheduled time and panned cost are not the only variables which justify the success of the project but he said that project many peoples have different perception about project success but the success of project means to meet technical performance specifications, mission of the project and high level of satisfactions projects keys stakeholders such as the users of the project outcomes.

(Freeman, 1992) after his analysis about different views of project stakeholders, he provided an example which presents different views about the success of the project whereby the success of

the project on the side of account depends on spending (if he spends less compared to the budgeted cost he said that the project achieved its success), the architect said that the success of construction project is achieved if the final building or constructed items looks like what is contained to his masterplan, an engineer said that project success is achieved if the performance shows technical competencies, human resources manager consider the success of the project when project employees are satisfied, etc.

(Stuckenbruck, 1986) Said that the assessment of project success should be performed in different groups of stakeholders such as shareholders, managers of the project, employees of the project, and others stakeholders.

(Baccarini, 1999), said that project success has two major components and these are:

Project Management Success: This focuses on the process of project and the success of the project is measured in terms of cost, time, quality objectives.

Product Success: The success of the project is measured in terms of the effects of the final products of the project. This means how the final product of the project solves the problem.

(Freeman, 1992) identified five main criteria which many project stakeholders use to determine the success of the project and these are:

- ✓ Technical performance
- ✓ Efficiency of execution
- ✓ Managerial and organizational implications (mainly customer satisfaction)
- ✓ Personal growth
- ✓ Business performance

(Pinto, 1988)conducted research about the measurement of project success and after sampling of over 650 project managers, and his research conclude by saying that the success of the project is more complex than using planned cost within scheduled time and performance satisfaction but the most valuable indicators of the project success is to get clients satisfied with the final result or products of the project.

According to (Albert P.C. Chan, 2013) said that technological change, development of processes and the budget make construction industry very dynamic in nature and the performance of construction project on how the project personnel are able to copy to the change.

(Sanvido.V., 1992) Tried to explain 5 factors which contribute to the success of the project and these factors are:

- ✓ Project related factors
- ✓ Procurement related factors
- ✓ Project management factors
- ✓ Project participants related factors
- ✓ External factors

2.6.1 Project related factors**:** These are factors which are related to the construction project its self. The size of the project, its nature, complexity of the project can be the factor of its success or its failure. In order to perform construction project which is complex in nature requires sound project management team who have sound planning capacity, effective communication, effective control mechanisms, effective in decision making, sound control techniques, able to deal with change, quality assurance skills, subcontractor follow up skills. (Hubbard, 1990)

2.6.2Procurement related factors**:** Procurement is important factor in construction project. (Kumaraswamy, 1999) defines procurement as the framework within which construction is brought about, acquired or obtained. Construction project to succeed should have strong procurement method in terms of choosing organization for the design and construction and in terms of tendering method (procedures adopted for selecting project team mainly contractor).

2.6.3 Project management factors**:** The way project is managed contribute more to its success or failure, communication among project team, control mechanisms, the way of providing feedback, planning effort of project managers, implantation capabilities, the way subcontractors are managed contribute more to the success of the project. (Hubbard, 1990) said that when management tools are used accordingly, the managers of the project will be able to plan and execute the construction projects and this will lead to the maximization of the project's chance of success. The study conducted by (Bekr G. A., 2015) to investigate the causes of delay in public construction project

in Iraq ranked poor controlling of subcontractors by contractors as the second factor of delay of construction projects in Iraq

2.6.4 Project participants related factors**:** Construction project is a collective work which requires a team spirit. (Chua, 1999) defined participants of the projects as its key players and those include the managers of the projects, clients of the projects, project contractors, subcontractors of the project, project consultants and suppliers of the project. Each parties in the project has its own responsibilities and when each perform the duties accordingly, their combination of efforts leads the project to its success. Projects managers have duties of overall coordination of the project and they should be strong enough in project management tools to avoid the waste of money and time.

2.6.5 External Environment factors: These are important factors to consider before, during and after construction project implementation and these factors include environmental factors, social factors, political factors, Technological factors and legal factors. (Akinsola, 1997) defines external environment as all external influences of construction project processes includes social environment, political environment and technological environment. These factors should be analyzed with much attention because fail to analyze one of these five external factors could lead to the project failure or project delay. The study conducted by (Nabil A. Hazim & Z.A. Salem , 2015) to assess the cause of delay and cost overrun in road construction projects in Jordan ranked weather conditions as the second cause construction project delay in Jordan.

This section will contribute more to the research because it is better to know which factors have contributed to the delay in construction project in public institutions in Rwanda, were these factors controllable or not, if yes why project implementation team didn't do so, if not what public institutions could do to minimize their influence to the delay of construction projects undertaken by them and to the construction project undertaken by different parties in general.

2.6.6 CONSTRUCTION PROJECT LIFE CYCLE

Every project passes through different stages during its life cycle. Each project started from the owner's idea and after generating idea, the owner develops an idea and pass through different stages until creating final product.

(Scoot, 1991) said that construction project life cycle has the same features as other projects and any mistake which can be made in early stage, it is difficult to improve or correct it and even it may be impossible to make correction due to complexity of construction project.

(Jammaz, 2010) identified and explained six stages by which each project idea should pass through in order to become final product and our concern will be the first five stages because is where project delays can occur.

Figure 2.1 The illustration of Project Life Cycle(Jammaz,2010)

2.6.6.1 Stage of feasibility study

According to (Jammaz,2010) this stage is carried out by the specialized consultant office for the owner of the project. The aim of this stage is to describe to the owner the feasibility of his project and to show him how the desired objectives will be achieved. This is carried out by the consultant office hired by the owner of the project.

The feasibility study of the project contains the following items:

- ✓ Cost to be used
- ✓ Project duration
- ✓ The availability of resources to be used in implementation process

- ✓ Cash flows during implementation process and cash return

This stage also shows recommendations to follow and these are:

- ✓ Identification of target
- ✓ Develop alternative solutions
- ✓ Assessment of alternative solutions in general view
- ✓ Assessment of alternative solution in detailed view

After the evaluation of project feasibility, the owner take decision about the starting of the project and approve the procedure to complete project or dismiss it.

During this stage, the owner of the project will determine is the project to be undertaken is legally accepted if so what are the total cost and time duration of the project. Some project delayed because of poor estimation of the project duration or because of poor estimation of the total cost of the project. In the study conducted by Amusan Lekan M (2014) in Nigeria for assessing the causes and effect of delay on construction project delivery time has revealed that the major causes of construction project delay is the lack of fund by the owner of the project to finance the project due to the poor estimation of the cost during this phase of construction project, researcher will assess if delayed project was because of poor estimation of time or if it was because of poor cost estimation, and if so, recommendations will be given. The study conducted by Nabil Al Hazim, 2015 to assess the causes of delay and cost overrun in road construction in Jordan revealed that poor study of terrain conditions has contributed to the delay of the project and this cause of delay is ranked on 1st place.

2.6.6.2 The design phase

The stage requires more consulting engineering office to prepare tender document. Their works include architectural designs, structural designs, detailed and implementation plans, bill of quantities, specifications, invitation of contractors to inter into tendering finally selecting contractors who fulfill the conditions set by bidding committee. The consultant office is required to visit the site to be aware of what to do to avoid extra work of adjusting and changing during implementation phase. The study conducted by Dr. Ashraf S. and Dr. G.A. Bekr, 2016 to assess the causes and effects of construction project delay in Jordan ranked change inn design as the second factors of delay which affects the cost of the project.

Many construction projects face the issue of change in design by the owner during the implementation stage, this is due to the lack of knowledge of the owner about construction work, when the owner of the project keep changing the design of construction work, there is a high possibility of time overrun which will require additional cost. Researcher will assess the effect of poor designing team to the implementation of the project. The study conducted by Luu Truong Van, 2015 to assess delay factors affecting government construction projects in Vietnam and the findings revealed that change in design was the 6th cause of government construction projects, in Vietnam.

2.6.6.3 The contracting phase

The main concern of this phase is preparation and processing of tenders documents and inviting contractors to tenders. Both consultant and owner of the project come together and choose contractors and after the selection of contractors, they sign contract.

After signing contract, each party is required to honor the obligations and fail to honor obligation one party can take another into court.

(Jammaz, 2010)mentioned keys elements that should be includes in the contract and these elements are:

- ✓ The details of all parties in the contract
- ✓ The contents of the contract such as insurance, delay's fine, conditions for drawings, cost of the project, completion time and other conditions.
- ✓ The way of financial transaction will be done between the owner of the project and contractor

(Jammaz, 2010)said that the contract should also involve the following:

- ✓ Avoiding contradiction between parties of the contract
- ✓ The contract should be clear, simple in wording, and understandable
- ✓ Clearly defining types of fines and the way of handling them.

Poor preparation of tender document also is the most challenge facing by owner of the project and selecting contractors who quote at lower price is also a challenge because it will not be easier for contractors to perform construction work, the study conducted by Mohammad (2017) for investigating the causes of delay in U.S. construction projects, the findings have revealed that the

major causes of construction project delay in United States is the excessive change of design, researcher will assess if delayed public institutions construction projects were because of poor preparation of contract documents and if so what could be done to solve the issue

2.6.6.4 The implementation phase

The concern of this stage is to take things from document to practice identical with the plans, specifications and conditions (Jammaz, 2010) . This phase is the most important as it requires the owner of the project to mobilize about 80% of total cost of the project. This stage requires a lot of supervision and monitoring of workflow to compare how actual implementation is related to the implementation plan to determine the level of deviation.

The concern of the contractors at this stage is to provide all necessary resources needed for project implementation such as human resources, financial means and material in general and also contractors are in charge of managing and uses of all resources property in line of what planned.

Also contractors are in charge of selecting suppliers of raw materials and the choice depends on the commitment to supply, the cost of raw materials and the quality. The choice should be made based on the how much suppliers are willing to supply at the right time to avoid the lack of materials on the site which may result in delay (Jammaz, 2010).

This party consist of resources mobilization especially money and labors. Some contractors enter in contract without knowing how much cost to get skilled people to perform work, and even how financial transaction between owner of the project and contractors will be done, when the pay is required, how to get resources are needed, does the owner of the project able to cover the cost of the project? Some construction project delayed because the owner is not able to cover the cost of project or because contractor does not needed experiences in construction work.

The study conducted by Dr. Ashraf Samarah and Dr. Ghanim (2016) to assess the causes and effects of delay in public construction projects in Jordan, the findings have revealed that the major causes of such delay was inadequate management and supervision by the contractor, also the study conducted by Luu Truong Van and Nguyen (2015) about conceptual model of delay factors affecting government construction projects in Vietnam have revealed that the incompetent owner were among top five causes of delay (it was the second after lack of information exchange between

parties), researcher will assess if delayed construction projects in public institutions in Rwanda was due to the financial difficulties of the owner or if it was because contractors.

2.6.6.5 Delivery phase

(Jammaz, 2010) have divided this phase into 2 main types:

First handing over of the project: This primary handing over consist of putting all works in the hand of contractor who has been agreed to perform the duties. In this stage, the project remains under control of contractors and he is in charge of controlling if all works are performed properly and any defects occurred during the execution, contractor is required to repair during maintenance period before final handing over of the project work.

Some project fails due to the poor management of construction work by contractor, the study conducted by Dr. Ashraf Samarah (2016) to assess the causes and effects of delay in public construction projects in Jordan have revealed that the major causes of delay was inadequate management and supervision by the contractor.

Last or final handing over: This stage occurs when the contractors completed all works and the maintenance period expired and the contractors handing over the final product to the owners. The last transaction is that the owner of the project pays the remaining balance to the contractors of the projects.

This phase consists of final checking if the designed construction item is matching to the actual constructed one and if so contractor hand it over to the owner, this stage does not contribute more to the delay unless if deviation occur. Researcher will assess if the delayed construction project happened at this stage and will assess how has impacted cost of the project.

2.6.6.6 Operation (investment) phase: The last phase is to use final project output according to the purpose of the project, in other words this last phase is to use constructed item in line with its purpose of construction.

By looking to the top 5 stages of construction project, causes off construction project delay may occurs at each stage of construction project, researcher will assess which stage contributed more to the delay of construction project in public institutions in Rwanda, how much does it impact the cost of the project and among three essential parties of the project which party have contributed

more to the delay of construction project under study and then conclusion and recommendations for minimizing or eliminating delay will be given.

Conclusion

The aim of this chapter was to explain the key terms of the topic understudy, to evaluate the research which area similar to the topic under study conducted by different researchers and journals of different authors. Some have assessed the causes of construction projects delay in developing countries while others have assessed the causes of construction project delays in developed countries, the causes differ from one nation to another, in some nations, causes of delay are related to the owner of the project while in other nations causes are related to the consultants or contractors of the project, even in developing countries causes of construction project delays and their impacts are differ, the aim of this research is to assess the causes of construction project delays and their impacts on cost in Rwandan public institutions.

CHAPTER III: RESEARCH METHODOLOGY

This chapter deals with research methodology of the topic under study. In more details, in this part the researcher detailed the research strategy, the research method, the research approach, the methods of data collection, the selection of the sample, the research process, the type of data analysis, the ethical considerations and the research limitations. (Langos, September 2014)

Research is a logical and systematic search for new and useful information on a particular topic.

Research methodology is a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research.

3.1 RESEARCH DESIGN

Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. it constitutes the measurement and analysis of data.

The reason which pushes a researcher to conduct his study to assess the causes of construction projects delay and its impact on cost in public institutions in Rwanda, is because public institutions in Rwanda are facing problem of delay of their construction projects. Based on the report of Auditor General of 2015 and the report of 2016 where he mentioned that from 2013 up to 2016, 99 projects worth of 95 billion Rwandan Francs were either delayed or abandoned. research will researcher will use descriptive research design and questionnaire with four- Likert scale level of agreement will designed to assess the causes of delay of construction project and their impacts on costs in Rwandan public institutions.

Descriptive research is used to describe a situation, subject, behavior or phenomenon. It is often described as studies that are concerned with finding out “what is”, descriptive research is also used to gather information data to be used to statistically analyze a target audience and is also used to describe a research problem without influencing or manipulating the variables in any way (Glasow, 2005). The aim of descriptive research is to describe a phenomenon and the main concern of

descriptive study is what, the aim of this research is to assess what are the causes of construction projects and their impacts on cost in Rwandan Public Institutions, and researcher will analyze findings by using frequencies, percentages, averages and to test the degree of how much the causes of delay affects the cost, research have evaluated mean and standard deviation.

Qualitative data will be collected to test the views, perceptions and attitudes of respondents about the causes of construction projects delays and their impacts on cost in Rwandan public institutions.

3.2 STUDY AREA

This study, the assessment of causes of construction project delay and its impact on cost in public institutions was conducted in RTDA, EWSA and GICUMBI DISTRICT. Each institution among these three institutions had delayed construction project, and researcher wants to access the causes of that delay.

3.3 POPULATION OF THE STUDY

A research population is a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait (www.explore.com, 2018)**.** Population of this study are owners of the project, members of contracting firms and consultants who were involved in these 3 delayed construction project selected by researcher as case study. The information gathered from these institutions which have delayed construction projects (from RTDA, EWSA, and GICUMBI District) revealed that 115 respondents and these are consultants, owners and contractors who have been involved on these 3 delayed construction projects.

Table 1: Population size and respondents

Project	**Stakeholders**			**Total**
	Owner	Contractors	Consultants	
EWSA	15	19	13	47
RTDA	13	12	11	36
Gicumbi District	10	9	13	32
Total	38	40	37	115

Source: Secondary data

3.4 SAMPLING METHODS AND SAMPLE SIZE

3.4.1 Sampling Frame

Sampling frame is the list of elements from which sample is being drawn. It is also an objective list of the population from which a researcher can make a selection. The frame will be obtained from contractors, owners and consultants of 3 delayed construction projects researcher has selected as case study

3.4.2 Sampling techniques

Good sampling techniques allow the researcher to get data at greater accuracy with low cost and greater speed of data collection depending on the availability of the population elements.

Probabilistic sampling methods will be used and the sample size will be determined by using simple random sampling methods and this will be the best for this study to select individual members to be subjected to the study as it ensures that every member of the population has accorded an equal chance of being included in the study thus eliminates bias

Simple random sampling was the methodology used where all elements of population was having equal chance of being selected.

3.4.3 Sample Size

Sample size is defined as the count of the individual samples or observations in any statistical setting, such as a scientific experiment or a public opinion survey. It measures the number of individual samples measured or observations used in a survey or experiment.

Based on the information gathered from public institutions researcher has selected as case study showing that 115 is target population, the sample size determined by using Yamane below equation

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

$n = 115/1+115(0.05)^2$

$n = 115/1.2875$

n = 89 respondents

n: sample size

N: Population

e: Degree of significance which is calculated at rate of 95% (100% - 95%)= 5%

3.5 SOURCE OF DATA

3.5. 1 PRIMARY SOURCE OF DATA

Primary data involves the data collected by research by first hand sources by using methods like questionnaires, surveys, interviews and experiments (Cooper, Donald R, Pamella, Schindler S, 2003).For the purpose of this study, survey questionnaire is preferred to collect primary data since it gives the respondents freedom to give answers to the questions. It also encourages respondents to give open and straight answers to the sensitive questions to help the researcher to acquire important and needed information. This survey questionnaire involves a list of written questions addressed to the owners, consultants and contractors of delayed construction projects in public institutions in Rwanda for seeking their views on the research questions. four- Likert scale will be used to test their level of agreement about the causes of construction project delay in public institutions in Rwanda

3.5.2 SECONDARY SOURCES OF DATA

Secondary data involves the data gathered from previous studies, surveys and experiments that have been done by other researchers, they refer to data which have been already collected and analyzed by someone else. In this research, researcher reviewed journals published by different scholars who conducted research related to the topic understudy.

3.6 STATISTICAL TREATMENT OF DATA

The research data will be collected and analyzed basing on research objectives and by descriptive research design. The data will be analyzed by using Statistical Package for Social Sciences (SPSS) version 20 for survey data and the results obtained will be presented in form of tables, and evaluation of mean to examine the factors causing construction project delay and their impacts on cost in public institutions in Rwanda.

3.7 ETHICAL CONSIDERATION OF THE STUDY

The aim of this study is to assess the causes of construction project delays and their impacts on cost in Rwandan public institutions and researcher has selected three public institutions that have delayed construction project and these are EWSA, RTDA and Gicumbi District. Researcher used questionnaire as a method of collecting data and after data collection and data analysis, researcher drawn conclusion based on the findings of his study. Researcher treated the findings of his research with high level of confidentiality and the findings will be used for scientific research only.

The aim of this chapter was to determine the research design and researcher will use descriptive research design to describe the major causes of construction project delay and qualitative data have been collected by using questionnaire and data have been analyzed by using different statistical methods and simple random sampling was the methodology used, after the analysis of the findings, conclusion and recommendations have been given.

CHAPTER IV: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

Data analysis has been defined as the process of bringing order, structure and meaning to the collected mass data (C. Marshall and G.B. Rossman, 1990). The aim of data analysis and interpretation is to obtain the useful information from collected data.

The aim of this research is to assess the causes of construction projects delays and their impacts on cost in Rwandan public institutions. Researcher collected information from three different public institutions which have delayed construction project to assess the major causes of construction projects delays in public institutions and their impacts on cost, and researcher analyzed data collected from owners, contractors and consultants who were involved in that projects, the analysis has been done to investigate the cause of such delay and to develop the tools that public institutions can put in place to minimize or avoid such delays.

To come up with sound research findings, researcher have analyzed the findings of each project and he selected causes of delay which have big percentage for each project and then after, researcher has compared the causes from each project to determine dominant causes of delay of construction project in Rwandan public institutions where researcher has selected 8 causes of delay (2 causes related to the owner, 2 causes related to the contractors, 2 causes related to the consultants and 2 causes related to the external environment) and test them against cost of project.

4.I CAUSES OF DELAY IN CONSTRUCTION OF WATER SUPLY SYSTEM AND RESERVOIR (EWSA)

The report of Auditor general 2016 showed that the project of construction of water supply system and reservoir initiated by EWSA has been delayed for 496 days, researcher assessed the causes of such delay and their impacts on cost by distributing questionnaire to 34 respondents and among them only 7 of them have failed to return questionnaires, this means 11% of respondents from EWSA have refused to return questionnaire and 27 respondents equal 79% have returned questionnaire. The findings from these respondents are distributed as follows:

4.I.1.Profile of respondents

Table 2: Distribution of respondents by gender

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	18	66.7	66.7	66.7
	Female	9	33.3	33.3	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The data collected from EWSA shows that among 27 respondents, 18 respondents (66.7%) were male while 9 respondents (33.7%) were female and it is better to collect information on both male and female because it gives assurance of credential data compared to one gender (male or female only). Researcher collected information on both male and female and this gives assurance that he collected valid data.

Table 3: Distribution of respondents by age group

		Age group			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-29	1	3.7	3.7	3.7
	30-39	9	33.3	33.3	37.0
	40-49	14	51.9	51.9	88.9
	50-59	3	11.1	11.1	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table shows that among 27 respondents, one respondent (3.7%) was between 20-29 years, 9 respondents (33.3%) were between 30-39 years, 14 respondents (51.9%) were between 40-49 years and 3 respondents (11.1%) were between 50-59 years. Based on the age group of respondents, it shows that many respondents are between 40-59 years (63%) which gives assurance that due to the maturity of respondents, researcher has collected validate information.

Table 4: Distribution of respondents by working experience

	working experience				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	13	48.1	48.1	48.1
	Between 5-10 years	14	51.9	51.9	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table shows that 14 respondents (51.9%) worked for between 5-10 years while 13 respondents (48.1%) worked for less 5 years. Experience matters a lot in construction project and a big percentage of respondents were these who worked for long period and who have experience in the industry, this shows that researcher have collected valid information from respondents.

Table 5: Distribution of respondents by Academic qualification

Academic Qualification					
		Frequency	Percent	Valid Percent	Cumulative Percent
.Valid	Bachelor degree holder	17	63.0	63.0	63.0
	Master degree holder	10	37.0	37.0	100.0
	Total	27	100.0	100.0	

The table above shows that 17 respondents (63%) were bachelor degree holder while 10 respondents (37%) were master degree holder and none who hold diploma degree, this shows that researcher have collected valid information because all respondents have good academic records.

Table 6: Distribution of respondents by occupation during project implementation

Occupation during project implementation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner	7	25.9	25.9	25.9
	contractors	9	33.3	33.3	59.3
	Consultants	11	40.7	40.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table shows the distribution of respondents by their occupation during project implementation and the results show that 7 respondents (25.9%) were owners of the project, 9

respondents (33.3%) were contractors while 11respondents (40.7%) were consultants. This finding show that all parties of construction project were represented and this gives validity of data collected from respondents because all parties have been involved in research. It would be a problem if one party misses during data collection because the findings would become incomplete.

Table 7: Distribution of respondents by institutions they work for.

Type of institution respondents work for					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public Institution	7	25.9	25.9	25.9
	Private institution	20	74.1	74.1	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table shows that the big percentage of respondents were from private institutions 20 respondents (74.1%) and 7 respondents (25.9%) were for public institution, this is because both consultants and contractors were from private companies while owner of the project were from public institutions.

4.I.2 views of respondents about the major causes of construction project delay in Rwandan public institutions (EWSA)

27 Respondents have mentioned their views about the causes of construction project delays that took place in EWSA, some causes are owner related, others are consultant related others are contractors related and others are external factors that causes delay of construction project. The information gathered from SPSS analysis shows that the causes of delay of construction of water supply system and reservoir were the following.

4. I.2.1. Owner related causes of delay

The following tables show the major causes of construction of water supply system and reservoir (EWSA)

Table 8: Lack of fund by the owner of the project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	26	96.3	96.3	96.3
	Disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table show that among 27 respondents in EWSA, 26 respondents (96.3%) strongly agree that the problem of fund for project exaction was the major causes of delay in EWSA during project implementation and only one respondent (3.7%) disagree that the cause of that delay was not the issue of fund, based on the data collected from respondents, it shows that delay which occurs in EWSA was first caused by the lack of fund by the owner of the project to implement the project.

Table 9: Choosing contractor who bids at lower price

choosing contractor who bids at lower price					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	25	92.6	92.6	92.6
	Strongly disagree	2	7.4	7.4	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The table above shows the second causes of construction project delay which took place in EWSA during implementation of construction of water supply system and reservoir project, among 27 respondents, 25 respondents (92.6%) strongly agree that the major causes of construction project delay which took place in EWSA was because of choosing contractor who bid at lower price, and only 2 respondents strongly disagree that the choose of contractor who bid at lower price was not the cause of delay, by comparing the views of respondents, it shows that choosing contractors who bid at lower price was the second cause of delay in EWSA construction project.

Table 10: Poor planning, controlling, scheduling and monitoring of the project

Poor planning, controlling , scheduling and monitoring of the project					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	22	81.5	81.5	81.5
	Disagree	5	18.5	18.5	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The table above shows that the third cause of delay which took place in EWSA during construction of water supply system and reservoir was because of poor planning of activities, poor controlling, scheduling and monitoring of the project, 22 respondents (81.5%) strongly agree about this causes and only 5 respondents (18.5%) respondents disagree about this cause, by comparing views of respondents, it shows that poor planning, controlling, scheduling and monitoring of project activities was the third causes of delay of that construction project.

Table 11: Delay in payment by owner

Delay in payment					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	19	70.4	70.4	70.4
	Agree	1	3.7	3.7	74.1
	Disagree	7	25.9	25.9	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table shows that delay in payment by owner was the fourth cause of construction project delay in EWSA during construction of water supply system and reservoir. The respondents view show that 19 respondents (70.4%) strongly agree about this cause of delay, one respondent (3.7%) agree about this cause and 7 respondents (25.9%) disagree about this cause. By looking to the views of respondents, delay of payment by owner is the fourth cause of delay which took place in EWSA during implementation of construction of water supply system and reservoir.

Researcher has taken these 4 causes of delay related to the owner because the analysis of data collected from respondents showed that these 4 causes are these which have contributed to the delay of construction of water supply system and reservoir in EWSA on the side of owner.

4.I.2.2 causes related to the consultant of project

The followings tables show the factors related to the consultants which causes delay of water supply system and reservoir construction projects in EWSA.

Table 12: Experience of consultants are not enough compared to the scope of the project

Experience of consultants are not enough compared to the scope of the project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	19	70.4	70.4	70.4
	Agree	5	18.5	18.5	88.9
	Disagree	3	11.1	11.1	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The first cause of delay related to the consultants during implementation of construction project of water supply system and reservoir was the experience of consultant which was not enough compared to the scope of project, 19 respondents (70.4%) strongly agree about this cause, 5 respondents (18.5%) agreed about this cause and only 3 respondents (11.1%) disagree about this cause, by comparing the percentage of these who strongly agree and those who agree with those who disagree, the findings show that lack of experience of consultants compared to the scope of the project is the first cause of delay on consultant side.

Table 13: Delay in the approval of sample submitted by contractors

Delay in the approval of sample submitted by contractors					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	17	63.0	63.0	63.0
	Agree	3	11.1	11.1	74.1
	Disagree	7	25.9	25.9	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

This table shows the second causes of delay in EWSA construction of water supply system and reservoir whereby by 17 respondents (63%) strongly agreed that delay of approval of sample submitted by contractors was the second cause of delay, also respondents (11.1%) agreed about this cause and only 7 respondents (25.9%) disagree about this cause. Based on the findings of research, it shows that many respondents agreed that delay of approval of sample submitted to consultants by contractors was the second causes of delay on the side of consultants.
Researcher has taken these 2 causes of delay related to the consultants because the analysis of data collected from respondents showed that these 2 causes are these which have contributed to the delay of construction of water supply system and reservoir in EWSA on the side of consultants.

4.I.2 4 causes related to the contractors of the project.

The findings from respondents of EWSA have mentioned some causes related to the contractors which has contributed to the delay of construction of water supply system and reservoir implemented by EWSA which has delayed for 496 days. The followings tables show the

different views of respondents about the causes of construction project delay related to contractors.

Table 14: Lack of skilled workers for project implementation

Lack of skilled workers for project implementation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	22	81.5	81.5	81.5
	Agree	2	7.4	7.4	88.9
	Disagree	3	11.1	11.1	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The ranking of respondents shows that the major causes of construction project delay related to the contractors was the lack of skilled workers for project implementation whereby 22 respondents (81.5%) strongly agree that the causes of delay which took place in EWSA during construction of water supply reservoir was due to the lack of skilled workers for project implementation and also 2 respondents agree about this cause and only 3 respondents(11.1%) out 27 have disagree about this cause of delay. Based on the number of respondents who strongly agreed and those who agreed about this cause of delay, the findings of this research in EWSA show that the lack of skilled workers for project implementation contributed to the delay of the project in EWSA.

Table 15: Incorrect and inappropriate bid price

Incorrect and inappropriate bid price					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	20	74.1	74.1	74.1
	Agree	1	3.7	3.7	77.8
	Disagree	5	18.5	18.5	96.3
	Strongly disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

This table shows that the causes of delay which took place in EWSA on the side of contractors was caused by incorrect and inappropriate bid price and the findings show that 20 respondents (74.1%) strongly agree that contractors bid at inappropriate price and 1 respondent agree the same cause and 5 respondents (18.5%) disagree about this cause and 1 respondent strongly agree about this cause. The findings show that a big percentage of respondents have same view that inappropriate bid price was the second cause of delay which took place in EWSA.

Table 16: Poor site management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	18	66.7	66.7	66.7
	Agree	5	18.5	18.5	85.2
	Disagree	4	14.8	14.8	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The third and last cause which the respondents have mentioned as the cause related to the contractors of the project was poor site management and the respondent views was 18 (66.7%) of them strongly agreed that poor site management contributed to the delay of construction of water dam in EWSA and 5 (18.55%) of them agree that poor site management contributed to the delay of EWSA project only 4 of them have disagree about this cause. The big size of respondents agreed that poor site management have contributed to the delay of EWSA construction project.

4.I.2.5 other factors of delay

Delay of construction project can take place due to other factors which are beyond the control of parties of the project and the factors are known as external environment factors. In EWSA construction project, respondents have identified 2 external factors which have contributed to the delay of its project and the following tables show the views of respondents about these factors

Table 17: Increase of cost of material

Increase of cost of materials					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	25	92.6	92.6	92.6
	Agree	1	3.7	3.7	96.3
	Disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The big percentage of respondents have mentioned that the increase of cost of material has contribute to the delay of construction project, 25 (92.6%) respondents strongly agreed that increase of cost of material have contributed to the delay of construction project in EWSA, and one respondent (3.7%) agree about this and only one respondent disagree about this cause, based on the finding from respondents, it shows that this external factor has contributed to the delay of project of EWSA.

Table 18: Inflation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	21	77.8	77.8	77.8
	Agree	6	22.2	22.2	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The total number of respondents agreed that the inflation is the issue which was the major causes of construction project delay in EWSA has caused by inflation, 21 respondents strongly agree that the major causes of delay

4.1.2.6 Views of respondents about the impacts of delay on cost of project

During research, researcher has investigated the views of respondents about the impact of cost when delay took place in EWSA, the following table show the views of respondents about the impacts of delay on cost.

Table 19: Construction project delay results in cost increase

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	23	85.2	85.2	85.2
	Agree	2	7.4	7.4	92.6
	Disagree	1	3.7	3.7	96.3
	Strongly disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The views of respondents show that they agree that when there is delay, there is cost increase also, 23(85.2%) respondents have strongly agreed that delay has results in cost increase, 2 (7.4%) respondents have agreed that delay results in cost increase and only one respondent disagree about the cost increase and one has strongly disagree about this impact. Based on the findings, big percentage of respondents have agreed that delay result in cost increase.

Conclusion of Construction project one

The aim of this interpretation was to assess the causes of construction project delay which took place in EWSA during construction of water supply system and reservoir which has been delayed for 496 days and to assess the views of respondents about the impacts of delay on cost of project, the findings show that delay which took place in EWSA was causes by parties of construction project (owners, contractors and consultants) and external factors, the findings show that ton the owner's side the causes of delay were lack of fund for project implementation (where respondents have strongly agreed about this cause at rate of 96.3%), Choosing contractor who bid at lower price (where respondents have strongly agreed about this cause at rate of 92.6%), poor planning, controlling, scheduling and monitoring of the project where respondents have strongly agreed this cause at rate of (81.5%), and delay in payment by owner of the project (where respondents strongly agree on this cause at rate 70.4%). On the side of contractors, respondents revealed that experience of consultants where not enough compared to the scope of project whereby 70.4% have strongly agreed that this have contributed to the delay of the project and delay of approving sample submitted by contractors also have contributed to the delay of the project whereby 63% respondents have strongly agreed on this cause of delay. Contractors also have contributed to the delay of project whereby 81.5% of respondents have strongly agreed that lack of skilled workers on the side of contractors have contribute to the delay of project, incorrect and inappropriate bid price contributed to the delay where respondents have strongly agree on this cause at rate of 74.1%, Poor site management by contractors also have contributed to the delay of project where respondents have strongly agreed on this cause of delay at rate of 66.7%.

External factors also have contributed to the delay of EWSA construction project and these factors were increase in cost of material whereby 92.5% respondents have strongly agreed to this as cause of delay and inflation also have contributed to the delay of EWSA construction project of water supply system and reservoir where 77.8% respondents have strongly agreed on this cause of delay. Researcher also has investigated if the delay impacts the cost of the project and 85.2%respondents have strongly agreed that when delay occur, the cost increase occurs.

4.II CAUSE OF DELAY IN CONSTRUCTION OF ACCESS ROAD TO RUSIZI III HYDROPOWER DAM (RTDA)

Rwanda Transport Development Agency is in charge of developing means of transport in Rwanda especially those road transport, despite its importance, RTDA is still facing the problem of its road construction project which faces the problem of delay. The report of Auditor General 2016 revealed that RTDA had faced the problem of delay in construction of access road to Rusizi III hydropower dam which had delayed for over 700 days.

Researcher has conducted research to assess factors which have contributed to such delay and to assess if such delay has impacted the cost of the project whereby researcher has distributed questionnaire to 31 respondents include owner of the project, contractors and consultants of such project and only four of them have failed to return back questionnaires, this means 27 respondents have returned questionnaires and the following are the interpretation of findings researcher has collected from them.

4 II.1 RESPONDENTS PROFILE

Table 20: Gender of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	19	70.4	70.4	70.4
	Female	8	29.6	29.6	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The above table shows the distribution of respondents whereby 19 respondents (70.4%) were male while 8 respondents (29.6%) were male, having collected data from both male and female gives assurance of credential data compared to one gender (male or female only). Researcher collected information on both male and female and this gives assurance that he collected valid data.

Table 21: Age group of respondents

Age group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-29	3	11.1	11.1	11.1
	30-39	10	37.0	37.0	48.1
	40-49	12	44.4	44.4	92.6
	50-59	2	7.4	7.4	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The above table shows that the respondents of this research were mature enough, 44.4% respondents were between 40 -49 years, 7,4% of respondents were between 40-59 years, 37%of respondents were between 30-39 years and 11.1% of respondents were between 20-29 years, this finding shows that the big number of respondents who participated in this research were mature enough which gives assurance too researcher that he has collected valid data because of maturity of respondents.

Table 22: Distribution of respondents by academic qualification

Academic Qualification					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	diploma holder	2	7.4	7.4	7.4
	Bachelor degree holder	15	55.6	55.6	63
	Master degree holder	10	37.0	37.0	
				3.7	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The above table shows that the respondents have good academic qualification whereby 37% of respondents were master degree holders, 55.6% respondents were bachelor holder and only 7.4 % of respondent were diploma holder, this means a lot to the researcher because the more respondents have high academic qualification, the higher they give you valid data, based on the academic qualification of respondents, they provide good contribution to this research.

Table 23: Distribution of respondents by experience

	working experience				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	9	33.3	33.3	33.3
	Between 5-10 years	12	44.4	44.4	77.8
	10 Years and above	6	22.2	22.2	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The above table shows that the respondents have excellent working experience and in this research working experience matter a lot because the higher the experience, the higher the knowledge about the case under study. 44.4% respondents work for between 5- 10 years in construction industry, 22.2% of respondents were work for 10 years and above while 33.3 % of respondents work for less than 5 years. Based on the findings, the big percentage of respondents have good working experiences and they really have skills about the industry which can contribute more to this research.

Table 24: Distribution of respondents based on occupation during project implementation

Occupation during project implementation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner	7	25.9	25.9	25.9
	Consultants	9	33.3	33.3	59.3
	Contractor	11	40.7	40.7	100.0
	Total	27	100.0	100.0	

Source: Primary source

The above table shows the distribution of respondents by their occupation during project implementation and the results show that 7 respondents (25.9%) were owners of the project, 9 respondents (33.3%) were consultants while 11 respondents (40.7%) were contractors. This finding show that all parties of construction project were represented and this gives validity of data collected from respondents because all parties have been involved in research. It would be a problem if one party misses during data collection because the findings would become incomplete data

Table 25: Distribution of respondents by institutions they work for during project implementation

Type of institution respondents work for					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public Institution	7	25.9	25.9	25.9
	Private institution	20	74.1	74.1	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table shows that the big percentage of respondents were from private institutions 20 respondents (74.1%) and 7 respondents (25.9%) were for public institution, this is because both consultants and contractors were from private institutions while owner of the project were from public institutions.

4.ii.2 Different views of respondents about the cause of delay in access road construction (RTDA)

Respondents have different views about the cause of delay which took place in RTDA during construction of access road to Rusizi III hydropower dam, some they think that the causes of delay were owner related, others they think he cause of delay was contractors related while others think that the causes of delay were consultants related.

The following were the views of respondents about the causes of delay.

4.II.2.1 Owner related causes of delay

The following tables show owners related causes which causes delay of construction of access road to Rusizi III hydropower dam.

Table 26: Lack of fund by owner

Lack of funds by the owner					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	24	88.9	88.9	88.9
	Agree	2	7.4	7.4	96.3
	Disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The above table show that the major cause of delay which took place in RTDA was the lack of fund by the owner whereby 88.9 respondents have strongly agreed about this cause of delay.

Table 27: Choosing contractors who bid at lower price

choosing contractor who bids at lower price					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	23	85.2	85.2	85.2
	Agree	3	11.1	11.1	96.3
	Disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source of data: Primary source 2018

The table above shows that the second cause of construction project delay which took place in RTDA during implementation of construction of access road to Rusizi III hydropower dam, among 27 respondents, 23 respondents (85.2%) strongly agree that the major causes of construction project delay which took place in RTDA was because of choosing contractor who bid at lower price, and 3 respondents agree that the choose of contractor who bid at lower price was the cause of delay, and only one respondents (3.7%) has disagree about this cause, by comparing the views of respondents, it shows that choosing contractors who bid at lower price was the second cause of delay in RTDA construction project related to the owner of the project.

Researcher has selected two causes of delay related to the owner because many respondents have strongly agreed that these causes have contributed more to the delay of RTDA project.

4.II.2.2 Cause related to the consultants

Table 28: Experience of consultant is not enough compared to the scope of the project

Experience of consultants are not enough compared to the scope of the project					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	14	51.9	51.9	51.9
	Agree	7	25.9	25.9	77.8
	Disagree	6	22.2	22.2	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The above table shows that 14 (51.9%) respondents have strongly that experience of consultants was not enough compared to the scope of the project and 7 (25.9%) respondents have agreed about this cause; this is the only cause related to the consultant which respondents mentioned as having high grade in the contribution of delay of RTDA project of construction of access road to Rusizi III hydropower

4.2.2.2 Cause related to the contractors

Table 29: Lack of experience by contractors

Lack of experiences by contractors					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	14	51.8	51.8	51.8
	Agree	5	18.5	18.5	70.3
	Disagree	8	29.7	29.7	100.0
	Total	27	100.0	100.0	

Source: Primary source 2018

The above table shows that 14respondents (51.8%) strongly agreed that the experience of contractors was not enough compared to scope of the project implemented by RTDA, and 5 respondents (18.5%) agreed about this cause related to the contractors and only one respondent have disagreed about this cause, the big percentage of respondents have agreed that the experience of contractors was not enough compared to the scope of the project.

Table 30: Lack of Skilled workers to implement project

Lack of skilled workers for project implementation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	18	66.7	66.7	66.7
	Agree	6	22.2	22.2	88.9
	Disagree	3	11.1	11.1	100.0
	Total	27	100.0	100.0	

Source: Primary source 2018

The above table show that many respondents (66.7%) have strongly agreed that the issue of lack of experienced workers have contributed to the delay of construction project in RTDA, and 22.2% respondents have agreed on the same cause only 11.1% respondents have disagreed about this cause, based on the percentage of respondents, a big number of them have strongly agreed that lack of experienced workers has contributed to the delay which happen in RTDA

Table 30: Incorrect and inappropriate bid price by contractors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	17	63	63	63
	Agree	5	18.5	18.5	81.5
	Strongly Disagree	5	18.5	18.5	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The above table shows that 63 % of respondents have strongly agreed that incorrect and inappropriate bid pricing by contractors have contributed to the delay of construction project in RTDA and 18.5% of respondents have agreed on this cause of delay.

4.II.2.3 Other factors of delay

Table 31: Increase of cost of materials

Increase of cost of materials					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	22	81.5	81.5	81.5
	Agree	2	7.4	7.4	88.9
	Disagree	2	7.4	7.4	96.3
	Strongly disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source: Primary source 2018

The big percentage of respondents have mentioned that the increase of cost of material has contribute to the delay of construction project, 22 (81.5%) respondents strongly agreed that increase of cost of material have contributed to the delay of construction project in RTDA, and one respondent (7.4%) agree about this and only (7.4%) respondents strongly disagree about this cause, based on the finding from respondents, it shows that this external factor has contributed to the delay of project of RTDA

Table 32: Inflation

Inflation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	15	55.6	55.6	55.6
	Agree	6	22.2	22.2	77.8
	Disagree	6	22.2	22.2	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The second cause of delay related to the external environment was inflation based on the findings where 55.6 % respondents have strongly agreed that the causes of delay which took place in RTDA was due to the inflation.

Table 33: Views of respondents about cost increase

Construction project results in cost increase					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	21	77.8	77.8	77.8
	Agree	3	11.1	11.1	88.9
	Disagree	2	7.4	7.4	96.3
	Strongly disagree	1	3.7	3.7	100.0
	Total	27	100.0	100.0	

Source: Primary data 2018

The views of respondents show that they agree that when there is delay, there is cost increase where, 21 (77.8%) respondents have strongly agreed that delay has results in cost increase, 3 (11.1%) respondents have agreed that delay results in cost increase and only one respondent disagree about the cost increase and one has strongly disagree about this impact. Based on the findings, big percentage of respondents have agreed that delay result in cost increase

Conclusion of Construction project 2

The purpose of this interpretation and analysis of data was to assess the causes of delay which took place in RTDA during construction of access road to Rusizi III hydropower and their impacts on cost whereby researcher has distributed questionnaire containing 38 causes and these causes were owners related causes, contractors related causes and consultants related causes. The findings of this research show that the major causes of delay of this project were lack of funds by owner of the project whereby 88.9% respondents have strongly agreed about this cause, choosing contractors who bid at lower price whereby 85.2% respondents have strongly agreed about this cause, lack of experience by contractors whereby 51.8% respondents have strongly agreed about this cause, Lack of skilled workers to implement project whereby 66.7% of respondents have strongly agreed about this cause, experience of consultants were not enough compared to the scope of the project whereby 51,9% respondents have strongly agreed, Increase of cost of material whereby 81.5 % respondents have strongly agreed and Inflation whereby 55.6% respondents strongly agreed about this cause and incorrect and inappropriate bid pricing by contractors have contributed to the delay of the project in RTDA. Researcher also has assessed the views of respondents if the delay impacts the cost of the project and 77.8%respondents have strongly agreed that when delay occur, the cost increase occurs

4.III. DELAY OF CONSTRUCTION OF RUTARE HEALTH CENTER (GICUMBI DISTRICT)

Health of the citizens is most important of element of economic development of country and based on their importance, the government of Rwanda has invested more to protect the health of its citizens, despite its importance, the government of Rwanda is facing problem of delayed construction of hospital project whereby the Auditor general report 2016 show that the construction of maternity ward at Rutare health center, Gicumbi district has delayed for 721 days.

After seeing this report, researcher conducted study to access the cause of such delay by distributing questionnaires to 24 respondents (owners, contractors and consultants) who were on that construction but 17 (70%) of respondents have returned questionnaire and the followings are the findings of this research conducted.

4.III.1 RESPONDENTS PROFILE

The followings tables present respondents profile:

Table 34: Distribution of respondents by gender

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	12	70.6	70.6	70.6
	Female	5	29.4	29.4	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows the distribution of respondents whereby 12 respondents (70.6%) were male while 5 respondents (29.4%) were male, having collected data from both male and female gives assurance of credential data compared to one gender (male or female only). Researcher collected information on both male and female and this gives assurance that he collected valid data.

Table 35: Distribution of respondents by age group

	Age group				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-39	4	23.5	23.5	23.5
	40-49	10	58.8	58.8	82.4
	50-59	3	17.6	17.6	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows that the respondents of this research were mature enough, 58.8% respondents were between 40 -49 years, 7,4% of respondents were between 40-59 years, 23.5%of respondents were between 30-39 years and 17.6% of respondents were between 50-59 years and none of 20-29 years who participate in this research, this finding shows that the big number of respondents who participated in this research were mature enough which gives assurance too researcher that he has collected valid data because of maturity of respondents.

Table 36: Distribution of respondents by academic qualification

	Academic Qualification				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor degree holder	7	41.2	41.2	41.2
	Master degree holder	10	58.8	58.8	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows that the respondents have good academic qualification whereby 58.8% of respondents were master degree holders, 41.2% respondents were bachelor holder and none respondent was having diploma degree, this means a lot to the researcher because the more

respondents have high academic qualification, the higher they give you valid data, based on the academic qualification of respondents, they provide good contribution to this research

Table 37: Distribution of respondents by experience

	working experience				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	2	11.8	11.8	11.8
	Between 5-10 years	14	82.4	82.4	94.1
	Between 10 years and above	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows that the respondents have excellent working experience and in this research working experience matter a lot because the higher the experience, the higher the knowledge about the case under study as respondents have experience on the industry,82.4% respondents work for between 5- 10 years in construction industry, 5.9% of respondent worked for 10 years and above while 11.8% of respondents worked for less than 5 years. Based on the findings, the big percentage of respondents have good working experiences and they really have skills about the industry which can contribute more to this research.

Table 38: Distribution of respondents based on occupation during construction project

Occupation during project implementation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner	5	29.4	29.4	29.4
	Consultant	7	41.2	41.2	70.6
	Contractor	5	29.4	29.4	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows the distribution of respondents by their occupation during project implementation and the results show that 5 respondents (29.4%) were owners of the project, 7 respondents (41.2%) were consultants while 5 respondents (29.4%) were contractors. This finding show that all parties of construction project were represented and this gives validity of data collected from respondents because all parties have been involved in research. It would be a problem if one party misses during data collection because the findings would become incomplete data

Table 39: Distribution of respondents by institutions they work for

Type of institution respondents work for					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public Institution	5	29.4	29.4	29.4
	Private institution	12	70.6	70.6	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows that the big percentage of respondents were from private institutions 12 respondents (70.6%) and 5 respondents (29.4%) were for public institution, this is because both consultants and contractors were from private institutions while owner of the project were from public institutions.

4.III.2 Views of respondents about the causes of delay of construction of Rutare health center (Gicumbi district)

The aim of this section is to present the views of respondents about the cause of delay which took place during construction of Rutare health center which has delayed for 721 days.

4.III.2.1 Owner related causes

The following tables show the owner related causes of delay during construction of Rutare health center

Table 40: Choosing contractors who bid at lower price

choosing contractor who bid at lower price					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	15	88.2	88.2	88.2
	Agree	2	11.8	11.8	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table show that no respondents who have disagreed about this cause of delay but 15(88.2%) respondents have strongly agreed that the delay which took place during construction of Rutare health center was due to the choosing contractor who bid at lower price and the remaining 2 (11.8 %) respondents have agreed about that the choose of contractor who bid at lower price was the cause of delay.

Table 41. Lack of fund by owner

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	14	82.4	82.4	82.4
	Agree	2	11.8	11.8	94.1
	Disagree	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

Source: Primary source 2018

The above table show that 82.4% respondents have strongly agree that the issue of fund have contribute to the delay of construction f maternity ward and 11.8% respondents have agreed, based on this finding, it shows that the issue of fund to the owner has contributed to the delay of this project.

Table 42: Poor planning, controlling, scheduling and monitoring the project by owner

Poor planning, controlling , scheduling and monitoring of the project					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	15	88.2	88.2	88.2
	Agree	2	11.8	11.8	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table show that no respondents who have disagreed about this cause of delay but 15(88.2%) respondents have strongly agreed that the delay which took place during construction of Rutare health center was due to the poor planning, controlling, scheduling and monitoring the project by owner and the remaining 2 (11.8 %) respondents have agreed about the same cause. The

analysis has revealed that those were dominant causes related to the owner which have contributed to the delay of construction of Rutare health center.

4.III.2.2. Causes related to the consultant

Table 43: Delay in the approval of the sample submitted by contractors

Delay in the approval of the sample submitted by contractors					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	12	70.6	70.6	70.6
	Disagree	4	23.5	23.5	94.1
	Strongly disagree	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows that consultants have contributed to the delay of the project whereby 70.6% respondents have agreed that delay in the approval of sample submitted by contractors have contributed to the delay of the project.

4.III.2.3 Causes related to the contractors

Table 41: Lack of skilled workers for project implementation

		Lack of skilled workers for project implementation			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	9	53	53	53
	Agree	1	5.9	5.9	58.9
	Disagree	7	41,1	41.1	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table show that contractors have faced the challenge of skilled workers to implement project whereby 53.00 % of respondents have strongly agreed about this cause, and 5.9 % of respondents have agreed about this cause. This cause was the dominant cause related to the contractors which respondents have mentioned as has contributed to the delay of construction of Rutare health center.

Table 44: Incorrect and inappropriate bid price by contractors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	13	76.4	76.4	76.4
	Disagree	2	11.8	11.8	88.2
	Strongly disagree	2	11.8	11.8	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows that 76.4 % respondents have agreed that incorrect and inappropriate bid price by contractors have contributed to the delay of the project and 11.8% respondents have disagreed on this cause and 11.8% of respondents have strongly disagreed on this cause, based on the finds , the big percentage of respondents have agreed on this cause.

*4.III.2.4 External factor related causes***.**

Table 42: Increase of cost of material

Increase of cost of materials					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	12	70.6	70.6	70.6
	Agree	2	11.8	11.8	82.4
	Disagree	1	5.9	5.9	88.2
	Strongly disagree	2	11.8	11.8	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The above table shows the views of respondents about external factor which has contributed to the delay of construction of Rutare health center and 70.6% of respondents have strongly agreed that the increase of cost of material has contributed to the delay of that project

Table 45. Inflation factor

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	13	76.4	76.4	76.4
	Agree	2	11.8	11.8	88.2
	Disagree	2	17.6	11.8	100.0
	Total	17	100.0	100.0	

Source: Primary source 2018

The above table shows that 76.4% of respondents have strongly agreed that inflation have contributed to the delay of construction of maternity ward and 11.8% of respondents have agreed that the inflation has contributed to the delay of construction project of maternity ward.

Table 46: Views of respondents about the impacts of delay on cost

Construction project results in cost increase					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	15	88.2	88.2	88.2
	Agree	1	5.9	5.9	94.1
	Strongly disagree	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

Source: Primary data 2018

The views of respondents show that they agree that when there is delay, there is cost increase where, 15 (88.2%) respondents have strongly agreed that delay has resulted in cost increase, 1(5.9%) respondents have agreed that delay results in cost increase and only one respondent

disagree about the cost increase and only 1 (5.9%) respondent has strongly disagreed about this impact. Based on the findings, big percentage of respondents have agreed that delay result in cost increase

Conclusion of project three.

The aim of this interpretation of data was to assess the causes of construction project delay which has happened during construction of Rutare health center at Gicumbi district where the project has delayed for 721 days according to the Auditor General report 2016. The findings have revealed that the followings elements have contributed to the delay of project and these were lack of fund by owner where 82.4% respondents choosing contractors who bid at lower price whereby 88.2 % of respondents have strongly agree to this cause, poor planning, controlling, scheduling and monitoring of the project whereby 88.2% of respondents have strongly agreed on this cause, incorrect and inappropriate bid price by contractors also has contributed to the delay where by 76.4% of respondents have agreed , delay in the approval of the sample submitted by contractors has contribute to the delay of the project whereby 70.6% of respondents have strongly agreed on this cause, Lack of skilled workers for project implementation has contribute whereby 53% of respondents have agreed on this cause, increase in cost of materials have also contributed to the delay whereby 70.6% of respondents have strongly agreed on this cause and 88.2% of respondents have agreed that when delay occur, it affects cost of the project.

The aim of this interpretation of data collected to this project was to assess the causes of delay of construction project and their impacts on cost in Rwandan public institutions and as the findings show, the causes of delay of the project undertaken by those three public institutions are almost similar even if the degree by which respondents ranked them are differ and the big number of respondents have agreed that when delay occurs, the cost increase occur at the same time.

The common causes identified in all these 3 construction projects are lack of fund by owner to finance project, choosing contractors who bid at lower price, poor planning, controlling, scheduling and monitoring the project by owner, experience of consultants are not enough compared to the scope of the project, lack of skilled workers for project implementation, incorrect

and inappropriate bid price, lack of experience by contractors, increase of cost of materials and inflation.

To check the impact of these causes of delay, researcher has tested the impact by using the descriptive data analysis where mean and standard deviation have been calculated to determine the degree by the selected common causes of delay impacts cost of the project. The more the causes have small mean and standard deviation, the more the causes impacts cost of the project.

Mean(X)

The most common expression for the mean of a statistical distribution with a discrete random variable is the mathematical average of all the terms. To calculate it, add up the values of all the terms and then divide by the number of terms. This expression is also called the arithmetic mean. The mean of a statistical distribution with a continuous random variable, also called the expected value, is obtained by integrating the product of the variable with its probability as defined by the distribution (Aggressti & Franklin, 2000).

The range is calculated by taking n-1 /n where n =number of evaluation

Range = 4-1/4 = ¾= 0.75

Table 43: Evaluation of mean

Mean	Evaluation
1.00 – 1.75	Very strong
1.75 – 2.5	Strong
2.5 – 3.25	moderate
3.25 -4.00	weak

Source: *Aggresti (2009)*

The standard deviation (σ)

It is the measure of the dispersion of a set of data from its mean. The more spread apart the data, the higher the deviation. Standard deviation is calculated as the square root of the variance. The standard deviation was used in order to measure the degree of dispersion (homogeneity if is less than 0.5 or heterogeneity if is great than 0.5) of responses was collected.

Table 44: Evaluation Standard Deviation

Standard deviation	Evaluation
$\sigma > 0.5$	Heterogeneity
$\sigma = 0.5$	Moderate
$\sigma < 0.5$	Homogeneity

Source: *(Franklin, 2000)*

The table below shows the findings from descriptive statistical analysis where means and standard deviation of common causes of delay of mentioned three constructions projects have been calculated.

Table 45: Descriptive statistics of causes of delay

Causes of delays	Mean	Interpretation	Std. Deviation	Interpretation
Poor planning, controlling , scheduling and monitoring of the project	1.2676	Very strong	.47683	Homogeneity
Lack of funds by the owner	1.1408	Very strong	.45656	Homogeneity
Experience of consultants are not enough compared to the scope of the project	2.3521	Strong	1.00141	Heterogeneity
Lack of experiences by contractors	2.4930	Strong	1.01240	Heterogeneity
Lack of skilled workers for project implementation	2.5775	Moderate	1.05101	Heterogeneity
Increase of cost of materials	1.4099	Very strong	.48703	Homogeneity
Inflation	1.6477	Very strong	.49991	Homogeneity
Incorrect and inappropriate bid price	1.5197	Very strong	.49026	Homogeneity
choosing contractor who bids at lower price	1.1631	Very strong	.49305	Homogeneity

Source: Primary source 2018

Homogeneity of standard deviation means that there is standard deviation is closer to the means of the study, this means that the big percentage of respondents have agreed that such variable

have strong impacts on cause of delay in other word, the variable contribute significantly to the delay of construction projects.

Heterogeneity with of standard deviation with strong mean this means that some respondents were agreed by the big number has disagreed or and strongly disagree about the variable but some of them have agreed on the variable.

The analysis of the findings has been carried out on the mentioned 9 elements of delays which have been mentioned in all three delayed constructions as contributors' factors of delays which have led to the cost increase.

Table 46: The impacts of delays

	N	Minimum	Maximum	Mean	Std. Deviation
Construction project delays results in abandonment	71	1.00	4.00	1.9014	.68083
Construction project results in cost increase	71	1.00	4.00	1.3380	.40965
Construction project delays results in poor quality of output	71	1.00	4.00	3.0563	1.02661
Construction project delay affects community	71	1.00	4.00	3.0563	.90849
Construction project delay affects reputation of contractors	71	2.00	4.00	2.9014	.65803
construction Project delay causes conflicts between owner and contractors of the project	71	1.00	4.00	1.7704	.47633
Valid N (list wise)	71				

Source : Primary source 2018

The aim of this table was to assess the views of respondents on the cost increase when delay occurs, and the mean found shows that many respondents have agreed that when delays occur, the cost of project increases.

CHAPTER V: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter of the study aim at providing a summary of the study findings by making conclusions and recommendations. The study conclusions and recommendations done are based on the findings from the study objectives.

SUMMARY OF FINDINGS

The aim of this study was to assess the causes of construction project delay and their impacts on cost in Rwandan public institutions, based on the descriptive statistical findings it shows that the followings were the causes which have contributed to delays and cost increase of Rwandan public institutions construction projects under study, lack of fund by the owner of the project were the major cause of construction project delay which has greatest impact on cost whereby it has mean of 1.1408 with 0.45656 of standard deviation, this means that most respondents have agreed that lack of fund by owner was the major causes of delay which has impacted more the costs of projects. This finding rank this cause as the cause which has greatest impact on cost of the project. The study conducted by (Owolabi James & Amusan M., 2014) to assess the causes and effects of delay on project construction delivery time has revealed that the major causes of delay in Nigeria was lack of fund by owner to finance the project and the findings revealed that when the owner of the project suffer the problem of insufficient fund for project implementation, it affects cost where by 78.8% respondents have agreed on this statement that the delay caused by lack of fund by owner to implement project affect the cost of the project, also the study conducted by (Bekr G. , Causes of delay in Public constrcution projects in Iraq, 2015) to assess the causes of delay in public construction project in Iraq revealed that the cause of the lack of fund by owner was ranked at the second place as the cause of delay in Iraq and respondents of this research agreed that this delay affect cost of the project whereby 88.5% have agreed on it. The finding from respondents show that this cause has contributed to the delay of construction project delay in public institutions and has impacted more the cost of project.

The second cause of delay in construction projects in Rwandan public institutions which has greatest impacts on cost is poor planning, controlling, scheduling and monitoring the project

whereby this cause has mean of 1.2676 with standard deviation of 0.47683, This finding shows that respondents have strongly agreed that this was the cause delay of construction project and have also agreed that it has greatest impact on the cost of the project. The study conducted by (Henry Alinaitwe & R.Apolot, 2013) to investigate the causes of delay and cost overruns in Uganda's public sector construction projects have ranked this cause as among top three causes of delay which caused cast overruns in the construction industry in Uganda's Public sector, the findings of this research conducted in Rwandan public institution has ranked this factor as the cause of delay which has impacted more the cost of the project.

The third cause of delay which has impacted more the cost of the projects is increase of cost of material whereby this cause has mean of 1.4099 and standard deviation of 0.48703, This finding revealed that the scarcity of construction materials has caused delay and also affect the cost of the projects undertaken by Rwandan Public institutions. Some construction works in Rwanda require to use materials which are not locally available, the market price fluctuation has impacted time and cost of construction projects undertaken by public institutions in Rwanda but it's not only in Rwanda , the study conducted by (Owolabi James & Amusan M., 2014) to assess the causes and effects of delay on delivery time in Nigeria, this cause occupied the third place of the cause of delay which affects time and cost of the projects in Nigeria, the study conducted by (Dr. Ashraf Samarah & Dr. G.A.Bekr, 2016) to assess the causes of delay in public construction projects in Jordan, have mentioned this cause as one among others causes of delay which affects the cost of the project in Jordan where they ranked this cause as the 22nd causes which cause delay and which affects the cost of the projects. The ranking on this cause of delay differ from Jordan to Rwanda perhaps because Jordan is economically stable compared to Rwanda but in both countries this cause has contributed to the delay of construction project in public institutions and have affected the cost of the project.

The fourth and fifth causes of delay of construction projects which impacts the cost of construction projects in Rwandan public institutions is incorrect and inappropriate bid price of contractors and choosing contractors who bid at lower price have affected the cost of the projects, due to the competitions, contractors try to minimize the bidding price to gain the market and the owner of the project try to select those who bid at lower price to minimize the cost of the project which finally result in the cost increase of the projects. The findings of this research show that Incorrect

and inadequate bid price of contractors has mean of 1.5197 and standard deviation of 0.49026, this means that it has significantly contributed to the delay of construction projects in Rwandan public institutions and has affected the cost of project, also choosing contractors who bid at lower price by owner of the project results in delay, the findings of research shows that this has contributed to the delay of the project and has impacted the cost whereby this cause has mean of 1.1631 and standard deviation of 0.49305, this means that many respondents have agreed that this has contributed to the project delay and has effects the cost of the projects, the study conducted by (Dr. Ashraf Samarah & Dr.G.A.Bekr, 2016) to assess the causes and effects of delay in Public construction projects in Jordan have ranked this cause of choosing contractors who bid at lower price as the 3rd cause of delay which has contributed to the cost increase of construction projects in Jordan. These factors have contributed in the delay of these Rwandan public institutions construction projects and have affected the cost of the projects.

The sixth cause of delay which has been identified as contributed to the delay of construction project in Rwandan public institutions and which has contributed to the cost increase of the project is inflation which has mean of 1.6477 and standard deviation of .49991, this statistic shows that respondents agreed that this factor has caused delay which has affect the cost of projects in Rwandan public institutions, the study conducted by (Henry Alinaitwe & R. Apolot , 2013) to investigate the causes of delays and costs overruns in Uganda's public sector construction projects ranked inflation among top 4 causes of delay and cost overruns in Uganda's public construction projects. Based on the findings from analysis, this has contributed to the delay of the projects and has affected the cost of construction projects which took place in Rwandan public institutions.

Others factors which has contributed to the delay of construction projects and which have affects the cost of the projects in Rwandan public institutions are experience of consultants was not enough compared to the scope of the project, when consultants do not have necessary qualification in regard of the project, this affect the project in terms of its completion period or cost, the findings show that some respondents revealed that unexperienced consultants have contributed to the delay of the projects and which has affected the cost of the project. Research done by (Bekr G. , Causes of delay in Public constrcution projects in Iraq, 2015) to assess the causes of delays in public construction projects have ranked this cause on the second cause of delay in Iraq public construction projects and this research show that this is cause of delay has affected the cost of the

construction project of public institutions in Iraq. This confirm that the findings of this research is valid and this has caused delay and affects the cost of the project in Rwandan public institutions. Another cause of delay which has affected the cost of construction projects in Rwandan public institutions was lack of skilled workers for project implementation on the side of contractors, the non-availability of skilled and experienced labor force has been identified as one among other causes of delay which has impacted the cost of the project in Rwandan public institutions, it is not in Rwanda only where this can result in delay and project cost increase, the study conducted by (Hazim N. , 2015) have ranked this as the 4th cause of delay in construction of road in Jordan. Lack of qualified have contributed to the delay and cost increase of construction projects in Rwandan public institutions. The last factor which has contributed to the delay ad cost increase of construction projects in Rwandan public institutions was experience of contractors was not enough compared to the scope of projects when contractors are not well experienced, they did many mistakes which can lead to the delay and project cost increase such bidding at lower price, poor communication with subcontractors, suppliers and other parties of the project, etc. The study conducted by (Shahid Hussain, 2017) to assess the critical delaying factors in public sector building projects in Pakistan has ranked this cause as the 4th cause of delay in construction projects which affects that affects the cost of the project.

Causes of delay and their impacts differ from one country to another but many countries face the problem of delay of construction, these 9 explained causes of delay are those causes identified by researcher as were the major causes of construction projects delay that have impacted the cost of construction project in Rwandan public construction projects.

5.2. Conclusion of the study

This study of assessment of causes of construction project delay and their impacts on costs in Rwandan public institutions have been conducted in RTDA, EWSA and GICUMBI District and the findings of research have shown that delays are inevitable (unavoidable), however they can be minimized or avoided when their causes are effectively identified and analyzed, to minimize the causes of delays require the effort of each parties of construction projects in terms of planning, controlling and periodically evaluation of their work, it also require strong communication and cooperation between parties of projects. Delays in construction projects are widely researched area for which more researches are constantly being carried out, due to the wide coverage of

construction projects in terms of size, type, geographically area, availability of resources and so on, there is still the need to investigate the causes and assess the effects of delays on various construction projects at various levels, this may eventually lead to the much needed development in construction industry in Rwanda.

5.3 Limitation of the study

During this research, researcher has encountered with many challenges whereby some respondents have refused to turned back questionnaire, duration of research was not enough compared to the scope of research, and even financial constraints.

5.4 Recommendations of the study

Based on the findings of the study, construction industry in Rwanda is still facing the problem of delay which results in cost increase and to minimize the causes of delays, the efforts of each party of construction project is needed because the most causes of delays which results in cost increase in Rwandan public institutions construction projects are attached to the owners of the projects (lack of funds by owner, poor planning, controlling, scheduling and monitoring of the project by owner, choosing contractors who bid at lower price) others are caused by contractors (lack of experiences of contractors and bidding at lower price) , others are caused by consultants (lack of experience by consultants compared to the scope of work) and others are externa factors (inflation and increase of cost of construction materials). By looking to the findings of research, to avoid causes of construction projects delays are impossible but to minimize the causes of delays and their impacts on cost are possible, because it is impossible to avoid external factors of delays and their effects but it is possible to minimize the causes of delays and their effects of construction projects on the side of parties of the projects (owners, consultants and contractors).

To minimize the causes of delays of and their impacts on costs in Rwandan public institutions construction projects, there should be sound planning and controlling of public construction projects by owners, there should be sound methodology of selecting parties of construction projects and the owners should be planned based on the funds available to avoid irregular cash flows and delays of payments. As inflation and materials cost increase are out of control of parties

of the projects, during planning and in contracts documents, they should include clause of how parties will deal with this situation when happened during implementation process.

5.4 Areas for Future Research

Basing on research findings and problems and limitations encountered in this research, the following should be considered for future research:

1. The role of sound planning and their effects on cost minimization in Rwandan public institutions construction projects.
2. Critical success factors of construction projects in Rwandan public institutions.
3. Eternal factors and cost overrun of construction projects in Rwandan public institutions

CHAPTER 6: APPENDICES

Bibliography

.T, T. (2009). *Types of construction Delays, understanding tem clearly, analyzing them correctly.* Oxford : Elsevier Inc.

(2018). Retrieved from www.explore.com: https://explorable.com/research-population

A.Bekr, G. (2015). Causes of Delay in Public Construction Projects in Iraq. *Journal of Civil Engineering* , 149-161.

Abbas, M. (2006). *Causes and effects of delay in Aceh construction industry in Malaysia.*

Akinsola, A. N. (1997). Identification and evaluation of factors influencing variations on building projects. *International journal of Project Management*, 263-267.

Al- Kharashi A., S. (2009). Causes of delays in Saudi Arabian Public sector construction projects. *Construction management and economics*, 3-23.

Albert P.C. Chan, D. S. (2013). Factors affecting the success of a construction project. *Project management journal*, 1-8.

Apuke, D. (2017). Quantitative Research Methods. *Arabian Journal of Business and Mangement Review*.

Apuke, D. (2017). Quantitave Resarch Methods : A synopsis Approach. *Arabian Journal of Business Management Review*.

Assaf SA, A.-H. S. (2006). Causes of dely in large construction projects . *International Journal of Project Management*, 349-357.

Audul -Rahman, H. B. (2006). Delay Mitigation in the Malaysian Construction Industry . *Journal of construction Engineering and Management*, 126-138.

Australia, S. w. (2012). *Construction work code of practice .*

Baccarini, D. (1999). The logical framework method for defining project success . *Project Mangement Journal* , 25-32.

Baker, B. N. (1988). *Factors affecting project sucesss in Cleland , D.I.& King, W.R.* New York : Van Nostrand Reinhold.

Bekr, G. (2015). *Journal of civil engineering*, 149-162.

Bekr, G. (2015). Causes of delay in Public constrcution projects in Iraq. *Journal of Civil Engineering* , 149-162.

Bekr, G. A. (2015). Ccauses of delay in public construction projects in Iraq . *Jordan Journal of civil enginnering* , 149-164.

C. Marshall and G.B. Rossman. (1990). *Designning Quallitative Research.*

C., W. (2011). Research Methods. *Journal of Business and Economics Research*.

Chua, D. Y. (1999). Critical Success factors for different project objectives. *Construction engeneering Journal*, 142-150.

Cooper, Donald R, Pamella, Schindler S. (2003). *Business Research Methods 8th Edition* . New York: Mc Gram - Hill Companies Inc.

Culas, P. R. (25th June 2014). Causes of Delays in construction Projects. *International Journal of Current Research*, 7219-7222.

Dr Patrick. X.W. Zou, D. G.-Y. (2014). Identifying Key Risks in Construction Projects: Life Cycle and Stakeholder Perspectives. *International Journal of construction Mnagement*, 6-12.

Dr. Ashraf Samarah & Dr. Ghanim A.Bekr. (2016). Causes and effects of delay in public construction projects in Joradan . *American Journal of Engineering Research* , 87-94.

Dr. Ashraf Samarah & Dr.G.A.Bekr. (2016). Causes and effects of delay in Pubblic construction projects in Jordan . *American Journal of Engineering Research (AJER)*, 87-94.

Dr.Ashraf Samarah & Dr. G.A.Bekr. (2016). Causes and effects of delay in public construction projects in Jordan . *American journal of Engineering Research (AJER)*, 87-94.

Freeman, M. &. (1992). Measuring project success. *Project Management Journal*, 8-17.

Frimpong Y.Oluwoye, J. a. (2003). Causes of delay and cost overruns in construction of ground water projects in a developing country Case study of Ghana. *International Journal of project management*, 321-326.

Fugar, F. a.-B. (2010). Delays in Building Construction Projects in Ghana . *Australian Journal of Construction Economics and Building* , 103-116.

Glasow, P. A. (2005). *Fundamentals of Survey Research Methodology.* Washington C3: MITRE PRODUCT.

Hazim, N. (2015). Delay and cost overrun in rood onstruction project in Jordan . *Civil engineering View project*, 288-293.

Hazim, N. A. (2015). Delay and cost overrun in road construction projects in Jordan. *International Journal of Engineering and Technology*, 288-293.

Henry Alinaitwe & R. Apolot . (2013). Investigation into the causes of delays and cost overruns in Uganda's public sector construction projects. *Journal of construction in developing countries* , 33-47.

Henry Alinaitwe & R.Apolot. (2013). Investigation into the causes of delays and cost overns in Uganda's public sector construction projects. *Journal of construction in Developing countries* , 33-47.

Henry Alinaitwe & Ruth Apolo . (2013). Investigation into the causes of delays and cost overruns in Uganda Public sector construction projects. *Journal of construction in develoing countries*, 33-47.

Hubbard, D. .. (1990). Successful utility project management from lessons learned. *Project Management Journal*, 19-23.

Infrastructure, M. o. (2016). *Energy and Infrastrucure Forum.* Kigali: IPAD Rwanda.

Isaac S.& Michael, W.B . (1997). *Handout in research and evaluation: A collection of principles, methods and strategies useful in the planning, design and evaluation of studies in education and behavioral sciences(3rd edition).* San Diego: Educational and industrial testing services .

Jammaz. (2010). *Strictural Project life cycle .*

Kaliba,C ,Muya,M&Mumba ,K . (2009). Cost esclation and Schedule delay in road construction project in Zambia. *International Journal of Project Mangement*, 522- 531.

Kumaraswamy, M. a. (1999). Factors facilitating faster construction . *Journal of construction procurement*, 88-98.

Langos, S. (September 2014). *Athens as an international tourism destinatio : An imperical investigation to the city's imagery and the role of of local DMO'S.* Derby: University of Derby.

Le- Hoai, Lee & Y.D. (2008). Delay and cost overrun in Vietnam large construction projects: A comparison with other selected countries . *Journal of Civl Engineering* , 367-377.

Luu Truong Van&Nguyen M.Sang. (2015). A Conceptual Model of Delay Fcators affecting Government Construction Project. *ARPN Journal of Science and Technology* , 92-100.

Luu Truong Van, N. Minh Sang . (February, 2015). A Conceptual Model of Delay Factors affecting Government Construction Projects. *ARPN Journal of Science and Technology*, 608-737.

M.R.B, M. (2010). *The facors and effects of delay in government construction project , Case study Kuankan - University of Malaysia Palang.*

Majid, I. (2006). *Causes and Effects of Delays in Eceh construction industry i Malaysia, Master thesis, University of Technology Malaysia.*

MININFRA. (August,2009). *Rwanda National Construction Industry Policy .* Kigali: Ministry of Infrastructure .

Mohammad soroush& Pramen P. (2017). Invesigating Causes of Delay in U.S. Construction Projects . *Project management journal*.

Mohammadsoroush & LEED AP. (March 2017). Investigating causes of delay in U.S. Construction Projects . *International Journal of project management*.

Muhammed, T. A. (January, 2015). Delay in construction project . *Project Management Journal* , 1-2.

Musirikare M.& Julius Warren Kule . (2016). Project Delays on Cost Overrun Risks : A study of Gasabo District Construction projects, Kigali - Rwanda. *ABC Journal of Advanced Research* .

Musoni, E. (2011, April 29). *The New Times .* Retrieved from www.google.com .

Mwizerwa, J. c. (March, 15 , 2017). *Gross Domestic Production National Accounts,2016.* Kigali: National Institute of Statistics of Rwanda.

Nabil A. Hazim & Z.A. Salem . (2015). Delay and cost overrun in road construction projects in Jordan . *International Journal of Engineering & Technology* , 288-293.

Nabil Al-Hazim and Z. A.Salem. (2015). Delay and cost overrun in road construction projects in Jordan. *International Jurnal of Engineering & Technology*, 288-293.

Nabil Ali-Hazim & Zayidoun Abu Salem . (2015). Delay and cost overrun in road construction projects in Jordan . *International Journal of Engineering & Technology*, 288-293.

NTIRENGANYA, E. (2017, May 17). *NewTimes.* Retrieved from www.google.com: http: //www.umucyo.gov.rw

Oberlender. (2000). Project management for engeeniring and construction . *Project Magement Journal*, P6-7.

Olomalaiye, Holt and Harris. (1997). Factors influencing construction time and cost overrun in high -rise construction project in Indonesia . *Construction Mangement and Economics Journal*, 83-94.

Owolabi James & Amusan M. (2014). Causes and Effects of delay on project construction delivery time in Nigeria . *International Journal of Education and Research* , 197-208.

Owolabi James D and Lekan M. (2014). Causes and effects of delay on project construction delivery time. *International Journal of Education and Research* .

Pinto, J. &. (1988). Project Success : Definitions and Measurement Techniques. *Project Management Journal* , 67-72.

Rashed, K. (2008, March 9). *Contractual aspects of construction projects.* Retrieved from http: //www.alqagas.com.kw/node/346199 Article in Alqabas newspaper, Kuwait.

Rider, R. a. (2013). *Analysis of concurrent/ Pacing delay .* New York.

S., S. (1997). Delay claims in UK Contracts. *Journal of construction Engineering and Management* , 238-244.

safety, H. a. (2012). *Definition of construction work.*

Sanvido.V., G. G. (1992). Critical Success Factors for Construction Project. *Construction Engeneering Management Journal*, 94-111.

Scoot, S. (1991). *Project plans and Record - Keeping Construction sites in the United Kingdom . A thesis submitted for the degree of Doctor in Philosophy in Engineering, Department of Civil Engineering* . New castle: New castle University .

Shahid Hussain. (2017). Critical delaying factors: Public sector building projects in Gilgit-Baltistan, Pakistan . *Building construction Journal*, 1-16.

Shahid Hussen&Fangwei Zhu. (3 January 2018). Critical delaying factors:Public Sector Building projects in Gilgit-Baltistan, Pakistan . 2-16.

Stuckenbruck, L. (1986). *Who determines project success ? .* Monreal/Canada: Project Management Institute.

Takim R, a. A. (2002). *A conceptual model for sucessful construction project performance .*

Vidals, M. a. (2002). *Cost and Time overruns in highway construction 4th transportation specially conference .* Mont real, Quebec: Canadian society for civil engineering.

Wells.J. (1984). *The construction industry in the context of Development : A new perceptive : Habitat International .*

Williams C. . (2001). Research Methods. *Journals of Business & Economics Research*.