FACTORS AFFECTING TOTAL QUALITY MANAGEMENT IN THE ROAD CONSTRUCTION SECTOR: A CASE STUDY OF MOROTO-NAKAPIRIPIRIT ROAD PROJECT

BY

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DECLARATION

I, Titus Aleper, declares that the dissertation entitled, "**Total Quality Management in the Road Construction Sector: A Case of Moroto-Nakapiripirit Road Project**" has been written solely except in where scholarly writings has been used. The dissertation has never been submitted to any institution of learning for any award.

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APPROVAL

This dissertation entitled, **"Total Quality Management in the Road Construction Sector: A Case of Moroto-Nakapiripirit Road Project"** has been submitted for examination with our approval as the Institute Supervisors.

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Dr. Proscovia Namubiru Ssentamu

DEDICATION

To my beloved wife Catherine Tusaba and son Mark Arthur Aleper and parents Moses Mugema and Anna Nangiro Mugema for their moral support.

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CVI	-	Content Validity Index
DV	-	Dependent Variable
IV	-	Independent Variable
PGD	-	Post Graduate Diploma
SMART	-	Smart-Measurable-Attainable-Reliable-Time bound
SPSS	-	Statistical Package for Social Sciences
TQM	-	Total Quality Management
UGX	-	Uganda Shillings
UMI	-	Uganda Management Institute
UNRA	-	Uganda National Roads Authority

ABSTRACT

The study was undertaken to establish the factors affecting total quality management on Moroto-Nakapiripirit road project. The specific objectives include establishing the relationship between quality planning and quality management, establishing the relationship between quality control and quality management and finally establishing the relationship between quality assurance and quality management. A case study design was used as supported by the quantitative and qualitative approaches. A number of (80) project staff formed the accessible population, with (74) respondents forming the sample. An overall response rate of 86.4% was obtained, with the following findings including a positive relationship (.589**) for quality planning, another positive relationship (.681**) for quality control and a positive relationship (.759**) for quality assurance.

From the study, it was concluded that although the road objectives were SMART, some were complex, fewer road targets were met, some road quality standards not met and political influence existed. Some specifications were ignored and some road funds were not accounted for, delays in project performance evaluation experiences, performance short falls realized, some user feedback was ignored and some inspections delayed. Road funds were insufficient, technical staff were hired and resigned. Some project staff were misplaced, numerous product tests were done, however delayed. Recommendations made include: technical staff should adhere to more stipulated and specified standards, accounting officer should be legally held accountable, review complex goal and objectives, set up an independent quality assurance, political influence be limited, conduct a short term technical job evaluation exercise, road funding sources and contract employment terms be reviewed. There is need to procure and install mobile road material testing lab equipment as well as hire more lab technical staff to handle testing tasks.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The study investigates the factors affecting total quality management in the road construction sector in Uganda with a case study of Moroto-Nakapiripirit road project. The factors affecting quality management in this study include quality planning, quality control and quality assurance, conceived as independent variables while the dependent variable includes quality management measured in dimensions of meeting product technical specifications, customer satisfaction, less quality defects and reliability. The chapter discusses the background to the study, statement of the problem, general objectives, specific objectives of the study, research questions, hypothesis, scope of study, significance of study, justification and closes with operational definition of terms and concepts.

1.2 Background to the study

1.2.1 Historical Background to the Study

The evolution of quality management is driven by factors such as external global competitiveness, dynamic environment change, increased task complexity and internal productivity. Organizations place emphasis on quality management and are in advanced stages of total quality management implementation, continually seeking to enhance their business (Baldwin, 2004).

In the 1980's, America began to embark on the quality improvement movement journey. The most prominent symbol of America's quality revolution is the prestigious Malcolm Baldrige National Quality Award (Crosby, 1992). The purposes of the award are to "promote quality awareness, recognize quality achievements of American companies, and publicize successful

quality strategies" (Hunt, 1992: 90). Established in 1987 by the U.S. Department of Commerce, this competitive award recognizes outstanding American companies that provide quality goods and services that demonstrate quality management processes, and demonstrate the commitment to continuously improve the quality of goods and services in the long-run. The ultimate goal of this quality revolution is that it is not only very important for American companies to produce quality goods and services today, but it also is of equal importance that American companies maintain a consistent commitment to continuously improve the quality of goods and services in the future.

In Africa, Total Quality Management first started in South Africa over two decades ago became diffused to Burkina Faso in the 1990's. The overarching logic of privatization due to Structural Adjustment Programs prepared the ground for far-reaching changes in management practices. TQM became exhorted as a new way of manufacturing. This new management concept was presented as a crucial part of new corporate success and put strong emphasis on empowerment of employees, customer service and charismatic leadership (Blunt & Jones, 1992).

In Uganda, Total Quality Management on road construction projects has been great problem. The Ministry of Finance Audit Report on the evaluation of the road construction reveals that the quality of roads constructed is not commensurate with the hefty budget earmarked for the road sector.

1.2.2 Theoretical Background to the Study

The study was underpinned by Deming's theory of Total Quality Management which is based on four principles: appreciation for systems, knowledge of variations, theory of knowledge and psychology (Deming, 1996) and Hugh Van Seaton's (2010) theory of Total Quality

Management which is based on performance management systems, organizational theory, sis sigma and continuous process improvement.

The major assumptions of Deming's theory of Total Quality Management are: Continuous improvements and satisfying the customer which not only means merely meeting his expectations, but to exceed them.

Van Seaton (2010) explained that underpinning performance management system is an understanding of organizational culture and presented the four functions of organizational culture that provided a way of promoting innovation. Among these is that an organization should give its members an organizational identity in order to seek collective commitments through facilitation of strong corporate values; stability of the social system should be promoted through provision of a positive work environment; and employees' behavior should be shaped through establishment and definition of long-term goals and expectations. Van Seaton (2010) further said that continuous process improvement and its validation, the basis for TQM and Six Sigma, depend upon the use of the statistical control tools.

The theory explains and substantiates the manner in which the quality management practices or dimensions are related in order to bring about improved organization performance (Oswald, 2009). The theory explains an understanding of the overall processes involving suppliers, products, and customers or recipients of goods and services.

Wruck & Jensen (1994) consider Total Quality Management (TQM) as an organizational technology that allows firms to increase their productivity. In fact, a need to save on production cost might have been one of the reasons for Toyota to pursue TQM. Toyota management observed that rework took considerable time and production cost for mass

manufacturers like Ford, and rightly thought that doing things right in the very first time has an effective cost cutting measure (Womack, 1991; Fujimoto, 1999).

Since the 1990's, TQM has begun to spread far beyond the private sector into the public sector as well (Carr & Littman, 1993). Academic research focusing on public productivity has grown significantly during this period and assumes that TQM practices are indeed applicable to government services (Milakovich, 1990). In recent years, the TQM program appears to continue to maintain its strong presence in several public organizations of modern times (Van Seaton, 2010).

1.2.3 Conceptual Background to the Study

In the study, two variables were studied including factors (independent variable) comprising of as quality planning, quality control and quality assurance affecting total quality management on Moroto-Nakapiripirit road project and total quality management were studied.

Total Quality Management includes all the activities of the overall management function that determine the quality policy, objectives, and responsibilities and implements these by means such as the quality planning, quality assurance, quality control, and quality improvement within the quality system.

The tenets of quality management are underpinned by; meeting products technical specifications, customer satisfaction, reducing re-work, employee appraisal, team work, process re-design, competitive benchmark, constant measuring of results and a closer supplier relationship (Ross, 1993).

In this study, road construction involves the process of ensuring that the planned activities are carried out in compliance with the process of quality planning, quality control and quality

assurance and the products expected to benefit the local people. Road construction is carried out on specific time frame, cost and quality.

Quality planning involves identifying which quality standards are relevant to the project and determining how to satisfy them. A Quality Management Plan is developed to state the overall activities and tasks that are needed to meet the project's quality standards (Ross, 1993).

Quality control involves evaluating the project's end results as compared to the stated goals and requirements, as well as how successful the project was in terms of budget, schedule and scope management. Evaluations are performed to determine if the stakeholders accept or reject the end result (Ross, 1993).

Quality assurance involves providing the stakeholders with the guarantee that standards are being maintained, and that the end result meet their needs. Quality audits are scheduled, to provide a structured review of the project activities. As a result of these audits, corrective actions are approved if necessary via change control processes (Ross, 1993).

1.2.4 Contextual Background to the Study

In Uganda, the quality of the roads measured in dimensions of meeting product technical specifications, customer satisfaction, less quality defects and reliability are managed by audit bodies such as Ministry of Finance and Uganda National Roads Authority. The details of the Moroto-Nakapiripirit road project are presented in Table 1.1 below

Table 1.1: Project Details

Project Name	**Upgrading of Moroto -Nakapiripirit road to Bituminous standard (93.3km)**
Client	Uganda National Roads Authority (UNRA)
Consultant	J. Burrow Ltd. (South Africa) in association with PROME Ltd.
Contractor	China Roads and Bridge Corporation (CRBC)
Funding Agency	Government of the Republic of Uganda
Contract Amount	UGX 184, 275,904,849
Contract Period	36 months (including 12 months Defects Liability Period)
Commencement date	February 1, 2013
Completion date	January 31, 2016
Time elapsed	19 months (52.78% of Contract period)
Physical progress	56.85%
Slippage	19.01% beyond schedule

Source: Uganda National Roads Authority Records (2013)

Based on the details reflected in Table 1.1 above, in relation to Total Quality Management, the Contractor is contractually mandated with the responsibility of implementing total quality management activities contained in the Quality management guidelines/manual issued to the Contractor by the Consultant/Supervisor, J. Burrow Ltd. after approval of the Client.

1.3 Problem statement

Currently with the Contract Period at 52.2%, the construction of culvert and bridge structures, earthworks and pavement layer works is behind schedule by 19.01% with respect to the original program of works (UNRA, 2013). This has among other factors been attributed to

delayed approvals of the works by the Consultant and failure by the Contractor to strictly adhere to the quality management guidelines to be followed in delivering satisfactory output.

Some works on Moroto-Nakapiripirit road project do not meet product technical specifications leading to re-working of some section thus staff attrition, the project is behind schedule by 4 months. The project was allocated a hefty budget of UGX 184,268,818,666, employs skilled and generally motivated labour force, encourages team-based decision making, procures quality testing equipment and conducts employee performance appraisal in order to deliver a better road in terms of quality, cost, and schedule and within contract period (Ugandan National Budget, 2013/2014).

Despite the above interventions, the road project still grapples with quality challenges such as inadequate supervision, inferior quality of construction materials, poorly drafted specifications, lack of proper testing equipment yet no research has been done to identify the factors that could be affecting quality management in this project. It's upon this background that the researcher is carrying out an investigation into the factors that could be affecting quality management on Moroto-Nakapiripirit road project.

1.4 Purpose or General purpose of the study

The main objective of the study is to establish the factors affecting total quality management on Moroto-Nakapiripirit road project.

1.5 Specific objectives of the study

The following specific objectives guided the study including:

1) To establish the relationship between quality planning and quality management on Moroto-Nakapiripirit road project.

2) To establish the relationship between quality control and quality management on Moroto-Nakapiripirit road project.
3) To establish the relationship between quality assurance and quality management on Moroto-Nakapiripirit road project.

1.6 Research Questions

The following research questions were answered. These include:

1) What is the relationship between quality planning and quality management on Moroto-Nakapiripirit road project?
2) What is the relationship between quality control and quality management in on Moroto-Nakapiripirit road project?
3) What is the relationship between quality assurance and quality management on Moroto-Nakapiripirit road project?

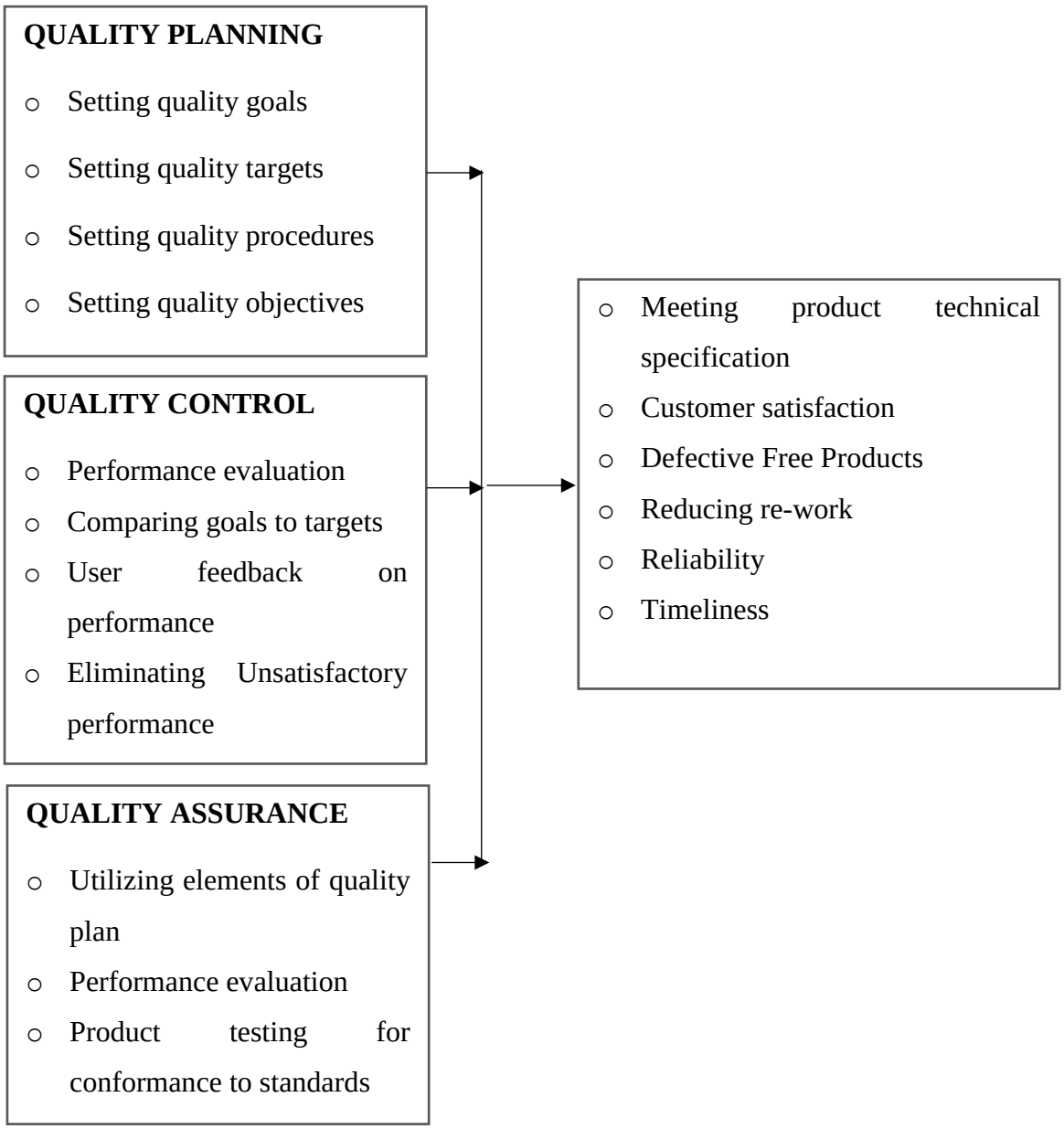
1.7 Research Hypothesis

The following hypotheses statements were answered including:

1) Quality planning significantly affects quality management in the road construction sector.
2) Quality control significantly affects quality management in the road construction sector.
3) Quality assurance significantly affects quality management in the road construction sector.

1.8 Conceptual framework

FACTORS (IV)



Source: Adopted from Van Seaton (2010) and modified by the researcher.

Figure 1.1: Conceptual framework showing the relationship between factors affecting total quality management and total quality management on Moroto-Nakapiripirit road project.

The conceptual framework explains how management factors including quality control, quality planning and quality assurance affect quality management on Moroto-Nakapiripirit road project. In the conceptual framework, the independent variable (IV) factors affect the dependent variable (DV) quality management. The Dependent Variable is measured in terms of customer satisfaction, meeting product technical specifications and having fewer defects while the independent variable (IV) takes on dimensions of quality planning, quality control and quality assurance.

Quality Planning has a major influence on quality management because the procedures written in a quality plan is used to ensure that all quality standards are followed. The Procedures designed to deal with inspection testing, non-conformance and resulting corrective actions are also important, as are the methods by which quality records are maintained. The Quality planning aspect on the Moroto-Nakapiripirit road involves implementing quality control plans for carrying out quality control checks on road materials, scheduling quality audits, and necessary training requirements. These ensure that product technical specifications for example on testing of materials on the project road are adhered to and hence customer satisfaction is attained.

Quality control involves implementing the outcomes of quality planning and evaluating actual performance of the road project. The effectiveness of an organization and its people depends on the extent to which each person and department perform their role to achieve the common goals and objective (Oakland, 1993). Through implementing quality control processes such as carrying out quality control checks and compliance tests on road materials, defective free products is attained.

Quality assurance processes are used to provide the stakeholders with the guarantee that standards are being maintained, and that the end result will meet their needs. To facilitate this

assurance, quality audits are scheduled to provide a structured review of the project activities. As a result of these audits, corrective actions are approved after every construction phased of the road project via change control processes.

The three factors; Quality planning, Quality control and Quality assurance affect Total Quality Management by ensuring the satisfaction of customers, meeting of product technical specifications and reducing re-work (Juran, 1999).

1.9 Significance of the study

The study is significant in the following ways including:

The prime beneficiaries of the study are the Moroto-Nakapiripirit road project and other road projects in Uganda. The study identifies dimensions underlying quality management and determines the best management practices emphasized or promoted to improve performance. The research contributes in fostering growth of total quality management approach in the face of the road construction sector.

The findings of the study contribute information to UNRA and other road construction authorities so that appropriate policies are designed to curb the problem of total quality management.

From the theoretical perspective the study contribute to the project quality management body of knowledge and may be used as reference material for researchers in quality management.

1.10 Justification of the study

Quality management is one of the major challenges affecting the road construction industry in Uganda. The industry has to construct roads which consistently and continuously meet or exceed customer expectations. Quality management in the construction sector therefore has a

strong client or customer orientation and successful implementation of quality management leads to stellar organizational performance. The study investigates the factors affecting effective quality management in road construction sector and recommend best practices for quality management implementation in organizations.

1.11 Scope of the study

The scope of the study focused on the geographical, content and time scope as presented below.

1.11.1 Geographical Scope

The study conducted out on the project site (Moroto Head office), 2km from Moroto on the Moroto-Nakapiripirit road. This is one of the sites where call for total quality management has been emphasized to avoid misuse of public funds.

1.11.2 Content Scope

The study investigate how the factors the independent variable including as quality planning, quality control and quality assurance as key indicators affect total quality management in the road construction sector (dependent variable) basing on Moroto-Nakapiripirit road project as the case study.

1.11.3 Time Scope

The study was limited to 20 months (1st February 2013 to 31st October 2014) because the project commenced on 1st February 2013 and the research was concluded on 31st October 2014.

1.12 Operational definition

1.12.1 Quality

It is defined as the conformance to requirements or fitness for use. It also implies meeting the expectations of customers or exceeding them achieved by way of deliverables and or other activities performed to produce those deliverables.

1.12.2 Quality Management

It is the assurance that the stakeholder requirements detailed within the project scope document are met. It involves processes of project Quality planning, project Quality assurance and project Quality Control which have to be conducted on a regular basis in order to achieve the quality standards and requirements needed to satisfy the needs for which interventions are undertaken.

1.12.3 Quality Planning

This involves identifying the quality standards which are relevant to the project and determining how to satisfy them.

1.12.4 Quality Control

This involves monitoring of specific project deliverables to evaluate whether they comply with the projects quality standards and to identify how to permanently remove causes of unsatisfactory performance.

1.12.5 Quality Assurance

This involves evaluating overall project performance on a regular basis to provide confidence that the project satisfy the relevant quality needs.

1.12.6 Management

The way total quality is conducted

1.12.7 Management Responsibility

This means providing the resources needed to sustain success.

1.12.8 Project Quality Management.

This refers to the process required to ensure that the project satisfies the need for which it is undertaken.

1.12.9 A Project Quality Plan

This refers to a set of activities planned at the beginning of the project that helps achieve quality in the project being executed.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter reviews the theories of quality management and the related literature on factors (independent variable) linking each dimension to the dependent variable quality management. The chapter points out the current trends on particular studies carried out and identifying the current gaps in the trends and how the research study narrows the gaps.

2.2 Theoretical review

Total Quality Management (TQM) was first developed in Japan, and then spread in popularity. However, while TQM may refer to a set of customer based principles that intend to improve quality and promote process improvement process, there are several different theories at work guiding TQM practices. The study is underpinned by Deming's theory of Total Quality Management which rests upon fourteen points of management. The theories are based on four principles: appreciation for systems, knowledge of variations, theory of knowledge and psychology (Deming, 1996).

The 14 quality principles should be used concurrently in order to achieve quality based on the elements of quality planning, quality control and quality assurance. The theory explains and substantiates the manner in which the quality management practices or dimensions such as quality planning, quality control and quality assurance are related in order to bring about improved organization performance. The theory explains an understanding of the overall processes involving suppliers, products, and customers or recipients of goods and services.

The major assumptions of Deming's theory of Total Quality Management are: Continuous improvements and satisfying the customer which not only means merely meeting his expectations, but to exceed them. In relation to the Moroto-Nakapiripirit road project,

through continuous improvement in quality planning, quality control and quality assurance, the quality of project management as well as the quality of project's products is improved.

Deming defines quality as "satisfying the customer, not merely to meet his expectations", but to exceed them". Deming's philosophy thus starts and finishes with the customer. Deming, one of the quality gurus placed great responsibility and importance on quality management. He emphasizes quality at both the individual and company level and he believes that managements are responsible for 94% of most quality problems. Therefore with continuous improvements in the processes of total quality management such as quality planning, quality control and quality assurance there improves organizational performance.

Van Seaton (2010) explained that underpinning performance management system is an understanding of organizational culture and presented the four functions of organizational culture that provided a way of promoting innovation. Among these is that an organization should give its members an organizational identity in order to seek collective commitments through facilitation of strong corporate values; stability of the social system should be promoted through provision of a positive work environment; and employees' behavior should be shaped through establishment and definition of long-term goals and expectations. Van Seaton (2010) further said that continuous process improvement and its validation, the basis for TQM and Six Sigma, depend upon the use of the statistical control tools.

2.3 Factors affecting Total Quality Management on Moroto-Nakapiripirit Road Project

There is a widespread consensus that TQM is a way of managing an organization including the Moroto-Nakapiripirit Road Project to improve its overall effectiveness. There is less agreement as to what the primary elements of TQM are, what the overall concept of TQM is,

and how many quality management methods actually exist. Scholars including Juran (1999) consider quality management as three basic processes: quality planning, quality control, and quality improvement (Juran & Gryna, 1993). This section is based on an extensive review of literature concerning the primary elements of TQM including quality planning, control and assurance as indicated below.

2.3.1 Quality Planning and Quality management on Moroto-Nakapiripirit Road Project

According to Deming (1996), the first step in the quality management process is planning which identifying the quality standards which are relevant to the project and determining how to satisfy them. Planning must consider required capital, labor, and technology resources. The alignment between the value that customers want and the value the company is capable of delivering or delivers is an overall effectiveness measure of strategic fit. Here a quality plan is developed and defines these activities or tasks that intend to deliver products while focusing on achieving customers quality expectations.

The quality plan also includes the procedure to ensure that the quality standards are being followed by all project staff. The plan also includes the steps required to monitor and control quality and the approval process to make changes the quality standards and quality plan

The second step in the Deming cycle is the Do-cycle dealing with process design and congruency issues. Once a value proposition is created or refined, processes need to be assessed according to their efficacy and congruence with the firm's value statement. Inter-related improvement plans are deployed at all levels of the organization (corporate, department, process, individual). Quality plans are established annually based on quality policy. The feedback on quality problems encountered in the past or expected in the future is collected and based on this feedback; quality objectives involving every function we set.

Quality audits may use the results obtained from quality control to determine if quality assurance activities are having the desired result. If not (not showing conformance to specifications), quality assurance activities should be reviewed and improved. Audits should be completed at the end of major milestones or when requested.

A baseline technical definition of what TQM is all about what has been given by the American Federal Office of Management Budget Circular that: "TQM is a total organization approach for meeting customer needs and expectations that involve all managers and employees in using quantitative methods to improve continuously the organizations processes, products and services" (Milakovich, 1990).

According to the latter definition TQM is not merely a technical system. In fact TQM is associated with the organization itself which is also a social system. Pike & Barnes (1996) argue that organizations are not merely technical systems, but also human systems. In addition, (Oakland, 1993) states that TQM is an attempt to improve the whole organization's competitiveness, effectiveness and structure.

A successful organization recognizes the need to put the customer first in every decision made (Philips, 1995). The key to quality management is maintaining a close relationship with the customer, in order to fully determine the customer's needs, as well as to receive feedback on the extent to which those needs are being met.

The ultimate measure of company performance is customer satisfaction, which may very well predict the future success or failure of an organization (Kanji & Asher, 1996). Thus, it is very important to find customer satisfaction and customer perception of quality. The insights gained can clearly help the organization improve quality.

2.3.2 Quality control and Quality management on Moroto-Nakapiripirit Road Project

Deming (1996) stated that the 14 points have become the bible for quality control proponents. With the post-war world returning to normal manufacturing patterns, Deming preached that inspecting products for quality after they were manufactured was unacceptable. Instead, he proposed a process known as "statistical quality control" that would use closely monitored performance measures to gauge quality as a product was being manufactured. The goal of statistical quality control was to gather data that would allow for the constant improvement of manufacturing processes, which would in turn improve quality control. Introducing such statistical controls could be expensive, but Deming argued that instituting quality measures ultimately saved companies money.

The third step in the Deming Cycle is check. Once processes are evaluated for their value-creating effectiveness and measures are developed, then data-driven tools can be used to routinely monitor, inspect, and improve them.

The final step in the Deming Cycle is act. Based on data collected using the process-improvement tools described, corrective actions should be taken to improve processes that fail to add value. He listed the following ways to improve business processes:

Eliminate tasks altogether if it has been determined that they are unnecessary.

Simplify the work by eliminating all nonproductive elements of a task.

Combine tasks, where appropriate.

Change the sequencing to improve the speed and execution.

Perform activities simultaneously.

Once a process improvement has been made, the change must be measured and evaluated for effectiveness. Comparing before and after indicators would be useful here as well as

comparing results with the targeted performance. Also, efforts should be made to celebrate and reward those participating in the process-improvement activity.

He stated that Quality control is a system of techniques for economically producing goods and services that meet the customers' requirements. It is used to evaluate the project's end results as compared to the stated goals and requirements, as well as how successful the project was in terms of budget, schedule and scope management. Evaluations are performed during quality control that will determine if the stakeholders accept or reject the end result. If rejected, rework actions must be planned in order to bring the end result up to expectations. As a result, adjustments are added to the overall process by means of a change control process.

Another important tenet of Deming's beliefs was that upper management was largely to blame for quality failures. He firmly believed that, given the right tools and working environment, workers would strive to create the highest quality products possible. In Deming's own words, "the basic cause of sickness in American industry and resulting unemployment is failure of top management to manage." He believed that strong leadership led to an inspired work force that did not fear management and did not fear taking chances when seeking ways to improve quality.

Total quality control is an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in an organization so as to enable marketing, engineering, production and services at the most economical levels which allow for full customer satisfaction.

2.3.3 Quality assurance and Quality management on Moroto-Nakapiripirit Road Project

According to Deming (1996), a constancy of purpose requires: innovation, e.g., long-term planning for it, investment in research and education, and continuous improvement of products and service. To apply this point, a quality assurance organization can develop a quality assurance plan that provides a long-range quality direction.

Quality assurance is defined as all the planned and systematic activities implemented within the quality system and demonstrated as needed to provide adequate confidence that an entity will fulfill quality requirements (Crosby, 1992).

Quality assurance involves managing the quality of the project deliverables. It refers to the actual testing of product components and the entire products before and during delivery. It is part of every project management processes from the moment the project initiates to the final steps in the project closure phase. Quality management also focuses on improving stakeholder's satisfaction through continuous and incremental improvements to processes.

Quality management starts with simple inspection-based systems. Under such a system, one or more characteristics of a product are examined, measured or tested and compared with specified requirements to assess its conformity (Kanji & Asher, 1996). This system is used to appraise incoming products, manufactured components and assemblies at appropriate points in the production process. It is undertaken mainly by staff employed specifically for this purpose. Products which do not conform to the specification may be scrapped, reworked or sold as lower quality items. In some cases, inspection is used to grade the finished goods.

In the past, most companies provided quality goods and services that demonstrate quality management processes, and demonstrated the commitment to continuously improve the

quality of goods and services in the long-run. The ultimate goal of this quality revolution is that it is not only very important for American companies to produce quality goods and services today, but it also is of equal importance that American companies maintain a consistent commitment to continuously improve the quality of goods and services in the future.

The new trends in TQM put strong emphasis on empowerment of employees, customer service and charismatic leadership, (Blunt & Jones, 1992). In recent years, the TQM program appears to continue to maintain its strong presence in several public organizations of modern times (Van Seaton, 2010).

Recent studies, similar to those carried out on the Moroto-Nakapiripirit road project and according to Reeves & Bednar (1994), Wood (2004), Savolainen (2000), Young & Wilkinson (2001) depend quality into four categories namely: Quality is excellence, Quality is value, Quality is conformance to specifications, and Quality is meeting or exceeding customer specifications.

The study narrows the gaps by enforcing TQM practices that aim at meeting product technical specifications, customer satisfaction, reducing re-work, employee appraisal and team work, competitive benchmark, constant measuring of results and a closer supplier relations

2.4 Summary of the literature review

The theory of Total Quality Management is based on the following principles of Deming Theory: appreciation for systems, knowledge of variations, theory of knowledge and psychology (Deming, 1996).

TQM is divided into ten elements. They are supplier improvement, process control and improvement, internal customer focus, measurement and reporting, leadership, quality system, participation, recognition, education and training, external customer focus (Mann & Kehoe, 1994).

Past studies placed emphasis on the commitment to continuously improve the quality of goods and services in the long-run. The new trends in TQM put strong emphasis on empowerment of employees, customer service and charismatic leadership (Blunt & Jones, 1992).

The study has narrowed the gap by enforcing TQM practices that aim at meeting product technical specifications, customer satisfaction, reducing re-work, employee appraisal and team work, competitive benchmark, constant measuring of results and a closer supplier relations

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the methodology that was adopted in collecting data for the research study. The research comprises of the research design, population, sample size, sampling procedure and technique, data collection methods, data collection instruments, quality control (validity and reliability), procedure for data collection, data management and analysis and measurement of variables.

3.2 Research design

The research adopted a case study design supported by both the quantitative and qualitative approaches. The choice for this design is that the design it provides an in-depth investigation of an individual, group, institution of phenomenon (Mugenda & Mugenda, 2003). In addition, a case study design is cost effective since there are many road construction projects currently on-going and time consuming to study all partnerships. The case study gives the story behind the result by capturing what happened to bring it about and can be a good opportunity to highlight a project success (Thapa, 2006).

Furthermore, both qualitative and quantitative approaches were used in order to increase viability and strength of the report. Patton (1990) advocates the use of triangulation by stating that "triangulation strengthens a study by combining methods. However, the idea of combining methods has been challenged by Barlour (1998). She argues that mixing paradigms can be possible but mixing methods within one paradigm, such as quality research, is problematic since each method within the qualitative paradigm has its own assumptions in "terms of theoretical frame works we bring to bear on our research."

The qualitative approach helped to obtain more information pertaining to factors affecting Total quality management on the Moroto-Nakapiripirit Road construction project specifically, the opinions and behavior of the respondents.

On the other hand, the quantitative approach enabled the researcher to obtain qualitative information whose qualitative results were used to draw or make generalizations based on measurements and testing of results on the factors affecting Total quality management on the Moroto-Nakapiripirit Road construction project.

3.3 Study population

The study population considered for the study was of (80) project staff. These included (10) UNRA staff from the departments of Projects, (35) Consultant staff and (35) Contractor staff (Moroto-Nakapiripirit Road Project Staff List, 2013). The study population excluded the casual labourers because of their limited knowledge on quality management practices, (details shown in Table 3.1 below).

3.4 Sample size of the study

A sample size may refer to a subset of a population. In this study, out of the 80 project staff, a sample of (74) staffs or respondents were determined and selected for the study based on the Krejcie & Morgan Mathematical Table of (1970) (See Appendix, page xii). This “Guide for sample determination” as reproduced in Table 3.1 below.

Table 3.1: Accessible population, sample size determination and Sampling technique

Category	**Study population**	**Sample size**	**Sampling technique**
UNRA Staff	10	10	Purposive Sampling
Consultant staff	35	32	Simple Random Sampling
Contractor staff	35	32	Simple Random Sampling
Total	**80**	**74**	

Source: Moroto-Nakapiripirit Road Project Staff List (2013) and constructed using Krejcie & Morgan, (1970).

Table 3.1 above shows the category, study population, sample size and sampling technique used. From the table, it can be observed that the sample size of 74 respondents included (10) UNRA staff, (32) consultant staff and (32) contractor staff.

3.5 Sampling procedure and Techniques

There are numerous techniques that can be used to support the extraction of a sample size from a given position. However, for this study the research used the purposive and simple random sampling as detailed below.

For the purpose of the study, the purposive sampling method, a method for selecting respondents assumed to have valuable information (On factors and Total Quality Management on Moroto-Nakapiripirit Road Project) was applied on UNRA staff from the Directorate of Projects. These respondents were assumed to hold as well as possess specific attribute or characteristic.

On the other hand, the simple random sampling, a method that involves selecting or picking a sample at random without discrimination and all samples are given equal chances of being picked for the study was applied on consultants and contractors (Mugenda & Mugenda,1999).

In addition, the simple random sampling ensures a desired representation from the members of accessible population.

3.6 Data collection methods

The study considered both qualitative and quantitative data collection methods to aid the collection of data. The use of multiple data collection methods checks validity of study findings and allowed the generalization of results to study population.

3.6.1 Questionnaire survey method

This method involved designing questions intended to obtaining valuable quantified information from respondents. Several closed ended questions on the factors and TQM on the Moroto-Nakapiripirit Road Project were set. This method was applied on Consultants and Contractor staff. This method was used as it is easier to administer and receive results at the earliest, with less costs involved (Mugenda & Mugenda, 2003). In addition, questionnaires were used because they are easier to employ to large numbers of respondents and requires fewer research assistants.

3.6.2 Interview method

An interview is a face-face interaction between the interviewer and the interviewee intended to acquire primary information (Amin, 2005). The method involved designing open ended questions on the factors affecting the TQM on Moroto-Nakapiripirit Road Project. The interview permits the researcher to follow up leads and thus obtain more data and great clarity. This method involved identifying key interviewees, organizing as well scheduling face to face sessions. This method was applied on UNRA staff from the Directorate of Projects who was interviewed so as to obtain an in-depth understanding of the study theme.

3.6.3 Documentary review method

Documentary review was used to obtain information from secondary sources in relation to the factors affecting the TQM on Moroto-Nakapiripirit Road Sector Project. Secondary data will be collected through reading policies, internet, textbooks, journals, reports and dissertations to review what other scholars have written about the study (Sekaran, 2000). Furthermore, a number of published and unpublished information documents including Moroto-Nakapiripirit Road Project Staff List (2013), Road Construction Guidelines (2011), Moroto District Development Plan (2013-2018), Uganda National Budget 2013/2014 and Nakapiripirit District Development Plan (2012-201) were reviewed. This is part of the information that could not be picked using the other methods of data collection.

3.6.4 Observation method

This method involved the researcher being part and partial of the study environment. The researcher was entrusted with the task of recording primary information about the phenomenon under study. In addition, the method involves direct and participatory observation intended to collect primary data form the field. The advantage of using this method was to enables the researcher to record and study respondents' behavior as it occurred and eliminates subjective bias.

3.7 Data collection Instruments

A number of data collection instruments were used for this study including the SAQ, interview guide, Documentary review checklist and observation checklist as detailed in 3.7.1, 3.7.2, 3.7.3 and 3.7.4 respectively.

3.7.1 Self-administered Questionnaire

The self-administered questionnaire was designed and administered to Consultant and Contractor staff. The questionnaire contained mainly the closed ended questions on the factors affecting TQM on the Moroto-Nakapiripirit Road Sector Project. The instructions and definitions used in the questionnaires were concise, sequenced and followed in a logical order. They SAQ was pretested before use and consisted of closed questions that did not arouse resentment and offend the respondent.

This instrument (Questionnaires) was preferred because they can be administered to a large number of individuals simultaneously and are less expensive and less time consuming compared to an interview (Sekaran, 2000). It does not require as much skill to administer when compared to an interview. The researcher was available to make little clarifications when necessary however, did not interpret the questions for the respondents to rule out bias. This instrument was administered on contractors and consultants. (See Appendix I, page i for the Questionnaire)

3.7.2 Interview Checklist

Unstructured interview guide was used to collect qualitative data from the UNRA project staff. An unstructured interview with open ended questions on the factors affecting TQM on the Moroto-Nakapiripirit Road Sector Project were used because it is more flexible and permits probing of respondents in order to obtain in-depth detailed information (Amin, 2005). (See Appendix II, page ii for the Interview Guide)

3.7.3 Documentary Review Checklist

Assortment of the project documents were be reviewed so as to augment information (Factors affecting TQM on the Moroto-Nakapiripirit Road Project) gathered using other research

instruments. Secondary data was reviewed before and during field data collection. These documents included: Moroto-Nakapiripirit Road Project Staff List (2013), Road Construction Guidelines (2011), Moroto District Development Plan (2013-2018), Uganda National Budget 2013/2014 and Nakapiripirit District Development Plan (2012-2017), (Appendix III, page x).

3.7.4 Observation Checklist

Observation checklist, the final instrument was used where the researcher used observation guide to collect primary data from observations in the field. Both participant and non-participant observations were used for the study. The advantages of this method include: Enables researcher to study behavior as it occurs; subjective bias is eliminated if observation is done accurately, can be used if respondents cannot express themselves meaningfully for instance sick respondents or if the individuals are unwilling to be interviewed (Baggett, 2003). The shortcomings of this method include: recording and interpretation errors, fatigue and memory lapse (See Appendix iv, page xi).

3.8 Quality control

The research focused on validity and reliability as quality control techniques as detailed below.

3.8.1 Validity

Validity is the degree to which a test measures what it is supposed to measure. It also means the accuracy or truthfulness of a measurement (Norland, 1990). Validity of the instrument was assessed through subjecting the data collection instrument to scrutiny from experts (including one of the supervisor and TQM specialist) to establish the relevance of the questions/items in the instruments using Content Validity Index (CVI). The formula below was used to reach the final CVI score.

CVI = Number of items (questions) declared valid
Total number of items (Valid and Invalid questions)

CVI = (31/42)

CVI = (0.738)

The CVI score of 0.7 was obtained. Amin (2005) stressed that for the research instrument to be valid, the CVI obtained should be equal or above 0.7 hence a score realized after running the CVI.

3.8.2 Reliability

Reliability is the degree to which a test consistently measures whatever it measures and yields consistent results over time (Kirk & Miller, 1986). It indicates the accuracy or precision of the measuring instruments (Norland, 1990). Furthermore, to ensure reliability of the research instruments, the research piloted the instrument on 10 respondents on which the SAQ was administered. The Self-administered Questionnaires was pretested and revised as necessary before the actual research process. The Cronbach's alpha coefficient test was used to measure the scale reliability for internal consistency of the items. Reliability was obtained using Cronbach Alpha Coefficient test as stated in the following formulae:

$$\partial = \frac{K}{K-1}\left[\frac{1-\sum Q^2 K}{Q^2}\right]$$

Where:

∂ = Reliability; alpha coefficient (Cronbach), K = Number of items in the instrument

$\sum Q^2$ K = Variance of individual items, Q^2 = Variance of total instruments and $\sum$ = Summation

The results obtained are presented in Table 3.2 below.

Table 3.2: Showing reliability results (Factors and TQM)

Variable name	**Alpha cronbach value**	**Number of Questions per variable**
Quality planning	.845	9
Quality control	.880	6
Quality assurance	.854	9
Quality Management	.871	9
	3.45	**33**

Source: Primary data

Table 3.2 above shows the reliability score was obtained by $\sum$ (alpha cronbach value) /n representing number of question per variable. The $\sum$ (cronbach) as 3.45 and n as 4 representing the number of variables =4. Therefore 3.45 divided by 4 = 0.862. The reliability score of 0.8 was obtained. The score is in line with Amin (2005) who stressed that the reliability score of 0.7 and above shows how reliable the instrument is. The closer the cronbach's alpha is to one the higher the reliability estimate of the instrument. The reliability coefficient (alpha) ranges from 0 to 1, with zero representing an instrument with full of error and 1 representing total absence of error. The value of alpha of 0.8 and above was considered reliable for the research instrument (Sekaran, 2003).

3.9 Procedure of data collection

After defense of the proposal, the Researcher obtain the field introduction letter from UMI, School of Management Science introducing him to the Moroto-Nakapiripirit road project where data was collected. After presenting the letter, permission was granted and the researcher will the help of research assistants administered the research instruments to the consultants and contractors. While the researcher tool charge of conducting the face to face interview sessions. The exercise took one month.

3.10 Data management and analysis

Data was managed and analysed using two techniques including the quantitative and qualitatively as detailed below.

3.10.1 Quantitative data management and analysis

Numeric data obtained from the self-administered questionnaires was obtained, sorted, transcribed, coded, edited and arranged in an array form and later entered into a computer statistical package, Statistical Package for Social Sciences (SPSS) version 19. Both descriptive and inferential statistical techniques were used to represent information.

Descriptive statistics entailed running statistics including measures of central tendencies like the mean, frequency, standard deviation and percentages. These were used to summarize the data in tabular and graphical form. Inferential statistics was used to make deductions from the data collected relate the findings to the sample size (Amin, 2005).

Furthermore, techniques including the Pearson Correlation Coefficient analysis (bivariate correlation) was used to test the relationship among the variables and the linear regression

coefficient models was used to determine the magnitude or effect that the independent variable (factors) on the dependent variable (quality management).

In addition, Conclusions and recommendations will then be drawn in relationship with the objectives of the study. Test of significance commonly the sig was performed at the probability level (95%) measured at the margin of error level of less than 0.05. The analyses were used because a good correlation between the variable exist.

3.10.2 Qualitative data management and analysis

Qualitative data consists of non-numeric data including words and observations. As with all data, analysis and interpretation are required to bring order and understanding. This requires creativity, discipline and systematic approach (Thapa, 2006). The qualitative data obtained from the interviews and direct observation using observation guide was edited for clarity and where completeness and internal consistence were discovered in response, the qualified data was coded.

The content analysis involved five steps namely: Getting to know your data, focusing the analysis, categorizing information, identifying patterns and connections within and between categories and interpretation of data (use of themes and connections). The pitfalls in qualitative data analysis included: issue of generalization, choosing/selecting quotes carefully, different communicators analyze a problem with different criteria or inference.

The obtained non quantified data was used in form of narrative statements to supplement on the information that was obtained using the self-administered questionnaire.

3.11 Measurement of Variables

A self-administered questionnaire was pre-formulated with written set of closed questions to which respondents were required to record the answers based on the well-known Likert scale,

whereby respondents were asked to respond to questions. A five scale Likert scale was used to rate respondents' views or study variables on the factors and TQM closed ended questions (Mugenda & Mugenda, 2003). The Likert scale was used to measure the level of agreement or disagreement of respondents' views because it is easy and quick to construct, reliable and can also be treated as an ordinal scale (Michelle, 1997).

The Likert scale ranged from strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). Two key variables including the nominal and ordinal scales were used. The ordinal scales facilitate meaningful statistics when calculating means, standard deviation, and inferential statistics including the Pearson correlation coefficients and linear regression.

In addition, the ordinal scales allowed the researcher to categorize and rank the subjects. The ordinal scale was used where the elements require categorization and ranking (Michell, 1997). On the other hand, nominal scale was applied on all bio-data information of the respondents including age, gender, job positions, education and years of experience that were not ranked.

3.12 Ethical consideration

Ethics refers to the appropriateness of your behavior in relation to the rights of those who become the subject of your work, or are affected by it (Saunders, M, Lewis, P. & Thornhill, A., 2007). During the research the following research ethics were adhered to: Informed consent of the research participants was ensured by informing the participants in advance about the purpose and possible uses of the research and what their participations in the research.

Confidentiality and anonymity of participants were ensured by giving more open responses. Research participants got involved in a voluntary way free from coercion and the researcher will be respectful of research subjects during the entire survey. Research ethics is intended to sustain and encourage good ethical practices in social science research (Amin, 2005).

CHAPTER FOUR: PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter comprises the presentation, analysis and interpretation of findings. It is arranged as follows including: bio data of the respondents, response rate, empirical findings (descriptive and inferential statistics on the Factors and TQM) and answering the hypothesis based on the specific objectives of the study.

4.2 Response Rate

Out of (n=64) distributed questionnaires, (n=59) were actually returned constituting (92.0%) while (n=10) interview sessions were planned, of these only (n=5) were actually interviewed forming (50.0%).

Table 4.1: Response rate of respondents

Tool	**Issued/planned**	**Returned/held**	**Percentage (%)**
Interview	10	5	50.0
SAQ	64	59	92.0
Total	**74**	**64**	71.2

Source: Primary data

Based on Table 4.1 above, it can be observed that an overall response rate of 86.4% (64/74 x 100%). The (86.4%) response rate is in line with Amin (2005) who asserts that a response rate ≥ 0.5 (50%) is representative of a survey population.

4.3 Demographic Characteristics of the respondents

The demographic characteristics of the respondents included: Age of the respondents, Gender of the respondents, Job position of the respondents, education of the respondents and experience of explained below.

4.3.1 Age of the Respondents

Respondents were of varying age ranges as indicated in Table 4.2 below

Table 4.2: Age distribution of the respondents

Age distribution	**Frequency (n)**	**Percentage (%)**
Less than 20 years	0	0.0
Between 20 – 30 years	22	37
Between 31 – 40 years	31	53
Above 40 years	6	10
Total	**59**	**100.0%**

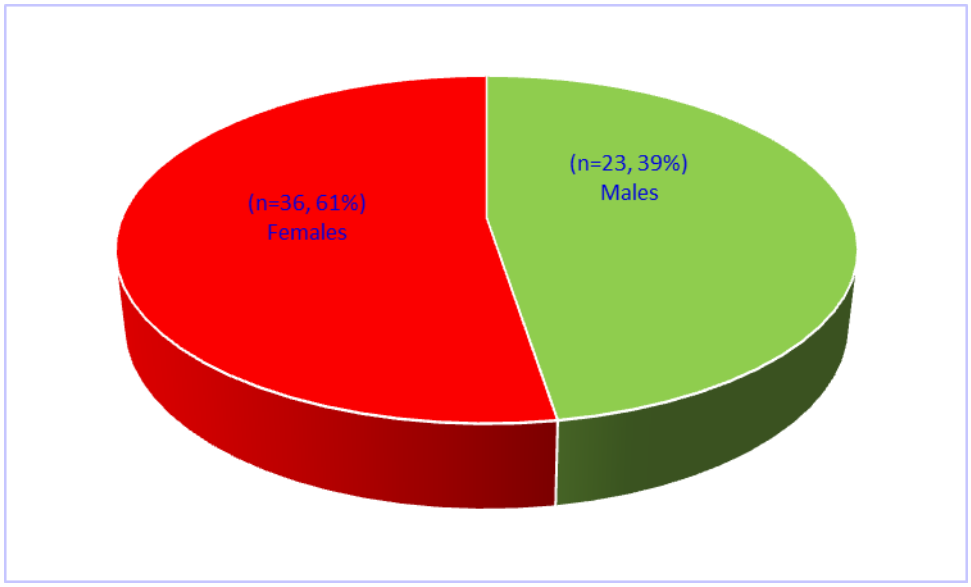
Source: Primary data

Table 4.2 comprises of the age range of the respondents, frequency and their respective percentage scores. The findings obtained reveal that no respondent fell between the age range of less than 20 years, (37%, n=22) fell between 20 – 30 years, while (53%, n=31) representing the majority fell between 31 – 40 years of age and the least (10%, n=6) were over 40 years of age.

Based on the statistics as reflected in the Table above, it can be argued that all the respondents in the study were mature (old enough in terms of age) to solely understand and answer the questionnaires pertaining to TQM that were administered on them.

4.3.2 Gender of the Respondents

In this study, there were both male and female respondents who participated in the provision of required information about TQM. These are reflected in the illustration provided below.



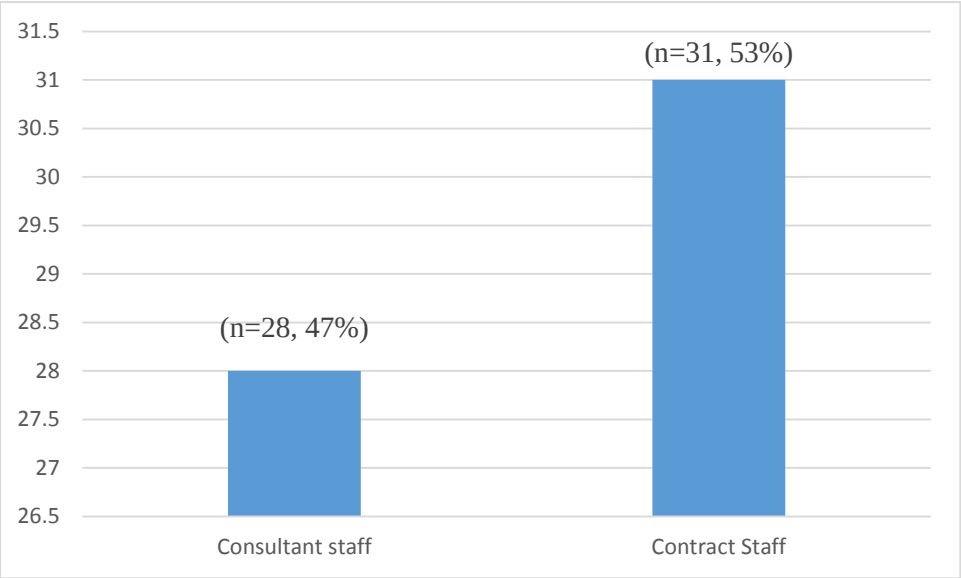
Source: Primary data

Figure 4.1: Gender distribution of the respondents

Findings as seen in the above illustration reveal more female participation (n=36, 61%) as compared to their male counter parts (n=23, 39%). The cause of such a return can be attributed to the fact that the female contractors and consultants were more office based as compared to the field based male hence making it easier for the researcher to track them. Secondly, it is seen that the researcher was able to collected more balance valuable information on TQM from both Gender as these seem to be evenly represented.

4.3.3 Respondents by Job Position

Respondents that participated in this study were of different job positions including contractors and consultants. These were able to provide key information pertaining to TQM and their proportion is represented in the illustration below.



Source: Primary data

Figure 4.2: Job position distribution of the respondents

The respondents in this study fell in two categories including consultants (n=28, 47%) and contract staff (n=31, 53%). These two categories of (respondents) staff are instrumental in ensuring that TQM, an approach for meeting customer (stakeholders) needs and expectations to improve continuously the organizations processes, products and services including the road construction is met. More, these staff were able to avail valuable information as most of their job roles have a linkage with ensuring quality and standards. Of these included staff in charge of supervision, Quality assurance and other day to day general administrative work.

4.3.4 Education Level of respondents

The research set out to establish the importance being literature had on ensuring that TQM was met. Below are the findings presented in Table 4.4 below that emerged from the field of study

Table 4.3: Education level of the respondents

Education level	**Frequency (n)**	**Percentage (%)**
Post Graduate Level	17	29.0
Bachelor's Level	36	61.0
Diploma Level	06	11.0
Secondary Level	0	0.0
Total	**59**	**100.0%**

Source: Primary data

Table 4.3 constitutes education level, frequency and the percentage scores. The education results obtained reveal that none of the respondent had secondary level education, diploma qualification holders were (n=6, 11.0%), degree holders representing a majority were (n=36, 61.0%) and (n=17, 29.0%) had PGD qualification. It is can be said that to realize TQM in the road construction sector, staff had to possess certain education requirements. Of these observed were qualifications in civil engineering, chemists and project planning among others.

Secondly, it is assumed that the all the respondents were literate (would read and write) hence, this made it easier for the researcher to conduct both the interviews as well as administer the questionnaire at the earliest.

4.3.5 Years of Experience

Respondents including contracts and consultants had stayed for some good period of time in the road construction sector. The findings that were obtained are presented in the Table below.

Table 4.4: Years of Experience

Year of Experience	**Frequency (n)**	**Percentage (%)**
Below 2 years	0	0.0
Between 3 – 4 years	18	31.0
Between 5 – 6 years	20	34.0
Between 7 – 8 years	12	20.0
Over 10 years	9	15.0
Total	**59**	**100.0%**

Source: Primary data

Table 4.4 constitutes, years of experience, frequency and percentage scores. These results can be analyzed as follows: first, respondents that had worked for less than four years were (n=18, 31.0%), those between 5 – 8 years were (n=32, 54%) and those that had worked for more than 10 years were (n=9, 15.0%) meaning that all the respondents had enough road construction experience as they had worked past the probation period and still must have found the road project working environment more stable and friendly to work hence decided to stay longer.

In addition, the respondents had obtained enough experience in understanding the TQM attributed required to realize better the road construction. Lastly, given their experience, the respondents were able to provide valuable information that was needed by the researcher.

4.4 Empirical findings on the Total Quality Management in the Road Construction Sector

This section provides an insight in the descriptive and inferential statistics that were obtained during the course of the study based on the specific objectives of the study as indicated below.

4.4.1 Quality Planning and Quality Management on Moroto-Nakapiripirit Road Project

The first objective of the study was to establish the relationship between quality planning and quality management on Quality planning had he following indicators setting quality goals, objectives, procedures, objectives and standards from which the responses presented in the Table below were obtained.

Table 4.5: Descriptive statements on Quality Planning

Questions about Quality Planning	**Percentage Response (%)**					**Mean**	**Std dev**
	SD (1)	**D (2)**	**UD (3)**	**A (4)**	**SA (5)**		
Setting quality policy is critical for quality planning	0% (0)	2% (1)	32% (19)	61% (36)	5% (3)	**3.69**	**.595**
Setting quality goals is critical for quality planning	0% (0)	2% (1)	17% (10)	70% (41)	11% (7)	**3.92**	**.596**
Setting quality targets is critical for quality planning	0% (0)	3% (2)	14% (8)	64% (38)	19% (11)	**3.98**	**.682**
Setting quality standards is critical for quality planning	0% (0)	0% (0)	35% (21)	46% (27)	19% (11)	**3.83**	**.723**
Setting quality specifications is critical for quality planning	0% (0)	0% (0)	17% (10)	63% (37)	20% (12)	**4.03**	**.615**
Setting quality procedures is critical for quality planning	0% (0)	2% (1)	24% (14)	39% (25)	15% (9)	**3.88**	**.672**
Quality elements are critical for quality planning	0% (0)	2% (1)	19% (11)	62% (37)	17% (10)	**3.95**	**.655**
Schedules for quality audits and training requirements are critical for quality control	0% (0)	7% (4)	24% (14)	42% (25)	27% (16)	**3.90**	**.885**

Source: Primary source

Key: SA=Strongly Agree, A=Agree UD=Undecided D=Disagree

SD=Strongly Disagree Stddev =Standard deviation

Source: Primary data

For purposes of interpretation, the research combined both agree and strongly agreed scores to represent the respondents that agree while both disagree and strongly disagreed scores were

combined to represent the respondents that disagree and the undecided score were not grouped. The mean scores above 3.00 reveal agreement and those below 3.00 indicate disagreement. The standard deviation score less than 1.00 indicate communalities (agreement) and the score above 1.00 reveal divergences in responses (mixed responses)

Question 1 of the study on quality planning was on whether setting quality policy was critical for quality planning. Responses obtained include: (66%, n=39) agreed, while (32%, n=19) that neither agreed nor disagreed and (2%, n=1) were not sure meaning that principles to guide TQM decisions and achieve better road sector outcomes. In addition, internal policies to assist in subjective road sector decision making assist road sector management with road decisions considered for the relative merits of a number of factors before making road decisions. This is be a statement held that, "*Policies can flag the organization's position and provide a framework to guide strategy development*"

A majority of respondents (81%, n=48) agreed, that setting quality goals was critical for quality planning, however, (2%, n=1) disagreed and (17%, n=10) neither agreed nor disagreed. These results can be linked to the fact that the road sector has a future expectation that the all road projects strive to accomplish. More, it was found out that the goal tended to be more specific desired accomplishment. In addition, goal-setting and planning can be said that it ideally involves establishing specific, measurable, attainable, realistic and time-targeted objectives. In an interview, another interviewee said, "*Goals should be stated clearly, emphasized and communicated to all employees of the organization in order to achieve effectiveness*" and another said, "*Setting goals makes the goal as basis for objectives and policies of the organization*"

The mean score of (3.98), (n=49, 83%) clearly indicate that setting quality targets was critical for quality planning. These findings can be linked to the fact that after the project has established priorities, it is vital to set quality targets by which to judge TQM and the levels of satisfaction aspired to during the road construction. In addition, the respondents realized that targets served to ensure that the road construction project had to achieve these priorities hence either short or long-term goals. "*Targets are the satisfaction objectives we are moving towards. Targets should also be set for the levels of citizen and client satisfaction the organization wants to achieve within a given timeframe*" said one responding UNRA staff

Another question asked was on whether setting quality standards was critical for quality planning. Responses including: (n=38, 65%) agreed and (n=49, 35%) neither agreed nor disagreed meaning that the respondents were aware of the levels of road construction performance that were expected from them within the road project. There road standards are the construction performance levels upon which staff including contractors and consults are committed to in the present hence the quality a beneficiary can expect. In addition, the respondents believed that quality standards are a commitment by their organization to provide a certain level of service including better roads to the users or clients. In a related interview, a responding official said, "*Service standards are an important tool for managing client expectations and should reflect the available resources. They tell your clients what you can provide and what they should expect to receive*" and another responding interview observed that, "*When targets are set in any part of the organization, they become the de facto purpose of the organization; meaning workers, managers, and executives are focused on meeting the target*"

Question 7 on whether setting quality specifications was critical for quality planning yielded the following responses including (n=49, 83%) agreed and (n=10, 17%) neither agreed nor

disagreed and question 8 that setting quality procedures was critical for quality planning has the following scores namely: (n=34, 54%) representing a majority agreed, while (n=1, 2%) of the respondents disagreed and (n=14, 24%) were not sure. The findings can be linked to the fact that road staff including engineers are aware and value the importance of ensuring that road specifications and procedures are followed (detailing measurements, road marking layouts including types of lines, positioning of lines and dimensions of line among others**).** Additionally, focusing on these two features has been seen as their primary responsibility of ensuring that required quality assurance including key measurements are frequently referred to during road construction technically on the Moroto-Nakapiripirit road project. In a linked interview, "*Conforming to specializes road specifications is the way to go to realize most road projects*" while another UNRA said, "*Following road specification is mandatory for road construction*"

In addition, (n=47, 79.0%) agreed that quality elements were critical for quality planning, although (n=11, 19%) were indecisive and (n=1, 2%) disagreed meaning that roads elements including the drainage channels, side slopes, bicycle and pedestrian facilities among others were found to form the quality road elements that were considered during the road design of both the rural and urban road. More the Nakapiripirit-Moroto road was designed and integrated into existing road structures and neighborhoods. To complement on the findings was a UNRA official who said, "*Our specialty in roads construction gives us the mandate to ensure that road quality elements are considered way back before even road construction*"

Finally, (n=41, 69%) respondents agreed that schedules for quality audits and training requirements were critical for quality control, with (n=14, 24%) having agreed and (n=4, 7%) were neutral meaning that staff were aware that quality audit is a defined process, independent of, but involving, the design team, that through planning, design, construction

and management stages of a project, provides a check that high quality places are delivered and maintained by all relevant parties, for the benefit of all road end users. While training requirement was linked to the ability by the road project to extend more road construction training aimed at improving employee skills, competence and qualification geared towards executing their road project roles or tasks during road construction. One responding UNRA officials stressed that, "*Quality Audit should be seen as being integral to the design process, from initial conceptual designs when the vision for a scheme is developed through to maintenance and monitoring.*"

4.4.1.1 Bivariate correlation results for Quality planning and Quality management

The bivariate correlation was used as a measure of the relationship between quality planning and quality management. This was intended to measure the strength of their relationship, which can range from absolute value 1 to 0. The Pearson Correlation (r), the most commonly used bivariate correlation technique was used to determine the association between the two quantitative variables as presented in the Table 4.6 below.

Table 4.6: Bivariate correlation results for Quality planning and Quality management

		Quality planning	Quality management
Quality planning	Pearson Correlation	1	.589**
	Sig. (2-tailed)		.000
	N	59	59
Quality management	Pearson Correlation	.**	1
	Sig. (2-tailed)	.000	
	N	59	59

**. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary data

Based on the above table, scores including correlation co-efficient (R=.589**), significance (Sig, p<0.001, .000) and number of cases (n=59) are presented. The results (r=.589**) reveal the magnitude and direction of the association between quality planning and management as statistically positive. These findings can be linked to the fact that, when the Nakapiripirit-Moroto road project management actively engages in road planning done by setting achievable road construction goals, objectives, targets as well as procedures and standards would result into constructing quality and long lasting roads hence road quality management.

4.4.1.2 Linear regression results on Quality Planning and Quality Management

A regression analysis specifically the adjusted R^2 value was used to determine the variation quality planning had on quality management. The choice for the adjusted R^2 is that an adjusted R^2 value ("Adj R-squared" row), which corrects positive bias to provide a value that would be expected in the population.

Table 4.7: Linear regression results for Quality planning and Quality management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.589[a]	.346	.335	.39137

a. Predictors: (Constant), Quality planning

Source: Primary data

The statistical outcome consists of: R as (.589**), R squared or R^2 as (.346), Adjusted R square or Adjusted R^2 as (.335) and standard error of the estimate as (.39137) using the predictor; Quality planning. The adjusted R^2 value of (.335**) explains up to 33.5% (.335*100%) variation quality planning had on quality management on the Moroto-Nakapiripirit road construction project. The remaining percentage of (66.5%) can be attributed to other factors not considered under this study.

4.4.1.3 Hypothesis One

Hypothesis statement one that, "Quality planning significantly affects quality management in the road construction sector" is accepted and the null statement rejected

4.4.2 Quality control and Quality management on Moroto-Nakapiripirit road project

The second objective of the study was to establish the relationship between quality control and quality management on Moroto-Nakapiripirit road project. Quality control entailed indicators including performance evaluation, comparing goals to targets, process redesign, user feedback and eliminating unsatisfactory performance. Below in Table 4.8 are the obtained results.

Table 4.8: Descriptive statements on Quality control

Questions about Quality Control	**Percentage Response (%)**					**Mean**	**Std dev**
	SD (1)	**D (2)**	**UD (3)**	**A (4)**	**SA (5)**		
Evaluating project performance is critical for quality control	0% (0)	5% (3)	29% (17)	61% (36)	5% (3)	**3.66**	**.659**
Comparing performance to project goals is critical for quality control	0% (0)	3% (2)	17% (10)	73% (43)	7% (4)	**3.83**	**.592**
Change control Process is critical for Quality Control	0% (0)	7% (4)	22% (13)	58% (34)	13% (8)	**3.78**	**.767**
User feedback is critical for Quality Control	0% (0)	3% (2)	0% (0)	72% (42)	25% (15)	**4.53**	**.807**
In process inspection activities are critical for Quality Control	0% (0)	7% (4)	27% (16)	42% (25)	24% (14)	**3.83**	**.874**
Eliminating causes of unsatisfactory performance critical for Quality Control	0% (0)	5% (3)	20% (12)	56% (33)	19% (11)	**3.88**	**.768**

Source: primary source

Key: SA=Strongly Agree, A=Agree UD=Undecided D=Disagree

SD=Strongly Disagree Stddev=Standard deviation

For purposes of interpretation, the research combined both agree and strongly agreed scores to represent the respondents that agree while both disagree and strongly disagreed scores were combined to represent the respondents that disagree and the undecided score were not grouped. The mean scores above 3.00 reveal agreement and those below 3.00 indicate disagreement. The standard deviation score less than 1.00 indicate communalities (agreement) and the score above 1.00 reveal divergences in responses (mixed responses)

Results as presented in Table 4.8 reveal that a majority respondents (66%, n=39) agreed to the statement that evaluating project performance was critical for quality control, with (5%, n=3) disagreed and (29%, n=17) neither agreed nor disagreed meaning that numerous road construction activities were checked to identify accomplishments, performance issues, and constraints in the implementation of the road project. The performance indicators were used to determine whether the highlighted and defined results were achieved coupled with understanding whether lessons learned in the course of the project were actually achieved in the road project implementation hence better road quality management. One responding interview said, "*The results of the performance evaluation program drives management in undertaking decisions including what activities to continue, modify, or enhance*".

Comparing performance to project goals is critical for quality control was another quality control question that was asked. Responses obtained include: mean score of (3.83), (80%, n=47) that agreed, while (3%, n=2) disagreed and (17%, n=10) were indecisive. The results can be linked to the fact that measuring performance helps the staff including contractors and consultants among others to understand how well the project is accomplishing the Nakapiripirit-Moroto road project. It can be observed that the comparison task or exercise allows for an analysis of where and what changes need to be made in order to improve road performance and the quality of service that is provided hence better road quality management.

This is further supported by a UNRA who argued that, "*Measuring project performance with its goals allows providers to understand what is working well; information that can be shared with other providers who can learn from their success*".

Question 3 asked in line with quality control was on whether change control process was critical for quality control. Several responses obtained including the mean score of (3.78), standard deviation score of (.767) agreed percentage score of (71%, n=42), disagreed percentage score of (7%, n=4) disagreed and undecided percentage score of (22%, n=13). Based on these results, it can be said that the findings describe how the road project performance control are used to improve current and future road projects done by identifying trends and closing gaps between targeted and actual road sector performance.

"*Once a project is completed, an assessment can be made of what worked well and where improvements in processes and project teams are needed for future projects*" was a statement made by an official.

Another question 4 posed was on whether the user feed-back was critical for quality control. Responses obtained include: (99%, n=57) that agreed and (3%, n=2) disagreed meaning that the use of feedback has helped the road construction project management including technical staff to obtain valuable information that is most important to them and focus their efforts more on meeting and/or exceeding those road user needs. The staff need the feedback to help them provide a better service to the locals as a whole.

One respondent said, "*Sharing the feedback from the local road users to obtain a sense belonging and support the project in achieving its goals*". By this argument, the respondent implies that constant interaction with the local road users on the opinion of the road project regarding the quality of services is of paramount importance.

Question 5, another question on quality control had the following responses obtained. First, (68%, n=39) that agreed that process inspection activities were critical for quality control, (7%, n=4) that disagreed and (27%, n=16) were not sure. Question six, and the last had the following scores including (75%, n=44) that agreed, while (5%, n=3) disagreed and (20%, n=12) were indecisive. On the fact that eliminating causes of unsatisfactory performance critical for quality control. The findings can be attributed to the fact that inspection process was intended to ensure that road measurements, material tests, and gauges applied to certain characteristics in regard to the road activity. The exercise entailed checking on the Nakapiripirit road construction works in progress and ensures that these were in line with the goals and objectives among others.

Furthermore, inspection here included obtaining general knowledge on crucial issues including road hazards, on safety issues matters to the road environment and effective infrastructure interventions are needed. More, issues on road black spots are defined as any location that has a higher expected number of accidents than other similar locations as a result of local risk factors.

In a related interview, one responding UNRA Official said, "*Inspections are held or carried out to identify road threats and dangers linked to the road environment characteristics and propose interventions to mitigate the detected threats*" By this argument, the respondent implies that in process inspection activities are critical for Quality Control for example inspection of materials is done in advance of its usage on the road to eliminated unsatisfactory performance on the road.

Another respondent said, "*In engineering activities, inspection calls for consistent checking that the reports availed detailing results are usually compared to specified requirements and standards for determining whether the road being constructed is in line with the intended*

targets". By this argument, the respondent implies that inspection of material is done and the results are regularly checked and compared for conformity with the specific requirements.

4.4.2.1 Bivariate correlation results for Quality control and Quality management

The bivariate correlation a measure was used of the relationship between the quality control and quality management. This was intended to measures the strength of their relationship, which can range from absolute value 1 to 0. The pearson Correlation (r), the most commonly used bivariate correlation technique was used to determines the association between the two quantitative variables as presented in the Table 4.9 below.

Table 4.9: Bivariate correlation results for Quality control and Quality management

		Quality control	Quality management
Quality control	Pearson Correlation	1	.681**
	Sig. (2-tailed)		.000
	N	**59**	**59**
Quality management	Pearson Correlation	.681**	1
	Sig. (2-tailed)	.000	
	N	**59**	**59**

**. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary data

Based on the above table, scores including correlation co-efficient (R=.681**), significance (Sig, p<0.001, .000) and number of cases (n=59) are presented. The results (r=.681**) reveal the magnitude and direction of the association between quality control and management as statistically positive meaning that as and when road performance evaluation is done, road goals compared to targets, ensuring proper road process redesigns, taking user feedback as valuable information and eliminating unsatisfactory performance road blocks would result into constructing quality and long lasting roads hence road quality management.

4.4.2.2 Linear regression results on Quality control and Quality management

A regression analysis specifically the adjusted R^2 value was used to determine the variation quality control had on quality management. The choice for the adjusted R^2 is that an adjusted R^2 value ("Adj R-squared" row), which corrects positive bias to provide a value that would be expected in the population.

Table 4.10: Linear regression results for Quality control and Quality management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.681[a]	.463	.454	.43830

a. Predictors: (Constant), Quality control

Source: Primary data

The statistical outcome consists of: R as (.681**), R squared or R^2 as (.463), Adjusted R square or Adjusted R^2 as (.454) and standard error of the estimate as (.43830) using the predictor; Quality control. The adjusted R^2 value of (.454**) explains up to 45.4% (.454*100%) variation quality control had on quality management on the Moroto-Nakapiripirit road construction project. The remaining percentage of (54.6%) can be attributed to other factors not considered under this study.

4.4.2.3 Hypothesis Two

Hypothesis statement one that, "Quality control significantly affects quality management in the road construction sector" is accepted and the null rejected

4.4.3 Quality assurance and Quality management on Moroto-Nakapiripirit road project

Objective three was to establish the relationship between quality assurance and quality management on Moroto-Nakapiripirit road project. Quality assurance comprised of (03) indicators including utilizing elements of quality plan, performance evaluation and product testing for conformance to standards from which a number of questions were set and the results that are presented in table 4.11 below.

Table 4.11: Descriptive statements on Quality assurance

Questions about Quality assurance	**Percentage Response (%)**					**Mean**	**Std dev**
	SD (1)	**D (2)**	**UD (3)**	**A (4)**	**SA (5)**		
Selecting standard or specification is critical for quality assurance	0% (0)	0% (0)	31% (18)	69% (41)	0% (0)	**3.75**	**.544**
Defining activities that will collect data and compare results to specification is key to QA	0% (0)	5% (3)	26% (15)	64% (38)	5% (3)	**3.69**	**.650**
Defining and providing resource is key to quality assurance	0% (0)	3% (2)	22% (13)	54% (32)	21% (12)	**3.92**	**.749**
Assigning responsibility to specific entity is critical to QA	0% (0)	3% (2)	21% (12)	63% (37)	14% (8)	**3.86**	**.681**
Utilizing all elements of quality plan for quality assurance is key	0% (0)	0% (0)	25% (15)	54% (32)	21% (12)	**3.93**	**.691**
Evaluation of quality performance on a regular basis is key to quality assurance	0% (0)	3% (2)	14% (8)	57% (34)	26% (15)	**3.81**	**.706**
Product testing for conformance is critical for quality assurance	0% (0)	2% (1)	27% (16)	49% (29)	22% (13)	**3.92**	**.749**
Instituting corrective action is important for quality assurance	0% (0)	2% (1)	29% (17)	49% (29)	20% (12)	**3.88**	**.745**

Source: Primary source

Key: SA=Strongly Agree, A=Agree UD=Undecided D=Disagree

SD=Strongly Disagree Stddev=Standard deviation

For purposes of interpretation, the research combined both agree and strongly agreed scores to represent the respondents that agree while both disagree and strongly disagreed scores were combined to represent the respondents that disagree and the undecided score were not grouped. The mean scores above 3.00 reveal agreement and those below 3.00 indicate disagreement. The standard deviation score less than 1.00 indicate communalities (agreement) and the score above 1.00 reveal divergences in responses (mixed responses)

The numeric findings presented in the table above reveal that (69%, n=41) constituting a majority accepted that selecting standard or specification was critical for quality assurance while none of the respondents disagreed and (31%, n=18) neither agreed nor disagreed. The findings can be credited to the ability of the technical staff including the road contractors and consultants to ensure that widely acceptable standards of road construction are fully adhered to while executing their assigned duties and responsibilities to successfully complete the Moroto -Nakapiripirit road project. In one interview held, an official said, "*Service standards are an important tool for managing client expectations and should reflect the available resources.*"

Question two linked to quality assurance that defining activities that collect data and compare results to specification is key to quality assurance had the following results obtained including: (69%, n=41) that agreed with a percentage mean score of (.369), standard deviation score of (.650), (5%, n=3) disagreed and (26%, n=15) were not sure meaning that several methods have been put in place including questionnaire survey, interview and documentary review methods with their linked tasks involved in the collection of valuable information (feed-back inclusive) about the targets set as well as the progress of work presented using progressive reports. The findings can be supported by a qualitative statement made by an interviewee where he said, "*Numerous tools are used to aid in collection of data. Some of these include SAQ, interview checklist and observation checklist*"

A portion of respondents constituting (75%, n=44) agreed that defining and providing resource is key to quality assurance, although (3%, n=2) disagreed and (22%, n=13) were not sure. The statistical findings can be linked to the fact that availability of resources may refer to the ability of the road sector to attract and retain the best staff including contractors and consultants with minimum qualifications, skills and competences. In addition, another valuable resource refers to the availability of road funds. The road funds are set up mainly to provide a stable flow of money to support operation and maintenance of roads. One responding interviewee said, "*Resources including human, finance and time are required for the successful completion of the roads being constructed*"

While another argued that, "*Without a road fund set up to finance part of the periodic maintenance budget, leaving all routine maintenance and the balance of periodic maintenance to be financed from the government's general budget, together with donor grants and loans. The road net system would have been a problem*"

Furthermore, (77%, n=45) respondents of the road sector project agreed that assigning responsibility to specific entity was critical to quality assurance, with (3%, n=2) disagreeing and (21%, n=12) being neutral. In addition, (75%, n=44) respondents agreed that utilizing all elements of quality plan for quality assurance is key, this was followed and (25%, n=15) that neither agreed nor disagreed and (25%, n=15) that disagreed. Based on this information, it can be argued that meaning that the project leaders were able to critically assess it is their staff and identified key role uniqueness in the way they performed their day to day tasks linked to their qualifications. It meant that specialization of staff including consultants and contractors were better placed where they could easily execute their road construction roles hence quality road sector management. One responding UNRA official said, "*Specialization*

of roles is considered as a key ingredient in required in the road sector to ensure better results"

Additionally, (83%, n=49) consultants and contractors indicated that evaluation of quality performance on a regular basis was key to quality assurance, (14%, n=8) were not sure and (3%, n=2) disagreed respectively meaning that several road construction tasks were checked for completeness, while evaluating the possible of constraints as well as coming up with remedies to ensure a successful completion of the road construction project.

Results from one of the interviews held, a respondent said,

> "*Numerous evaluation programmes are in place and continuously held including field tests including: average road user costs; level of satisfaction travel time and its reliability, quality of road user information; protected road user risk; unprotected road user risk; processes in place for market research and customer feedback; long-term programmes*"

More still, (71%, n=42) respondents representing a majority percentage agreed that product testing for conformance is critical for quality assurance, (2%, n=1) disagreed and (27%, n=16) were not sure. Lastly, (69%, n=41) respondents agreed that instituting corrective action is important for quality assurance, however, (2%, n=1) disagreed and (29%, n=17) were not sure meaning that the road sector project staff engaged much in ensuring that testing to determine whether the road and specifically the raw- product including quarry stones of required sizes, sand mixtures and cement among others met the specified standard developed for efficiency or interoperability. To aid in this, the staff were able to engage in many test procedures and test setups, either by the standard's maintainers (UNRA and UNBS), for

testing conformance to road standards. One respondent said, "*On spot conformance tests are performed, to give greater guarantees of compliance. In addition, road products tested in such a manner are then advertised as being certified and said to be complying with the standard".*

4.4.3.1 Bivariate correlation results for Quality assurance and Quality management

The bivariate correlation was used as a measure of the relationship between the quality assurance and quality management. This was intended to measures the strength of their relationship, which can range from absolute value 1 to 0. The Pearson Correlation (r), the most commonly used bivariate correlation technique was used to determine the association between the two quantitative variables as presented in the table 4.12 below.

Table 4.12: Bivariate correlation results for Quality assurance and Quality management

		Quality assurance	Quality management
Quality assurance	Pearson Correlation	1	.759**
	Sig. (2-tailed)		.000
	N	59	59
Quality management	Pearson Correlation	.759**	1
	Sig. (2-tailed)	.000	
	N	59	59

**. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary data

Based on the above table, scores including correlation co-efficient (R=.759**), significance (Sig, p<0.001, .000) and number of cases (n=59) are presented. The results (r=.759**) reveal the magnitude and direction of the association between quality assurance and management as statistically positive meaning that the ability for the contractors and consultants to utilize key elements of quality road plan, ensure that the road performance evaluation is done and ensuring that timely product testing for conformance to standards is effectively handled would result into constructing quality and long lasting roads hence road quality management.

4.4.3.2 Linear regression results on Quality assurance and Quality management

A regression analysis specifically the adjusted R^2 value was used to determine the variation quality assurance had on quality management. The choice for the adjusted R^2 is that an adjusted R^2 value ("Adj R-squared" row), which corrects positive bias to provide a value that would be expected in the population.

Table 4.13: Linear regression results for Quality assurance and Quality management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.759[a]	.576	.569	.31523

a. Predictors: (Constant), Quality assurance

Source: Primary Data

The statistical outcome consists of: R as (.759**), R squared or R^2 as (.576), Adjusted R square or Adjusted R^2 as (.569) and standard error of the estimate as (.31523) using the predictor; quality assurance. The adjusted R^2 value of (.569**) explains up to 56.9% (.569*100%) variation quality assurance had on quality management on the Moroto-Nakapiripirit road construction project. The remaining percentage of (43.1%) can be attributed to other factors not considered under this study.

4.4.3.3 Hypothesis Three

Hypothesis statement one that, “Quality assurance significantly affects quality management in the road construction sector” is accepted and the null rejected

4.5 Regression Matrix results on Factors affecting TQM

A regression matrix analysis was used to determine the variation that factors had on total quality management on Moroto-Nakapiripirit road project. The choice for using the adjusted R^2 is that an adjusted R^2 value corrects positive bias to provide a value that would be expected in the population.

Table 4.14: Regression matrix for Factors and Total quality management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.787[a]	.620	.599	.301401

a. Predictors: (Constant), quality planning, quality control, quality assurance

Source: Primary Data

The statistical outcome consists of: R as (.787**), R squared or R^2 as (.620), Adjusted R square or Adjusted R^2 as (.599) and standard error of the estimate as (.31523) using the predictor; quality assurance. The adjusted R^2 value of (.599**) explains up to 59.9% (.599*100%) variance that a combination of factors (IV) had on Total quality management (DV) on the Moroto-Nakapiripirit road construction project. The remaining percentage of (40.1%) is attributed to other factors not considered under this study.

CHAPTER FIVE: SUMMARY, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the summary, discussion, conclusions and recommendations on the factors affecting Total Quality Management (TQM). Additionally, the chapter presents the limitations and areas for further study.

5.2 Summary of the factors affecting Total Quality Management on Moroto-Nakapiripirit Road Project

This section in chapter five gives a summary of the key findings on the factors that affect the Total Quality Management of the Moroto-Nakapiripirit Road Construction Project presented based on the specific objectives of the study including:

5.2.1 Quality planning and Quality Management

In summary, based on the key descriptive findings obtained and presented in previous chapter, it can be said that quality planning was a key requirement for improved quality management on the Moroto-Nakapiripirit road project indicated by a (.589**) positive and statistically significant relationship. The Moroto-Nakapiripirit road project was found to have quality road policies with (66%), specific-measurable-attainable-reliable and time road bound goals hence (81%). The project was possible to set achievable targets (78%) and based on quality standards, with (64%). In addition, adhering to the quality specifications (83%) has yielded better roads and road audits to ensure proper accountability and transparency of public funds, (69%) was done.

The findings are in agreement with the views of scholars such as Crosby (2002) who argues that the quality plan includes the procedures to ensure that the quality standards are being

followed by all project staff and the steps required for monitoring and controlling quality and the approval process to make changes to the quality standards.

Based on the findings of the respondents in open-ended interviews and observation guide, it was concluded that developing a good quality plan and to strictly follow all the elements in the plan such as description of all relevant quality standards and definitions, as well as a description of all conditions that must be met to satisfy the stakeholders including the procedures that will be used to ensure that all quality standards are followed.

5.2.2 Quality control and Quality Management

It was found out that the magnitude and direction of the association between quality control and management was statistically positive (.681**). The next are summarized containing evaluating of the road sector project was based on progressive reports, the progress of the road construction project was matched on the compared to the project goal performance and it was found out that the project was on schedule. User feedback was collected and user to improve on the project expectations, on spot checks one of the process inspection activities was frequently referred too and most of the unsatisfactory causes of project underperformance were eliminated.

Based on the findings of the respondents in open-ended interviews and observation guide, it was concluded that constant checking of results with specifications is done and process improvement towards beneficial change by use of a plan-do-check-act process.

5.2.3 Quality assurance and Quality Management

Based on the finding held in chapter four, it was found out quality assurance and quality management were statistically positively (.759**) related. The following are drawn and summarized including the Moroto-Nakapiripirit road being constructed is a standard road

drawn based on key specifications, resources including funds, human key personnel with skills, competence and qualifications were hired to aid the successful execution of this project. Job specialization was encouraged, practiced or adhered to, road engineers guided by road contractor continuously supervised and evaluated the road site. Finally, several random road material samples were moved from the road site and tested in the lab to check whether they conformed to the specified standards.

Base on the findings of the respondents in an open-ended interview and observation guide, it was observed that training and education, top management responsibility, motivation and communication are key in ensuring that quality assurance processes are followed.

5.3 Discussion of the factors affecting Total Quality Management on Moroto-Nakapiripirit Road Project

This section gives a detailed account of the key findings as presented in chapter four linking them to the literature chapter two while identifying the gaps evident on the factors that affect the Total Quality Management of the Moroto-Nakapiripirit Road Construction Project. These are presented based on the specific objectives of the study including:

5.3.1 Quality planning and Quality Road Construction Management

Quality planning helps in identifying the quality standards which are relevant to the project and determining how to satisfy them. This statement is supported by the positive responses that were collected during the course of the study about quality planning where for example a margin of respondents representing (65%) agreed that setting quality standards was critical and (69%) indicated quality audit support for quality planning. The findings can be seen to have a link with scholarly literature held in Chapter two where Deming (1996), revealed that the first step in the quality management process is planning with identification of the quality standards which are relevant to the project and determining how to satisfy them. In addition,

Milakovich (1990) while referring to meeting customer needs and expectations argues that quality audits may use the results obtained from quality control to determine if quality assurance activities are having the desired result. If not quality assurance activities should be reviewed and improved.

The researcher agrees as road audits need to be completed at the end of major milestones. However, the 35% that were reserved or disagreed reveal inconsistencies in the existing standards. Some of these inconsistencies seemed to link the criterion used in identifying the quality standards relevant to the project and determining how to satisfy them. Furthermore, improvements in road standards may result in discrepancies between characteristics of newly built or reconstructed roads and existing ones, interfering with the establishment of common a prior expectations concerning road use. Due to technological developments and new technical standards, existing road equipment may become obsolete, its replacement being necessary hence a problem

Furthermore, the (31%) disagreement and not sure percentage scores reflected above reveal there are audit challenges hindering the road project from realizing its successful intended goal. Some of these may range from failure to account for advanced public funds in relation with the magnitude of road works that have been executed hence a problem.

In addition, a proportion of respondents constituting (81%) agreed that setting quality goals was critical for planning and (83%) agreed that quality targets were crucial for planning. These findings can be linked to scholarly literature as presented in chapter two where scholars including Philips (1995) who argues that a successful organization recognizes the need to put the customer first in every decision made while Kanji & Asher, (1996) stressed that the ultimate measure of company performance is customer satisfaction, which may very well predict the future success or failure of an organization. The further argue that, it is very

important to find customer satisfaction and customer perception of quality. The presence of such statistics clearly reveals how aspects including setting quality goals and targets are crucial to the improved road construction planning by any road management staff. However, the criterion upon of selecting the key road stakeholders involved in the setting of the project goals seems unknown as reflected by the (19%) disagreement or not sure scores. This void goal setting gap cannot be left unnoticed. Secondly, some of the goals and targets set seem complex and therefore tend to hinder the successfully completion of the project.

5.3.2 Quality control and Quality Road Construction Management

Quality control and quality management were found to relate positively to one another reflected by the number of positive responses that were obtained in chapter four. Some of these include Staff constituting a majority (66%) who agreed that evaluating project performance was critical for quality control and (80%) other respondents indicated that comparing performance to project goals was critical for quality control. This is supported by Deming (1996) who argues that once a process improvement has been made, the change must be measured and evaluated for effectiveness. Comparing before and after indicators would be useful here as well as comparing results with the targeted performance. Also, efforts should be made to celebrate and reward those participating in the process-improvement activity.

It can be said that evaluation performance and ensuring through comparing that planned and actual project tasks allows for an a better analysis of where and what changes need to be made on the project activities in order to improve road performance and the quality of service that is provided. However, the (34) disagreement on the project performance evaluation exercise and a (20%) disagreement on comparing the goals on the actual results yielded reveals a weakness in the way both activities are handled. First, evaluating project performance reveals how far a project has gone. Despite having such positive scores, the

(34%) might reveal that the exercise is delayed as a result of varying political interests. Since most of the projects though meant for the public are politically managed, the evaluation exercise seems not to be often done hence a problem

Secondly, comparing performance to project goals in most cases is intended for release of more funds to support the completion of the project. Here in most cases, this exercise is not fully executed and the responsible personnel are required to avail progress reports reflecting more work done as compared to the shoddy work done. In the end, much as the projects commence, they may terminate with sub-standard work done and loss of public resources.

Furthermore, (97%) agreed that user feedback was critical for quality control and (66%) agreed that in process inspection activities are critical for quality control. This is supported by Deming (1996) who argues that the goal of statistical quality control was to gather data that would allow for the constant improvement of manufacturing processes, which would in turn improve quality control. The presence of valuable information through feed-back helps an organization put right or amend administrative issues that might not be right. However, the (3%) disagreement reveals minor instances that might halt information reaching any management. (3%) is such small a percentage margin however, failure to attend to it at an early stage might prove problematic (information inaccuracy) in the long run. The failure to obtained (100%) feedback might be attributed to some of the communication gaps that need fixing.

More still, (66%) is quiet a good margin to explain the importance of process inspection activities as crucial for quality control required to realize better road construction results; Nevertheless, the (34%) is a moderate percentage that presents a widening gap in the way such process inspection activities are handled. The schedule for process inspection activities seems to be in place, however, the responsible personnel to handle the processes seem fewer

and hence delays are experience which may impart negatively on the completion time in the long run.

5.3.3 Quality assurance and Quality Road Construction Management

The positive relationship between quality assurance and management means the ability for the contractors and consultants to utilize key elements of quality road plan, ensure that road performance evaluation and timely product testing for conformance to standards intended to better quality management. This phrase is supported by the positive responses obtained about quality assurance and presented in the previous chapter.

Some of these positive responses obtained include an appropriate presentation of respondents constituting (75%) who agreed that defining and providing resource was key to quality assurance. These findings can be linked to Crosby (2002) who argues that Quality assurance is defined as all the planned and systematic activities implemented within the quality system and demonstrated as needed to provide adequate confidence that an entity will fulfil quality requirements. The researcher concurs with the findings as the presence of required local resources including time, funds and personnel within an organization, including the Moroto-Nakapiripirit Road Construction project tend to bring success and are a requirement for the continuity of other similar projects. The availability of funds means timely operations while the presence of human capacity ensure the accomplishment of set roles geared towards attaining an organization's role.

None the less the (25%) difference highlights challenges linking to funds and human personnel. There is a resource (funds) availability issue where establishment of a reliable source of finance to fund such projects has always been a problem coupled with the constant allocation of the fewer existing funds to other priority areas. On the other hand, the hired

personnel are less tied to the projects since such projects are short term, these personnel especially the Engineers tend to express intent to quit for other jobs hence these two loopholes may negatively affect the road construction project.

In addition, (77%) agreed that assigning responsibility to specific entity is critical to QA and (83%) agreed that evaluation of quality performance on a regular basis is key to quality assurance. These findings can be complemented by Blunt & Jones (1992) who argue that the new trends in TQM put strong emphasis on empowerment of employees, customer service and charismatic leadership. Specialization tends to be a requirement in any project. In addition, it can be said that several organizations including Moroto-Nakapiripirit Road Construction project ensure specialization of roles. These respective roles are assumed to be executed to realize successful goals. In addition, the role executed by human resource in hiring of the right candidates for the best position is appreciated, however, proof representing misplaced staff and their respective responsibility are reflected by the 23% and 17% disagreement scores realized indicating a human resource problem still existing that in the long run may affect the evaluation performance exercise.

Lastly, 71% of the respondents agreed that product testing for conformance was critical for quality assurance. The exercise of testing site materials is always appreciated as a way of ensuring standards were met, followed and used. The findings cab be supported by Kanji & Asher (1996) who argued that quality management starts with simple inspection-based systems. Under such a system, one or more characteristics of a product are examined, measured or tested and compared with specified requirements to assess its conformity However, the 29% disagreement or neutrality explains gaps in the way product testing is carried out. Some of these gaps may be attributed to the fact that the project lacks mobile

testing equipment and probably sufficient expertise to conduct this exercise on time hence a widening gap especially in product (including material) testing.

5.4 Conclusion of the factors affecting Total Quality Management on Moroto-Nakapiripirit Road Project

In this section, conclusions are drawn in line with the factors affecting total quality management on Moroto-Nakapiripirit Road Project. The conclusions are presented based on the specific objectives of the study including:

5.4.1 Quality planning and Quality management

Conclusively, it can be said that the Moroto-Nakapiripirit road project possessed quality road policies however, of these some were found to be ineffective and obsolete in nature, given the current trend of road innovations. Much as the project had well road goals that were specific-measurable-attainable-reliable and time bound, some of these goals were complex and challenging to achieve. The road project set achievable targets although fewer were actually accomplished. Traces of deteriorating road quality standards were available assumed to be caused by political influence. In some road construction areas, quality specifications were not followed and therefore ignored hence negatively affecting the quality of the road. Lastly, some of the advanced resources were not properly accounted for.

5.4.2 Quality control and Quality management

The following are concluded based on the quality control and quality management discussions held. Much as project performance evaluation was done and critical for quality control, the exercise was not held on time, several performance short falls were realized when comparing performance on the project goals. Most user feedback given by stakeholders

tended to be ignored, numerous road inspection delays in the inspection of the road construction were experienced with numerous under performances evidenced.

5.4.3 Quality assurance and Quality management

Conclusively, the following can be made including pockets of mismatching standard or specifications were evident. Much as the road funds were available, others were insufficient, while human resources including engineers were hired and quitted. Some project staff were designated jobs not tallying with their qualification, evaluation of quality road performance were delayed, numerous product tests were done to ensure conformance however, some of the test reports were manipulated.

5.5 Recommendation of the factors affecting Total Quality Management on Moroto-Nakapiripirit Road Project

This section presents the recommendations identified to close up the gaps identified during the course of the discussion held and these are based on the specific objectives of the study as explained below.

5.5.1 Quality planning and Quality management

The following are some of the recommendations planned to close the quality planning gaps identified in the discussion held above. Of these include:

- The researcher recommends that the project management closes the standard gaps by ensuring that engineering department specifically the technical staff (Engineers) continuously adhere to the stipulated and specified standards to realise better road outcomes. Furthermore, more sensitization programs can be arranged to enhance their ethical practices (code) as this is important for better results.

- Secondly, the researcher recommends that the project management specifically the accounting officer should be legally held accountable for any release of public funds on shoddy works executed in corrupt tendencies. This will ensure that funds are well allocated and used.

- Lastly, the issue of having complex goals or targets can be handled through the timely review of these complex goals or targets done between Project management and the Engineering department. The essence is to ensure that much SMART goals or targets are set and therefore realised.

5.5.2 Quality control and Quality management

Gaps were identified during the discussions held above, on the quality control and quality management and these are presented as follows:

- The researcher recommends that the Project management considers setting up an independent Quality Assurance department and entrusting it with the task of managing road standards and other quality formalities. This is intended to increase on product quality and reduce on the work backlog duties that project technical staff including engineers and consultants among others faces. This helps them to be more specialized.
- Lastly, the researcher recommends that project management independently handles these road construction matters and limit on the political influence or interest that always crop up during such mega multi million construction deals, this however, this may not be attained as a result of political pressures.

5.5.3 Quality assurance and Quality management

The research came up with the following recommendation as remedies to close the gaps identified under quality assurance as one of the independent indicators. Of these are:

- The road project management and its administration department should ensure conducting a short term technical Job evaluation exercise. This will address the issue to do with wrong job placement where responsibility discrepancies are numerous entailed with more irregular supervision and evaluation gaps

- The issue of financial support (funds) should be critically addressed through the road project management and the UNRA reviewing its sources of road funding and ensure that they lobby for more multinational agencies to support such projects. This is intended to address the problem of insufficient road funds.

- The issue of project personnel staff (resigned from the project at short notice) can be handled by Project management in support of the personnel session should review the contract employment terms. This is intended to ensure that such staff (including contractors, engineers etc.) are legally bided and their intent to quit be met with penalty (s) since re-recruiting others only increases costs, time involved and tends to stall road construction work in progress.
- Lastly, the researcher recommends that the project management through its engineering session and UNRA procure and install mobile road materials lab testing equipment as well as hire more technical staff to handle the testing tasks. This is intended to reduce on the time that specialists take to carry raw materials to and from the site for testing purposes. This will ensure that quality work is done from within the sites.

5.6 Limitations of the study

The major limitation of the study was that the Morot-Nakapiripirit road project encounters challenges that appear different from those that other road projects located else-where nationally experience. For instance, the transport problems that affect the progress of works

for example delayed delivery of construction equipment to the project as both routes i.e. Soroto-Moroto and Muyembe-Nakapiripirit are often in poor state, poor social services, language barrier as some Chinese staff hardly communicated in English and insecurity concerns. Despite the above, the process of data collection was not affected in that UNRA staff from head office in Kampala would periodically come to site and thus interviews were conducted. For language concerns, I used an English-Chinese translator to communicate in Chinese.

Therefore based on this, it is necessary to generalize the research findings.

5.6 Areas for further studies

The researcher came up with a number of areas for future studies. Some of these include:

- Studies be carried on the role that road site material testing plays in the realization of quality of roads constructed in Uganda
- Secondly, would be to study the ever increase political influence in the construction of quality roads in Uganda
- The impact of fewer QA departments established in the road sector in the realization of quality road construction in Uganda

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APPENDICES

Appendix I: Self-Administered Questionnaire for Consultant and Contractor staff

SECTION A

BACKGROUND INFORMATION

The information you provide in this questionnaire helps the researcher in investigating the factors affecting Total Quality Management on Moroto-Nakapiripirit road project. The information you provide shall be held with utmost confidentiality.

Please circle the category or response that best suits you.

1. Age

[1] Less than 20years [2] Between 20 and 30 years [3] Between 30 and 40

[4] Above 40 years

2. Sex

[1] Male [2] Female

3. My job position can be described as working as

[1] UNRA staff [2] Consultant staff [3] Contractor staff

4. My education qualification is in the category of:

[1] Secondary [2] Diploma level [3] Bachelor's level [4] Post graduate level

5. I have the following years of experience in my organization

[1] Below 2 years [2] 3-4 years [3] 5-6 years [4] 7-8 years [5] Over 10 years

SECTION B: Critical success factors for quality planning

The purpose of this section and all subsequent sections is to give you a chance to indicate the degree to which you agree with the statements. Tick the numbers that best describes your opinion on each of the statements. Using the scale below the highest score is Strongly Agree and the least score is Strongly Disagree. Use the Likert scale below to complete the questions.

Table 2: Likert scale

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

If you strongly disagree, tick 1, where you agree, tick 2, in case you agree, tick 3, neutral tick 4 and where you believe you strongly agree, tick 5.

6. Project Quality Planning

No.	Statement	1	2	3	4	5
4(a)	Is writing a quality plan necessary for project success					
4(b)	Setting quality goals is critical for quality planning					
4(c)	Setting quality targets is critical for quality planning					
4(d)	Setting quality standards is critical for quality planning					
4(e)	Setting quality specifications is critical for quality planning					
4(f)	Setting quality procedures is critical for quality planning					
4(g)	Quality elements are critical for quality planning					
4(h)	Schedules for quality audits and training requirement are critical for quality control					

SECTION C: Critical success factors (CSFs) for Quality Control

7. Quality Control

No.	Statement	1	2	3	4	5
5(a)	Evaluating project performance is critical for quality control					
5(b)	Comparing performance to project goals is critical for quality control					
5(c)	Change control process is critical for quality planning					
5(d)	User feedback is critical for quality control					
5(e)	In process inspection activities are critical for quality control					
5(f)	Eliminating causes of unsatisfactory performance critical for quality control					

What in your view should be done to improve quality control on the project?

SECTION D: Critical success factors for quality assurance

8. Quality Assurance

No.	Statement	1	2	3	4	5
6(a)	Selecting standard or specification is critical for quality assurance					
6(b)	Defining activities that will collect data and compare results to specification is key to quality assurance					
6(c)	Defining and providing resources is key to quality assurance					
6 (d)	Assigning responsibility to specific entity is critical to quality assurance					
6(e)	Utilizing all elements of quality plan for quality assurance is key					
6(f)	Evaluation of quality performance on a regular basis is key to quality assurance					
6(g)	Product testing for conformance is critical for quality assurance					
6 (h)	Instituting corrective action is importance for quality assurance					

SECTION D: Factors affecting quality management

9. Quality Management

No.	Statement	1	2	3	4	5
7(a)	Planning for quality is critical for quality management					
7(b)	Controlling quality is key to quality management					
7(c)	Effective leadership is critical for quality management					
7(d)	Top management support is critical for quality management					
7(e)	Continuous improvement of processes is key for quality management					
7(f)	Customer feedback on our products is key to quality management					
7(g)	Employee training and education levels lead to quality management					
7(h)	Customer satisfaction is critical for quality management					
7(i)	Employee involvement is critical for quality management					

END OF QUESTIONNAIRE

Thank you for your participation and cooperation

Appendix II: Interview Guide for UNRA Staff

SECTION A: Factors affecting effective project Quality planning

Qn.1. Does your organization set quality goals?

If Yes, what are the goals? Are the goals adhered to?

If No, Why?

Qn.2. Is setting quality goals important for quality planning in your organization?

If Yes, why is it important?

If No, Why?

Qn.3. Does your organization set quality targets?

If Yes, what are the targets? Are the goals adhered to?

If No, Why?

Qn.4. Is setting quality targets important for quality planning in your organization?

If Yes, why is it important?

If No, Why?

Qn.5. Does your organization set quality standards?

If Yes, why is it important?

If No, Why?

Qn.6. Does your organization set quality specifications?

If Yes, why is it important?

If No, Why?

Qn.7. Does your organization put in place quality procedures?

If Yes, why is it important?

If No, Why?

Qn.8. Is putting in place quality procedures important for quality planning in your organization?

If Yes, why is it important?

If No, Why?

SECTION B: Factors affecting effective Quality control

Qn.9. Does your organization evaluate quality performance?

If Yes, why is it important?

If No, Why?

Qn.10. Is performing evaluation important for quality control in your organization?

If Yes, why is it important?

If No, Why?

Qn11. Does your organization compare performance to project goals?

If Yes, why is it important?

If No, Why?

Qn.12. Is performance evaluation important for quality control in your organization?

If Yes, why is it important?

If No, Why?

Qn. 13. Does your organization compare receive beneficiary feedback on performance?

If Yes, how? and why?

If No, Why?

Qn. 14. Does your organization eliminate causes of unsatisfactory performance?

If Yes, why is it important?

If No, Why?

SECTION C: Factors affecting effective Quality assurance

Qn. 15. Does your organization eliminate causes of unsatisfactory performance?

If Yes, why is it important?

If No, Why?

Qn. 16. Is utilizing elements in a quality plan important for quality assurance?

If Yes, why is it important?

If No, Why?

Qn.17. Does your organization test products for conformance to set standards?

If Yes, why is it important?

If No, Why?

SECTION D: Factors affecting quality management

Qn.18. Is planning for quality important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn.19. Is quality control important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn.20. Is leadership important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn.21. Is top management important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn.22. Is continuous improvement important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn.23. Is beneficiary feedback on products important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn.24. Is employee training important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn. 25. Is employee involvement important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn. 26. Is beneficiary important for quality management in your organization?

If Yes, why is it important?

If No, Why?

Qn. 27. Is employee involvement important for quality management in your organization?

If Yes, why is it important?

If No, Why?

END OF INTERVIEW

Appendix III: Documentary Review Checklist

The purpose of the documentation review checklist is to find out whether Moroto-Nakapiripirit road project has documented and implemented quality management process and monitors the process with a view to assure quality of the products and services. Below is a list of documents that were reviewed including:

1) Moroto-Nakapiripirit Road Project Staff List (2013)
2) Road Construction Guidelines (2011)
3) Moroto District Development Plan (2013-2018)
4) Nakapiripirit District Development Plan (2012-2017)

Appendix IV: Observation Checklist

The researcher used observation guide to collect primary data from observations in the field. Both participant and non-participant observations was used for the study and in both cases structured and non-structured observations were studied.

SN	Observation guide	Comment	
		Available/Done	Not Available/Not done
1	Quality plan		
2	Quality goals		
3	Quality objectives		
4	Quality manuals		
5	Product standards		
6	Work specifications		
7	Programme for redoing work		
8	Compaction of processed work		
9	Survey level checks carried out		
10	Equipment used approved		
11	Programme of works approved		
12	Employee training program		
13	Employee training records		

Appendix V: Krejcie & Morgan Mathematical Table (1970)

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384