**THE ROLE OF QUALITY CONTROL ON THE IMPLEMENTATION OF WATER PROJECT IN LINDI MUNICIPAL COUNCIL**

**LWIMIKO MWAKISOLE**

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

**2020**

# CERTIFICATION

The undersigned certifies that she has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation titled: ***“The Role of Quality Control on the Implementation of Water Project in Lindi Municipal Council"*** in partial fulfillment of the requirements for the Degree of Master of Project Management (MPM) of Open University of Tanzania.

……………………………….

Dr Hawa Uiso

**(Supervisor)**

……………………………….

Date

# COPYRIGHT

No part of this dissertation may be reproduced, stored in any retrieval system, or transmitted in any form by any means, electronic, mechanical, photocopying, recording or otherwise without prior written permission of the author or the Open University of Tanzania in that behalf.

# Declaration

I, **Lwimiko Mwakisole,** do hereby declare that, this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

………………………………………

Signature

………………………………………

Date

# Dedication

To my GOD ALMIGHTY and my Lord, Saviour Jesus Christ who gave me the strength all the time. Also, to my lovely wife Mrs Prisca D. Mwakisole for her care and help all in times of need as well as our children Tumpale, Mponjoli, Mpeli and Josephina. I will not forget to mention my beloved father, the late Mr. Andembwisye Mwakalobo and lovely mother Tumpale Ngoka Mwakalobo, as I believe that they fulfilled their parental responsibility to me. To all, I have every reason to thank them for their love, support, and encouragement throughout the study period.

# Acknowledgement

It is my pleasure to raise up my hand and give the honour, glory and thanks to almighty God for his wisdom and mercy that gave me the strength and courage to perform this study especially in a new environment. I would like to thank the Government of the United Republic of Tanzania, the management of Don Consult Limited for the support and recognizing me as student, registered by The Open University of Tanzania (OUT) for two years and allow me to pursue a master’s programme in project management.

I have enjoyed the privilege of working under the guidance of Dr. Hawa Uiso whose invaluable contribution was exceptional in the development of this dissertation. I take this opportunity to extend my appreciation to the administrative and academic staff of the Open University of Tanzania for their co-operation and support that was received during the period of my study. Moreover, the note of adorable memories has taken of co-operation enjoyed from my colleagues in the project team. Thus, I would further wish to thank the Lindi Municipal Council for allowing me to carry out this study in their respective areas and different administrative units within the Lindi Municipal.

I sincerely extend my thanks and appreciation to my Pastor namely Rev Dr. Alphonce S. Mwanjala for his spiritual care and strong prayers to me and my family. Not only that but also, a word of appreciation goes equally to all my fellow colleagues at OUT whose contributions have been noted in accomplishing my study.

Lastly but not least, my sincere appreciation goes to my lovely wife Mrs Prisca Mwakisole, who has been encouraging me through prayers, moral inspiration, and sometimes, material support. She persevered the stressful moment of being alone with the kids during the entire study period and all the time she appeared to be strong and polite to me something which made me to perform my studies efficiently. Also, thanks to our lovely children, Tumpale, Mponjoli, Mpeli and Josephina for their patience during days and nights of writing this report.

# aBSTRACT

This study was conducted to assess the role of quality control on the implementation of water projects in Lindi Municipal Council. Specifically, it compared the standards set with actual implementation and enquired into the reasons for variations. Monitoring mechanism was instituted to ensure quality control on the implementation of water project. It also examined the relationship between standards set, technical skills and finally monitoring mechanism on implementation of water project. The study used modified Juran’s Approach to TQM and Crosby’s Approach to TQM in construction industry. The study employed pragmatism philosophy and descriptive research design. A sample of 90 respondents was extracted from a population of 135, using probability and purposive sampling technique. Descriptive statistics together with correlation analysis was used in data analysis. SPSS Version 20 was used to code and analysis. The findings of the study basing on the opinion of the respondents revealed that implementation of water projects complied with standard sets. It was also observed that project expertise’s technical skills and monitoring mechanism for quality control influenced the implementation of water project at Lindi Municipal Council. The study recommends to all stakeholders that the capacity building and effective quality management control should be implemented to both new and on-going project.

**TABLE OF CONTENTS**

CERTIFICATION ii

COPYRIGHT iii

Declaration iv

Dedication v

Acknowledgement vi

aBSTRACT viii

LIST OF TABLES xiii

LIST OF FIGURES xiv

LIST OF ABBREVIATIONS AND ACRONYMS xv

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background Information 1

1.2 Statement of the Research Problem 3

1.3 Research Objective 4

1.3.1 General Research Objective 4

1.3.2 Specific Objectives 4

1.4 Research Question 5

1.4.1 General Research Question 5

1.4.2 Specific Research Question 5

1.5 Significance of the Study 5

1.6 The Organization of the Dissertation 5

CHAPTER TWO 7

LITERATURE REVIEW 7

2.1 Overview 7

2.2 Conceptual Definitions 7

2.3 Theoretical Literature Review 7

2.3.1 Juran’s Approach to TQM 8

2.3.2 Revised Crosby’s Approach to TQM 9

2.4 Quality in Water Projects 10

2.5 Empirical Literature Review 12

2.5.1 Monitoring Mechanisms 12

2.5.2 Training and Technical Competency 13

2.6 Research Gap 16

2.7 Conceptual Framework 16

2.7.1 Dependent Variable 17

2.7.2 Independent Variables 17

CHAPTER THREE 19

RESEARCH METHODOLOGY 19

3.1 Overview 19

3.2 Research Philosophy 19

3.3 Research Design 19

3.4 Survey Population 20

3.5 Sampling Design and Sample Size 20

3.5.1 Sampling Design 20

3.5.2 Sample Size 21

3.6 Variables and Measurement Procedures 22

3.7 Methods of Data Collection 23

3.7.1 Interview 23

3.7.2 Questionnaire 24

3.7.3 Documentary Review 24

3.8 Data Processing and Analysis 24

3.9 Reliability and Validity 25

3.10 Ethical Considerations 25

CHAPTER FOUR 27

PRESENTATION AND DISCUSSION ON THE FINDINGS 27

4.1 Overview 27

4.2 Response Rate and Respondents’ Characteristics 27

4.3 The Relationship between Independent and Dependent Variable 28

4.3.1 Standard Sets and the Implementation of Water Projects 28

4.3.2 Training and Technical Factors and the Implementation of

Water Projects 29

4.3.3 Monitoring Mechanism and the Implementation of Water Projects 29

4.4 Descriptive Statistics 30

4.4.1 Standard Sets 30

4.4.2 Training and Technical Factors 35

4.4.3 Monitoring Mechanism 39

4.5 Discussion of the Findings 41

4.5.1 Standard Sets on Implementation of Water Projects 41

4.5.2 Training/Technical Competency on the Implementation of

Water Projects 42

4.5.3 Monitoring Mechanisms on the Implementation of Water Projects 43

CHAPTER FIVE 44

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS 44

5.1 Introduction 44

5.2 Summary 44

5.3 Conclusion 45

5.4 Recommendations 46

5.5 Limitations of the Study 47

5.6 Further Studies 47

REFERENCES 48

APPENDICES 54

# LIST OF TABLES

Table 2.1: A Summary of Empirical Literature Review 14

Table 3.1: Distribution of Sample Frame 21

Table 3.2: Reliability Statistics 24

Table 4.1: Respondents’ Characteristics 27

Table 4.2: Correlation between Standards Sets and Implementation of Water

Project 28

Table 4.3: Correlation between Training and Technical Factors on

Implementation of Water Projects 29

Table 4.4: Correlation on Monitoring Implementation of Water Projects 30

# LIST OF FIGURES

Figure 2.1: Conceptual Framework 16

Figure 4.1: Training and Technical Factors 35

Figure 4.2: Monitoring Mechanism 39

# LIST OF ABBREVIATIONS AND ACRONYMS

HR Human Resource

ISO International Standard Organization

LUWASA Lindi Urban Water and Sewerage Authority

M&E Monitoring and Evaluation

NBS National Bureau of Statistics

NRWSSP National Rural Water Supply and Sanitation Programme

QC Quality Control

QMS Quality Management System

SPSS Statistical Package for Social Science

TANROAD Tanzania National Roads Agency

TQM Total Quality Management

TQMS Total Quality Management System

Tshs Tanzanian Shillings

URT United Republic of Tanzania

UWSSP The Urban Water Supply and Sewerage Programme

WHO World Health Organization

WRMP Water Resources Management Programme

WSDP Water Sector Development Programs

WSP Water Supply Programme

# CHAPTER ONE

# INTRODUCTION

# 1.1 Background Information

Water comprises 70 percent of the earth's surface while it has been estimated that only one percent of water occupied at the earth is safe water for human drinking (Nashiru, 2015). According to the study, the population growth in the world has made access to safe and drinking water to remain an obstacle for human being. It is estimated that less than 50% of population in the world gets safe and clean water for drinking, (ibid, 2015). Many people in the world experience challenges related to access of safe and clean water for drinking (Zerah, 2016). The access of safe and quality drinking water remain important for the population in the world; and countries around the world have initiated various strategies to tackle the challenge related with quality control of water for personal use.

According to World Health Organization (2010), many developing countries face water quality control problems that hinder access to quality and safe water for human use. In 2010, WHO revealed that Africa contains 29% of the world population that has access to poor quality water for their use? Furthermore, the report illustrated that only 62% of the people in African countries have access to improved water supplies.

Tanzania has different sources of water but access to quality and safe water to the society remains 56% of the total population (URT, 2016). According to the report, the quality control of water to communities remains the main agenda in Tanzania. The control of water quality service to people depend on various factors, including adequate investments in constructed water storage facilities, water resources infrastructure and adequate investments in water resources management systems (URT, 2015). The concept of control covers five basic elements including setting standards, comparing standards with actual, enquiring into reasons for deviation, taking corrective actions and obtaining feedback from both internal and external environment to ensure that the problem does not recur (Thorpe and Summer 2014 and Lam et al., 2014).

During the budget speech, April 2016 the Minister of Water and Irrigation his excellence Eng. Gerson Lwenge noted saying that existing water supply systems are unable to meet up water demands. The demand of water is relatively higher than supply of quality water services to the populations of Tanzanians. Therefore, the effort of the government of United Republic of Tanzania is to ensure that more water project are developed and communities are able to get safe and quality water (URT, 2016).

The government of Tanzania through its Water Sector Development Programs (WSDP) has three components to ensure quality water service for the communities. These include the Water Resources Management Programme (WRMP), the National Rural Water Supply and Sanitation Programme (NRWSSP) and The Urban Water Supply and Sewerage Programme (UWSSP) (URT, 2016). Despite these efforts, many water projects still face quality control problems (URT, 2016).

Tanzania has witnessed many water project run in different local government authorities are either built substandard or others are not completed timely (URT, 2016). The daily News of 4th March 2017 reported that there were uncompleted water projects at Lindi Municipal Council, which commenced in March 17, 2013 and was supposed to be completed in March 17, 2015. However, the contractor has so far failed to complete the project even after two years from the agreed time. According to President Magufuli, the project is worth 29bn/- and so far a total of 21.8bn/- has been paid to the contractor (URT, 2017).

This indicates that despite the initiative to implement water project under WSDP in different municipalities in Tanzania, the quality control of water project has remained unquestionable in Tanzania. Many water projects constructed to improve water quality are substandard or not accomplished on time and if completed do not meet the requirements needed (URT, 2016). Therefore, this study assessed the role of quality control on the implementation of water projects in Lindi Municipal Council. However, the researcher was motivated to conduct this study because it is within his working experience as civil and water engineer; hence it was easy to generalize in-depth findings.

# 1.2 Statement of the Research Problem

Tanzania like other African countries faces the challenges of demand of quality water service being relative higher than the supply (URT, 2016). According to Maganga (2015) quality water depends on quality-constructed project that meets the required standards. URT (2016) indicated that the problem of water project constructed substandard continue in Tanzania and efforts are needed to ensure the water projects address the central problem of access of quality water. Mansoon (2016) said that quality water project contributes largely to access of quality water but there is insufficient technical analysis on ongoing projects if they are capable to provide access to quality water, which need more analysis on it.

Daibes (2016) investigated the challenges of accessing quality water and associated it with nature and design of water projects. Nashiru (2015) found that access to quality water has been a problem in developing countries and is caused by water projects designation, implementations and monitoring. Zerah (2016) showed that quality water is a greatest challenge that needs an empirical investigation to address because it can be a health hazard. According to Zerah (2016) clean and safe water is vital for human health and can reduce the burden of common illnesses, such as diarrhea disease, especially in young children, cholera and other related problems. It is estimated that in 2010, 1.8 billion people globally drank water that was not safe; therefore, this study was conducted to assess the role of quality control on the implementation of water projects in Lindi Municipal Council.

# 1.3 Research Objective

# 1.3.1 General Research Objective

The main objective of this study was to assess the role of quality control on the implementation of water project in Lindi Municipal Council.

# 1.3.2 Specific Objectives

1. To determine if the implementation of water projects complied with the standards set.
2. To assess the role of technical skills on the implementation of water projects in Lindi Municipal Councils.
3. To assess the monitoring mechanism in ensuring quality control on the implementation of water projects at Lindi Municipal Council in Tanzania.

# 1.4 Research Question

# 1.4.1 General Research Question

The general question is what is the role of quality control on the implementation of water project at Lindi Municipal Council?

# 1.4.2 Specific Research Question

1. Is implementation of water projects according to standards set?
2. What is the role of technical skills on the implementation of water projects in Lindi Municipal Council?
3. How does the monitoring mechanism affect quality control on the implementation of water projects at Lindi Municipal Council in Tanzania?

# 1.5 Significance of the Study

This study is a pre requisite for the accomplishment of Master of Project Management. The study contributes to the existing body of knowledge and literature related to quality control in the water sector on the implementation of water project at Lindi Municipal Council. The results of this study will also benefits academicians by adding knowledge related with aspects contributing to the challenges facing quality control on the implementation of water project that can be used for further academic purposes.

# 1.6 The Organization of the Dissertation

This dissertation is organized in five chapters. Chapter one has covered; background information, statement of the problem, objectives, research question, and significant of the study. Theoretical and empirical literature review will be addressed in chapter two. This study discussed research methodology in chapter three while research findings and discussion were addressed in chapter four and finally conclusion and recommendation were done in chapter five.

# CHAPTER TWO

# LITERATURE REVIEW

# 2.1 Overview

The study focused on assessing the role of quality control on implementation of water project in Lindi Municipal Council. In order to have a critical analysis, it is very important to review various literature related to the nature of the study. Therefore, this chapter covered definition of key concept, theoretical and empirical literature review, research gap and conceptual framework.

# 2.2 Conceptual Definitions

The term Quality control (QC) is defined as procedure or set of procedures intended to ensure that, a performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer (Zerah, 2016).

In addition, quality control is defined as the process of ensuring that water services meet agreed national standards and institutional targets (WSP, 2016). In this study, quality control means the water projects designed and implemented in order to ensure access of safe water for human use are available to the intended community.

# 2.3 Theoretical Literature Review

This part deals with theories and other theoretical issues related with the study. The study used modified Juran’s Approach to TQM and Crosby’s Approach to TQM in construction industry.

# 2.3.1 Juran’s Approach to TQM

Juran (1950) developed the quality trilogy model called Juran Approach to total quality management based on three major variables (quality planning, quality control and quality improvement). These three processes of the Juran trilogy are interrelated and they focused to ensure that there is quality assurance in the implementation of various projects and production. After Juran developed his approach, different scholars from his original ideas did various developments. The revised Juran’s approach to TQM developed in 2014 focusing on assessing quality management in project design and implementation in order to achieve the intended objective. The theory assumed an effective system that integrated the quality development, quality-maintenance, and quality-improvement efforts of the various groups in a firm in the process of marketing, engineering, production, and service at the most economical levels. The theory shows that an effective quality management consists of four main stages, which are setting quality standards; appraising conformance to standards; acting when standards are not met and planning for improvement for standards in the project design and implementation.

The theory demonstrates that project design is the identification of customers’ requirements and it starts and ends only when the product or service is delivered to the customer and should reflect the facts that customer should remain the most satisfied. The water sectors development projects should focus on attaining quality as defined by the customers (Mahmood, *et al,* 2016).

The advantage of this theory is that it provides a basis of understanding the quality measurement and assurance from the project design, project implementation and project evaluation. The critique for this theory are that it did not explain issues that act as the challenge for realizing total quality control in various projects. Despite, the theory having critiques on its failure to demonstrate issues that are challenges in realization of quality in the project or production process but it is suitable because it has provided basis for analysing challenges facing quality control during the implementation of water project, A Case of Lindi Municipal Council.

# 2.3.2 Revised Crosby’s Approach to TQM

The revised theory of Crosby’s approach to TQM was based on identifying principles for quality improvement (McCabe, 2015). The theory focused on identifying a number of important principles and practices for a successful quality improvement program. The theory focused on promoting quality management by participation, management responsibility for quality, employee recognition, education, reduction of the cost of quality, emphasis on prevention rather than inspection, doing things right the first time and zero defects.

The theory assumed that lack of knowledge and attention has been important factors that contribute to quality management failure in project design, implementation and evaluation. The theory considered that, the best mechanism of addressing the existing problem was by developing a comprehensive education and training and promote management change in style to successful quality improvement in project implementation.

The study assumed that the management of an organization has a role to ensure an effective management and monitoring of the project implementation. There is no quality achievement in a project implementation without management monitoring and evaluation of the project. The theory is suitable for this study because it defines quality assessment as a means of ensuring the accountability of the management in quality management in the projects.

# 2.4 Quality in Water Projects

Different scholars have viewed quality differently. The study focused on assessing quality control aspects in implementing water project at Lindi Municipal Council in Tanzania. The term quality in water project demonstrated thorough quality management system (ISO, 9000). According to quality management, system (ISO, 9000) which defined quality as the degree to which a set of inherent characteristics fulfils prescribed indicators of quality or requirements. This means that; the quality of water projects depends on a set of quality control indicators during its implementation.

This implies that quality is essential for the construction of water project, which requires contractors to realise the agreed indicators of quality. The contractor in water project should fulfil the need of the customer, the consultants should make sure that the needs of the customers are fulfilled during the construction of the project and the customer should ensure the needs are met through the water project implementations (Tricker, 2015).

Lam *et* *al.,* (2014) defines quality management as that aspect of the overall management function that determines and implements the quality policy and quality system as the organisational structure, responsibilities, procedures, processes and resources for implementing quality management.

Thorpe and Sumner (2014) describe a QMS in companies as a formal statement of an organization's business policy, management responsibilities, processes and their controls, that reflects the most effective and efficient ways to meet or exceed the expectations of those it serves, whilst achieving its own prime business objectives”. In this study, quality management system is defined as the degree to which water project realise the quality or requirements as determined during the project design.

The application of a QMS in order to consider the important aspects of the quality is one of the key quality concepts reviewed by the writers on quality. Thorpe and Sumner (2014) considered four basic elements to address in QMS of water project. The elements include quality materials, management team, planning, evaluation and assessment. The management of an organization such as Lindi Municipal Councils understand and knows that quality of the water project should be initiated from the top management to lower management.

In addition, it should ensure that the operations of the water project in the areas should be aligned with operations based on quality construct. The management and stakeholders use important statistical indicators that are more useful and reliable to demonstrate the specified quality measurement that are properly and efficiently managed from the construction period to the implementations of water project.

Finally, the staff and management teams and other stakeholders such as end user of the project are given training on how to maintain the quality of infrastructure and the manner of maintaining them in order to promote sustainability for the project.

# 2.5 Empirical Literature Review

# 2.5.1 Monitoring Mechanisms

Dominick (2014) conducted a study to assess the effects of water pipe leaks on water quality and its implication on revenue collection in Arusha Water Authority. The study employed descriptive study design. The study also found that human activities, poor infrastructure, poor water connectivity among customers and lack of satisfactory technical staff to monitor and manage water project were the main causes of water leaks.

The study made a number of recommendations to water authority in Arusha including controlling physical losses, ensuring customer meters were accurate and making all efforts to keep the number of illegal connections to a minimum. The focus of this study was on effects of water pipe leaks on water quality, it did not consider the issues of quality of the project implementations from the designing phase as addressed in the current study.

Johnson (2016) conducted a study on quality control in construction of Kimara Msewe to Baruti road project. The study employed descriptive analysis method. It revealed a number of problems including the fact that the contractor did not construct the road timely, management of the contract was not implemented as per agreed terms and close monitoring of the project was not implemented properly which affected quality of the road. The study recommended, TANROAD to make sure that contractors that win bid for construction of road project have capacity and ability to implement the project per contract. This study was based on quality control in road construction as opposed to the current study, which is based on water project.

The management commitment in terms of quality assurance in water projects and monitoring of the contractors ensured that the project was implemented timely and according to specifications (Pearson, et al, 2015). The management of public organization, which was highly committed with corruption free water project, invested on proper monitoring and evaluations of its projects and they had committed to pay the contractor timely. In addition, they were capable of evaluating the ability of the contractor to complete the project on time, which had a significant impact on promoting quality implementation of water projects.

The project that was dominated with corruption activities could not realise quality as defined by the customers (Marlow *et al,* 2016). Corruption is the biggest challenge that faces water project in many developing countries (Hartstone *et al,* 2016). According to the literature, corruption increases costs of operation for the contractor in water project, which ultimately influence the decisions of contractors in the choice of materials. In some instances, the materials used were not as specified in the project during design and as a result, it affected the quality of water project (Hartstone *et al.,* 2016). According to the study, corruption was defined as the enemy towards realising the quality project implementations of many emerging countries. Both study above, It was empirically employed in this study because of similarities on methodologies used and variables; Therefore it was helpful in the study discussion.

# 2.5.2 Training and Technical Competency

Many public organizations have employees who do not have enough capacity of either designing the project that realise the quality standard or monitor the project so that quality standard is realised (Allender, 2006). The study employed descriptive statistics research resign. Investing in human resources capacity yields staff who have quality skills and competent in evaluating the water project for achieving the quality standards. The contractors need to have competent and capable staff for implementing the water project in order to ensure that quality standards are realized.

The ability of contractors in developing countries is dominated by various challenges in implementing the quality water projects (McCabe, 2015). The ability of contractors in delivering quality project remains very important for projects and its development. According to the study, proper and effective quality water project depend upon technical capacities of contractor and financial ability toward the implementation of the project and this was noted as the main challenge for many local and foreign contractors in developing countries.

The challenges facing many developing countries in formulating the project are based on interest of politicians leading to projects that were either not completed at all or not completed on time (McCabe, 2015). According to the study, the politically initiated project tended to be designed and implemented based on political interest that affected their credibility of promoting quality of its implementation. The politically initiated projects did not have a critical analysis during the design problem and this ended with quality problem during the implementation.

According to the study, leakages of water reservoir and storage tank act as the sources of water pollution as a result it undermined the quality of water to distribute to the customers Many countries in Africa faced challenges related with age of infrastructure that is used for distribution of water to the customers. David, (1996) reported old age of infrastructure used for distribution of water to the customers as the main cause of leakages that affected quality of water. Silver (2011) argued that water supply systems required infrastructure that were completely out of leakage in order to maintain quality of water that was distributed to customers. It is argued that high leakage together with high failure rate was one of the characteristics of deteriorated pipelines, which ultimately affected quality of water distribution (Farley and Trow, 2003). Study above, both it was empirically employed in this study because of similarities on methodologies used and variables; therefore, it was helpful in the study discussion.

**Table 2.1: A Summary of Empirical Literature Review**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author (Year)** | **Title of the study** | **Methodology** | **Findings** |
| Hartstone et al., (2016), | Water in Tanzania | Descriptive statistics | Inadequate education and corrupt practices led to water pipe leakage |
| Dominick (2014) | Effects of water pipe leaks on water quality and on non-revenue water. | descriptive statistics | Water leakage reduced revenue collection, poor infrastructure, human activities, and poor water connectivity. Lack of sufficient technical staff to monitor and manage water project were the main source of water leaks. |
| Pearson et al., (2015) | Water Resource Management | Factor analysis | Management commitment. Ensures that the project is implemented timely and according to specifications. The study found that the inclusion of social learning and engagement is necessary to achieve urban water management strength. |
| Johnson (2016) | Quality control in construction of Kimara Msewe to Baruti road project | Descriptive statistics | Poor management, monitoring and supervision, time management. |

Source: Field data

# 2.6 Research Gap

A number of studies on quality control in implementation of projects were conducted in other countries and other sectors such as construction sectors (Hartstone et al., 2016, Pearson et al., 2015 Johnson 2016, and Noi, 2016. Only Dominick (2014) conducted a study in water projects in Tanzania and focused on leakage and revenue loss among water authorised and modality of investment in water sector development. Therefore, the current study intended to fill a contextual gap since none of the studies mentioned were conducted in the implementation of water project in Tanzania and in particular Lindi Municipal.

# 2.7 Conceptual Framework

The conceptual framework demonstrates the relationship between the independent and dependent variables basing on the literature reviewed. Juran's total quality management identified variables such as conformity to quality in the implementation of project and continuous improvements as some of the variables that determine quality of the projects.

Implementation of Water Projects

Training and technical

competence

Monitoring and Evaluation

(M&E) Mechanism

Standards set

**Figure 2.1: Conceptual Framework**

Source: Field data (Researcher 2017)

In this study, the role of quality control of water project at Lindi Municipal Council was regarded as independent variable while dependent variable was the implementation of quality of water project.

# 2.7.1 Dependent Variable

The dependent variable of this study was implementation of water projects, which estimated based on efficiency and effectiveness, acceptability, motive and attitude of water project beneficiaries, improves compliances, and time for completion of the project; which influenced by functions of quality control such as standard set, training and technical competence as well as monitoring and evaluation mechanism.

# 2.7.2 Independent Variables

According to this study functions of quality controls is independent variable which includes; standards set, training and technical competency and Evaluation and monitoring mechanizations.

Training and Technical Competence; provision of extra field-related skills to technical personnel appears to be catalyst to water projects implementation; especially when indicators of quality control suite to meet all of the established quality goals. Therefore, these compliances improvements rely on execution, fulfilments of requirements and standard sets.

In order to make sure that the intended quality of water project was achieved: Monitoring and Evaluation was compulsory and its goal was to improve the current and future management outputs, outcome and impact basing on timely milestones completion for every specific stage of the water project.

In this study, standard set means prescribed indicators of quality or requirements for water project implementation. This implies that quality is essential for the construction of water project, which requires contractors to realise the agreed indicators of quality in order to meet customer needs.

# CHAPTER THREE

# RESEARCH METHODOLOGY

# 3.1 Overview

The chapter presents how the study was conducted. The chapter consists of research philosophy, research design, and study population, sampling procedures, data collection methods, data analysis process and ethical consideration of the study.

# 3.2 Research Philosophy

The research philosophy is a belief about the way in which data about a phenomenon are gathered, analysed and used. A research paradigm is a way of describing a worldview that was informed by philosophical assumptions about the nature of social reality, ways of knowing and ethics and value systems (Patton, 2002). Two major research philosophies have been identified in the Western tradition of science, namely positivist (sometimes called scientific) and interpretivist (also known as antipositivist). Positivist philosophy based on scientific and systematic verification hence uses quantitative research paradigm while antipositivist based on subjects interpretation and intervention in reality hence uses qualitative paradigm.

This study employed pragmatism philosophy, which involves mix of quantitative and qualitative approach. The researcher employed this methodology because it provides an accurate and valid representation of the variables that are relevant to research question.

# 3.3 Research Design

According to Kothari (2004), research design refers to arrangement of condition for collections and analysis of data in a manner that aims to combine relevance to the research purpose with economy and procedure. This study adopted descriptive research design. It involved cross-sectional survey, employing questionnaires as a tool for collecting data from the officers and customers of the Lindi Urban Water and Sewerage Authority (LUWASA). Its approach is deductive as it was beginning with hypothesized predictions, collect data and test whether the data offers information as evidence in support of the prediction.

# 3.4 Survey Population

The survey population was 95 people comprising of staff of Lindi Urban Water and Sewerage Authority and consultancy of water project. The staff who were working at LUWASA were categorised as Management team, Supervisors, Technicians and other staffs. Lindi Municipal Council had 120 staff working at LUWASA and 15 consultants in water project (Lindi Municipal Council, 2016). The total targeted population therefore was 95 made up of staff at LUWASA (Lindi) and consultants in water project a (LUWASA HR database, 2018) Kothari (2004) defined population as the total number of items whose information is desired. The study was conducted at Lindi Region and it involved water projects under Lindi Urban Water and Sewerage Authority.

# 3.5 Sampling Design and Sample Size

# 3.5.1 Sampling Design

According to Kothari (2004) Sample design refer to the technique or the procedure the researcher would adopt in selecting items for the sample. The study adopted probability-sampling technique to select the staff at LUWASA to ensure representativeness of the respondents. The method was used to give each individual an equal chance to be selected in the study. However, purposive sampling technique was also applied to the Management team, Supervisors and Technicians so as to get vital information. The technique also provided a sample, which was more representative, accurate, easy to administer, and led to results that were more reliable. Purposive sampling technique was used to select consultants for water project at Lindi Municipal Council.

# 3.5.2 Sample Size

The sample size constituted 90 staff of Lindi Urban Water and Sewerage Authority and consultancy of water project. The following equation Fisher et al (1991) was adopted in this study to determine the sample size of the respondents.

n=Z2pq/d2where: n = the desired sample size

z = the standard normal deviation, which is 1.96 set at 95% confidence level

p = Expected proportion of staff of Lindi Urban Water and Sewerage Authority and consultancy of water project at 7% (NBS and ICF Macro, 2016).

q = 1.0 – p (expected proportion of staff to be interviewed) = 0.93

d = Degree of accuracy set at 5% (0.05).

n = (1.96)2 x 0.94 x 0.06 n= 90

(0.05)2

According to the above formulae the distribution of 90 respondents was provided with questionnaires, however 5 participants were interviewed, making a total of 95 sample size as represented at Table 3.1.

**Table 3.1: Distribution of Sample Frame**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit of Enquiry** | **Sample Size (Respondents to answer questions from questionnaire and interview)** | | | **Percent** |
| **LUWASA Employees and consultancy** | **Questionnaire** | **Interview** | **Total** |
| Management team | 5 | 1 | 6 | 6% |
| Supervisors | 9 | 3 | 12 | 13% |
| Technicians | 19 | - | 19 | 20% |
| Consultancy of water project | 12 | 1 | 13 | 14% |
| Other staff | 45 | - | 45 | 47% |
| **Total** | **90** | **5** | **95** | 100% |

Source: Field data

The study assumed that there was perfect knowledge about quality implementation of water projects among all stakeholders. Based on this assumption, the researcher prepared data collection instrument answered by sample frame in this study in order to collect more data related to the study problem. The questionnaires were distributed to 90 respondents comprising of 79 staff working with Lindi Municipal Council and 11 consultancies. The interview was conducted for 4 staff at LUWASA and 1 consultant of water project in order to get their views on quality control in the implementation of water project.

# 3.6 Variables and Measurement Procedures

The study variables were categorised into independent and dependent variables. The dependent variable was implementation of water projects, while independent variables were standards set, training and technical competency; and Monitoring and evaluation mechanisms. Moreover, demographic data that were discussed included Gender of the respondents, Age and education level.

Dependent and independent variables were structured in questionnaires with five ordinal responses where; 1=Strong disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly agree. While, respondents were asked to declare gender as male =1 female =2; Age were grouped into 1= 30-40 years, 2=41-50 years, and 3=above 51years; respondents were asked to indicate level of education basing on the following values of measurements; primary education=1, secondary education=2, certificate=3, diploma=4, bachelor degree=5, master degree=6.

# 3.7 Methods of Data Collection

There were two main sources of data collection in research; primary and secondary data (Kothari, 2004). The primary data are those, which are collected afresh and for the first time, and thus happen to be original in character and Secondary data on the other hand are those which have already been collected by someone else and which have already undergone through the statistics process. Both primary and secondary data were used in this study. The questionnaire, interview and documentary review were used in collecting data. Secondary data were also in form of literature reviewed where various databases were consulted.

# 3.7.1 Interview

According to Kothari (2004), interview is a method of collecting information through oral or verbal communication between the researcher and the respondents. Interviews were facilitated by interview guides. Interview method were chosen because it is quite flexible, adaptable and can be applied to many people and information can be obtained in detail and well explained. This was employed because the researcher wanted to gather professional and technical information from top management.

# 3.7.2 Questionnaire

Questionnaires were constructed to collect primary data from respondents. According to Saunders et al., (2003) it is a data collection technique in which each person is asked to respond to the same set of questions in a predetermined order. 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 perception and opinions as it possessed a peculiar advantage over other tools in obtaining both qualitative and quantitative information.

# 3.7.3 Documentary Review

The Documentary review is a rich source of second hand information. Most of the data were derived from documents like LUWASA profile, reports and evaluation analysis. The documentary analysis also revealed the customer’s complaints that were reviewed.

# 3.8 Data Processing and Analysis

Data processing as explained by Kothari (2004) involved a number of processes such as editing, error checking, classification, coding tabulation and variable manipulation. Editing is the process of examining the collected raw data especially in survey to detect error and omissions and to correct them before data analysis. Coding refers to the process of assigning numeral or other symbols to answers so that responses can be put into limited number of categories or classes appropriate to the research problem under consideration.

The researcher processed the data from the respondents prior to analysis using the statistical package for social science (SPSS) version 20. During the study, the researcher adopted descriptive analysis together correlation, which was used to test the statistical significance of the relationship between variables.

# 3.9 Reliability and Validity

According to Kothari, (2004), a test is considered reliable when the same results are obtained repeatedly. According to Chronbach’s Alpha results this study reported a figure of 0.950 as shown in the Table 3.2.

**Table 3.2: Reliability Statistics**

|  |  |  |
| --- | --- | --- |
| **Reliability Statistics** | | |
| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
| .950 | .952 | 36 |

Validity refers to the truthfulness of a measure and the application of the principles of statistics to arrive at valid conclusions (Kothari, 2004). A valid measure is the one that measures what it is supposed to measure. Information and data collected through questionnaire and interviews were valid with facts. The questions asked to the respondents were related to the objectives of the study. The validity of instruments was established by using expert judgments. Discussion with expert in the area confirmed the validity of the instrument.

# 3.10 Ethical Considerations

Respondents were assured of confidentiality and were not obliged to write their names on the questionnaires. The purpose of the questionnaires was explained to them so as to ensure their freedom in answering questions because it was mainly for academic purposes. Research clearance was obtained from the Directorate of Post Graduate Studies. According to Mugenda & Mugenda (1999) a researcher must comply to the principle of voluntary consent to participate in the research.

# CHAPTER FOUR

# PRESENTATION AND DISCUSSION ON THE FINDINGS

# 

# 4.1 Overview

This chapter presents the findings and discussion of findings on the role of quality control on the implementation of water project in Lindi Municipal Council.

# 4.2 Response Rate and Respondents’ Characteristics

During the study, the researcher aimed to know various opinions from the respondents. These were based on characteristics such as gender group, age, and analysed by using descriptive statistics methods (See Table 4.1). In assessing quality of water projects, age, gender and education are very vital for the purpose of understanding workers experience in water projects in relation to technical competence.

**Table 4.1: Respondents’ Characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Category** | **Frequency** | **Percent** |
| Gender | Male | 53 | 58.9 |
| Female | 37 | 41.1 |
| **Total** | **90** | **100.0** |
| Education level | Primary education | 6 | 6.7 |
|  | Secondary education | 25 | 27.8 |
| Certificate level | 34 | 37.8 |
| Diploma | 11 | 12.2 |
|  | Bachelor degree | 11 | 12.2 |
|  | Master’s degree | 3 | 3.3 |
| **Total** | **90** | **100.0** |
| Age | Below 30 years | 36 | 40.0 |
| 30–40 Years | 24 | 26.7 |
|  | 41–50 Years | 21 | 23.3 |
|  | Above 51 years | 9 | 10.0 |
|  | **Total** | **90** | **100.0** |

Source: Field data

More than half of the respondents were males. About two thirds of the population were below the age of 40 years with a minority group above the age of 50. About two thirds of the population had attained at least secondary education indicating that the level of education was satisfactory. According to the study results, 90 questionnaires were administered out of which all were properly filled in and received indicating the response rate of 100%.

# 4.3 The Relationship between Independent and Dependent Variable

# 4.3.1 Standard Sets and the Implementation of Water Projects

Table 4.2 show a strong association between standard sets and implementation of water projects. The Pearson correlation between variable was 0.702 and its Significant level 0.000 less than 0.05 (5%), implying that there is significant statistical relationship between Implementation of water projects and standard sets.

**Table 4.2: Correlation between Standards Sets and Implementation of Water Project**

| **Correlations** | | | |
| --- | --- | --- | --- |
|  |  | **Implementation of the project** | **Standard set of control quality** |
| Implementation of the project | Pearson Correlation | 1 | .702\*\* |
| Sig. (2-tailed) |  | .000 |
| N | 90 | 90 |
| Standard set of control quality | Pearson Correlation | .702\*\* | 1 |
| Sig. (2-tailed) | .000 |  |
| N | 90 | 90 |

\*\*, Correlation is significant at the 0.01 level (2-tailed)

Source: Field Data

This relied on factors such as standard operating procedures; water demand assessment in initial stage; identification of reliable sources of water supply; quality of pipes required for water project awareness about the importance of water quality in project and the water services available at all geographical area of the project.

# 4.3.2 Training and Technical Factors and the Implementation of Water Projects

According to the results shown in Table 4.3, there is statistical significance between training and technical competence and implementation of water projects, due to its Pearson correlation was 0.865 and its significant level 0.000 less than 5% level.

**Table 4.3: Correlation between Training and Technical Factors on Implementation of Water Projects**

| **Correlations** | | | |
| --- | --- | --- | --- |
|  |  | Implementation of the Project | Training and Technical Factors |
| Implementation of the project | Pearson Correlation | 1 | .865\*\* |
| Sig. (2-tailed) |  | .000 |
| N | 90 | 90 |
| Training and Technical factors | Pearson Correlation | .865\*\* | 1 |
| Sig. (2-tailed) | .000 |  |
| N | 90 | 90 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed) | | |  |

Source: Field data

# 4.3.3 Monitoring Mechanism and the Implementation of Water Projects

According to the correlation analysis results in Table 4.4, there was strong association between monitoring mechanism and implementation of water project because its Pearson correlation 0.667 had significant level of 0.000, which is very small than 5% level of significance.

**Table 4.4: Correlation on Monitoring Implementation of Water Projects**

| **Correlations** | | | |
| --- | --- | --- | --- |
|  |  | Implementation of the Project | Monitoring Mechanism |
| Implementation of the project | Pearson Correlation | 1 | .667\*\* |
| Sig. (2-tailed) |  | .000 |
| N | 90 | 90 |
| monitoring mechanism | Pearson Correlation | .667\*\* | 1 |
| Sig. (2-tailed) | .000 |  |
| N | 90 | 90 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | |  |

**Source:** Researcher (2017)

# 4.4 Descriptive Statistics

# 4.4.1 Standard Sets

With reference to appendix D the following observations were made.

**Adhering to Standards Operating Procedure**

More than three quarter of the respondents agreed that the water projects had standard operating procedures, which were kept and followed by all employees. 10 of 90 respondents were undecided while only 9 respondents out of 90 disagreed that adherence to standard operating procedures were checked. This means that water project standard operating procedures were kept and followed by all employees at Lindi Municipal Council as planned a thing which help to fulfill customers’ expectation from implementation of water projects.

**Water Demand Assessment**

The result shows that more than two third of the respondents agree that the water demand assessment was well conducted, very few respondents amounting to 6% were undecided, while 16% of the sample argued that the water demand assessment was not done. This means that water demand assessment was carried out in the initial stages of all water projects at Lindi Municipal to make sure that are satisfied with the project. This is similar to the study of Hoyle (2013) which claimed that the use of a quality system as the management suite to meet quality goals. This imply that water demand assessment was done during initial stages of water project implementation at Lindi municipal council.

**Water Source Identification**

Shows that majority of the respondents agree that the water source identification was conducted by the water experts as planned, only 11% were either undecided or disagreed that the water source identification was done. This reveals that Identification of sources of water supply was done taking into account the most reliable sources to fulfill customer expectations.

**Topographical & Geographical Survey**

The results show that more than three quarter of the respondents agreed that topographical and geographical surveys were conducted while, 11.2% disagree that the topographical and geographical survey were conducted. This proves that topographical and geographical survey was conducted in initial stages of water projects at Lindi Municipal Council.

**Pipe Quality**

Outlines that majority of the respondents agreed that the pipe quality has been overseen and crosschecked; whereas only 6% of the respondents were undecided, while 11% disagreed that the pipe quality has been checked. This shows that pipe quality was clearly defined and checked by project manager.

**Pipes Procurement**

Majority of the respondents agreed that pipe procurement and other plumbing materials were checked per standard specifications, 11% and 4% were either undecided or disagreed. This means that pipe procurement and other plumbing materials was conducted as per specification.

**Survey Done**

Portrays that most of the respondents agree that the survey was done in each initial stage of the water project. Whereas only 6% were undecided, while a few (5%) disagreed. This shows that the survey was checked if it was done as per specifications in each initial stage of the water project.

**Cost Estimated**

More than three quarter of respondents agreed that the cost was estimated for water projects based on accurate survey, 11% of the respondents were undecided, while only 10% disagree that the cost was estimated. This proves that cost estimation was accurately checked at initial stage of the project.

**Planned Customer Connection**

79% of the respondents agree that connecting water to customer was done as planned, 9 of 90 respondents that amount to 10% were undecided, while 10 of 90 respondents disagreed. This implies that water connection to customers were done as planned.

**Surveying for Pipe Routes**

Majority of the respondents agreed that the pipe routes were surveyed as planned, 6% were undecided while other 11% disagree that the pipe routes were surveyed. This shows that surveying for pipes routes were implemented in Lindi Municipal’s water project.

**Customer Cost Estimation**

More than three quarter of the respondents agreed that estimating cost to customer has been implemented in the initial stage of water project, 11% were undecided while 10% disagreed that customer cost estimation was done. This proves that customer cost estimation in water project was checked.

**Proper Water Connection**

Most of the respondents agreed that there was proper water connection to customer as planned. 11% were undecided, while only 10% disagreed that there was proper water connection to customer. This shows that the proper water connection of water to customer was checked.

**Water Quality Awareness**

Almost three quarter of the respondents agreed that there was awareness on the importance of water quality in the project, 6% were undecided, while 21% disagree that water quality awareness was checked. This proves that there was awareness on the importance of water quality in the project.

**Water Supply to Customer**

More than two thirdof the respondents agree that water supply to customer was readily available, whereas 6% were undecided while 26% disagreed that water supply to customers was checked. This portrayed that water supply to customers was checked all the time.

**Water Service Coverage**

Almost three quarter of the respondents agreed that water service are available at all geographical areas of the project, 11% of the respondents were undecided while 16% disagreed that water service coverage in all projected geographical areas was checked. This implies that water service coverage was checked in all projected areas.

**Low Pipe Leakage**

The results show that almost three quarter of the sample agreed that pipe leakage was relatively low and water was available. Whereas only 11% were undecided while 16% of the respondents disagreed that low pipe leakage was checked. This shows that the rate of pipe leakages was relatively low and water was available.

**Water connectivity Ensures**

Majority of the respondents agreed that water connectivity ensured minimal pipe leakages. Whereas 5% were undecided, while other 11% disagreed that water connectivity ensured minimal pipe leakage. This proves that water connectivity ensured minimal pipe leakage in water projects at Lindi Municipal. This also argued by Dominick (2014) that human activities, poor infrastructure, poor water connectivity among customers and lack of satisfactory technical staff to monitor and manage water project were the main causes of water leaks.

Furthermore, during the process of obtaining various views from respondent’s, interview questions were used to get opinions from consultants, water and irrigation department in Lindi Municipal Council. All focus group agreed that standard sets towards implementation of water project were very important. This was supported by the following statement made by one of the consultants;

*“There is significant relationship between standard sets of the projects and its implementation. The respondents reported that; if there was* compliance *with operating procedures, water assessment would be carried out in the initial stages, followed by identification of reliable sources of water and finally the quality of water construction pipes would improve the implementation of water project and hence customer satisfaction will also increase’’ (****Consultants 1)***

# 4.4.2 Training and Technical Factors

**Figure 4.1: Training and Technical Factors**

Source: Field data

**Contractors' Insufficient Technical Personnel**

Figure 4.1 shows that almost three quarter of the respondents agreed that there was insufficient technical personnel on the side of the contractor, whereas 6% were undecided, and 22% of the respondents disagreed. This shows that there were insufficient technical personnel on the side of the contactors, this was also noted in statements made by one of the consumers that, due to the complaint from stakeholders that the project took more time to be completed as contractor experts are few. There always witness poor management of activities and no proper coordination.

**Contractors' Insufficient Material Mobilization**

More than two third of the respondents agreed that there was insufficient mobilization of construction materials by contractors, whereas 11% were undecided, while 17% disagreed that contractors' insufficient material mobilization was checked. This reveals that there was insufficient construction material mobilization in water projects at Lindi Municipal.

**Bureaucracy in Implementation**

From figure 4.1; almost three quarter of the respondents agreed that there was bureaucracy in implementation of water projects in the municipal. Only 11% of the respondents were undecided while 17% disagreed that there was bureaucracy in implementationof water projects. This revealed that in Lindi municipal there was bureaucracy in implementation of water projects.

**Delay in Implementation Decisions**

Majority of the respondents agreed that there were delays in decisions related to implementation of project. While not more than 4% were undecided and 10% disagreed that there was delay in implementation decisions. This proves that there was delay in decisions related to implementation. In addition, this was supported by one of the consumers, who said;

*“The behaviour of contractor performance was noted at the beginning but to date nothing has been decided until President ordered. Rehabilitation of existing network was announced seven years ago but observations revealed only repairs to leakages. New customer’s pipe connection took more time without any reason”* ***(Consumers 2)***

**Political Intervention**

Figure 4.1 portrays that more than three quarter of respondents agreed that there was political intervention in the project implementation. While only 9% were undecided, and 10% of the sample disagreed that there were political intervention in implementation of water projects. This portrays that there was political intervention in water project implementation in Lindi Municipal. Moreover, this was clear from one of the following quotations made by consumer;

*“When you observe quick movements in project execution and labours are working hard, the chances are that, there is a top leader (politician) coming to visit the project site. After that visitation, execution of project slows down and continue with normal pace. Thus, illustrates that project execution have connection to political intervention in one way or other. Also, project fund is following at that time” (****Consumer)***

**Lack of Community Participation**

Majority of respondents agreed that there was lack of community participations in project implementation, not more than 4% were undecided while 15% disagreed that lack of community participations was checked. This shows that at Lindi municipal there was lack of community participations in implementation of water projects. This can be seen on the statement made by a dweller:

*“All dwellers were invited at early stage to participate, but ending with little turn-up. Many of the respondents around the project area were unable to undertake heavy works and not willing to be part of project. Contractor was allowed to mobilize labours all over Tanzania in order to ensure the project are completed within the schedule” (Dwellers)*

**Cash Availability**

From Figure 4.1; majority of the samples agree that there was availability of cash required for project implementation. Only 9% were undecided while 10% disagreed that cash availability was checked: This shows that cash was available for implementing water projects in Lindi municipal. This was similar to the statement declared by President Hon John Pombe Magufuli on March, 2017 during his visitation to Lindi Municipal Council:

“*Fund for water project has been allocated and Contractors paid almost 90% of contract sum but works not completed on time*.”

**Lack of Quality Control Expertise**

The results on Figure 4.1 shows that more than two third of the respondents agreed that there was lack of quality control expertise in implementation of water projects. Only 11% were undecided, while 11% disagree that lack of quality control expertise was checked. This shows that there was lack of quality control expertise on the part of staff in implementation of water project at Lindi Municipal.

**Lack of Cooperation**

Majority of the respondents agreed that there was lack of cooperation in supervision and contractor’s staff, not more than 6% were undecided, while 11% disagreed that lack of cooperation was checked. This means that at Lindi Municipal; there was lack of cooperation in supervision and contractors’ staff on implementation of water projects.

**Lack of Motivation**

From Figure 4.1; more than two third of the respondents agreed that there was lack ofmotivation at project working environment, as 11% were undecided while 11% disagreed that lack of motivation was checked. This shows that lack of motivation in working environment was checked at Lindi Municipal.

**Lack of Training**

More than three quarter of the respondents agreed that there was lack of short courses and onsite training.Whereas only 11% were undecided, as 11% disagreed that lack of training was not checked. This shows that there was lack of short courses and onsite training at Lindi municipal during water project implementation.

# 4.4.3 Monitoring Mechanism

**Figure 4.2: Monitoring Mechanism**

Source: Field data

From the above analysis, it is clearly noted that technical factors and training had direct influence on implementation of water projects at Lindi Municipal Council.

**Routine Inspection**

Figure 4.2 portrayed that more than three quarter of the respondents agreed that routine inspection was conducted, whereas only 9% were undecided, while 10% disagreed that routine inspection was checked. This shows that routine inspection on water infrastructure was conducted by LUWASA staff.

**Feedback on Inspection**

The results shows that majority of the sample agreed that feedback on inspection was implemented in identifying problems; while 9% disagreed that feedback on inspection were checked. This shows that feedback on inspection was implemented in addressing identified problem.

**Suggestion boxes are used**

From Figure 4.2, three quarter of the respondents agreed that suggestion box were used for checking customer complaints. Only 8% were undecided while 9% disagreed that suggestion box were checked. This means that suggestion box were used effectively for gathering customer’ complaints by LUWASA.

**Customer Telephone Feedback**

The results show more than two third of the respondents agreed that customer telephone feedback for project was checked. Only few samples were undecided while 13% disagreed that customer telephone feedback was checked. This shows that customer telephone feedbacks for the projects were implemented.

Moreover, one of the managers reported that monitoring mechanism affected significantly the implementation of the water project; mostly when there is on routine follow up, poor identified water infrastructures and procurement of construction materials are not done timely. This imply that a successfully water project at Lindi Municipal Council is highly influenced by its monitoring mechanism.

# 4.5 Discussion of the Findings

# 4.5.1 Standard Sets on Implementation of Water Projects

According to this study results, standards sets had statistical influence on implementation of water project at Lindi Municipal council. Also, the results reveal that standard operating procedures were done as per standard specification in implementation of water projects at Lindi Municipal Council. Such procedures included; adhering to standard operating procedures, water demand assessments, water source identification, topographic and geographical survey, pipe quality, pipe procurement, survey, cost estimate, planned customer connection, customer cost estimation, water connection, water quality awareness, water supply to customer, water service coverage, pipe leakage and water connectivity.

This is similar to the Juran’s theory which shows that an effective quality management consists of four main stages, which are setting quality standards; appraising conformance standards; acting when standards are not met and planning for improvement for standards in the project design and implementations (Juran 1950). According to the theory, the standard sets for the project is based on effective quality management control (Mahmood and Mohammed, 2015).

# 4.5.2 Training/Technical Competency on the Implementation of Water Projects

The study found that, there was statistical significance between training and technical competence with implementation of water projects at Lindi Municipal Council. According to this study competent contractor, consultants and other stakeholders resulted into quality project implementation. Despite of availability of cash required for water project implementation in LMC; there was insufficient technical competency in project implementation. This included insufficiency in material mobilization, bureaucracy, political intervention, poor community participation, lack of expertise, poor cooperation between staffs and lack of motivations in working environments; things which affects the implementation of water projects. Moreover, this has been proven by majority of respondents whose age was below 40 years, a thing which imply that mostly lacked experience.

This argument was similar to the study of Allender (2006) who found that many public organizations have employees who do not have enough capacity of either designing the project that realise the quality standard or monitor the project. Therefore, the authority needs to have competent and capable staff for implementing the water project in order to ensure that quality standards are realized.

McCabe (2015) found that the ability of contractors in developing countries is dominated by various challenges in implementing quality water projects. The ability of contractors in delivering quality project remains very important for projects and its development. This is because proper and effective quality water project depend upon technical capacities of contractor and financial ability toward the implementation of the project, which was noted as the main challenge for many local and foreign contractors in developing countries.

# 4.5.3 Monitoring Mechanisms on the Implementation of Water Projects

According to the results, monitoring and evaluation mechanism had statistical impacts on implementations of water projects at Lindi Municipal Council. Moreover, results revealed that routine inspections, feedbacks on inspection, uses of suggestion boxes and customer telephone feedback were mechanisms used by LUWASA in project monitoring. These study findings are consistent with the study of Johnson (2016) who examined quality control in construction of Kimara Msewe to Baruti road project. This study found that contractor should make proper management of the contract as per agreed terms and there should be management commitment in terms of quality assurance in water projects. Pearson, et al, (2015) found that monitoring of the contractors ensures that the project was implemented timely and according to specification.

The results illustrate that monitoring and evaluation of project procedures and operation is very crucial in order to maintain or to attend the intended quality of projects. Any project quality is achieved through proper monitoring of operating procedures.

# CHAPTER FIVE

# SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

# 5.1 Introduction

This chapter covers conclusion and recommendations, which can be helpful for water sector, government authorities and other stakeholders so as to improve quality control in implementation of water projects.

# 5.2 Summary

This study was conducted to assess the role of quality control on the implementation of water project in Lindi Municipal Council; specifically, to determine if the implementation of water projects complied with the standards set; technical skills and monitoring mechanism in ensuring quality control on the implementation of water projects. The study used modified Juran’s Approach to TQM and Crosby’s.

Approach to TQM, similarly to a number of related studies conducted in Tanzania, East Africa and all over the world was employed in construction. Mixed research approach was employed with questionnaire and interviews; where a total of 90 sample was selected using probability and purposive sampling technique. The data were coding and analyzed by SPSS Version 20. The study finds that in order to have proper quality control in the water project, human resources in term of skills and technical is inevitable factor as well as ensuring standard set are well known to all project stakeholders and monitoring mechanism should be implanted.

# 5.3 Conclusion

Significant association was observed between the standard set and implementation of water projects. Moreover, the standard operating procedures were implemented in the initial stage of water project at Lindi Municipal Council, as per standard specifications. These included standard operating procedures, carrying out water demand assessment at the initial stages, early identification of most reliable sources of water supply, quality of materials required as per design, awareness about the importance of water quality in project as well as water services. In addition, availability of service at all geographical area of the projects illustrates that the project achieved the intended project requirement, things which resulted to high customer satisfaction.

Moreover; project expertise influences the implementation of any project. The implementation of water project is affected by the knowledge of technical background as well as management system. Despite the availability of cash for implementation of water projects, Lindi Municipal Council faces a problem of incompetent technical personnel. A number of challenges were observed during the project implementation due to lack of competence among the staff during the initial stage, design stage and construction stage a thing which limits the value on implementation of water projects at Lindi Municipal.

However, monitoring mechanism affects significantly the implementation of water project in Lindi Municipal Council. Monitoring and Evaluation was compulsory and its goal was to improve management outputs, outcome and impact basing on timely milestones completion for every specific stage of the water project. Techniques such as routine inspections, feedbacks on inspection, suggestion boxes and customer telephone feedback helpsmonitoring supervision of the projects, identification of reliable water sources and procurement of construction materials, consequently the project will have satisfactory results both in terms of quality and out of budget and schedule.

# 5.4 Recommendations

Based on the conclusion made on the association between the standard set and project implementation, the study recommends the following:

Management should put more efforts on ensuring that the standard sets are well known to the staffs and other stakeholders and that they are followed. These include standard requirements on all four main stages of quality control, such as setting quality standards; appraising conformance standards; and planning for improvement for standards in the project design and implementations.

Government and other stakeholders should be responsible for building enough capacity in designing the project that realise the quality standard and monitor the project. Proper and effective quality water project depend upon technical capacities of contractor and financial ability toward the implementation of the project which was noted as the main challenge for many local and foreign contractors in developing countries.

Moreover, monitoring and evaluation of project procedures and operation is very crucial in order to maintain or to attend the intended quality of projects, therefore the government should invest in a good and timely monitoring and evaluation mechanism.

# 5.5 Limitations of the Study

The respondents had tendencies to hide some useful information especially actual standard sets used in water project implementation; this is due to avoiding of having noticed some of the confidential information may not be sufficient to their working career. The researcher employed unstructured interview to probe for more information.

Furthermore, the study was limited with the ability of generalizing the results. Since sample generalizability was inappropriate in this study, the researcher adopted purposive sampling to mitigate the weakness of probability sampling procedure.

In addition, data collected in Swahili not English language; this was limitation since the idea of the respondents changes their meaning when they begin translating into other language.

# 5.6 Further Studies

This study was limited to water sector project, at Lindi Municipality hence further studies can be conducted in other Municipalities in Tanzania. Also, the same study can be conducted using a different methodology to see if similar results will be obtained. The proposed methodologies include qualitative data analysis using NVIVO and other software.

# REFERENCES

1. Abdul-Nashiru, M. (2015). Assessing National Water Sector issues in support of both National and International advocacy work. Water Aid Country Programs, Ghana.
2. Abrams, L. (2015). Water for Basic Needs, World Health Organization.
3. Adam, S. I. (2016). Water accessibility and supply in Ghana: Large Scale Quantitative Socio-economic Research Amongst Residential Customers for PURC. Adam Smith Institute.
4. Al-Jayyousi, and Greywater, O. (2016) theory toward sustainable water management. *Decentralization and devolution of water resources*, *156*, 181–192.
5. Allender, H. (2006), Integrated Water Meter Management. IWA Publishing, Alliance House, Claxton St. London, U.K. pp 17-23.
6. American Water Works Association, (2009). Water Audits and Loss Control Programs, 3rd Edition, M36 Publication.
7. Armstrong, M. (2003). Human Resources Management Practice, the Batch Press Ltd, London, UK.
8. Aswathanarayana, U. (2001). Water Resources Management and the Environment. A. A Balkema, Abingdon, Oxfordshire, UK.
9. Bill, K., Liemberger, R., and Philippe, M. (2006). The Challenge of Reducing Non-Revenue Water in Developing Countries, The World Bank, Washington, DC.
10. Binayak. D., Ek, S. C., Chea, V., Ganesh, P., and Robin, S. (2010). Sharing the Reform Process. Leaning from the Phnom Penh Water Supply Authority (PPWSA), International Union for Conservation of Nature and Natural Resources and Phnom Penh Water Supply Authority, 26-28
11. Blakely. I. A. (1987). The Wangingómbe Water, Sanitation and Health Education Programme. UNICEF Project Report 1977–1987. 5 pp.
12. Butler David and Memon Fayyaz (Eds), (2006). Water Demand Management. IWA: London, UK.
13. Butterworth, J., & Soussan, J. (2001). Water Supply and Sanitation & Integrated Water Resources Management: why seek better integration.
14. Bwire. N. (2004). Ten Admitted as Cholera Spreads. The Arusha Times, 00348,p. 1).
15. Daibes, F. (2016). Towards sustainable development in the water sector: A perspective from Palestine. *Water Sci. Technol. 42*, 81–86.
16. Fanner. P., T. J., Liemberger, R., and Sturm R. (2007). Evaluating Water Loss and Planning Loss Reduction Strategies. AWWA Research Foundation.
17. FAO, (2005). Impact of climate change, pest and Diseases on food Security and Poverty Reduction: Special event background document for the 31st Session of the Committee on the World Food Security Rome.
18. Farley, M., Wyeth, G., Ghazali, Z. B. M., Istandar, A., and Signh, S. (2008). The Manager’s Non-Revenue Water Handbook, A Guide to Understanding Water Losses.
19. Farley, M., Wyeth, G., Ghazali, Z. B. M., Istandar, A., and Signh, S. (2010) The Manager‘s Non-Revenue Water Handbook For Africa, A Guide to Understanding Water Losses.
20. Farley, M. (2008). The Manager’s Non-revenue Water Handbook, A Guide to Understanding Water Losses, Ranhill & USAID.
21. Farley, M., and Trow, (2003). 'Losses in Water Distribution Networks A Practitioner's Guide to Assessment, Monitoring and Control. IWA London Uk.
22. Farley, M., Wyeth, G. Ghazali, Z. B. M., Istandar, A., and Singh, S. (2008). The Manager’s NRW Handbook. USAID.
23. Hartstone, L. C., Knight, J., and Riley, J. J. (2016). Water in Tanzania*,* Journal of Int. Agr. And Extension Education, 13 (1), 59- 7.
24. Hasnul, B. M. S. (2002). Evaluation of Non-revenue Water and Leakage in Public and Private Water Supply Systems, Heriot-Watt University.
25. James, F. (2010). Water Conflicts Supply and Demand, Xaverian College, Manchester, United Kingdom.

Juran, (1950). *Quality Planning and Analysis for Enterprise Quality.* New York: McGraw-Hill.

1. Kingdom, W. (2009) “Characteristics of well-performing Public Utilities” water Supply and Sanitation working Notes 9, February 2009, World bank, Washington, DC.

Kothari, C. R. (2004). *Research Methodology: Methods and Techniques.* New Delhi: New Age International (P) ltd.

1. Lahlou, Z. M. (2001), Leak Detection and Water Loss Control, National Drinking Water Clearing House at West Virginia University.

Lam, A. (2014). Survey of internet usage in Malaysia contruction industry, *Electronic journal of information technology in construction*, Vol, 7, 259-269

1. Lambert, A. (2001). What do we know about Pressure: Leakage Relationships in Water Distribution Systems? IWA Conference System Approach to Leakage.
2. Lindi Municipal Council, (2016). TZ-Jul16-PFMPR-SN-Final consolidated report, Lindi

Mahmood, P. (2016), Identification of a set of approach critical success factors for successful TQM implementation in Construction, and other industries, *International Journal of Advanced Research, 4(11),* 1581-1591.

1. Mahmood, W. Y. W., and Mohammed, A. H. (2015) A conceptual framework for the development of quality culture in the construction industry. Paper read at 24th Annual ARCOM Conference, 1-3 September 2008, at Cardiff, UK.
2. Mahmood, W. Y. W., A. H. Mohammed, M. S. Misnan, Z. M. Yusof and A. Bakri (2016) Development of quality culture in the construction industry. In In: ICCI-2006. (Unpublished). Beijing: Universiti Teknologi Malaysia, UTM Skudai 81310, Johor, Malaysia.
3. Marlow, D. R., Moglia, M., Cook, S.; Beale, D.J (2016) towards sustainable urban water management: A critical reassessment. *Water Res. 47*, 7150–7161.
4. McCabe, S. (2015). *Quality improvement techniques in construction*. London: Addison Wesley Longman Limited.
5. Mugenda, O. M. & Mugenda, A. G., (1999). *Research Methods: Quantitative and Qualitative Approaches.* London: Sage Publications Inc.
6. NBS and ICF Macro, (2016). Tanzania demographic and health survey, Dar es salaam, NBS and ICF

Patton, M. Q. (2002). *Qualitative research and evaluation methods (3rd ed.).* Thousand Oaks, CA: Sage.

1. Pearson, L. J., Coggan, A., Proctor, W., Smith, T. F. A. (2015). Sustainable decision support framework for urban water management. *Water Resource. Manag*, *24*, 363–376.

Thorpe and Sumner, (2014). Quality assurance in human resource management for computer intergreted manufacturing. *International Journal of Quality and Reliability Management, 14(2)*, 18-30

Tricker 2015 Tricker, B. (2015). Corporate governance principles, policies, and practices. Oxford: Oxford University Press. ISBN: 9780198702757.

1. URT, (2013). Water Sector Status Report 2010. Ministry of Water and Irrigation, United Republic of Tanzania.

URT. (2015,2016 & 2017). The Economic survey, Dar es-salaam: The ministry of Finance, KIUTA.

1. Vitens Evidence International, (2013). Non-Revenue Water reduction, East Africa, YEP, Mombasa, Kenya.
2. WHO, (2005). Leakage Managment and Control – A Best Practice Training Manual World Water Development Report 2014, Water and Energy.

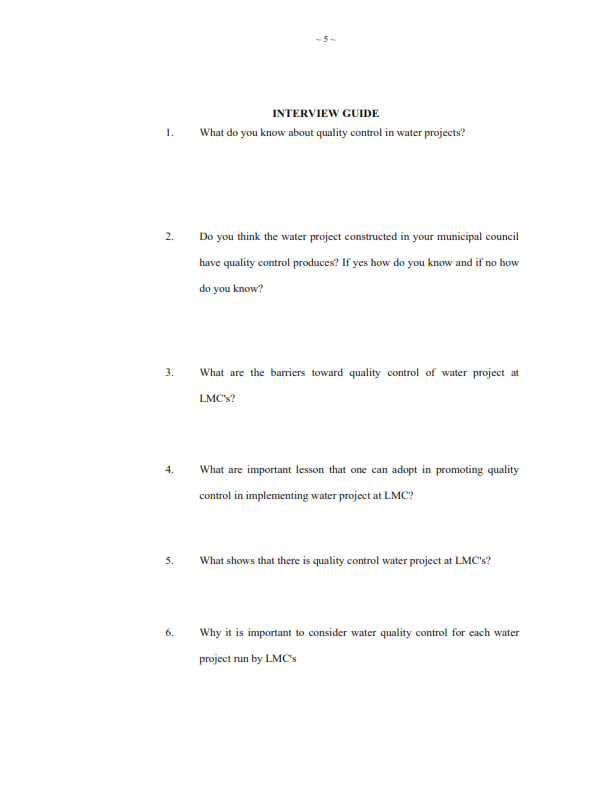
WHO, (2010). Evaluation of water quality control and surveillance in Iraq. *Global Evaluation Report Oversight System,* Iraq

1. WHO/UNICEF, (2013). Urban Population: Joint Monitoring Programme (JMP) for Water Supply and Sanitation Data. NRW Estimates: Roland Liemberger.
2. World Bank, (2010). Capacity building in Africa: An OED Evaluation of World Bank Support. Washington D.C*.*
3. WSP, (2016). India water supply and sanitation: bridging the gap between infrastructure and service, *Water and sanitation program*: Delhi.
4. WUP, (2016). The reform of the water supply and sanitation sector in Africa, Enhancing PPP in the context of the Africa vision for water (2025) - Issues and challenges for Africans water supply and sanitation delivery, WUP.

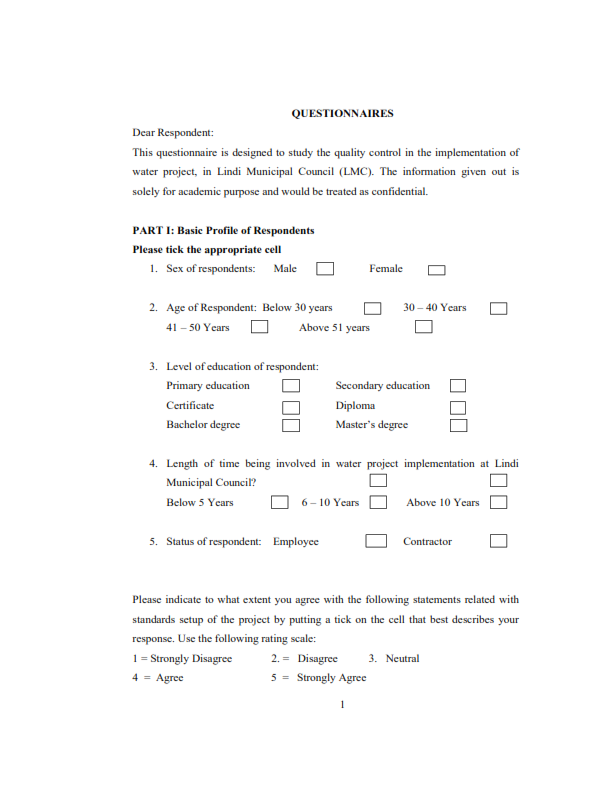
Zerah, M. H. (2016). Household strategies for coping with unreliable water supplies: the case of Delhi, *Habitat International*, 24: 295-307.

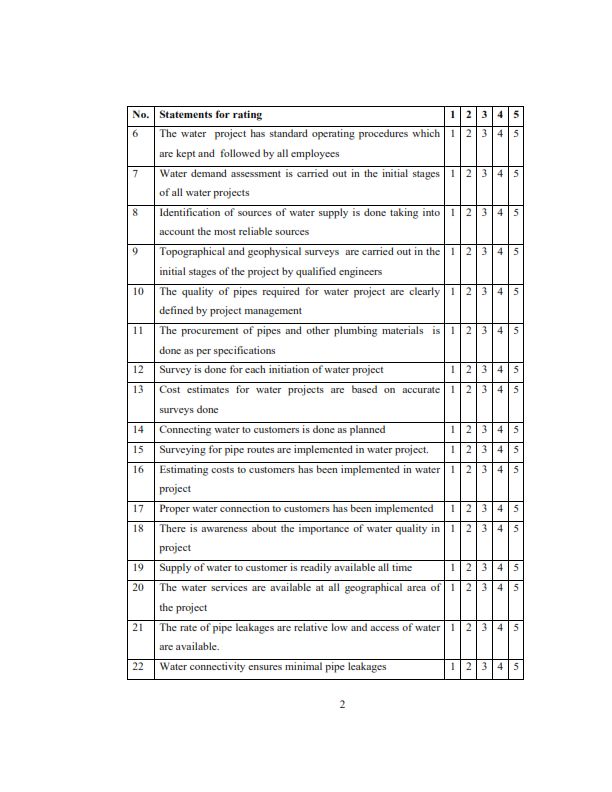
# APPENDICES

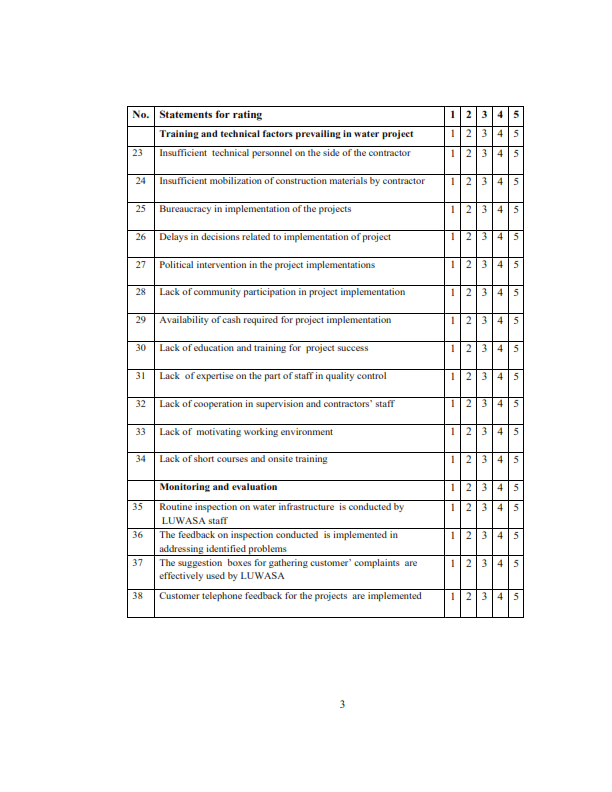
**Appendix I: Interview Guide**



**Appendix II: Questionnaires**







**Appendix III: Results of Data Analysis for Quality Control**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Scores** | **Strong Disagree** |  | **disagree** | **Neutral** | **Agree** | **Strong agree** | **Total** |
| Adhering to Standard Operating Procedure | Frequency | 4 |  | 5 | 10 | 45 | 26 | 90 |
| Percentage | 4.44 |  | 5.56 | 11.11 | 50 | 28.89 | 100 |
| Water Demand  Assessment | Frequency | 5 |  | 9 | 5 | 54 | 17 | 90 |
| Percentage | 5.56 |  | 10 | 5.56 | 60 | 18.89 | 100 |
| Water Source  Identification | Frequency | 5 |  | 5 | 10 | 44 | 26 | 90 |
| Percentage | 5.56 |  | 5.56 | 11.11 | 48.89 | 28.89 | 100 |
| Topographical&  Geographical Survey | Frequency | 5 |  | 5 | 0 | 49 | 31 | 90 |
| Percentage | 5.56 |  | 5.56 | 0 | 54.44 | 34.44 | 100 |
| Pipe Quality | Frequency | 5 |  | 5 | 5 | 44 | 31 | 90 |
| Percentage | 5.56 |  | 5.56 | 5.56 | 48.89 | 34.44 | 100 |
| Pipes Procurement | Frequency | 4 |  | 0 | 10 | 40 | 36 | 90 |
| Percentage | 4.44 |  | 0 | 11.11 | 44.44 | 40 | 100 |
| Survey Done | Frequency | 5 |  | 0 | 5 | 53 | 27 | 90 |
| Percentage | 5.56 |  | 0 | 5.56 | 58.89 | 30 | 100 |
| Cost Estimated | Frequency | 5 |  | 4 | 10 | 45 | 26 | 90 |
| Percentage | 5.56 |  | 4.44 | 11.11 | 50 | 28.89 | 100 |
| Planned Customer  Connection | Frequency | 5 |  | 5 | 9 | 40 | 31 | 90 |
| Percentage | 5.56 |  | 5.56 | 10 | 44.44 | 34.44 | 100 |
| Surveying for  Pipe Routes | Frequency | 5 |  | 5 | 5 | 49 | 26 | 90 |
| Percentage | 5.56 |  | 5.56 | 5.56 | 54.44 | 28.89 | 100 |
| Customer Cost  Estimation | Frequency | 4 |  | 5 | 10 | 39 | 32 | 90 |
| Percentage | 4.44 |  | 5.56 | 11.11 | 43.33 | 35.56 | 100 |
| Proper Water  Connection | Frequency | 4 |  | 5 | 10 | 35 | 36 | 90 |
| Percentage | 4.44 |  | 5.56 | 11.11 | 38.89 | 40 | 100 |
| Water Quality  Awareness | Frequency | 9 |  | 10 | 5 | 41 | 25 | 90 |
| Percentage | 10 |  | 11.11 | 5.56 | 45.56 | 27.78 | 100 |
| Water Supply to  Customer | Frequency | 5 |  | 19 | 5 | 39 | 22 | 90 |
| Percentage | 5.56 |  | 21.11 | 5.56 | 43.33 | 24.44 | 100 |
| Water Service  Coverage | Frequency | 9 |  | 5 | 10 | 41 | 25 | 90 |
| Percentage | 10 |  | 5.56 | 11.11 | 45.56 | 27.78 | 100 |
| Low Pipe  Leakage | Frequency | 9 |  | 5 | 10 | 49 | 17 | 90 |
| Percentage | 10 |  | 5.56 | 11.11 | 54.44 | 18.89 | 100 |
| Water Connectivity  Ensures | Frequency | 5 |  | 5 | 5 | 54 | 21 | 90 |
| Percentage | 5.56 |  | 5.56 | 5.56 | 60 | 23.33 | 100 |

Source: Field data

**Appendix IV: Results of Data Analysis for Technical Training**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Scores** | **Strong Disagree** | **Disagree** | **Neutral** | **Agree** | **Strong Agree** | **Total** |
| Contractors' Insufficient Technical Personnel | frequency | 10 | 10 | 5 | 31 | 34 | 90 |
| Percentage | 11.11 | 11.11 | 5.56 | 34.44 | 37.78 | 100 |
| Contractors' Insufficient Material Mobilization | frequency | 10 | 5 | 10 | 41 | 24 | 90 |
| Percentage | 11.11 | 5.56 | 11.11 | 45.56 | 26.67 | 100 |
| Bureaucracy in Implementation | frequency | 10 | 5 | 10 | 48 | 17 | 90 |
| Percentage | 11.11 | 5.56 | 11.11 | 53.33 | 18.89 | 100 |
| Delay in Implementation Decisions | frequency | 4 | 5 | 4 | 49 | 28 | 90 |
| Percentage | 4.44 | 5.56 | 4.44 | 54.44 | 31.11 | 100 |
| Political Intervention | frequency | 5 | 4 | 8 | 44 | 29 | 90 |
| Percentage | 5.56 | 4.44 | 8.89 | 48.89 | 32.22 | 100 |
| Lack of Community Participations | frequency | 5 | 8 | 4 | 52 | 21 | 90 |
| Percentage | 5.56 | 8.89 | 4.44 | 57.78 | 23.33 | 100 |
| Cash Availability | frequency | 5 | 4 | 8 | 46 | 27 | 90 |
| Percentage | 5.56 | 4.44 | 8.89 | 51.11 | 30.00 | 100 |
| Lack of Quality Control Expertise | frequency | 5 | 5 | 10 | 40 | 30 | 90 |
| Percentage | 5.56 | 5.56 | 11.11 | 44.44 | 33.33 | 100 |
| Lack of Cooperation | frequency | 5 | 5 | 5 | 49 | 26 | 90 |
| Percentage | 5.56 | 5.56 | 5.56 | 54.44 | 28.89 | 100 |
| Lack of Motivation | frequency | 5 | 5 | 10 | 38 | 32 | 90 |
| Percentage | 5.56 | 5.56 | 11.11 | 42.22 | 35.56 | 100 |
| Lack of Training | frequency | 5 | 5 | 10 | 34 | 36 | 90 |
| Percentage | 5.56 | 5.56 | 11.11 | 37.78 | 40.00 | 100 |

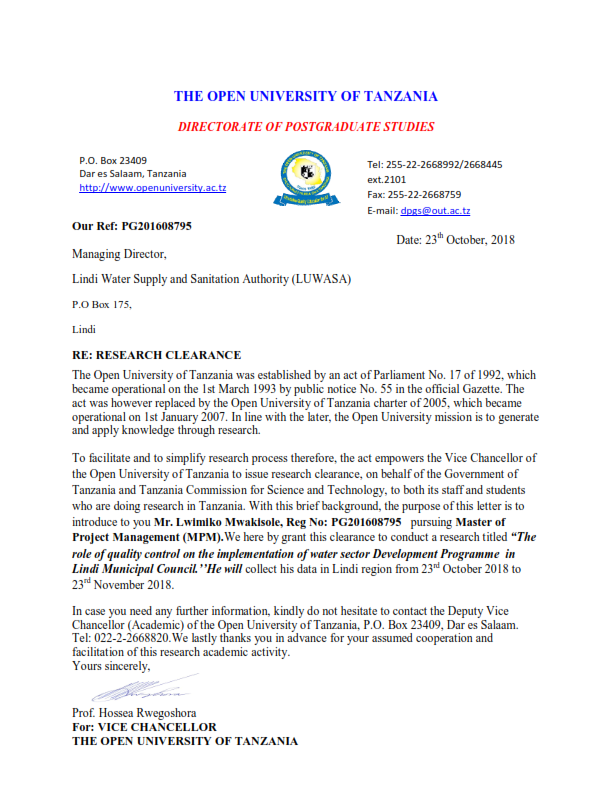
Source: Field data

**Appendix V: Results of Data Analysis for Monitoring Mechanism**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Scores** | **Strong Disagree** | **disagree** | **Neutral** | **Agree** | **Strong agree** | **Total** |
| Routine Inspection | frequency | 5 | 4 | 8 | 46 | 27 | 90 |
| Percentage | 5.56 | 4.44 | 8.89 | 51.11 | 30.00 | 100 |
| Feedback on  Inspection | frequency | 4 | 4 | 0 | 50 | 32 | 90 |
| Percentage | 4.44 | 4.44 | 0.00 | 55.56 | 35.56 | 100 |
| Suggestion Boxes  are Used | frequency | 4 | 4 | 7 | 45 | 30 | 90 |
| Percentage | 4.44 | 4.44 | 7.78 | 50.00 | 33.33 | 100 |
| Customer Telephone  Feedback | frequency | 8 | 4 | 8 | 38 | 32 | 90 |
| Percentage | 8.89 | 4.44 | 8.89 | 42.22 | 35.56 | 100 |

Source: Field data

| **Item-Total Statistics** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
| Implementation of the project | 137.14 | 508.934 | .870 | . | .948 |
| perceived control quality | 137.13 | 507.735 | .795 | . | .948 |
| The water project has standard operating procedures which are kept and followed by all employees | 137.13 | 508.454 | .606 | . | .949 |
| Water demand assessment is carried out in the initial stages of all water projects | 137.30 | 506.010 | .637 | . | .949 |
| Identification of sources of water supply is done taking into account the most reliable sources | 137.17 | 506.815 | .613 | . | .949 |
| Topographical and geophysical surveys are carried out in the initial stages of the project by qualified engineers | 137.00 | 517.303 | .399 | . | .950 |
| The quality of pipes required for water project are clearly defined by project management | 137.06 | 516.188 | .410 | . | .950 |
| The procurement of pipes and other plumbing materials is done as per specifications | 136.91 | 508.689 | .646 | . | .949 |
| Survey is done for each initiation of water project | 137.04 | 512.942 | .504 | . | .950 |
| Cost estimates for water projects are based on accurate surveys done | 137.14 | 504.844 | .668 | . | .948 |
| Connecting water to customers is done as planned | 137.10 | 513.619 | .455 | . | .950 |
| Surveying for pipe routes are implemented in water project. | 137.11 | 511.358 | .527 | . | .949 |
| Estimating costs to customers has been implemented in water project | 137.07 | 505.996 | .637 | . | .949 |
| Proper water connection to customers has been implemented | 137.02 | 512.449 | .487 | . | .950 |
| There is awareness about the importance of water quality in project | 137.37 | 503.696 | .561 | . | .949 |
| Supply of water to customer is readily available all time | 137.47 | 493.196 | .781 | . | .947 |
| The water services are available at all geographical area of the project | 137.31 | 505.610 | .553 | . | .949 |
| The rate of pipe leakages are relative low and access of water are available. | 137.40 | 496.422 | .769 | . | .947 |
| Water connectivity ensures minimal pipe leakages | 137.17 | 513.511 | .497 | . | .950 |
| Training and Technical factors | 137.19 | 505.256 | .783 | . | .948 |
| Insufficient technical personnel on the side of the contractor | 137.30 | 496.639 | .639 | . | .949 |
| Insufficient mobilization of construction materials by contractor | 137.36 | 506.052 | .531 | . | .949 |
| Bureaucracy in implementation of the projects | 137.43 | 499.147 | .692 | . | .948 |
| Delays in decisions related to implementation of project | 137.04 | 512.650 | .523 | . | .949 |
| Political intervention in the project implementations | 137.09 | 507.430 | .606 | . | .949 |
| Lack of community participation in project implementation | 137.22 | 504.400 | .666 | . | .948 |
| Availability of cash required for project implementation | 137.11 | 505.358 | .659 | . | .948 |
| Lack of expertise on the part of staff in quality control | 137.12 | 516.603 | .394 | . | .950 |
| Lack of cooperation in supervision and contractors’ staff | 137.11 | 514.190 | .466 | . | .950 |
| Lack of motivating working environment | 137.10 | 508.406 | .558 | . | .949 |
| Lack of short courses and onsite training | 137.06 | 512.862 | .456 | . | .950 |
| monitoring mechanism | 136.92 | 510.455 | .633 | . | .949 |
| Routine inspection on water infrastructure is conducted by LUWASA staff | 137.11 | 505.358 | .659 | . | .948 |
| The feedback on inspection conducted is implemented in addressing identified problems | 136.93 | 517.007 | .440 | . | .950 |
| The suggestion boxes for gathering customer’ complaints are effectively used by LUWASA | 137.03 | 516.055 | .443 | . | .950 |
| Customer telephone feedback for the projects are implemented | 137.16 | 513.549 | .410 | . | .950 |

**Appendix VI: Research Clearance Letter**