# ASSESSING FACTORS CAUSING DELAY AND COST OVERRUNS IN CONSTRUCTION OF GROUNDWATER PROJECT IN DAR ES SALAAM

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PROJECT MANAGEMENT OF THE OPEN UNIVERSITY OF TANZANIA**

**2019**

## CERTIFICATION

The undersigned certifies that I have read and hereby recommends for the acceptance of the dissertation titled; "Assessing Factors Causing Delay and Cost Overruns in Construction of Ground Water Project in Dar es salaam*"* by Seliudi, Muganyizi; that was done under my supervision and guidance for submission to Open University of Tanzania for the award of the Masters of Project Management.

…….

Dr. Saganga M. Kapaya

(Supervisor)

…….

Date

## COPYRIGHT

## DECLARATION

I, Seliudi, Muganyizi, do hereby declare that this dissertation is entirely my work and it has not been presented to any other institute of higher learning for a similar or other academic awards.

.....

Signature

.....

Date

## DEDICATION

To my lovely wife Doricus Hizza and lovely son Ethan Buberwa Seliudi as well as to my beloved parents Mr. Celestine Rugemalira and Mrs. Gerensia Rugemalira. I believe that they fulfilled the parental responsibility to me. I, therefore, have every reason to commend them very highly for their love, support and encouragement throughout my program.

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## ABSTRACT

This research examined the causes of delays and cost overruns in construction projects and their effect on groundwater projects completion and cost escalation in Dar es Salaam. The study employed theories of project, management, planning, execution and control. The study employed mixed research using questionnaires and later on different interviews were carried out to get information from the sample of 87 respondents. Data collected were analysed using SPSS and data described by using percentage and coefficient of variation and presented using tables. The study found that time allocated to the design phase was statistically significant correlated with financial constrains; payment difficulties; and design phase changes order while poor site management and supervision was statistically significant correlated with unpredictable weather condition and shortage of site workers. Financial constrains; related material problems; payment difficulties; and lack of experience in contraction had positive statistical influence on cost overrun of groundwater projects in Dar es salaam; however, design changes, unpredictable weather condition, fluctuation in the cost of contraction materials, shortage of site workers and incorrect planning and schedule had positive significant relationship with delay in time completion of groundwater projects in Dar es Salaam. The researcher recommended that; contractors should consider proper planning in order to avoid delays during the constructional stage, develop action plan, organise payment and structure for all stages of work on the project. While consultant should be flexible in evaluating projects, comparing between the cost and high quality should be considered. Clients should choose team to do and track project sustainable competence and experience in groundwater projects.

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## LIST OFABREVIATION

| | |
|---|---|
| ANOVA | Analysis of Variance |
| CAC | cumulative actual cost |
| CBC | cumulative budgeted cost |
| CEV | cumulative earned value |
| EVA | Earned Value Analysis |
| FI | Frequency Index |
| H0 | Null hypothesis |
| H1 | Alternative hypothesis |
| II | Importance Index |
| PMBOK | Project Management Book of Knowledge |
| SI | Severity Index |
| SPSS | Statistical Package for Social Sciences |
| TBC | total budgeted cost |
| URT | United Republic of Tanzania |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

Delays and disruptions are among the challenges faced in the course of executing of groundwater construction projects. Delays, as well as disruptions, are sources of potential risks that current studies are looking into ways to manage (Kikwasi, 2012). Various studies (Finnerty, 1996; Miller and Lessard, 2001, Baloi and Price, 2003; Cohen and Palmer, 2004 ;) have identified sources of and types of construction risks that need to be managed as part of project management process. There are also risks and factors that affect construction project delivery time which are also causes of delays (Zou, *et al.*, 2006; Aiyetan, Smallwood and Shakantu; 2008).

Delays and distractions have had effects to groundwater construction projects. Some of these effects are: time overrun cost overrun, arbitration, total abandonment dispute and litigation. (Yaw Frimponga, 2002; Sambasivan and Soon, 2007). Groundwater exploration (siting of boreholes) which involves geophysical surveys conducted at the ground surface using highly complicated equipment, borehole sampling and geophysical logging of the borehole with highly sophisticated well-logging equipment (Frimpong *et al*,2002).

Borehole drilling and Construction; which involves drilling, installing the casing, placing a well screen and filter pack, if required, grouting to provide sanitary protection, and developing the well to ensure sand-free operation at maximum yield. (Frimpong *et al*, 2002). Pumping test and water quality analysis; which involves pumping a well at a certain rate, recording the drawdown in the pumping well,

monitoring and conducting water quality tests.

Civil works and explorations which involves construction of well base pads and installation of appropriate pump. (Frimpong *et al*, 2002). The nature of works in groundwater projects and the environment within which they are built make such projects susceptible to delay and cost overruns. Poor technical performance due to inappropriate planning result number of wells abandoned and thereby causes project delay and cost overruns. Work in these projects depends largely on equipment, plants and materials, project may be delayed without effective and efficient procurement procedures.

Numerous series of activities are involved in the water-drilling project and reluctant to use of scheduling techniques and update schedules on a regular basis are needed. A great deal of coordination among these activities is required to evade delay, especially in public projects. borehole drilling and construction; which involves drilling, installing the casing, placing a well screen and filter pack, if required, grouting to provide sanitary protection, and developing the well to ensure sand-free operation at maximum yield. Pumping test and water quality analysis; which involves pumping a well at a certain rate, recording the drawdown in the pumping well, monitoring and conducting water quality tests.

Civil works and explorations: which involves the construction of well base pads and installation of appropriate pump. Management of Groundwater construction projects involves a great deal of managing risks. Managing risks involves planning, identifying, analysing, developing risk handling strategies, monitoring and control.

Project team members particularly clients, consultants and contractors should mitigate delays when playing their respective roles. Cohen and Palmer (2004) identify sources of construction risks to include changes in project scope and requirements, design errors and omissions, inadequately defined roles and responsibilities; insufficient skilled staff; force majeure; and new technology. Baloi and Price (2003) categorize construction risks as social, technical, commercial, economic, construction, financial, legal, natural, logistics, and political.

Similarly, Mills (2001) lists three most important risks to include weather, the productivity of labour and plant and the quality of material. Other researchers such as Finnerty (1996), and Miller and Lessard (2001) have categorized same risks in addition to regulatory, supply, demand, operational, sovereign and completion . Time-related risks identified by Zou et al (2006) that are have influence on project delivery are: design variations, tight project schedule, excessive approval procedures in administrative government departments, incomplete approval and other documents, variations by the client, unsuitable construction program planning and inadequate program scheduling. Aiyetan et al (2008) point out that the three most significant factors that adversely affect construction project delivery time performance are: quality of management during construction; quality of management during design, and design coordination. The purpose of this study is to identify causes and effects of delays in Dar es Salaam groundwater construction projects.

## 1.2 Statement of the Research Problem

In Tanzania, groundwater is an important water source supplying more than 25 % of the domestic water consumption (JICA, 2002). Groundwater is the main source of

water for most rural water systems and municipalities like Dodoma, Arusha, Shinyanga, Moshi and Singida, and of recent Dar es Salaam City (Kashaigili, 2010). Considering that groundwater in Tanzania is likely to be the key resource to improve the water supply coverage in many areas under the changing climate, the development of groundwater should be carefully managed to make full benefit of its potential, to protect its quality and to guard against over-exploitation of the aquifers. Currently, only about 58.3% of the rural and 83% of urban population in Tanzania are served with clean water (MOWI, June 2009).

As the human population, industries and irrigation schemes increase the demand for water increases too. To arrest this situation, Groundwater Exploration & Exploitation activities are necessary. Though construction of the groundwater project is the main alternative sources for water supply, there are a number of factors that cause the delay and cost overruns of the project. Serious factors cause delay and cost overruns for constructions of groundwater projects to include delays in payment to contractors, information delays, funding problems, poor project management, compensation issues and disagreement on the valuation of work done.

Other causes are conflicts among the involved parties, project schedule changes, supply or procurement problems, bureaucracy, multiple projects by contractors and incompetent contractors. Some of these causes were identified in countries such as Tanzania (Kikwasi, 2012). Therefore, the Government and private sectors through their agencies need to understand the causes of delays and cost overruns in groundwater construction projects in order to minimize the factors which cause delay

and cost overruns in groundwater construction projects. The research examined the causes of delays and cost overruns in ground water constructions projects and their effect on groundwater projects completions and cost escalations in Dar es Salaam

## 1.3 Research Objectives

### 1.3.1 General Research Objective

The purpose of this research is to assess factors, which causing delay and cost overruns in the construction of groundwater projects in Dar es Salaam.

### 1.3.2 Specific Research Objectives

Specifically, the study embarked on accomplishing the following specific objectives;

i. To determine the relationship between delay and cost overruns in construction of groundwater projects in Dar es Salaam
ii. To assess factors causing delays in construction of groundwater projects in Dar es Salaam
iii. To assess factors causing cost overrun in construction of groundwater projects in Dar es Salaam

## 1.4 Relevance of the Research

This work is important because time is one of three pillars of groundwater project management; time, cost and quality. A study on project delays will lead to a better understanding of the causes of inefficiency in groundwater construction projects. Once the most significant delay causing factors are identified, the parties to the projects shall then be able to channel their energies and resources to the specific factors thereby reducing delays to the projects.

Walker (1994) carried out an investigation in Australia on construction time performance and concluded that through improving its productivity, the construction industry can have an important role in promoting National competitiveness, and therefore in defending living standards and achieving a satisfactory rate of growth. The benefits from such improvement would include increased attractiveness of Australia as a location for investment in new areas or projects. Measures that prevent or slow steps toward improving building and construction industry are, in effect, an attack on the employment prospects and future welfare of Australian workers. Such measures would also be an attack on the potential performance of Australian industry and the economy generally.

The above view can also be applicable to Tanzania and reinforces the argument for attention to construction time performance. The study on groundwater construction is important in the Tanzanian context because groundwater potential contribute to economic growth and poverty reduction. The findings of the research study can be different ways few among many include. First, the fulfillment of the masters' degree of Project Management second the dissertation can a good insight for other students who will be interested on the topic in future, third the findings can be of great help for improvement of the performance of project in Tanzania construction agency. Lastly the study will be of great help for me in person as a future project manager merged in construction of ground water sector.

## 1.5 Organization of the Research

The structure of this research report meets the requirements of the guideline of the open university of Tanzania. This study consists of five chapters, chapter one

comprised of introduces the problem, it comprises of background information the statement of the problem as well as research objective and question also the chapter gives an insight of how the study was relevant in the society. Chapter two comprised with literature review as well as a conceptual framework of the study, Chapter three merges in the methodology in which the study had conducted. Chapter four describe the data presentation and discussion of findings and Chapter five merge in the conclusion and recommendation of the study including the area identified for further study.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Overview

This chapter focuses on analyzing some of the relevant literature on the topic under study. This review aims to identify what is so far available in the literature on the subject matter as far as the objectives of this study are concerned. Furthermore, the chapter focuses on identifying the relevant knowledge gaps in the literature, which this study aims to capitalize into bridging them. Furthermore, the section puts forward some theoretical arguments/tools, which guided the researcher to organize the contents of the study.

## 2.2. Conceptual Definition

**Delay**- is defined as the slowing down of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project (Lo, Fung and Tung, (2006)). Syed, *et al.* (2002) classify delays into non-excusable delays, excusable non-compensable delays, excusable compensable delays and concurrent delays.

Excusable non-compensable delays are delays caused by factors that are not foreseeable, beyond the contractor's reasonable control and not attributable to the contractor's fault or negligence. Compensable excusable delays these are compensable delays are excusable delays, suspensions, or interruptions to all or part of the work caused by an act or failure to act by the owner resulting from owner's breach of an obligation, stated or implied, in the contract. Concurrent delays occur

when both owner and the contractor are responsible for the delay. Causes of delays have been identified in various parts of the world such as Malasyia, Saudi Arabia, Jordan, Kuwait, Hong Kong and Thailand (Sambasivan and Soon, 2007; Al-Kharashi and Skitmore, 2008; Al-Momani, 2000; Kumaraswamy and Chan, 1998; Noulmanee, Wachirathamrojn, Tantichattanont and Sittivijan, 1999). The results reveal that there are differences and similarities as to the causes of delays.

**Disruptions** are events that disturb the construction programme. Interferences with the flow of work in the project are common disruptions (Howick, Ackermann, Eden and Williams, 2009*)*. Howick *et al* (2009) point out that many disruptions to complex projects are planned for at the bid stage because they may be expected to unfold during the project (Howick *et al*, 2009). For example, some level of rework is usually expected, even when everything goes well, because there will always be 'normal' errors and mistakes made by both the contractor and client.

**Project Success;** according to the study of Frimpong et al (2002) project success is the meeting of intended goal or/and objectives in the project plan and accomplishes its technical performance, maintain its schedure within its budget. Cost is among the major consideration throughout the project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success" (Azhar et al., 2008). Gido and Clements (2003) mentioned that cost performance is an effective technique in project management effort expended and it is widely accepted in the literature and industry. Earned Value Analysis (EVA) is used to evaluate cost performance of different types of projects. Cost control, cost estimating, and cost budgeting are three cost related processes that

interact among each other and with other scopes of construction of groundwater projects.

However, Gido &Clements (2003) argued that there are four cost-related measurements in cost performance analysis which used to evaluate if the project is performed within the budget; this includes cumulative budgeted cost (CBC), cumulative earned value (CEV), total budget cost (TBC) and cumulative actual cost (CAC). As cost will be projected before its actual imprementation, more than one person are required and more than once during the life of the project depending on its complexity. Not only that but also there is need consideration of stakeholders in the project cost.

**Cost Overrun** is a very common phenomenon and majority projects in construction industry especially the ground water project facing this problem. Cost overrun occurs when the final cost or expenditure of the project exceeds the original estimation cost, Avots (1983). Angelo and Reina (2002) pointed out that cost overrun is one of the main problems in the construction industry. The problem may found in both developing and developed countries. This problem is quite serious and further study on this issue is needed to reduce the problems.

## 2.3. Theoretical Analysis

In understanding the causes of delay and cost overruns in the project it's very important to understand the managerial system of the process. According to Project Management Book of Knowledge (2013), fifth addition the process of project

management can be defined as application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. According to Koskela and Howel (2002) theory of project management can be categorized into two processes which include project management and product-oriented process. They further explain that to understand the theory we need to understand the underlying theories of project, for the product-oriented process and planning execution and controlling on the management process.

The Theory of Project according to Koskela & Howel (2001) this theory can be explained by looking on turner 1993. In the understanding of turner the theory can be explained in three major categories which is managing works, second the process of managing works is possible by breaking every work in small chunks of works and third the task are related and its sequential are dependent.

The Theory of Project-according to Koskela and howel (2002b) conceptualization project is a transformation of inputs to outputs, the total transformation of a project can be decomposed into manageable and well-understood sub transformations, tasks. A project can be realized optimally by realizing each task in an optimal manner and the tasks in optimal sequence. The theory can be explained in three major categories which are managing works, second the process of managing works is possible by breaking every work in small chunks of works and thirdly the task are related and its sequential are dependent.

Theory of Management- is the other side of the coin that explains the project management theory. According to the Project Management Book of Knowledge

(PMBOK) guide, this process is characterized into initiating, planning execution and controlling process, whereby planning execution and controlling being the core and forming the closed-loop (Koskela *et al*, 2002a).

Theory of Planning according to Project Management Book of Knowledge (PMBOK) the planning process is structured into ten core process which is the input for the process. This includes scope planning, scope definition, activity definition, resource planning, activity sequence activity duration estimating, cost estimating, schedule development, cost budgeting and project plan development, which in return bring about the project plan for execution.

**Theory of Execution;** according to this theory, execution is about dispatching task to work, by implementing what has been planning. The execution will occur when the task and the resources to execute it are ready at the time of authorization and the task is fully understood, started and completed according to the plan.

**Theory of Controlling** in this aspect Koskela *et al,*2001 suggested that the controlling process is based to two sub-process; performance reporting and change control whereby correction is prescribe for the execution process and change prescribed for planning process. Hence by looking at these sub theories in management the theory of management is based on management planning,dispatching model and thermostat model. (Koskela *et al,* 2002a).

### 2.4 Empirical Literature Review

In the project management life cycle, Time and cost are among the major considerations throughout the project. As such these parameters can be regarded as

the most important parameters of a project and the driving force of project success. Despite of its importance its not uncommon to see a ground water construction project failing to achieve its objective within the definite stipulated time and cost. Cost overrun and time in most groundwater construction projects vary significantly in its magnitude from project to project, they contribute to high cost of ground water constructions in many countries for many years. Time delays and cost overruns are frequent problems in groundwater construction face many countries.

According to Aftab et al, (2011) Time overrun has positive and strong linear relationship with cost overrun. This leads to negative nations' economic growth rate and monetary loss. Hence it is crucial to unearth the actual causes affecting cost of ground water construction, a thing which will be helpful in controlling and achieving project constraction within projected cost. According to Aftab *et al* (2011) argue that construction cost overrun is one of the effect of project delay. The responsibility for project delay is reflected in whether the contractor is likely for costs and additional time to complete the project.

According to Aftab *et al* (2011) highlighted the factors that cause cost overruns in construction of groundwater projects and found that most of the factors are due to the contractors and consultants, monthly payments difficulties was the most important cost overruns factor, while owners ranked poor contractor management as the most important factor. Despite some differences in viewpoints among the three groups surveyed, there is a high degree of agreement among them concerning their ranking of the factors. The overall ranking results indicate that the three groups felt

that the significant factors that can cause excessive groundwater project cost overruns in developing countries are poor contractor management, monthly payment difficulties, material procurement, poor technical performances, and escalation of material prices.

Memon an el (2014) categorized the trouble of delay in five different groups in his research he tried to study problem by grouping the problem of research in five groups including those contributed by the owner consultant contractor, resources related and other factors. The researcher concluded that out of the thirty top delay contractor contribute the three most leading factor including money flow and financial difficulties faced by contractors, poor site management and supervision, Incompetent subcontractors, also other causes included inadequate planning, lack of experience as well as a mistake during construction.

Causes of owner's responsibility include financial problem and progress of payment, change in the scope, delay in decision making, unrealistic contract duration, requirement imposed and owners, resources related causes include shortage of site workers, material shortage, late delivery of material, fluctuation of price of material, labor productivity, insufficient number of equipment. Other causes include unforeseen ground condition, accident on site, law and regulatory framework, lack of coordination between parties, effect of weather and delay in inspection and approval of completed works. Consultant cause of delay includes delay in inspection and approval of completed work, mistake and errors in design, poor project management, incomplete design in the time of tender and delay in preparation and approval of drawing.

On the other hand the study carried by Kadiri and Shittu (2015) on the perspective of causes of time overrun in building projects with a view to attracting policy response which could enhance project time performance he divided the construction delay in terms of those influenced by the contractor and those with the client and came to find out that they both contribute in the delays although as the consultant is more influenced with the decision making, financial difficulties as well as inadequate planning the factors of delayed caused by the contractor delay factor are financial as well as delay of information and from the contractor

According to Dolage and Rathnamali (2013) who wrote on the causes of delay on construction phase in their province, they came with the conclusion that 'Rainy weather', 'poor liquidity of the contractor' and 'inaccurate planning and scheduling of projects are the leading causes of the project delay. The study of Cohen and Palmer (2004) identifies main sources of construction risks to include design errors and omissions, changes in project scope and requirements, lack of defined role and responsibilities, insufficient skilled staffs and new technology.

Also Baloi and Price (2003) grouped risks in contructions in social, technical, economic, construction, financial, legal, commercial, natural, political and logistics; while Mills (2001) categolised risks in most three significant groups such as productivity of labour and plant, weather and quality of material. Other studies including Miller and Lessa (2001) and Finnerty (1996) mentioned the same risks including demand, supply, operational, regulatory, soverregn and completion Time-related risks identified by Zou *et al* (2006) as causes of project delay includes ; design variation, tight project schedure, government administrative department

approval procedures, incomplete approval and other documents, variation by clients, ineadequate program scheduling and unfavourable contruction program planning.

Also Aiyetan *et al* (2008) argued that the three most significant factors for rojrct overrun are quality of management during design and construction and design coordination. A study by Kumaras wamy and Chan (1998) on causes of construction delays in Hong Kong found differences in perceptions as to causes of delays by different groups of participants in building and civil engineering works. They suggested that biases of different industry groups might direct blame for delays to other groups.

Noulmanee *et al* (1999) investigated causes of delays in highway construction in Thailand and concluded that delays can be caused by all parties involved in projects; however, main causes come from the inadequacy of sub-contractors, organizations that lack sufficient resources, incomplete and unclear drawings and deficiencies between consultants and contractors. Al-Momani (2000) investigated factors which causes of delay in 130 public projects in Jordan and found that main causes of delay were related to designer, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity.

Al-Kharashi and Skitmore (2008) point out that the leading cause of delay in the Saudi Arabia's public project construction sector lacked qualified and experienced personnel. Ahmed et al (2002) mentioned ten major factors in Florida including; approval, puilding permits, decision during development stages, change order, incomplete documents, change in drawing, inspection and change in specification.

According to Sambasivan and Soon (2007) name major causes of delay in Malaysian construction industry inadequate client's finance, contractor's poor site management, contractor's improper planning, inadequate contractor experience, and payments for completed work, problems with subcontractors, shortage in material, labour supply, equipment availability and failure, mistakes during the construction stage, and lack of communication between parties.

Other researchers including Chan and Kumaraswamy (1997) investigated factors for delay in construction projects and found five principle dalay factors such as unforeseen site condition, client initiated variation, bad risk management and supervision and slow decision making. While Kaming *et al* (1997) come up with cost and time overrun, the researchers investigated that main factors for cost overrun are inaccurate material estimation, degree of complexity and material cost due to inflation; whereas factors for time overrun includes poor labour productivity, changes in design, resource sholtage and inadequate planning. Furthermore Heseeb et al (2011) revieled that most usual factors for dealy are natural disaster like floods and earthquake, as well as some others including lack of experience, poor site management, improper planning, financial and payment problem and shortage of equipment and materials.

A study by Aibinu and Jagboro, (2002) reveals six effects of delay on project delivery in Nigerian construction industry which are: time overrun, cost overrun, dispute, arbitration, total abandonment and litigation. Sambasivan and Soon (2007) disclose the same effects of delay in Malaysian construction industry. Haseebet al (2011) identify effects of delays in Pakistan construction industry as clash, claims,

total desertion and slowing down the growth of the construction sector. Ramabodu and Verster (2010) identify critical factors that cause cost overruns in construction projects as changes in scope of work on site, incomplete design at the time of tender, contractual claims (extension of time with cost), lack of cost planning and monitoring of funds, delays in costing variations and additional works. These critical factors in turn are the delay factors.

Chileshe and Berko (2010) indicate that causes cost overrun in the Ghanian road construction sector are delay in monthly payments to contractors; variations; inflation, and schedule slippage. Again, these explain the causes of delays and the effect of cost overrun. Since the 1980s various studies have investigated the causes for project cost overruns on construction projects. Kaming, Olomolaiye, Holt, and Harris (1997), who studied 31 Construction projects in Indonesia, found that from a contractor's point of view, cost overruns were mainly caused by inaccuracy of material take-off, increase in material costs and cost increase due to environmental restrictions.

Le-Hoai et al. (2008) ranked the three top causes of cost overruns in Vietnam as material cost increase due to inflation, inaccurate quantity take off, and labor cost increase due to environment restriction. Kaliba, et al. (2009) conclude that cost escalation of construction projects in Zambia are caused by factors such as inclement weather, scope changes, environment protection and mitigation costs, schedule delay, strikes, technical challenges and inflation. According to Kaliba et al. (2009) argue that if projects costs or schedules exceed their planned targets, client satisfaction would be compromised, the funding profile no longer matches the

budget requirement and further slippage in the schedule could result. In addition, project delays and cost overruns also have devastating effect on contractors and consultants in terms of growth in adversarial relationships, mistrust, litigation, arbitration, cash-flow problems, and a general feeling of trepidation towards other stakeholders (Ahmed et al., 2002). Although this problem is not unique to developing countries; it is also experienced in most developed economies (Kaliba et al. 2009).

**2.5 Delays and Cost Overruns Factors**

According to Gwahula, (2016), The Null hypothesis (H0) tested was that "there is no significant association between the views of different groups of experts in regard to the relative importance of the quality performance factors", However. The Alternative hypothesis (H1) is "there is a significant association between the views of different groups of experts regarding the relative importance of the quality performance factors" were accepted. With regards to this assessment study the Null hypothesis (HO) is no Positive correlation between the factors causing cost overruns and factors causing delay in groundwater projects.

The study will consist of four alternative hypotheses as (H1) There is a positive correlation between at least one of the factors causing cost overrun and one of the factors causing delay in groundwater projects, (H2) Factors for cost overrun positively contributes to cost escalations in groundwater projects. (H3) Factors for project delay positively contribute to the length of time in groundwater projects. And (H4) that there is a positive relationship between cost escalations and time to completion for groundwater projects.

## 2.6 Critical Literature Review

This section provides the summary of all reviewed literature by describing all the important contents and information which include the Authors (year), country in which research was conducted, the objective of studies, methods used, main findings and area proposed for future studies.

**Table 2.1: Literature Review**

| Authors (year) | Country research done | Study Objective | Methods used | Main findings | Areas proposed for future studies |
|---|---|---|---|---|---|
| Amandin MM and Kule JW. 2016 | Rwanda | Examine the major causes of project delays and costs/risks that arise from project delays when implementing public construction projects in Gasabo district, Kigali City. The objectives were; to assess the relationship between project expected time and real time, determine project expected cost and real cost, to calculate both project delay and cost overruns and finally to identify the relationship between public construction project delay and their respective cost overruns | The study adopted a descriptive survey research design. | The study revealed that 65.7% of public construction projects which were implemented between 2009-2012 were delayed, whereas only 5.2% of these projects faced cost overruns. | The study recommends the use efficient mitigation techniques for planning efficiency rather formalities. |
| Kikwasi, (2012) | Tanzania | To assess causes and effects and disruptions in construction projects. | Purposive and random sampling. Literature review, questionnaires and interviews techniques were used to collect data for the study. | main causes of delays and disruptions are: design changes, delays in payment to contractors, information delays, funding problems, poor project management, compensation issues and disagreement on the valuation of work done. On the other hand, time overrun, cost overrun, negative social impact, idling resources and disputes are the main effects of delays and disruptions | The study forms baseline for future researches in Tanzania to monitor the changes in the effects of delays in construction projects |
| Gwahula, (2016) | Tanzania | An assessment of critical factors affecting quality performance of government financed construction projects in Tanzania | Closed end questionnaire, Statistical Package for Social Sciences | critical factors that have direct impact on quality performance of government financed construction projects are; project financing | The study recommends further studies on the economic |

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|---|---|---|---|---|---|
| | | | version 16 (SPSS) multiple regression model, | processes, experience of contractors in construction industry, project technology, availability of plant and equipment, procurement system and processes as well as the project manager knowledge and skills. There is a linear relationship between project quality performance and the critical quality. There is a linear relationship between project quality performance and the critical quality. All the critical quality performance factors had positive coefficients with an acceptable level of significance | and social factors that hinder women participation in construction relation activities and how training and learning opportunities for continuous improvement will have positive impact on the performance of construction projects |
| (Frimpong *et al*, 2002); | Ghana | Examine the causes of delay and cost overruns in the construction of groundwater Project in Ghana. | Questionnaire Survey | The results of the study revealed the main causes of delay and cost overruns in construction of groundwater projects included; monthly payment difficulties from agencies; poor contractor management; material procurement; poor technical performance; and escalation of material prices. | |
| (Frank *et al*, 2010); | Ghana | causes of delay of building construction projects in Ghana | Questionnaire Survey | The overall results of the study indicate that the respondents generally agree that financial group factors ranked highest among the major factors causing delay in construction projects in Ghana. The financial group factors were delay in honouring payment certificates, | |

| | | | | | |
|---|---|---|---|---|---|
| | | | | difficulty in accessing credit and fluctuation in prices. | |
| Adugna, (2015) | South Africa | To assess the dominant causes of cost and time overruns, identifying possible and practical measures that can minimize overruns in office building construction projects around eThekwini Municipal area of Kwazulu-Natal | literature review and questionnaire survey | there is strong agreement on ranking the importance of the individual variables of delay and cost overruns between parties. Based on overall results, the top five most important causes are contractor's cash flow problems, delay in progress payments by the client, poor site supervision and management by contractor, inefficient quality control by the contractor during construction leading to rework due to errors, and contractor's difficulties in financing the project. | Further studies are recommended to be undertaken in other areas of South Africa on various building and civil construction projects in order to come up with a nationwide mechanism for minimizing cost overruns and delays in the general construction industry. |
| Githenya & Nguki (2014) | Kenya | The study aim was to assess project planning, project control, motivated project team and project management competency, on housing project implementation in Kenya | The study employed descriptive study | The study found that project planning, project control, motivated project team and project management competency have a great influence on housing project implementation in Kenya | |
| (Haseeb *et al*, 2011). | Pakistan | causes of<br>delay and effects of delay | questionnaire survey | around 80% construction projects in Pakistan faced delays, and only 20% of<br>construction projects were completed within scheduled time duration and estimated cost | |
| Aftab *et al* (2011) | Malaysia | Significant factors causing time overrun in Malaysian construction | Investigation through survey | The study revealed that cash flow and financial difficulties faced by | |

| | | | | | |
|---|---|---|---|---|---|
| | | industry | | contractor, poor site management and supervision, incompetent subcontractor, shortage of workers and financial difficulties of the owner are major contributors of time overrun | |
| Wong and Vimonsatit (2012) | Australia | identify the major causes of delays in the Western Australian construction industry | literature review and questionnaire survey | causes identified were: Shortage of skills; Financial difficulties; Shortage of labour; Unrealistic deadlines for project completion; Unforeseen ground conditions; Poor organization of the contractor or consultant; Poor communication; Underestimation of time of completion; low speed of decision; and Design errors made by designers | |
| kumar *et al* (2016) | India | The purpose of this study is to identify this is important causes of cost and schedule overruns in transportation sector projects of Madhya Pradesh and to suggest possible solutions for reducing such overruns. in Madhya Pradesh | Questionnaire survey together with desk study was used to collect data on cost overrun | The most common effects of cost overrun identified by this research were delay, and supplementary agreement or adversarial relations among stakeholders, and budget shortfall of project owners. | |

**Source**: Field Data, 2019

## 2.5 Research Gap Identified

Several researchers have tried to look on the problem of causes delay and cost overruns on the bases of types of delay. Another researcher explains the phenomena of research on the bases of parties to the project such as contractor consultant and owner of the project, in other studies the resources and gods act have been put into consideration mainly using quantitative methods. This research examines the causes of groundwater project delay and their effects on project completion and cost overruns in respect to groundwater projects and examines the cause of project costs on project cost escalation in construction of groundwater projects in Dar es Salaam using quantitative multiple regressions method. To the best of my review and knowledge there are no such kind of study that has been done so far addressing these issues in that combination within Dar es Salaam groundwater projects.

## 2.6 Conceptual Framework

The study is conceptualized diagrammatically in Figure 2.1 to demonstrate how causes of delay and cost overruns in respect to project successful for underground water projects.

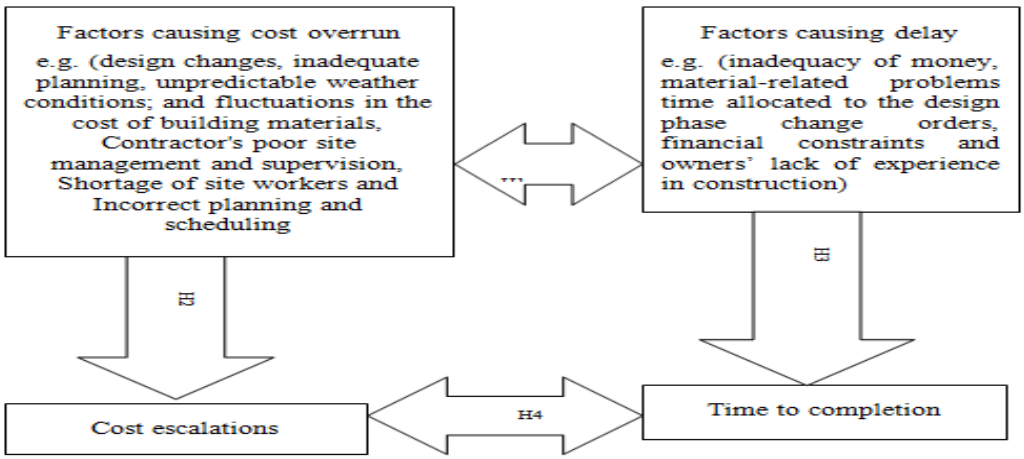


**Figure 2:1 showing the Conceptual Framework**
**Source**: Researcher's Construct, 2019

**Hypotheses:**

**H1:** There is a positive correlation between at least one of the factors causing cost overrun and one of the factors causing a delay in groundwater projects.

**H2:** Factors for cost overrun positively contributes to cost escalations in groundwater projects.

**H3:** Factors for project delay positively contribute to length of time in groundwater projects.

**H4:** There is a positive relationship between cost escalations and time to completion for groundwater projects.

### 2.6.1 Definition of Variables

According to this study, the dependent variable is construction of groundwater projects while independent variables are factors for cost escalation and timely completion. Factors for cost escalation include design changes, inadequate planning, unpredictable weather conditions; and fluctuations in the cost of building materials, contractor's poor site management and supervision, shortage of site workers and incorrect planning and scheduling; while factors for time completion includes; inadequacy of money, material-related problems time allocated to the design phase change orders, financial constraints and owners' lack of experience in construction.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

This study was designed to obtain views from clients, consulting firms, regulatory boards and construction firms in regard to causes and effects of delays and disruptions in groundwater construction projects. The study focused on identifying the critical factors that cause delays and cost overruns for construction projects in Tanzania. Basing on literature review and field discussions with experienced practitioners in constructions industry a list of 11 quality performance factors was established.

## 3.2 Research Approach

Johnson and Christensen (2005) defines research approach as perspective that based on the set of shared values, assumptions, practice and concepts. In this study the researcher employed mixed method (a combination of both qualitative and quantitative research designs) so as to examine further into the dataset to understand its meaning and to use one method to verify from another method (Creswell and Plano, 2007). The study employed mixed approach which provided a huge amount of data on examining the relationship between variables this was done using questionnaires and later on different interviews were carried out so as to get vital information on the study.

## 3.3 Area and Study Population

The study was carried out in Dar es Salaam Region. Dar es Salaam city is located in the eastern part of Tanzania lying between latitude 6 and 8 degrees east and

longitude 39 and 40 south. It stretches along the coast for about 100 kilometers from the mouth of River Mpiji in the North, Rivers Mzinga and Makosi at the centre, and river Mbezi in the south. Offshore, there are eight islands. It has an area of about 1,393 square kilometers, covering a coastal zone of some 10 kilometers to 2 kilometers wide. The region is bounded by Coastal region in all sides, except in the eastern part where it is bordered the Indian Ocean. The site of the city is contained within a lowland area (URT, 1989). Most of the people in Dar es Salaam depend their water from the boreholes. However most of the clients, consultants and contractors in construction of Groundwater projects are found in Dar es salaam

In order to evaluate and analyze the cause of delay and cost overrun in groundwater projects, a wide range of personnel involved in a groundwater construction project in Tanzania was targeted. Personnel were randomly selected from Tanzanian project managers consultants, contractors, client's representative and construction managers. The list of contractors and consultants dealing with groundwater in Tanzania was provided from the Ministry of water resources and Irrigation and used as the benchmark for selecting the representative number of consultants and contractors involved in groundwater project.

The study population comprises of clients, consulting firms, construction firms and regulatory boards. The target population of the study were consisting of construction project managers, consultants or implementers during the period starting from 2012 till the end 2016. Dar es Salaam Religion was selected as a study area because it currently has recorded with numerous of ground water construction projects and the most populated city in Tanzania in general (National Bureau of Statistics, 2012).

## 3.4 Sampling Desgn and Sample Size

### 3.4.1 Sampling Techniques

List of Clients comprising the government agency (key decision-makers) responsible for the projects, private organisations (industries), and individual owners., Consultants working in the groundwater construction and Contractors who are involved in the groundwater who had their offices based in Dar es Salaam was obtained from respective regulatory board office (Ministry of water and Irrigation). According to the Ministry of water and Irrigation there a total number of 32 Consultants, 42 contractors and 10 clients registered for groundwater construction. For the sake of a representative sample, random sampling was used. For each groundwater construction project implemented in Dar es Salaam Region during the period 2010-2016, random sampling was used to select managers, consultants, Contractors or project implementers.

### 3.4.2 Sample Size

Slovin's Formula; $n=N/ (1+Ne^2)$, was used for the determination of the number of samples to be taken for conducting in the study. Where n is the sample size, N is the research population and e is the sampling error that must be insignificant (=<0.05) (Adanza, 1995). The sample size for Contractor was calculated as follows

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{42}{1 + 42\ x0.05^2}$$

$$n = 38$$

According to Slovin's Formula the sample to be distributed to contractor was supposed to be not less than thirty eight (38)

The sample size for consultant was calculated based on the total number provided from the ministry of water and irrigation

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{32}{1 + 32\ x0.05^2}$$

$$n = 29$$

The sample size for the client was calculated based on the total number provided from the ministry of water and irrigation

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{10}{1 + 10\ x0.05^2}$$

$$n = 9.75$$

This making the total of not less than 77 sample space; however the researcher added 10 respondents so as to eliminate errors caused by missing of major questions, therefore this making the total of 87 respondents

### 3.5 Research Data

This study was descriptive, designed to obtain views from clients, consulting firms, regulatory boards and construction firms regarding causes and effects of delay and cost overruns in construction of underground water project.

### 3.5.1 Data Source

The studies were using both primary and secondary data sources. Primary data that were used were collected from consultants and contractors involved in groundwater construction projects during 2012-2016 year. A questionnaire was carefully designed from previous preliminary investigations conducted in groundwater drilling projects between 2000 and 2012 in Tanzania and Africa in general. Secondary data such as costs, project durations, and factors cause delay and cost overruns in groundwater projects were reviewed to establish what others have documented on the subject matter. The documents reviewed included the ministry of water and Irrigation policy document and other relevant documents from consultants and Contractors. This information was collected from respective regulatory boards offices and website.

### 3.5.2 Data Collection Techniques

These are the techniques that are used to assemble and gather data from different sources so as to evaluate the results of a particular collection. Kothari (2004) depicts that on deciding which method of data collection is to be used, the primary and secondary data sources of data should be considered because their method of data collection also differs. The study used both primary and secondary data.

#### 3.5.2.1 Primary Data

This entails data collected in the field thus from the study or the data collected from an institution that initially collected the information for a specific purpose. It's the first-hand data that can be collected through questionnaires, interviews, observations and interviews (But, 2009). This method has been used through personal and

telephone interviews, this data was collected from targets group of consultants and constructors.

**Questionnaire:** M.Groves (2011) portrays a questionnaire as a standardized list of questions that are presented to the respondents in a study or survey which requires them to fill specific information that will be useful to acquire the information required. A questionnaire is mainly used in a survey. Framing of the questionnaire should be highly considered because it has a larger impact on the quality of the response received. A questionnaire provides room for collecting a large amount of data in a quick manner especially when self-administered. A questionnaire should be constructed in such a way that it is not biased or contain vague questions that will affect the response rate or questions that will offend the respondents.

The self-administered questionnaires that were used contained both open-ended questions that allowed the respondents to provide adequate information and closed-ended questions that enabled the respondents to answer the questions upon the requirement of the study. This method was used since it is the most flexible tool in studying respondent's perceptions and opinions as it possesses a peculiar advantage over other tools in obtaining both qualitative and quantitative information.

#### 3.5.2.1 Secondary Data

It involves researching pre-existing data, which can be from different sources including government reports, journals and archived data (Godwin, 2012). It includes data from the internet, organizational records and reports and information collected from the government departments. A secondary data is of more advantage

because most of the background check such as literature review is already done. The researcher adopted documentary review because it is rich source of secondary data; where books, journals, reports and articles from different authors with adequate information on cost and delay of groundwater projects from different areas and countries worldwide were used.

### 3.6 Reliability and Validity

At this point, the data were tested for validity and reliability. Validity refers to how well the test measures what was supported to be measured. Reliability is the measure of homogeneity in the test results. Reliability in data was tested by use of Cronbach's Alpha. The validity of data were assured by use of closed-end questionnaires. Reliability is at low level when Cronbach α is less than 0.3 and it cannot be accepted. Reliability is at high level when Cronbach α is more than 0.7 where it indicates inner consistency of indexes table is at high level and it can be highly acceptable.

### 3.7 Data Analysis

Data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 23. The software was chosen because it has been widely used in previous studies. The Kendall's tau correlation coefficients were applied to confirm data agreements for engineers, contractors and consultants usually the process of analysis was beginning during early stage of data collection (Bradley an el, 2007). Database platform was sorted, coded, analyzed and interpreted using descriptive statistical techniques. Set of data described by using percentage and coefficient of variation and presented using tables. Correlation analysis was carried out to test relationship between variables. Multiple regression analysis was then used to

determine the effect of each of the independent variables and the dependent variable.

### 3.7.1 Variable Measurements

The researcher employed ordinal scale of measurement using five scale where both factors for delay and cost overrun respondents were required to choose the degree of impact. The responses provided by every respondents were coded and counted in their respective categories. Imprortance Index (II) and Frequency Index (FI) data analysis was used to identify, rank and examine importance based on degree of occurance and level of soerverity for the both factors of cos and time overrun in project construction. Data were analysed using equation 1 to 5 with other statistical methods as follows;

Assaf and Hejji (2006) the severity index (SI) for the variable is computed with the formula;

$$SI\ (\%) = \left(\frac{\sum_{i=1}^{5} AiNi}{5\sum_{i=1}^{5} Ni}\right) x\ 100\%$$

Where A is the constant expressing the weighting given to each response, it ranges from 1 for none to 5 for very high; N is the frequency of the responses.

Similarly, the Frequency Index (FI) for each of the variable was computed with the formula;

$$FI\ (\%) = \left(\frac{\sum_{i=1}^{4} BiNi}{4\sum_{i=1}^{4} Ni}\right) x\ 100\%$$

B is the constant stating the weighting given to each response, it will range from 1 for never to 4 for high

Importance Index (II) for each of the variables will be computed as the product of both severity and frequency indices. It is given by;

$$II\ (\%) = \{S.I\ (\%) X\ F.I\ (\%)\}/100$$

The variable was ranking through the Important index (II) by assigning the first rank for the highest value, the second rank to the next highest value and so on. The measurement of the communality of the rank from observers was done by Kendall coefficient of concordance (W). It is computed with the following formula (Kendall, 1970);

$$\mathrm{W} = \frac{12S}{M^2(n^3 - n)}$$

Where S is the sum of squares of deviations of the rankings, that is;

$$\boldsymbol{S} = \sum_{i=1}^{N} (\boldsymbol{R_i} - \bar{\boldsymbol{R}})^2$$

*m* is the number of sets of rankings, *n* is the number of variables being ranked, *Ri* is the sum of rankings for the variable and -R is mean of sum of the ranks.

With the reference to the above empirical literature review as discussed in chapter two of this report, the study considered existence of a linear relationship between the project cost escalation and Time to completion (dependent variable) and the critical factors (independent variables). The relationship assumed to be in the form of a multiple linear models. Collected data were tested on concurrence with the assumptions that underpin the multiple linear regression models. Finally, the model itself was developed. Inorder to find the relative importance of the the factors identified as influencing completion of projects the researcher was conducted dinferential analysis which included.

Coefficient of determination and multiple regression analysis. Linear regression can be used to model the relationship between a continues dependent variable and one or more independent variables.

The regression equation

y= β0 + β1X + ε)

Whereby Y = is the dependent variable, the parameters, $\beta_0$ and $\beta_1$ are the coefficients which are unknown and are to be estimated. X is the independent variable, and e is a random error, which is the amount of variation in Y not accounted for by the linear relationship. The theoretical models are derived and explained in the following.

Correlation

Further analyses were carried out to show the correlation of the effect of delay and cost overruns in the construction of underground water projects. Spearman's correlation was employed in this analysis. The Spearman's correlation coefficient is calculated for the ranking using the following equation:

$$rs = 1 - \frac{6\sum d^2}{N(N2-1)}$$

Where

rs= Spearman's rank correlation coefficient

d = the difference in ranking

N = the number of variables

### 3.7.2 Draw Conclusion from Coded Data

In this stage the data collected already gave the meaning and the understanding of the phenomena hence personal reasoning will be the greatest tool in reaching the

conclusion.

### 3.8 Ethical Consideration

The sample from which data was collected was assured confidentiality on the respondents' response and they were not forced to write their names in the questionnaires. Moreover, the purpose of the questionnaires was explained to them so as to ensure their freedom in answering questions because it's mainly for academic purpose, therefore, the information are secured. The researcher observed participant's right to privacy and right to withdraw participation at any time.

# CHAPTER FOUR

# DATA PRESENTATION AND DISCUSSION OF FINDINGS

## 4.1 Introduction

This chapter comprises the findings and discussion of data on the assessment of factors that causing delay and cost overruns in the construction of groundwater projects in Dar es Salaam. 97.7 percent of the respondents who amounting 85 of 87 respondents responded fully to questionnaires. The data fulfilled the research objectives to answer the research questions of the study

## 4.2 Respondents Characteristics

Assessing the which causing delay and cost overruns in construction of groundwater projects in Dar es Salaam; age, education, and respondents position on groundwater project was very vital for understanding the nature of the respondents.

### 4.1.1 Age of the Respondents

**Table 4.1: Age of the Respondents**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 15-25 | 4 | 4.7 | 4.7 | 4.7 |
| | 26-35 | 23 | 27.1 | 27.1 | 31.8 |
| | 36-45 | 29 | 34.1 | 34.1 | 65.9 |
| | 46 and above | 29 | 34.1 | 34.1 | 100.0 |
| | Total | 85 | 100.0 | 100.0 | |

**Source**, Field Data (2019)

According to the study result presented in Table 4.1 above, respondents with different age range were sampled in the study. The majority of the participants were aged between 36-45 and above 46 years of age, who was 34.1% each group mounted

to 68.2 percent of all 85 respondents. While followed by 26-35 group of age with 27.1% of the respondents and least were aged between 15-25 who were only 4.7%. This implies that majority of people associated with groundwater projects in Dar es Salaam are aged above 35.

### 4.1.2 Respondents' Education Level

The study results reviled that more than a half of the respondents had an undergraduate level of education, who amounted 54.1% followed by Diploma/Advanced level secondary education level who were about 28.2% while 14.1% were postgraduate and only 3.5% ordinal/certificate level as shown in Table 4.2

**Table 4.2: Education Levels of the Respondents**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | O-level Secondary school/ Certificate | 3 | 3.5 | 3.5 | 3.5 |
| | Diploma/ A-level secondary education | 24 | 28.2 | 28.2 | 31.8 |
| | Undergraduate | 46 | 54.1 | 54.1 | 85.9 |
| | Postgraduate | 12 | 14.1 | 14.1 | 100.0 |
| | Total | 85 | 100.0 | 100.0 | |

**Source:** Field Data (2019)

### 4.1.3 Respondents' Discipline

In Table 4.3 the nature of targeted group of questionnaire indicates that majority of respondents were Contractors who were 47.1% and the percent of Consultants was 35.3%,, Clients were 14.1% while only 3.5% were others who specified as owners, surveyors and project managers

**Table 4.3: Respondent Discipline**

| Respondents' discipline to groundwater projects | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Constructor | 40 | 47.1 | 47.1 | 47.1 |
| | Consultant | 30 | 35.3 | 35.3 | 82.4 |
| | Client | 12 | 14.1 | 14.1 | 96.5 |
| | Others | 3 | 3.5 | 3.5 | 100.0 |
| | Total | 85 | 100.0 | 100.0 | |

**Source**: Field Data (2019)

### 4.2 Regression Analysis

This study was based on three hypotheses that pertained as to the existence of the variables which are influencing delay and cost escalation of groundwater projects in Dae es Salaam. The researcher tested the hypothesis while employing the multiple regression analysis methods. The use of this method is premised on the use of three assumptions to test relationship between variables.

**1st Assumption:** In the Pseudo R-Square table, if McFadden value≥0.5 then the variables in the hypothesis indicated that they have a statistically significant fit in the overall model.

**2nd Assumption:** In ANOVA table, if the P value≤0.05-0.000 implies there is a statistically significant relationship between variables.

**3rd Assumption:** In the coefficient table, P-values of independent variables should be between p≤0.05-0.000 implying statistically significant relationship between variables thus accepting alternative Hypotheses.

The study had four objectives stated as shown in the following Alternative Hypothesis:-

**$H1_1$;** *There is a positive correlation between at least one of the factors causing cost overrun and one of the factors causing delay in groundwater projects.*

**$H2_1$:** *Factors for cost overrun positively contributes to cost escalations in groundwater projects.*

**$H3_1$:** *Factors for project delay positively contribute to length of time in groundwater projects.*

**$H4_1$:** *There is a positive relationship between cost escalations and time to completion for groundwater projects***.**

Where; $H1_0 \neq H1_1$; $H2_0 \neq H2_1$; $H3_0 \neq H3_1$ and $H4_0 \neq H4_1$

### 4.2.1 Factors for Cost Overrun in Ground Water Project

According to the results, the overall model for cost overrun was statistically fit due to its P-value in ANOVA table being 0.000 which is very small than 0.05 level of significance, see Table 4.5 below. However, it's Pseudo R-Square test has McFadden R-Square of 0.677 implying that dependent variable is explained by 67.7% by its independent variable, see Table 4.4.

**Table 4.4: Pseudo R-Square: Cost escalation**

| **Pseudo R-Square** | |
|---|---|
| Cox and Snell | .727 |
| Nagelkerke | .852 |
| McFadden | .677 |

**Source:** field data (2019)

This implies that cost overrun in groundwater projects in Dar es Salaam are influenced by the Inadequacy of money/financial constrains; Related material problems; Time allocated to the design phase change order; Payment difficulties, and

Lack of experience in contraction by 67.7 percent, other things remain constant.

**Table 4.5: ANOVA Cost Escalation**

| ANOVA | | | | | |
|---|---|---|---|---|---|
| | Sum of Squares | Df | Mean Square | F | Sig. |
| Regression | 39.098 | 11 | 3.554 | 5.653 | .000 |
| Residual | 45.902 | 73 | .629 | | |
| Total | 85.000 | 84 | | | |

**Source**: Field Data (2019)

According to coefficient Table 4.6 independent variables such as Inadequacy of money/financial constrains; Related material problems; Payment difficulties; and Lack of experience in contraction had statistical influence on cost overrun of groundwater projects in Dar es salaam because their P-values (0.000; 0.003; 0.000 and 0.000 respectively) except Time allocated to the design change order was statistically insignificant at 0.05 level. Other things remain constant. Therefore the alternative hypothesis **($H2_1$):** Factors for cost overrun positively contribute to cost escalations in groundwater projects was failed to be rejected.

**Table 4.6: Coefficients Cost Escalation**

| Coefficients | | | | | |
|---|---|---|---|---|---|
| | Standardized Coefficients | | | | |
| | Beta | Std. Error | df | F | Sig. |
| Inadequacy of money/Financial constrains | .308 | .087 | 4 | 12.471 | .000 |
| Related material problems | .276 | .090 | 1 | 9.514 | .003 |
| Time allocated to the design phase change order | .158 | .091 | 2 | 3.028 | .055 |
| Payment difficulties | .282 | .090 | 2 | 9.740 | .000 |
| Lack of experience in construction | .278 | .092 | 2 | 9.143 | .000 |

**Source:** field data (2019)

### 4.2.2 Time to Completion in Ground Water Project

The researcher used Pseudo R-square to test the significance impact of the overall model, where this model has 54.8%; implying that, the dependent variable (Time to completion) explained by independent variables (see in Table 4.7) by 54.8 % which is above 50 percent level (1st assumption), for that reason Time completion in ground water project In Dar es salaam explained by its factors by 54.8 percents. Other things remain constant. However, the model was statistically fit because its Analysis of Variance had a P-Value of 0.000 which is very smaller than 0.05 significance level.

**Table 4.7: Pseudo R-Square: Time Completion**

| **Pseudo R-Square** | |
|---|---|
| Cox and Snell | .531 |
| Nagelkerke | .709 |
| McFadden | .548 |

**Source**: Field Data (2019)

**Table 4.8: ANOVA Time Completion**

| **ANOVA** | | | | | |
|---|---|---|---|---|---|
| | Sum of Squares | Df | Mean Square | F | Sig. |
| Regression | 50.307 | 17 | 2.959 | 5.715 | .000 |
| Residual | 34.693 | 67 | .518 | | |
| Total | 85.000 | 84 | | | |

**Source**: Field Data (2019)

The coefficient Table 4.9 below factors such as Design changes, Unpredictable weather condition, fluctuation in the cost of contraction materials, shortage of site workers and incorrect planning and schedule had P-Values of 0.000; 0.003; 0.000; 0.00; and 0.000 respectively which are very small than 0.05 significance level; implying that they have significant statistical relationship with dependent variable (Time to completion of groundwater projects). Consequently, variables such as

inadequate planning and Poor site management and supervision had no statistical influence on dependent variable because their P-Value exceeded 0.05, level of significance. Therefore, the alternative hypothesis **($H3_1$):** Factors for project delay positively contribute to length of time in groundwater projects was accepted.

**Table 4.9: Coefficients, Time Completion**

| Coefficients | | | | | |
|---|---|---|---|---|---|
| | Standardized Coefficients | | | | |
| | Beta | Std. Error | Df | F | Sig. |
| Design changes | .337 | .080 | 3 | 17.523 | .000 |
| Inadequate planning | .081 | .082 | 2 | .977 | .382 |
| Unpredictable weather condition | .209 | .082 | 2 | 6.517 | .003 |
| Fluctuation in the cost of contraction materials | .257 | .080 | 2 | 10.399 | .000 |
| Poor site management and supervision | .114 | .085 | 2 | 1.809 | .172 |
| Shortage of site workers (skills and unskilled) | .325 | .083 | 3 | 15.239 | .000 |
| Incorrect planning and scheduling | .306 | .081 | 3 | 14.361 | .000 |

**Source:** field data (2019)

### 4.2.3 Cost Overrun and Time Completion

The correlation analysis between cost overrun and time to completion of the groundwater project was done using Pearson correlation technique. The result presented in Table 4.10 the test had one objective to check linearity assumption through the correlation between cost overrun and Time completion; linearity assumption is met when there is high correlation between variables. In the results there was weak inverse correlation ($r = -0.147$, $p=0.18$) between cost overrun and time escalation, yet it was insignificant. This implies that there is no statistical relation between cost overrun and completion, other things remain constant; therefore we reject alternative hypothesis **($H4_1$):** There is a positive relationship between cost escalations and time to completion for groundwater projects**.**

**Table 4.10: Correlations between Cost escalation and Time completion**

| Correlations | | | |
|---|---|---|---|
| | | How do you judge the timely completion of groundwater projects in Dar es Salaam? | Did the actual cost of the projects be more than the estimated cost of groundwater projects |
| How do you judge the timely completion of groundwater projects in Dar es Salaam? | Pearson Correlation | 1 | -.147 |
| | Sig. (2-tailed) | | .180 |
| | N | 85 | 85 |
| Did the actual cost of the projects be more than the estimated cost of groundwater projects | Pearson Correlation | -.147 | 1 |
| | Sig. (2-tailed) | .180 | |
| | N | 85 | 85 |

**Source:** field data (2019)

Table 4.11 below shows only 14.1% agreed that company imposed strict methodologies to handle project cost while majority about 61.2% who mounted 52 respondents said sometimes strict methodologies are used and few about 24.7% who mounted 21 samples said no. One of the consultants said that

> "*most of the companies impose a method to deal with cost of their project but their main objective is to win tender without considering the other risks*''.

**Table 4.11: Cost handling Methodologies**

| **Does your company impose any strict methodologies during construction to handle project cost?** | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 12 | 14.1 | 14.1 | 14.1 |
| | Sometimes | 52 | 61.2 | 61.2 | 75.3 |
| | No | 21 | 24.7 | 24.7 | 100.0 |
| | Total | 85 | 100.0 | 100.0 | |

**Source**: Field Data (2019)

### 4.2.4 Software Usage in Handling Project Cost

According to the results (Table 4.12), many respondents about 42.4% who amounted 36 of 85 respondents agreed that they apply some software on plan, monitoring and

cost control, while 36% (31) said sometimes and 21.2% (18) said no any software application on plan, monitoring and cost control.

**Table 4.12: Software Usage**

| Do you apply any software on plan, monitoring and control cost? | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 36 | 42.4 | 42.4 | 42.4 |
| | Sometimes | 31 | 36.5 | 36.5 | 78.8 |
| | No | 18 | 21.2 | 21.2 | 100.0 |
| | Total | 85 | 100.0 | 100.0 | |

**Source**: Field Data (2019)

### 4.2.5 Correlation between Factors for Cost Overrun and Time Escalation

Correlation analysis between the factors for cost overrun and time completion (Table 4.13) was done to test whether there is at least one variable correlate between cost overrun and time to completion of groundwater projects. In the results, Time allocated to the design phase were statistically significant correlated with Inadequate of money/financial constrains (r=0.26, p=0.015); Payment difficulties (r=0.265, p=0.014); and Design phase changes order (r=0.231, p=0.033).

While poor site management and supervision were statistically significantly correlated with Unpredictable weather condition (r=0.267,p=0.014) and shortage of site workers (r=0.28, p=0.009); for that reason at least one factors for cost overrun correlated with at least one factor for timely completion. Therefore, we fail to reject alternative hypotheses ($H1_1$): There is a positive correlation between at least one of the factors causing cost overrun and one of the factors causing delay in groundwater projects.

**Table 4.13: Correlation between Factors for Cost Escalation and Factors for Time Completion**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inadequacy of money/Financial constrains | Pearson Correlation | 1 | | | | | | | | | | | |
| | Sig. (2-tailed) | | | | | | | | | | | | |
| | N | 85 | | | | | | | | | | | |
| Related material problems | Pearson Correlation | .078 | 1 | | | | | | | | | | |
| | Sig. (2-tailed) | .479 | | | | | | | | | | | |
| | N | 85 | 85 | | | | | | | | | | |
| Time allocated to the design phase change order | Pearson Correlation | .264* | .012 | 1 | | | | | | | | | |
| | Sig. (2-tailed) | .015 | .913 | | | | | | | | | | |
| | N | 85 | 85 | 85 | | | | | | | | | |
| Payment difficulties | Pearson Correlation | .010 | .195 | .265* | 1 | | | | | | | | |
| | Sig. (2-tailed) | .931 | .074 | .014 | | | | | | | | | |
| | N | 85 | 85 | 85 | 85 | | | | | | | | |
| Lack of experience in construction | Pearson Correlation | -.045 | -.099 | .067 | .158 | 1 | | | | | | | |
| | Sig. (2-tailed) | .680 | .369 | .544 | .147 | | | | | | | | |
| | N | 85 | 85 | 85 | 85 | 85 | | | | | | | |
| Design changes | Pearson Correlation | -.148 | -.046 | -.231* | .115 | -.177 | 1 | | | | | | |
| | Sig. (2-tailed) | .176 | .676 | .033 | .293 | .106 | | | | | | | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | | | | | | |
| Inadequate planning | Pearson Correlation | -.117 | -.094 | -.023 | .146 | .037 | .074 | 1 | | | | | |
| | Sig. (2-tailed) | .285 | .394 | .831 | .183 | .737 | .503 | | | | | | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | 85 | | | | | |
| Unpredictable weather | Pearson Correlation | -.042 | .071 | -.138 | -.115 | .077 | .033 | -.014 | 1 | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| condition | Sig. (2-tailed) | .702 | .516 | .209 | .296 | .484 | .764 | .902 | | | | | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | | | | |
| Fluctuation in the cost of contraction materials | Pearson Correlation | -.161 | .025 | -.141 | .037 | .024 | .186 | .025 | -.067 | 1 | | | |
| | Sig. (2-tailed) | .141 | .823 | .199 | .738 | .827 | .088 | .818 | .543 | | | | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | | | |
| Poor site management and supervision | Pearson Correlation | -.031 | .074 | -.181 | -.072 | .020 | .051 | -.060 | .267* | .082 | 1 | | |
| | Sig. (2-tailed) | .777 | .503 | .097 | .515 | .857 | .646 | .587 | .014 | .454 | | | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | | |
| Shortage of site workers (skills and unskilled) | Pearson Correlation | .098 | .177 | -.060 | -.043 | .130 | .045 | .175 | .132 | .003 | .281** | 1 | |
| | Sig. (2-tailed) | .374 | .105 | .585 | .696 | .237 | .685 | .109 | .228 | .981 | .009 | | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | |
| Incorrect planning and scheduling | Pearson Correlation | .077 | -.163 | .027 | .108 | .035 | .014 | .212 | .140 | -.074 | .078 | .167 | 1 |
| | Sig. (2-tailed) | .486 | .136 | .806 | .326 | .751 | .898 | .052 | .201 | .501 | .476 | .127 | |
| | N | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | | | | | | | | | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | | | | | | | |

**Source**, Field Data (2019)

**Key;**

| No | Definition | No | Definition |
|---|---|---|---|
| **1** | Inadequacy of money/Financial constrains | **7** | Inadequate planning |
| **2** | Related material problems | **8** | Unpredictable weather condition |
| **3** | Time allocated to the design phase change order | **9** | Fluctuation in the cost of contraction materials |
| **4** | Payment difficulties | **10** | Poor site management and supervision |
| **5** | Lack of experience in construction | **11** | Shortage of site workers (skills and unskilled) |
| **6** | Design changes | **12** | Incorrect planning and scheduling |

**Source**, Field Data (2019)

## 4.3 Discussion

### 4.3.1 Delay and Cost Overrun/Escalation

The study finds that Design changes, Unpredictable weather condition, fluctuation in the cost of contraction materials, shortage of site workers and incorrect planning and schedule had significant positive relationship with Delay in time completion of groundwater projects in Dar es Salaam; While, another variable such as inadequate planning and Poor site management and supervision had no statistical influence on dependent variable. On the other hand the result revealed that Inadequacy of money/financial constrains; Related material problems; Payment difficulties, and Lack of experience in contraction had statistical influence on cost overrun of groundwater projects in Dar es salaam while Time allocated to the design change order was insignificant.

Adugna, (2015), there is substantial agreement on ranking the importance of the individual variables of delay and cost overruns between parties. Based on overall results, the top five most important causes are contractor's cash flow problems, delaying progress payments by the client, poor site supervision and management by

contractor, inefficient quality control by the contractor during construction leading to rework due to errors, and contractor's difficulties in financing the project.

The study of Aftab *et al* (2011) found that, cashflow and financial difficulties faced by contractors, poor site management and supervision incompetent sub contractors, sholtage of workers and financial difficulties of the oweners are main cause of time overrun. Other causes identified were: Shortage of skills; Financial difficulties; Shortage of labour; Unrealistic deadlines for project completion; Unforeseen ground conditions; Poor organization of the contractor or consultant; Poor communication; Underestimation of time of completion; low speed of decision; and Design errors made by designers

Kikwasi, (2012) argued that the main causes of delay and disluption includes delay in payment, changes of design, delays of information, problem of funds, management, disagreement and compersation on the valuation of work done. Also Frimpong *et al* (2002) the main effects of delay and disluption are idling resources, negative social impact, time overrun, cost overrun and disputes The results of the study revealed the main causes of delay and cost overruns in construction of groundwater projects included; monthly payment difficulties from agencies; poor contractor management; material procurement; poor technical performance; and escalation of material prices.

### 4.3.2 Correlation between Delay in Time Completion and Cost Overrun

The study analysis found that other things remain constant; there is no statistical relationship between cost overrun and completion. However there are at least one

factor for cost escalation positively correlate with at least one of the delay in time completion. Where Time allocated to the design phase was statistically significantly correlated with Inadequate money/financial constrains; Payment difficulties, and Design phase changes order. Whereas poor site management and supervision were statistically significantly correlated with Unpredictable weather condition and shortage of site worker.

# CHAPTER FIVE

# CONCLUSION AND RECOMMENDATION

## 5.1 Introduction

This is the final chapter in this research; it contains a conclusion and recommendations that might contribute to solve the problem of delay and cost escalation in groundwater projects in Dar es Salaam, which will apply to contractors, consultants and clients as well as others especially policymakers.

## 5.2 Summary and Conclusion

In accordance and in line with the analysis result drawn up from the desk study and respondents' responses of the questionnaires regarding an assessment of factors that causing delay and cost overruns in construction of groundwater projects in Dar es Salaam. The researcher collected data from 85 respondents by using structured questionnaires; the aim of the study was broken down in four objectives; The study found that Time allocated to the design phase was statistically significantly correlated with Inadequate of money/financial constrains; Payment difficulties, and Design phase changes order while Poor site management and supervision were statistically significantly correlated with Unpredictable weather condition and shortage of site workers.

The results reviled that Inadequacy of money/financial constrains; Related material problems; Payment difficulties; and Lack of experience in contraction had positive statistical influence on cost overrun of groundwater projects in Dar es salaam; however, Design changes, Unpredictable weather condition, fluctuation in the cost of contraction materials, shortage of site workers and incorrect planning and schedule

had significant positive relationship with Delay in time completion of groundwater projects in Dar es Salaam. Moreover, it has been evident that there is no statistical relationship between cost escalation and delays in time completion of groundwater projects in Dar es Salaam. However, there are at least one factor for cost escalation positively correlate with factors of delay in time completion.

## 5.3 Recommendation

The contractors have the major responsibilities for the delay in groundwater projects in Dar es Salaam. They should consider proper planning in order to avoid delays during constructional stage, develop action plan, organise payment and structure for all stages of work on the project, Prepare team with qualifications to work in project and appoint the manager for the development of an action plan through which to regulate, control, supervision and adjust things for the project to avoid the problems in implementation or problems between workers or employee and complete on time.

Also constructors should manage his financial resources and plan cash flow by utilizing progress payment. The consultant should check, review and approving designed documents, checking any delay caused by consultant engineer, approving and reviwewing the design submitals priar to phase of construction, could delay the progress of that project. They should be flexible in evaluating projects, comparing the cost and high quality should be considered. Clients should choose team to do and track project sustainable competence and experience in groundwater projects.

## 5.4 Area for Further Studies

This study was limited on the assessment of factors that causing delay and cost

overruns in construction of groundwater projects in Dar es Salaam. Another researcher may not only investigate delay and cost overrun of groundwater projects in other Tanzania regions, but also may study other contraction projects, or should dig down in a single factor for instance, investigates the effects of financial and cash flow problems on delay in either groundwater projects or other contractions projects in either Dar es Salaam or other regions.

## REFERENCES

Aftab, H. M., Ismail, A. R., Muhammad A.& Nornashima M. A., (2014). Significant Factors Causing Time Overrun in Construction Projects of Peninsular Malaysia. *Canadian Center of Science and Education*, 13, 286-293.

Ahmed, M. S., Azhar, S., Castillo, M. & Kappagantula, P. (2002). Construction delays in Florida: an empirical study, retrieved on July 16th , 2019 from; .www.cm.fiu.edu/pdfs/Research.

Aibinu, A. A. & Jagboro, G. O. (2001). The effects of construction delays on project delivery in Nigerian construction industry, *International Journal Project Management,* 20( 8), 593-599.

Aiyetan (2008) A systems thinking approach to eliminate delays on building construction projects in South Africa, *Acta Strutilia*, 18(2), 33-43.

Akintoye, A. (2000). Analysis of factors influencing project cost estimating practice, *Construction Management and Economics,* 18(1), 77-89.

Al-Khalil A. & Ghafly, A. (1999). Al-Khalil, M. I., & Al-Ghafly, M. A. (1999b). Important causes of delay in public utility projects in Saudi Arabia. *Construction Management & Economics, 17*(5), 647-655.

Al-Kharashi and Skitmore (2008) Causes of delay in Saudi Alabia public sector construction projects. *Construction Management and Economics,* 27, 3-23.

Al-Momani, A. (2000) Al-Momani, A. H. (2000). Construction delay: a quantitative analysis. *International Journal of Project Management,* 18(1), 51-59.

Angelo, W. J. & Reina, P. (2002). *Megaprojects Need More Study Up Front to Avoid Cost Overruns.* McGraw-HilL New York

Apolot, A. (2012). Apolot, Ruth., Alinaitwe, Henry. & Tindiwensi, Dan. (2012). An

Investigation into the Causes of Delay and Cost Overrun in Uganda's Public Sector Construction Projects, Second International Conference on Advances in Engineering and Technology, Kampala: Uganda.

Assaf, S.A. & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management,* 24(7), pp. 349-357.

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

Azhar, N., R.U. Farooqui & Ahmed, S.M. (2010). Cost Overrun Factors in Construction Industry in Pakistan. Proceeding of First International Conference on Construction in Developing Countries (ICCIDE-1), Karachi, Pakistan, 4-5 August, pp: 499-508

Baloi and Price (2003) Modeling global risk factors affecting construction cost performance. International journal of Project Manageent. 21(10), 261-269.

Bradley an el, (2007). Qualitative data analysis for health service research. *Hearth Service Research.* 42, 1758-72.

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

Creswell, J. & Plano Clark, V. (2007). *Designing and Conducting Mixed Methods Research.* Thousand Oaks, CA: Sage.

Dlakwa, M. M. & Culpin, M. F. (1990). Reasons for overrun in public sector construction projects in Nigeria. *International Journal of Project Management*, 8(4), 237–41.

Dolage and Rathnamali (2013) Causes of time overrun in construction phase of

building projects: a case study on Department of Engineering Services of Sabaragamuwa Provincial Council. *Journal of the Institution of Engineers, Sri Lanka*, 46(3),9–18.

El-Razek, M. E. A., Bassioni, H. A. & Mobarak, A. M. (2008). Causes of delay in building construction projects in Egypt", *Journal of Construction Engineering and Management*, retrieved on 21st March, 2019 from; http://uhl2332butterfly.wikispaces.com/file/view/project+delay+3.pdf.

Frimpong, Y., Oluwoye, J. & Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case Study. *International Journal of Project Management*, 21(5), 321-326.

Gido, J. & Clements, J. (2003). *Successful Project Management*, 2nd edition, South-Western: Mason, OH.

Giridhar, P. & Ramesh, K. (1998). Effective management of Turnkey projects, PM7-PM11.

Haseeb, M., Xinhai-Lu, Aneesa Bibi, A., Maloof-ud-Dyian, Rabbani, W. (2011). Problems of projects and effects of delays in the construction industry of Pakistan. *Australian Journal of Business and Management Research*, 1(5), 41-50.

Henry Alinaitwe, Ruth Apolot2 and Dan Tindiwensi, (2013). Investigation into the Causes of Delays and Cost Overruns in Uganda's Public Sector Construction Projects *Developing Countries*, 18, 33-47.

Howick, S., Ackermann, Eden, F., and Terry Williams. (2009).Understanding the causes and consequences of disruption and delay in complex projects: How

system dynamics can help. School of Management, Southampton, University Southampton SO171BJ, UK

Johnson, R. & Christensen, L. (2005). *Educational research quantitative, qualitative and Mixed approaches,* fifth edition, London: Sage.

Kadiri, D. S. & Shittu, A. A. (2015). Causes of time overrun in building projects in Nigeria; Contracting and consulting perspectives Department of Quantity Surveying, *International Journal of Civil Engineering, Construction and Estate Management*, 3(4), 50-56.

Kaliba, et al. (2009 Kaliba, C, Muya, M & Mumba, K. (2009). Cost Escalation and Schedule Delay in Road Construction Projects in Zambia, *International Journal of Project Management*, 27(5), 522-531.

Kaming, I. S. (1997). Factors Influencing Construction Time and Cost Overrun on High-Rise Project in Indonesia. *Constr. Manag. Econ.* 15(1), 83-94.

Khalil, A, & AL-Ghafly M. A. (1999), Delay in public Utility projects in Saudi Arabia. *International Journal of Project Management,*17(2),101–6.

Kikwasi, G. J. (2012). Causes and effects of delays and disruptions in construction projects in Tanzania, *Australasian Journal of Construction Economics and Building*, 1( 2). 52-59.

Le-Hoai, L., Lee, Y. D. & Lee, J. Y. (2008), Delay and Cost Overrun in Vietnam Large Construction Projects: *A comparison with other selected Countries, KSCE Journal of Civil Engineering*, 12(6), 367-377.

Lo, F. & Tung, K. (2006). Lo, T. Y., Fung, I. W. H., Tung, K. C. F. (2006), 'Construction delays in Hong Kong civil engineering projects'. *Journal of Construction Engineering and Management*, 132(6), 636-49.

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

Memon, A.H., I. Abdul Rahman, M.R. Abdullah and A.A. Abdu Azis, (2010): "Factors Affecting Construction Cost in Mara Large Construction Project". Perspective of Project Management Consultant. *Int. J. Sustain. Constr. Eng. Techno*., 1(2), 22-30.

Miller, R., & Lessard, D. (2001). Understanding and managing risks in large engineering projects, *International Journal of Project Management,* 19, 437-443.

Mills, A., (2001). A systematic approach to risk management for construction, Structural Survey, 19(5), pp. 245-252

Mukuka M.J, Aigbavboa C.O., and Thwala W.D. (2014) A theoretical review of the cause and effect of construction project costs and schedule overrun. International Conference on Emerging Trends in Computer and Image Processing (ICETCIP'2014) Dec. 15-16, 2014 Pattaya (Thailand)

Ogunlana SO, Promkuntong K, Vithool J. (1996). Construction delays in a fast-growing growing economy: comparing Thailand with other economies. *International Journal of Project Management,* 14(1), 37–45.

Ramabodu, M. S., and Verster, J. J. P. (2010). Factors Contributing to Cost Overruns ofConstruction Projects. In the proceeding of ASOCSA 5th Built Environment Conference, Durban South Africa.

Robert, M. G. (2011). Tree eras of survey research, Public opinion quarterly, l75(5), 861-871.

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

Syed, Azhar, Castillo and Kappagantula, (2002) Syed M. Ahmed, Salman Azhar, Mauricio Castillo and Pragnya Kappagantula. 2002. Construction Delays in Florida: An Empirical Study

Zou, P. X. W., Zhang, G., & Wang, J. (2006). Identifying key risks in construction projects: life cycle and stakeholder perspectives. *Procedia Computer Science, 64*, 24-31.

# APPENDICES

## A: QUESTIONNAIRE

Dear Respondent,

My name is SELIUDI, Muganyizi; a postgraduate student at OPEN UNIVERSITY OF TANZANIA. In partial fulfillment of the requirements for a degree Masters of Project Management. I am undertaking research on *"*Assessing Factors Causing Delay and Cost Overruns in Construction of Ground Water Project in Dar Es Salaam*"*. I wish to emphasize that the research is purely academics and all the information given and views expressed shall be treated with confidential. It is hoped that the findings will be useful for both academicians and the public as whole. I would appreciate if you spend some times to answer the questions as required.

*NB; Please indicate your response by putting a tick (√) in a specific box/column answer. Do not hesitate to provide further information in space provided.*

**Part I**; Demographic data

1) Age

i. 15-25 [ ]

ii. 26- 35 [ ]

iii. 36- 45 [ ]

iv. Above 45 [ ]

2) Education level

i. Not attended any school education [ ]

ii. Primary school education level [ ]

iii. Certificate education level [ ]

iv. Diploma (Ordinary or Advance diploma) [ ]

v. Basic University degree [ ]

3) What is your position to ground water projects?

i. Constructor [ ]

ii. Consultant [ ]

iii. Client [ ]

iv. Others (Please specify) [ ]

……

**Part II**; please respond to the following questions;

4) How do you consider timely completion of ground water projects in Dar es Salaam?

1. Delayed [ ]
2. Competed on time [ ]

5) Do you think delay in completion of ground water project leads to cost escalation?

1. Yes [ ]
2. No [ ]

**Part III**; Please indicate by ticking the appropriate column the relative your response on each of the following factors Causing Delay of time completion and cost overrun in Construction of Ground Water Project

| **Factors for delay of time completion** | Strong Disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| 6) Inadequacy of money/Financial constrains | | | | | |
| 7) Related material problems | | | | | |
| 8) Time allocated to the design phase change orc | | | | | |
| 9) Lack of experience in construction | | | | | |
| **Factors for cost escalation** | | | | | |
| 10) Design changes | | | | | |
| 11) Inadequate planning | | | | | |
| 12) Unpredictable weather condition | | | | | |
| 13) Fluctuation in the cost of contraction material | | | | | |
| 14) Poor site management and supervision | | | | | |
| 15) Shortage of site workers (skills and unskilled) | | | | | |
| 16) Incorrect planning and scheduling | | | | | |

## B. ESTIMATED RESEARCH BUDGET

The detailed proposed budget for undertaking the research is as proposed in Table 6.1 below

**Table 6.1 Research Budget**

| **TRANSPORT COST** | | | | | | |
|---|---|---|---|---|---|---|
| Transport Mode | Activities | Field days | Cost (TSH) hiring Cost | | | Total cost Transport (TSH) |
| Tax | Transport within Dar es Salaam | 14 | 30000 | | | 420000 |
| **PURCHASING OF DATA** | | | | | | |
| Purchasing of Secondary data | | | | | | 500000 |
| **PRINTING CHARGES** | | | | | | |
| Report | Number of Copies | Number of Pages | Total Pages | Cost/page (TSH) | | Total Cost (TSH) |
| Questionnaires | 50 | 5 | 250 | 500 | | 125,000 |
| Dissertation Report | **4** | **220** | 880 | 500 | | 440,000 |
| **RESERCH COST** | | | | | | **1,485,000** |

## 7. Expected time of Commencing the Study

The expected time of commencing this research is 1st April, 2017

## 8 Expected time of completing the Study

The expected time of completing the study this research is 30st September, 2017

## 9. Signatures:

Student…… ……

Date…10/09/2017……

## 10. Comments of the supervisor

……. …….. …… …….

…….. ……. …… ……. ……. …….

Supervisor……Date……