

LIFE CYCLE COSTING ADOPTION AND APPLICATION AND THE EFFECTIVENESS OF PROCUREMENT IN PUBLIC ENTITIES

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DECLARATION

I, Godwin Nomwesigwa hereby declare that the above-mentioned research report is my own original work and has not been submitted for examination elsewhere

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Date: 13th May 2026

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APPROVAL

This is to certify that this dissertation on the topic “Life Cycle Costing Adoption and Application and the Effectiveness of Procurement in Public Procurement” by Nomwesigwa Godwin M23B12/046 was conducted under my supervision and guidance and is now ready for submission to the School of Business for Examination in partial fulfillment of the requirements for the award of a Degree in Procurement and Logistics Management.

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MR. DUNCAN TUMUHAMYE

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ABSTRACT

This study examined the influence of Life Cycle Costing (LCC) adoption and application on procurement effectiveness in public sector entities in Uganda, with specific reference to Mukono District Headquarters. The study was guided by three objectives: to assess the level of LCC adoption, to examine its influence on procurement effectiveness, and to identify challenges affecting its implementation.

A descriptive cross-sectional research design was employed, using a quantitative approach. Data were collected from 23 procurement and finance professionals through structured questionnaires and analyzed using descriptive statistics, correlation, and regression analysis with the aid of SPSS.

The findings revealed that Life Cycle Costing is partially adopted within public procurement processes, with greater emphasis placed on acquisition and operational costs, while maintenance and disposal costs receive comparatively less attention. A correlation analysis found a positive association between all LCC aspects and procurement effectiveness. Regression analysis revealed that acquisition cost was the strongest factor associated with the procurement process ($B = 0.431$), followed by disposal cost ($B = 0.112$). Operation cost had a moderate effect while maintenance cost was negatively associated ($B = -0.055$), showing deficiencies in maintenance management.

Further findings reveal that implementation of LCC is crucial for enhancing cost efficiency, quality, and value for money, but its effects on procurement timeliness are minimal. Major barriers to adopting LCC include lack of adequate technical expertise, absence of accurate data, poor training, low-value procurement policy, and change resistance.

The study concludes that while LCC has the potential to enhance procurement effectiveness, its application in public entities remains fragmented and inconsistent. It recommends strengthening institutional capacity, integrating LCC into procurement frameworks, enhancing data systems, and enforcing policy guidelines to support comprehensive lifecycle-based decision-making

CHAPTER ONE

1.0 Introduction

1.1 Back ground of the study

Public procurement plays a vital and major role to ensure that government and public institutions acquire goods, works and services to support service delivery and growth. In Uganda, procurement accounts for more than 60% of total public expenditure, making it a key driver of efficiency, accountability and value for money (National Public Sector Procurement Policy, 2019). Given the magnitude of public expenditure devoted to procurement, inefficiencies in procurement decisions can have significant financial, operational and service delivery implications for public entities.

However, traditional procurement approaches or even e-procurement have often focused on the lowest initial purchase price rather than the long-term cost implications [expenses associated with ownership, operation, maintenance and disposal of the product and the service] leading to inefficiencies, high maintenance costs, and premature asset failures (Public Procurement Integrity Survey Report, 2023). In most cases, this kind of procurement method often leads to increased total costs of ownership, failure of assets at an earlier time than expected, and poor value for money. There is, therefore, a need for more comprehensive procurement evaluation methods that would facilitate decision-making, ensure cost-effectiveness, and promote sustainability in the public sector. LCC, which refers to the analysis of the total costs of ownership of goods, works, and services over the whole period during which they will be useful, has become an important procurement method in such a case.

However, the life cycle costing (LCC) theory has become an essential tool in overcoming this weakness by evaluating the whole life cost of a product or service. LCC involves looking at the total cost of ownership that includes costs incurred when acquiring, using, maintaining, and disposing of the asset, thus enhancing sustainability and value (Life Cycle Costing in Sustainable Public Procurement: A Question of Value, 2016). Therefore, incorporating LCC principles is recommended in developed and developing nations for improving the effectiveness of procurement operations (Guidance Note: Sustainable Public Procurement, 2020).

Uganda's public sector organizations like the PPDA and the Ministry of Finance have highlighted the importance of LCC in the country's procurement process and training activities (MAPS Assessment Uganda Main Report, 2021). However, despite these initiatives, there has been no practical use of LCC principles because of various reasons, including lack of technical skills, information scarcity, and resistance to change.

In respect to procurement in public sector, the use of LCC is more relevant especially because of budget restrictions, need for accountability, as well as effective use of public funds. Through the consideration of long-run costs in procurement decision making, LCC assists in promoting strategic procurement among public bodies by shifting focus from low-costing approach to sustainability and efficiency. Nevertheless, despite the advantages associated with LCC, the adoption and use of LCC has not been easy for most public organizations especially developing countries. Issues of insufficient technical capability, absence of sound cost information, weak institutional framework and continued dependence on lowest-price evaluation have hampered the process of LCC adoption. The research gap, therefore, lies in examining empirically the impact of adoption and application of LCC on procurement in public bodies in relation to developing nations especially the Ugandan public sector.

1.2 Problem statement

Although there has been widespread acknowledgment of the importance of Life Cycle Costing as a procurement tool around the world, LCC, which considers the total cost of ownership, such as acquisition cost, operation cost, maintenance cost, and disposal cost, offers a more effective procurement process compared to the conventional procurement practices where only acquisition cost is considered. Despite the wide importance of LCC, procurement activities in many public institutions in Uganda are characterized by short-term cost considerations which have seen public institutions spending more money in the long run while losing value for money. The implementation of LCC in Ugandan public institutions is yet to be well recognized and fully embraced. The procurement and disposal of entities (PDEs) are still focused more on obtaining a bid that has the lowest price but without considering the total cost of ownership during the entire lifecycle of an asset. This has made many public projects suffer from the

high cost of operations and maintenance and budgetary overruns since the life-cycle costing aspect has not been adequately addressed (Public Procurement Integrity Survey Report, 2023)

While there have been some changes made to the Ugandan government's policies that allow for Life Cycle Costing, these changes have not necessarily been implemented consistently across public entities. According to the researchers, such inconsistency can be explained by a lack of knowledge regarding the concepts behind Life Cycle Costing, the absence of accurate cost data, and limited technical expertise on the part of procurement specialists (Sustainability integration and procurement planning in Uganda, 2022).

As a result, the efficiency, speed, output quality, and sustainability of public procurement remain compromised (MAPS Assessment Uganda Main Report, 2021). This suggests the need for conducting research focused on understanding the impact of Life Cycle Costing adoption and application on procurement outcomes.

1.3 Purpose of the study

The purpose of the study is to establish the association that exists between the use and implementation of LCC and procurement effectiveness in public institutions in Uganda.

1.4 Objectives of the study

Objectives of the Study:

This study shall be based on the following objectives:

- i). To evaluate the extent of the use of Life Cycle Costing by public procurement agencies in Uganda.
- ii). To explore how the use of Life Cycle Costing affects procurement efficiency among public agencies.
- iii). To highlight issues that affect the use of Life Cycle Costing among public organizations in Uganda.

1.5 Research questions

The study will seek to answer the following research questions:

1. What is the level of adoption of Life Cycle Costing in Uganda's public entities (Mukono District Headquarters)?
2. How does the application of Life Cycle Costing influence procurement effectiveness in public entities?
3. What challenges hinder the adoption and application of Life Cycle Costing in Public procurement?

1.6 Scope of the study

The study will focus on Mukono District Headquarters, a public sector entity regulated by the Public Procurement and Disposal of Public Assets Authority (PPDA), which will serve as the case study. In terms of the content scope, the study will focus on the adoption and application of Life Cycle Costing in public procurement processes and examine its relationship with procurement effectiveness, particularly in relation to cost efficiency, quality, timeliness and sustainability of procurement outcomes.

Geographically, the study will be limited to Mukono city in Central Uganda, allowing for an in-depth examination of procurement practices within the selected public entity. With regard to time scope, the study will concentrate on the period between mid-October and March 2025, during which data will be collected and analyzed to assess the current application of life cycle costing and its influence on procurement effectiveness.

1.7 Significance of the study

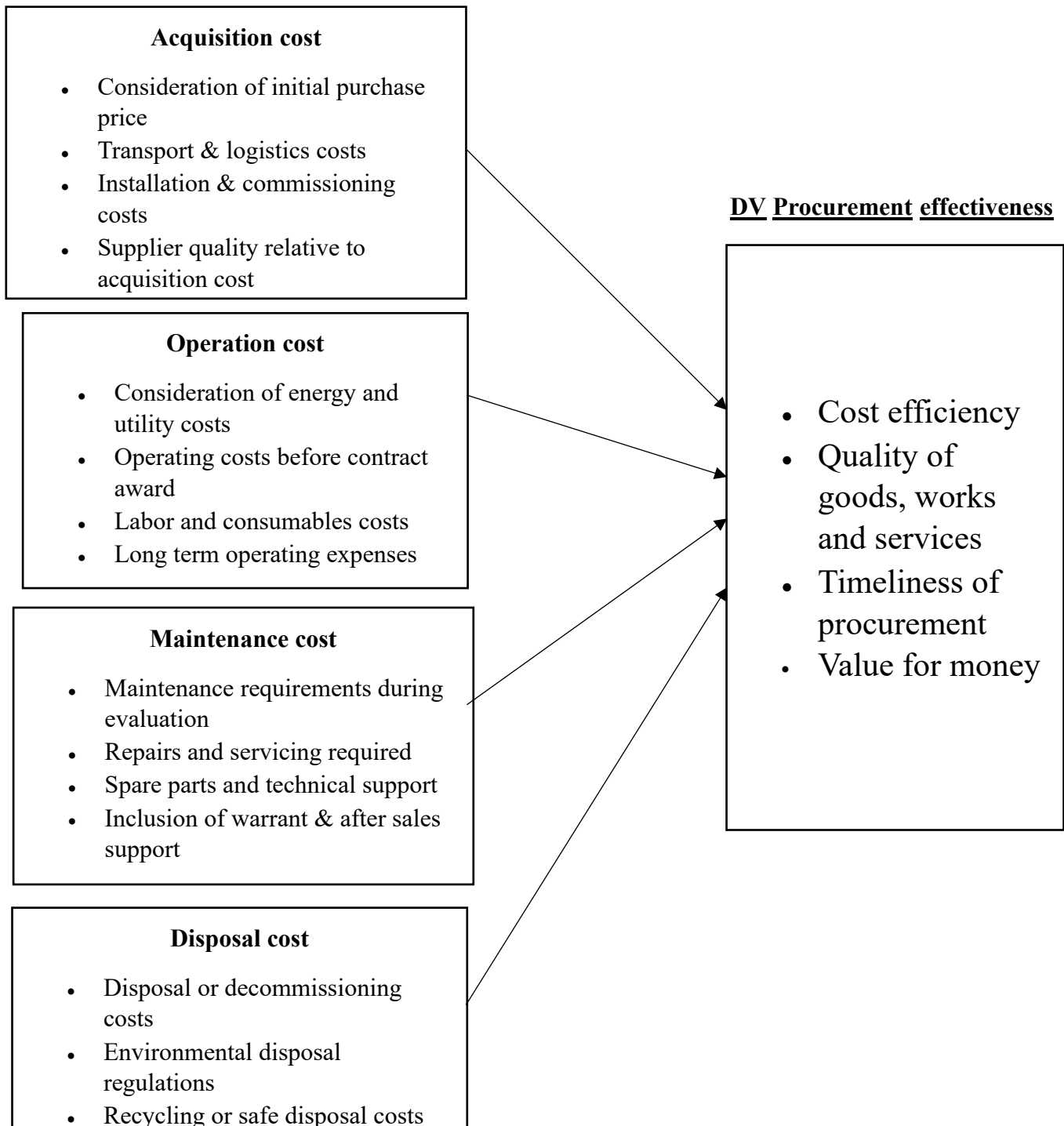
The study will contribute to both policy and practice by providing empirical evidence on how the adoption and application of Life Cycle Costing influence procurement effectiveness within Uganda's public entities. The results will guide policymakers and other regulatory authorities like the Public Procurement and Disposal of public Assets Authority (PPDA) and Ministry of Finance, Planning and Economic Development to formulate sound procurement policies that are cost-effective and sustainable in the long run.

The research findings will be beneficial to procurement practitioners and public sector administrators in gaining insight into how life cycle costing is integrated in procurement planning and evaluation to make better decisions, lower the cost of operations and maintenance in the long run, and ensure sustainable outcomes of public procurement. The results will help them to understand how the process of including life cycle costing principles in procurement activities can be achieved successfully (Sustainable Public Procurement Implementation Guidelines, 2021).

From an academic perspective, the research will contribute to the already existing literature on sustainable public procurement. Specifically, it will fill the gap in empirical knowledge concerning life cycle costing in developing countries such as Uganda. It will become a source of information for other scholars who will conduct their studies in this field in the future.

1.8 Conceptual framework

I.V Lifecycle costing (LCC) Adoption and application.



Adapted and modified from ISO 15686-5:2017 *Life-Cycle Costing* and OECD (2015) *Public Procurement Guidelines*

CHAPTER TWO:

LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant scholarly and policy literature related to Life Cycle Costing (LCC) and its influence on procurement effectiveness in public sector entities. The review draws on theoretical perspectives, empirical studies and policy frameworks to establish a comprehensive understanding of the concept of Life Cycle Costing, its principles and its application in public procurement. Particularly attention is given to how LCC contributes to procurement effectiveness indicators such as cost efficiency, value for money, quality of procured outputs, timeliness and sustainability.

The chapter further examines existing studies on public procurement practices in both developed and developing countries, with specific emphasis on the public sector context in Africa and Uganda. By synthesizing findings from prior empirical studies, the chapter highlights the benefits of adopting Life Cycle Costing as well as the challenge that constrain its effective implementation within public entities. This review provides the theoretical and empirical foundation for the study and helps to identify gaps in existing literature, thereby justifying the need for the current research on how the adoption and application of Life Cycle Costing influence procurement effectiveness in Uganda's public entities.

2.1 Theoretical Review

2.1.1 Systems Theory (General System Theory: Foundations, Development, Applications, 1950; General System Theory: Foundations, Development, Applications, 1950)

Systems theory views organizations as complex and interrelated systems in which various components function together to achieve common objectives. According to (General System Theory: Foundations, Development, Applications, 1950), a system is composed of interdependent elements where a change in one component inevitably affects the performance of the entire system. As part of the procurement process in the public sector, procurement processes are not independent but are interlinked with

the processes of budgeting, planning, supplier management, contract management, and service delivery.

The use of systems theory in Life Cycle Costing (LCC) places emphasis on the importance of looking at procurement decisions from a holistic perspective, and not only concentrating on the cost involved in purchasing goods and services. Procurement decisions taken during the procurement phase like choosing suppliers, designing specifications, and contract terms influence the maintenance and operational cost of products or services over time. Thus, using LCC in the systems approach will enable public organizations to examine the total effect of procurement decisions over the life of assets.

2.1.2 Value for Money (VfM)

The Value for Money (VfM) principle focuses on the efficient use of government resources by seeking the best possible compromise among cost, quality and performance through the full life span of a product or service. The OECD (Public Procurement Guidelines, 2015) notes that according to the Value for Money principle, it is not enough to buy goods or services at a low price, but it is also necessary to get a high economic and social return on government spending.

The Life Cycle Costing method is directly linked to the principles of VfM because procurement agencies have the possibility to analyze the total cost of ownership rather than simply considering the initial price of products or services. Thanks to LCC, it is possible to consider all costs associated with acquisition, utilization, maintenance and disposal. This aspect is particularly relevant when dealing with public sector procurement where the VfM principle will ensure that government resources are efficiently used.

2.1.3 Principal-Agent Theory (Theory of the Firm, 1976)

The principal-Agent Theory, developed by Jensen and Meckling (1976) in the Theory of the Firm, (1976), provides an explanation of the nature of the relationships existing between principals, such as government institutions or tax payers, and their agents, namely procurement officers and other public managers who make decisions on behalf of the principals. Specifically, the theory focuses on the difficulties associated with

divergence between the interest of the principal and the agent, which occur in case of information asymmetry and conflicting incentives of both parties and the absence of appropriate monitoring.

In terms of dealing with agency issues, the Life Cycle Costing (LCC) is crucial in terms of enhancing transparency and decreasing information asymmetry in the process of making procurement decisions. First, procurement officials should take into account the full costs of procurement decisions, which include operating, maintenance and disposal costs besides acquisition costs. As a result, the possibility of procuring short-sighted, convenient, but potentially costly solutions based exclusively on lower purchase prices is minimized.

Additionally, the implementation of LCC will contribute to improved monitoring and control processes through public procurement procedures by offering quantitative measures and comparisons of costs that can be easily quantified over the entire asset's lifespan. Hence, Principal Agent Theory is a well-suited theoretical framework that can be employed in explaining how Life Cycle Costing can be effectively used within public procurement practices.

2.2 Conceptual Review

2.2.1 Life Cycle Costing (LCC)

Life Cycle Costing (LCC) refers to a methodological process of determining the total cost involved in owning an asset over its entire lifespan. ISO 15686-5: Life-Cycle Costing, 2017 defines LCC as the sum of all costs involved in planning, designing, acquiring, operating, maintaining, replacing, and disposing of an asset. Contrary to conventional procurement methods that focus on the cheapest initial price, LCC considers all financial aspects that provide a holistic evaluation and decision-making framework.

With regard to public procurement, Life Cycle Costing is crucial in improving the efficiency of costs and optimizing value for money. Public organizations are mandated to manage assets for prolonged periods, requiring considerations of repetitive expenses such as energy use, maintenance, repairs, and asset disposal. LCC is thus instrumental in identifying procurement alternatives that reduce the overall cost over the lifetime

of the asset compared to short-term saving options that ultimately incur greater expenses in the future.

Moreover, the implementation of LCC facilitates procurement planning through enhanced budgeting, resource allocation, and asset management. Also, the process of decision-making becomes more transparent and accountable since decisions made through the process will be supported by cost information. In a public sector setting, where accountability for public monies takes precedence, LCC provides the much-needed instrument that fosters efficiency in resource utilization and sustainable procurement practices. Therefore, LCC has a substantial role to play in enhancing the success of procurement practices.

2.3 Dimensions of Variables

In this segment, the core variables for the study are stated along with the explanation of their dimensions, as they will have an impact on achieving the goals of the research. For instance, the independent variable will be LCC and the dependent variable is Procurement effectiveness.

2.3.1 Independent Variable: Life Cycle Costing (LCC)

Life Cycle Costing is defined as the technique of analyzing the overall cost of buying, operating, maintaining, and discarding a product throughout its entire lifespan. Within the context of public procurement, LCC allows managers to shift their attention away from purely price-related factors in the short term toward long-term cost efficiency. The key aspects of LCC taken into consideration in this study are: acquisition cost, operation cost, maintenance cost, and disposal cost.

a) Acquisition cost (Total Cost of Ownership Model, 1995)

Acquisition costs are defined as the total cost associated with acquiring goods, products, or services, such as the cost of acquisition, cost of acquisition process, transportation cost, installation cost, and cost of commissioning. As indicated by (Total Cost of Ownership Model, 1995), acquisition cost constitutes a significant part of life cycle cost and usually impacts procurement decisions because of budgetary limitations and approval processes. Nevertheless, focusing solely on lowering the acquisition cost can

result in the choice of inferior alternatives that incur greater costs at later life cycle stages. In government procurement, proper assessment of acquisition costs guarantees sound purchasing decisions.

b) Operation cost (Life Cycle Costing in Construction, 2004)

The operation cost includes all costs incurred while using the asset, such as energy consumption, labor cost, and other operational costs. (Life Cycle Costing in Construction, 2004). Highlights that the operational costs play an important role in making up the total cost of ownership especially of capital-intensive assets owned by public bodies. Poor handling of the operational cost may lead to financial difficulties for the public bodies. The integration of the operational cost into the procurement process makes the cost prediction more manageable.

c) Maintenance cost (Product Life Cycle Cost Analysis, 1998)

Definition of maintenance costs includes expenditures involved in servicing, fixing, and maintaining equipment in order to keep their proper function and operation. As per Product Life Cycle Cost Analysis (1998), maintenance costs play a crucial role in influencing the economic performance of the equipment throughout its entire lifecycle. In the case of procurement of the public sector, improper planning for maintenance causes breakdowns, interruption of services, and early replacement of the equipment. Considering maintenance costs within LCC helps choose maintenance-cost-efficient alternatives.

d) Disposal cost (Life Cycle Costing: A Review, 2008)

Disposal cost is a term that refers to costs incurred with regard to the decommissioning, dismantling, recycling, or environmentally sound disposal of an asset towards the end of its economic life. Korpi and Ala-Risku, in "Life Cycle Costing: A Review" (2008), point out that disposal costs tend to be ignored during procurement process planning although they may hold substantial financial and environmental ramifications. As such, accounting for them during the public procurement process will help to practice sustainable actions as required by regulations.

2.3.2 Dependent Variable: Procurement Effectiveness

Procurement effectiveness refers to the extent to which procurement activities achieve desired or intended objectives in terms of efficiency, effectiveness, and value creation within an organization. In the context of public sector procurement (Public Procurement Guidelines, 2021), effectiveness is commonly assessed through dimensions such as cost efficiency, quality, timeliness, and value for money.

I. Cost efficiency (Public Procurement Reforms: Issues and Trends, 2001)

Cost efficiency is defined as the procurement system's capability of cutting down on cost in order to maintain the required levels of quality and performance standards. As per (Public Procurement Reforms: Issues and Trends, 2001), efficient procurement systems should be capable of optimizing the use of the taxpayer's money through minimizing any extra costs incurred. LCC helps enhance cost efficiency since it allows for identifying areas of cost savings throughout the lifecycle of the procurements.

II. Quality (Public Procurement Guidelines, 2021)

Quality within the procurement process refers to the extent of compliance with certain criteria for performance and requirements. According to the Public Procurement and Disposal of Public

Assets Authority, (Public Procurement Guidelines, 2021), quality control in the public domain is necessary for guaranteeing reliability and consumer satisfaction. Incorporating LCC into procurement will enable organizations to focus on quality and performance instead of cutting costs.

III. Timeliness (Procurement Planning and Local Governance, 2008)

Timeliness is defined by how quickly procurement operations are accomplished in the planned schedule. (Procurement Planning and Local Governance, 2008). Delays in procurement may have negative effects on the provision of services and projects in the public sector. The efficient use of LCC helps in good planning and scheduling since the future needs for operations and maintenance will be known.

IV. Value for Money (Public Procurement Frameworks, 2016)

Value for Money (VfM) refers to the best balance between cost, quality, and performance throughout the lifetime of the acquired resource. The World Bank (Public Procurement Frameworks, 2016) highlights that value for money is not only about obtaining the lowest cost but rather the maximum benefit and sustainability. By utilizing the principles of LCC, organizations involved in procurement can improve VfM because they will distribute resources to those alternatives that provide the most substantial gain to society.

2.4 Empirical Literature Review

2.4.1 Global Studies

Several case studies undertaken around the world indicate how increasingly LCC is becoming an essential tool to enhance the effectiveness of the procurement process. Research conducted in advanced countries proves that implementation of LCC results in better decision making and improves overall cost management along with increased efficiency in long-term asset management.

The European Commission (Public Procurement for a Better Environment, 2017) claims that implementation of LCC in public procurement processes has resulted in significant long-term savings amounting to between 15 and 30 percent in such areas as infrastructure, energy, and construction. In other words, implementation of LCC allows one to choose economically sustainable approaches to asset management and procurement rather than trying to find solutions with the lowest initial cost.

Similarly, the United States Department of Defense (DOD) (Life-Cycle Costing Guide, 2014) has extensively implemented the technique of Life Cycle Costing in defense procurements to deal with the challenges of the high costs incurred in developing military equipment. The U.S. Department of Defense (Life-Cycle Costing Guide, 2014) states that the implementation of LCC makes it possible for stakeholders to examine the potential cost impacts during the planning and acquisition stage in order to reduce the lifecycle cost and improve budgeting predictability. Moreover, the introduction of LCC in defense procurements has made decision-making processes more accountable by offering an opportunity for assessing different alternatives over their entire lifespan.

Moreover, other empirical evidence collected from advanced countries reveals that the implementation of the technique results in enhanced procurement planning, reduction in risks, and higher congruence between decisions and strategic goals.

2.4.2 African Studies

Numerous empirical investigations conducted in various African nations confirm increased understanding of the significance of LCC for enhancing the efficiency and sustainability of procurement processes. However, adoption and implementation differ greatly from country to country as a result of the aforementioned institutional, technical, and capacity-related difficulties.

In particular, concerning the use of LCC in public sector procurement processes in South Africa,

Ambe and Badenhorst-Weiss (Supply Chain Management Challenges in the South African Public Sector, 2012) have analyzed the role of LCC and found out that its implementation is an effective tool for achieving sustainable procurement results. According to the findings, adoption of LCC facilitates cost efficiency, environmental sustainability, and asset management. Nevertheless, the scholars underline the lack of technical capability in terms of implementing LCC.

In the same vein, research carried out in East Africa also reveals ongoing difficulties in implementing LCC models. For instance, in Kenya, Nderu (Life Cycle Costing Adoption in Kenyan Public Procurement, 2019) found that even though procurement reforms advocate for value for money, the use of LCC has been hampered by the lack of technical expertise, absence of credible cost data, and low awareness on the part of procurement professionals. According to the author, without any concerted efforts at capacity building, public organizations will not be able to implement LCC principles during their procurement processes.

In Tanzania, Nyamukura (Challenges of Life Cycle Costing in Tanzania, 2020) also found that there was no established model for LCC practice and that there were no available lifecycle cost data which could have facilitated its implementation. The study also revealed that procurement practices in many public organizations were still based on selecting suppliers offering products and services at the lowest prices irrespective of

their economic viability. This shows that even though LCC might be embedded in procurement policies, its practice continues to pose numerous challenges to its effective implementation.

2.4.3 Ugandan Studies

In the Ugandan environment, some studies have pointed out various difficulties encountered in adopting the Life Cycle Costing concept during public procurement processes. For instance, Basheka and Bisangabasaija in their study entitled 'Public Procurement Reforms in Uganda' revealed that most public procuring and disposing agencies tend to use the lowest price method of evaluation in most cases without putting into consideration the value-for-money issue. The findings of their study suggest that procurement activities in most cases are done just for purposes of meeting legal requirements and not for maximizing value.

On the other hand, there is some evidence from the Public Procurement and Disposal of Public Assets Authority (PPDA) which suggests that while procurement regulations at the national level recommend the analysis of life cycle cost and value for money issues, it does not always happen due to the lack of technical expertise, analytical tools, and reliable cost data for carrying out life cycle cost analyses.

Moreover, research on the performance of the public sector in Uganda reveals that constraints in institutions, lack of professional skills, and stiff procurement processes are some of the factors that cause dependency on conventional cost evaluation approaches. As such, application of the concept of life cycle cost has been hindered by these limitations. Therefore, in Uganda, there is a good reason to consider how the implementation of Life Cycle Costing will affect procurement efficiency.

2.5 Research Gaps

Although a wealth of information is available on Life Cycle Costing (LCC) and public procurement, many research gaps exist in the literature, especially concerning developing countries like Uganda. First, although previous international studies indicate the advantages associated with LCC in making procurement more efficient and creating better value for money, there is a lack of empirical literature on LCC practices in

Ugandan government organizations. Lack of locally applicable knowledge limits the capacity of policy makers and other stakeholders to make local conclusions.

Second, one of the critical issues that need to be addressed is the lack of an established national guideline that can help integrate LCC into the procurement process in Uganda. Although the procurement policies of Uganda give importance to value for money, they lack detailed guidelines on how to integrate LCC into procurement procedures.

Thirdly, previous studies demonstrate an inadequate empirical connection between the use of LCC and the attainment of procurement effectiveness, especially in terms of cost-effectiveness, quality, timeliness, and value for money. The majority of past researches tend to concentrate more on theoretical perspectives or descriptive evaluations rather than providing empirical analysis that shows the direct impact of LCC on procurement effectiveness indicators. Therefore, further empirical studies are required to prove the connection between the adoption of LCC and procurement effectiveness measures in the Ugandan context.

It is important to conduct empirical studies that will address these gaps.

2.6 Conceptual Framework

The conceptual framework of this research is anchored on the premise that the implementation and effective utilization of the Life Cycle Costing (LCC) method greatly affect procurement efficiency within the context of public sector institutions. Within the conceptual framework, the Life Cycle Costing model is regarded as the independent variable, while procurement efficiency is considered the dependent variable.

The independent variable, the Life Cycle Costing model, is measured using the following four components: acquisition cost, operation cost, maintenance cost, and disposal cost. The above components encompass all the expenses that are incurred throughout the entire life cycle of the purchased product.

The dependent variable in the research question - procurement effectiveness - is operationalized through several indicators including cost effectiveness, the quality of goods and services procured, efficiency in the procurement process, and value for money. This framework postulates that effective consideration of the Life Cycle Costing

dimension will result in improved decision making during the procurement process, improved use of the public sector resources, and improved service delivery performance.

The conceptual framework presented above recognizes that there might be other variables that mediate the influence of LCC on procurement effectiveness performance. However, these variables will not form part of the research analysis since this study focuses on assessing the influence of LCC dimensions on procurement effectiveness performance.

CHAPTER THREE:

RESEARCH METHODOLOGY

3.0 Introduction

This chapter covers the research methodology used to explore the effect of Life Cycle Costing on procurement efficiency in public institutions. It elaborates the detailed processes followed to collect, analyze and interpret data as a means of achieving the goals of the study and answering the research questions raised. In particular, the chapter discusses the research design used, population and sampling methods used in the study, tools and methods used to collect data, and the data analysis techniques, among other aspects of the methodology used in conducting the research.

The research methodology adopted in this research ensured the rigour, objectivity, and consistency of the investigation into the relationship between Life Cycle Costing processes and procurement efficiency indicators like cost-efficiency, quality, timely procurement and value for money. Through the application of effective methodologies and data analysis techniques, the study aimed at producing sound findings capable of informing evidence-based procurement practices. Besides, the methodological approach enabled replication of the study and enhanced its validity in both academic and professional procurement practice.

3.1 Research Design

The study used a descriptive cross-sectional approach in analyzing the impact of Life Cycle Costing (LCC) on procurement effectiveness in public organizations. This methodological approach is appropriate for the analysis of data from a particular population in a specified point of time hence facilitating the description of existing procurement processes and evaluation of relationships among variables without altering the organizational environment.

The descriptive cross-sectional approach was especially fitting for the analysis in this study due to the fact that the study required an assessment of actual practices and perceptions of procurement and finance professionals concerning LCC and its impacts

on procurement effectiveness in the organization. It would have been difficult and ethically incorrect to carry out an experiment on procurement systems that already existed in the public organizations under study.

Quantitative research was mainly used as a research method so as to enable the objective measurement of the connection that exists between life cycle costing factors like the costs of acquisition, operations, maintenance, and disposal on the effectiveness criteria in purchasing management that include costs, quality, time and value for money. Quantitative research enabled generation of generalizable results hence making the application of inferential statistics like correlation and regression analysis possible in finding out the strength of connections between variables.

3.2 Study Population

The study subjects were those in charge of procurement and finance functions at the Mukono District Headquarters. These included procurement officers, contract administrators, accountants, finance officers, and others who had a direct hand in the process of procurement planning, assessment, contract administration, and property management. The categories of employees were significant in the process of making procurement decisions and the implementation of Life Cycle Costing concepts in the public service sector.

The chosen subjects were suitable for the study in that they had the requisite skills, expertise, and knowledge in procurement procedures, techniques, and approaches. They were involved in the key procurement process phases, thus enabling them to provide valid information on the implementation of Life Cycle Costing in procurement and its impact on the effectiveness results.

In addition, targeting procurement and finance managers ensured that the findings were credible since they emanated from people who have a role in managing the overall procurement process. As such, the data was more accurate because it was gathered from people who had an active role in the procurement process. Therefore, the sample population was an appropriate basis for evaluating the impact of Life Cycle Costing in enhancing procurement performance in Mukono Municipality.

3.3 Sample Size and Sampling Technique

The sample used in this research has been collected through the process of stratified random sampling from the target population to ensure proper and appropriate representation of various departments and professional categories playing an important role in the procurement processes of public sector organizations. The stratification criteria have been set as per the position of individuals in various departments related to procurement processes like procurement officers, finance and account officers, contract managers, project managers, and other professionals working on procurement processes.

Simple random sampling is applied within each stratum to ensure that all members of the population have an equal probability of being selected. It helps in ensuring that the results are generalizable and unbiased in nature. The application of stratified random sampling is most appropriate in this case since the decision-making process in procurement entails the participation of different people having different roles in shaping procurement processes.

The sample size was arrived at through the use of the standard formula of determining the sample size in social science research. In particular, the formula for finite population developed by Taro Yamane (1967) was adopted. The formula is well-known in sampling studies since it enables the determination of the required sample size from a known population of interest and a predetermined margin of error. As a result, the reliability of the sample could be ensured. The sample size adopted in the study was adequate for quantitative analysis involving correlation and regression analyses that would reveal the existence of any relationship between the dimensions of Life Cycle Costing and procurement effectiveness indicators. It also enabled a good compromise between accuracy and practical limitations of time and resources.

Apart from stratified random sampling, purposive sampling technique was utilized wherever necessary to ensure inclusion of key informants who possessed expert knowledge about procurement policy and regulation as well as Life Cycle Costing principles. These key informants would offer insights into the procurement institution

of the organization under study and, hence, complement quantitative data from the sample.

3.4 Data Collection Methods

Both primary and secondary research techniques were applied in this study to gather adequate and accurate information concerning the adoption of LCC and its impact on procurement effectiveness in public sector organizations. The employment of more than one data source contributed to the increase in depth of the analysis and helps to triangulate findings of this study.

Primary data was collected by the use of structured questionnaires given to carefully selected respondents who were members of the target population. The questionnaires were designed in such a way that they would capture data in numeric form concerning the extent of adoption of LCC, procurement activities and procurement effectiveness. These questionnaires were made up of closed ended questions and questions based on Likert scale, through which respondents expressed their level of agreement to certain statements regarding dimensions of LCC and indicators of procurement effectiveness.

Secondary sources were employed alongside the use of primary data to obtain secondary data. In this regard, pertinent documents including procurement policy, guidelines, audit and inspection reports, performance evaluation reports, and institutional documentation are analyzed to complement the primary data gathered. The use of documentary review helped in gaining an insight into the context of the procedures and processes followed regarding procurement as well as the regulations guiding procurement activities in the public sector. It also served as a means of corroborating and supplementing questionnaire responses by way of documented evidence.

This approach ensured that the study incorporates both perceptual and factual information.

3.5 Data Collection Instruments

The main data collection tool in the study consists of a questionnaire that focuses on collecting quantitative data concerning the objectives of the research. The questionnaire was structured by splitting it into parts that corresponded to the research variables to achieve an effective and objective way of gathering data. The parts

included sections on demographics of respondents, LCC elements (such as acquisition cost, operation cost, maintenance cost, and disposal cost), and procurement effectiveness elements like cost efficiency, quality, timeliness, and value for money.

In designing the questionnaire, close-ended questions and Likert-scale items were used to make sure that respondents provided objective answers that can be subjected to statistical analysis. Through the Likert scales, the respondents could give their views and opinions about specific questions by indicating the level to which they agreed or disagreed with statements regarding LCC and procurement effectiveness.

This was done through the use of clear and concise wording in the instrument as well as logical questioning. Respondent fatigue was addressed through making the instrument brief and relevant, which was achieved by keeping the instrument in line with the conceptual framework of the research. The final instrument is presented in the appendix to this dissertation.

3.6 Validity and Reliability of Research Instruments

In order to validate the instruments used for data collection, the questionnaire was validated through content analysis by subject matter experts and university supervisors knowledgeable in the areas of procurement management and research methodology. Content analysis involved evaluating the relevance, clarity, and consistency of items with respect to the objectives of the study. Validity in terms of content was attained when the questionnaire items addressed all components of life cycle costing and procurement management effectiveness according to the literature and theoretical framework.

Construct validity was achieved through the formulation of questions based on the theories and empirical works surrounding life cycle costing and procurement in the public sector.

The reliability of the research tool was measured by means of a pilot study carried out on a limited sample population, which consisted of people working in public sector organizations, similar to the ones in the actual research. The data collected through the pilot study will be used for evaluating the internal consistency of the scales using

the Cronbach's Alpha method. The acceptable range for Cronbach's Alpha is above 0.70, which shows that the tool is reliable.

1.7 Data Analysis Techniques

Data collection involved use of statistical packages, such as the IBM Statistical Package for Social Sciences (SPSS), for analyzing collected data. The use of SPSS assisted in enhancing efficiency in coding, entry, manipulation, and analysis of collected data. Before data analysis, data was screened for consistency, validity, and accuracy through checking for any missing value and outlying values.

The descriptive statistic approach was applied in summarizing collected information from respondents in terms of their demographics and variables of interest. Descriptive statistics included use of percentages and frequencies to describe categorical variables, as well as use of mean and standard deviation in describing numerical variables measured on a five-point Likert scale. This was done for the purposes of identifying prevailing Life Cycle Costing practices and procurement effectiveness within the public sector organizations.

In order to analyze the relations between the variables under investigation, methods of inferential statistics were applied. Specifically, correlation analysis was performed to determine the degree and direction of the association between the factors involved in Life Cycle Costing and procurement performance. Moreover, regression analysis was applied in order to evaluate the predictive ability of Life Cycle Costing concerning procurement performance outcomes. As a result, the study could determine whether variations in procurement performance can be statistically predicted on the basis of the usage of Life Cycle Costing.

Findings were provided by means of tables, graphs, and charts. Furthermore, the results were analyzed in terms of the objectives of the study and research questions as well as reviewed in light of relevant literature.

1.8 Ethical Considerations

There has been strict adherence to ethics throughout the process to ensure the protection of respondents' rights and integrity of the research. Participation in the

research was voluntary, with respondents fully aware of the aim, objectives, and extent of the study before data collection.

Therefore, potential respondents had enough knowledge to decide whether to participate or not.

Informed consent has been sought from all the respondents before administering the questionnaire. Respondents were reassured that they have the right to withdraw from the study at any point without repercussions. To maintain confidentiality and anonymity of the data collected, there were no details of the identity of respondents such as name, employee identification number, or institutional affiliation on the questionnaire. Data gathered will be handled with strict confidentiality and only accessible to the researcher and academic supervisors.

Data gathered is for academic use only and not accessed by unauthorized parties. Information is stored safely, and findings will be reported in aggregated forms to protect identities of respondents. Moreover, the study conforms to ethical standards and research protocol set by the relevant academic institution.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

The data obtained from the respondents on the use and application of LCC in public procurement in the headquarters of Mukono District are presented, analyzed, and interpreted in this chapter. The analysis is structured according to the study objectives, covering acquisition costs, operational costs, maintenance costs, disposal costs, procurement effectiveness, and challenges affecting LCC adoption.

4.1 Characteristics of respondents

4.1.1 Gender distribution of respondents

Table 4.1 Gender distribution of Respondents

Gender	Proportion of respondents	Percentange
Male	12	52.2
Female	11	47.8
Total	23	100

A total of 23 respondents participated in the study. The gender balance indicates that THE majority of the study was represented by male respondents who made 52.2% and female respondents making 47.8%. This represents an adequate response for analysis and provides a reliable basis for drawing conclusions regarding LCC practices in public entities.

4.1.2 Age distribution

Distribution by age will assist in knowing the diversity of the respondents in regard to age and level of experience. It is useful to have an idea of the age of the respondents as it will give an idea of how various age groups perceive and interact with the LCC and its tools and its adoptability in public procurement.

The table shows the age distribution of the respondents who took part in the research.

Table 4.2 Age Distribution of Respondents

Age group	Number of respondents	Percentage
Below 25	4	17.4
25-34	13	56.5
35-44	4	17.4
45 and above	2	8.7
Total	23	100

The results indicate that the highest percentage of respondents (56.5 %) were between 25-34 years old meaning that majority of the respondents were in their prime working age and were highly engaged with procurement processes and had knowledge on the use and adoption of LCC in public procurement, with the other portions being 17.4 % for below 25 years and 35- 44 years and 8.7 % for 45 and above years. This age combination gave a blend of young flexibility and experience with the old touch and experience and this helped in a balanced comprehension of the research topic.

4.1.3 Educational background

Educational background will insight the qualification levels of the respondents and will assist in knowing the level of their knowledge and capacity to participate in the use of LCC tools, its adoptability and effectiveness, and decision making concerning public procurement and the table below shows the educational background of the respondents who participated in the study. **Table 4.3 Educational Background of respondents**

Level of Education	Number of respondents	Percentage
Diploma	1	4.3
Bachelor's degree	14	60.9
Masters	6	26.1
PHD	2	8.7
Total	23	100

These findings indicate that most respondents (representing 60.9 %) had a Bachelor's degree and

26.1 % of them had a Masters qualification, 8.7 % had a PHD qualification, 4.3 % had a diploma qualification which means that most participants had formal training that would be applicable in public procurement at Mukono district headquarters. The availability of respondents who had diverse educational qualifications made the study richer since it involved both practical knowledge of operations and academic and technical knowledge that made the interpretation of findings in terms of enhancing the use of LCC in public procurement.

4.1.4 Job title/position

The job title/position also plays a significant role in the perception of the professional background of respondents as it shows their degree of engagement with public procurement and the use and adoption of LCC in public procurement and the table below shows the job title of the respondents at Mukono district headquarters who took part in the study.

Table 4.4 job title/ position

Job title/position	Number of Respondents	Percentage
Procurement officer	10	43.5
Finance officer	2	8.7
Contract manager	5	21.7
Project manager	3	13
Administration	3	13
Total	23	100

The findings above indicate that the most respondents were from the procurement department, most of which were procurement assistants, secretary, and both the senior officers covering a percentage of 43.5%. Respondents from the finance department were covering a percentage of 8.7%, contract managers were 21.7%, project managers

were 13% and the administrators were 13% totaling to the 100% of the 23 people engaged in the study.

4.1.5 Work experience

The work experience also plays a significant role in the perception of the professional background of respondents as it shows their degree of exposure to the adoption and application of LCC in public procurement. The table below demonstrates the distribution of work experience among the respondents who took part in the study.

Table 4.5 Work Experience

Years of work experience	Number of Respondents	Percentage
Less than 2 years	7	31.8
2-5 years	8	36.4
6-10 years	5	22.7
Above 10 years	2	9.1
Total	23	100

The results indicate that the respondents that had less than 2 years of experience were 31.8% whereas those with 2-5 years of work experience were 36.4%, the respondents that had 6-10 years of work experience were 22.7% and lastly those that were above 10 years of work experience were 9.1%. This distribution shows that there were many respondents who were moderately and substantially experienced in the field of public procurement and the relative mix of comparatively experienced and moderately experienced personnel was a source of valuable practical knowledge of how LCC has been used, the challenges and opportunities associated with the way to enhance the performance of public procurement through the use of LCC tools.

The demographic profile of the respondents gives a clear representation of the individuals involved in public procurement, and the gender distribution allows both men and women to participate in the study, hence giving the study an opportunity to capture a wide range of experience in various positions in the operations. The age group reveals that the majority of respondents belong to the category of young and middle-aged

people, which implies that the workforce is energetic, flexible, and capable of responding to the application and adoption of LCC in public procurement and commenting on its effectiveness, whereas the educational level of the interviewees reveals that the workforce is well-educated and has the knowledge and skills to comprehend the effectiveness of the adoption and application of LCC in public procurement. The variety of work experience also indicates a good combination of relatively new workers and employees having extensive real-life experience in public procurement.

These demographic variables are also significant in terms of understanding the results of the research since the positive attitudes towards use of LCC might be conditioned by the educational levels of the respondents and the fact that the majority of them are involved in public procurement, the concentration of the respondents in the active working age group can also be taken into consideration as the reason behind the willingness to adopt digital tools of LCC in public procurement. Moreover, the presence of various experience levels contributes to the explanation of how not only innovative ideas but also pragmatic and experience-based knowledge influence the perception of efficient use of LCC, and consequently, the insight into these demographic factors gives a good background to explain the results of the study and formulate the practical recommendations which will help to optimize the performance of public procurement.

4.2 Descriptive Analysis Based on Study Objectives

The descriptive analysis summarizes and categorizes the gathered data to gain an insight into the overall perception and experience of the respondents because this part provides a summary of the main findings regarding the adoption and application of life cycle costing and its effectiveness on public procurement, as mean of 1.0- 1.8 represents that respondents strongly disagree, 1.9- 2.6 represents that respondents disagree, 2.7- 3.4 represents that respondents remained neutral, 3.5- 4.2 represents that respondents agree, and 4.3- 5.0 represents that respondents strongly agree.

4.2.1 Adoption and Application of Life Cycle Costing

(a) Acquisition Cost Considerations

Table 4.6.1 Acquisition cost considerations.

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Initial purchase price is the main factor considered during procurement evaluation	0	2	9	9	3	3.57	0.84
N Transport and logistics costs are considered during procurement planning	1	2	3	10	7	3.87	1.10
Installation and commissioning costs are included in procurement evaluation	0	0	7	12	4	3.87	0.69
Supplier quality is evaluated relative to acquisition cost	0	4	6	7	6	3.65	1.07

Table 4.6.1 shows the opinion of the respondents as regards adoption and application of LCC tools and its effectiveness on procurement, and the results of the responses are summarized through mean scores to indicate the overall trend of the opinion and the extent to which the respondents agreed with the views. The presence of higher mean values demonstrates that respondents agreed with the statements and the reverse is true.

A majority of respondents agreed that initial purchase price is a key determinant with a high mean of 3.57 and S.D of 0.84 thus indicating low variability, suggesting a high level of agreement among respondents, although responses were moderately distributed, suggesting that some entities are beginning to consider broader cost factors.

Additionally, most respondents agreed that transport and logistics costs are considered with a mean of 3.87, indicating awareness beyond just purchase price and the standard deviation of 1.10 indicating moderate variability, suggesting some differences in respondents' views. The resounding majority is in agreement that the installation and commissioning costs are considered, showing partial integration of LCC concepts with a mean score of 3.87 while the low standard deviation of 0.69 shows little variation among the opinions of the respondents. Nevertheless, the respondents varied in their opinion on whether the quality of suppliers was taken into consideration when comparing it to its cost with a total mean score of 3.65 with most agreeing, while the standard deviation of 1.07 shows moderate variation.

On average, the standard deviation of acquisition cost is low.

These findings address Objective One, which sought to assess the level of adoption of Life Cycle Costing in public procurement. The moderate mean scores indicate that while acquisition cost factors are considered, there is still a strong reliance on initial purchase price, suggesting partial adoption of LCC principles.

The findings are consistent with Systems Theory (General System Theory: Foundations, Development, Applications, 1950), which emphasizes that procurement decisions should consider interrelated components across the entire lifecycle of an asset. However, the

continued dominance of initial cost suggests that procurement entities are not fully adopting a holistic systems approach.

Furthermore, the results relate to the Value for Money (VfM) principle (Public Procurement Guidelines, 2015), which advocates for balancing cost, quality, and long-term performance. The limited integration of broader acquisition cost elements indicates that VfM is not yet fully optimized at this stage of procurement.

(b) Operational Cost Considerations

Table 4.6.2 operational cost considerations

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Energy and utility costs are	0	2	8	7	6	3.74	0.96
considered when selecting suppliers							
Operational costs are evaluated before awarding contracts	0	0	7	12	4	3.87	0.69

Labor and consumables costs are considered during procurement planning	0	5	3	12	2	3.50	0.96
Long-term operating expenses influence procurement decisions	0	2	2	8	10	4.18	0.96

The findings show a moderate to high level of consideration of operational costs. A significant number of respondents agreed that energy and utility costs are considered when selecting suppliers with a mean of 3.74 and a standard deviation of 0.96 which shows a low variability, suggesting a high level of agreement among respondents. Majority of the respondents agreed that operational costs are evaluated before awarding contracts with a mean of 3.87 and standard deviation of 0.69 indicating low variability, suggesting a high level of agreement among respondents. . Also most of the respondents agreed that labor and consumables costs are considered during procurement planning with a mean of 3.50 and a standard deviation of 0.96 indicating low variability, suggesting a high level of agreement among respondents.

Lastly many respondents strongly agreed that long-term operating expenses influence procurement decisions with a mean of 4.18 and a standard deviation of 0.96 indicating low variability, suggesting a high level of agreement among respondents.

Such findings also reinforce Objective One since they clearly show that more attention is paid to operational costs as part of the procurement process, indicating an increasing application of life cycle costing principles.

The significant association between factors like consideration of operational costs and procurement decisions corroborates Systems Theory (General System Theory: Foundations, Development, Applications, 1950).

In addition, the findings reinforce the Value for Money principle (Public Procurement Guidelines, 2015), as the consideration of long-term operating costs ensures that procurement decisions deliver sustained economic benefits rather than short-term savings.

However much, this suggests growing recognition of operational costs in procurement decisions, the inconsistency indicates that LCC application is not yet systematic across all entities.

(c) Maintenance Cost Considerations

Table 4.6.3 Maintenance cost considerations

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Maintenance requirements are considered during procurement evaluation	1	2	5	10	5	3.70	1.06

Expected repairs and servicing costs are considered when selecting suppliers	0	3	9	8	3	3.48	0.90
Availability of spare parts and technical support influences procurement decisions	0	4	6	6	7	3.70	1.11
Warranty and after-sales services are considered during procurement	0	2	4	9	8	4.00	0.95

Results indicate that maintenance-related factors are moderately considered. Most respondents agreed that maintenance requirements and warranty provisions are included in procurement evaluation with a mean of 3.70 and a standard deviation of 1.06 indicating moderate variability, suggesting some differences in respondents' views. Most of the respondents remained neutral on the opinion that expected repairs and servicing costs are considered when selecting suppliers with a mean of 3.48 and a standard deviation of 0.90 indicating low variability, suggesting a high level of

agreement among respondents. There was agreement on the importance of spare parts availability and technical support to influence procurement decisions with a mean of 3.70 and a standard deviation of 1.11 indicating moderate variability, suggesting some differences in respondents' views. There was also agreement from most of the respondents for the statement that warranty and after-sales services are considered during procurement with a mean of 4.00 and a standard deviation of 0.95 indicates low variability, suggesting a high level of agreement among respondents.

The findings on maintenance cost considerations also contribute to Objective One, indicating that procurement entities are integrating some aspects of Life Cycle Costing into their decision-making processes.

These results are consistent with Systems Theory (General System Theory: Foundations, Development, Applications, 1950), as they demonstrate recognition of the interdependence between procurement decisions and future maintenance requirements.

Additionally, the findings support the Principal-Agent Theory (Theory of the Firm, 1976; Theory of the Firm, 1976), as the inclusion of maintenance and warranty considerations enhances accountability and reduces information asymmetry between procurement officers and stakeholders.

This shows that maintenance cost considerations are fairly integrated into procurement decisions, which aligns with LCC principles. However, variations in responses suggest uneven application across institutions.

(d) Disposal Cost Considerations

Table 4.6.4 Disposal cost considerations

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		

Disposal or decommissioning costs are considered during procurement planning	0	2	10	10	1	3.43	0.73
Environmental regulations influence disposal decisions	0	3	3	9	8	3.96	1.02
Recycling or safe disposal costs are considered in procurement decisions	0	3	4	7	9	3.96	1.07
Residual or salvage value of assets is considered during procurement planning	1	4	6	7	5	3.48	1.16

Disposal costs appear to be the least emphasized. Many respondents selected moderate responses regarding disposal and decommissioning costs consideration during procurement planning, remaining neutral with a mean of 3.43 and a standard deviation of 0.73 indicating low variability, suggesting a high level of agreement among respondents. However, there was agreement that environmental regulations that influence disposal decisions with a mean of 3.96, standard deviation of 1.02 indicating moderate variability, suggesting some differences in respondents' views and recycling costs influence procurement decisions with a mean of 3.96 and standard deviation of

1.07 indicating moderate variability, suggesting some differences in respondents' views. Most respondents yet again selected moderate responses regarding residual or salvage value of assets considered during procurement planning thus remaining neutral with a mean of 3.48, a standard deviation of 1.16 indicating moderate variability, suggesting some differences in respondents' views.

The relatively lower emphasis on disposal cost directly relates to Objective One, highlighting a gap in the full adoption of Life Cycle Costing in public procurement.

Under Systems Theory approach (General System Theory: Foundations, Development, Applications, 1950), this shows that procurement is not yet entirely based on lifecycle management because the issue of disposal is usually forgotten.

It also shows constraints to attaining Value for Money (Public Procurement Guidelines, 2015) as there will be unaccounted long-term costs and possible environmental repercussions since the disposal cost was not accounted for.

It also suggests that the disposal cost is mainly taken into consideration as a means of complying with regulations and not as a critical aspect of life cycle costing.

4.2.2 Influence of LCC on Procurement effectiveness

(a) Cost Efficiency

Table 4.6.5 cost efficiency

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Procurement decisions help minimize overall costs to the organization	0	0	4	7	11	4.32	0.78

Procurement practices reduce unnecessary expenditure	0	3	1	11	7	4.00	0.98
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It can be observed that the majority of the respondents have strongly agreed that procurement decisions play an important role in minimizing costs, as evident by the mean score of 4.32 and the standard deviation of 0.78. Many also agreed that procurement practices reduce unnecessary expenditure with a mean of 4.00 and a standard deviation of 0.98 indicating low variability, suggesting a high level of agreement among respondent

These findings address Objective Two, which sought to examine how the application of Life Cycle Costing influences procurement effectiveness.

The positive results are consistent with the Value for Money principle (Public Procurement Guidelines, 2015), as LCC enables procurement entities to minimize total costs over the asset lifecycle rather than focusing solely on initial expenditure.

This also aligns with Principal-Agent Theory (Theory of the Firm, 1976), as improved cost efficiency reflects better decision-making and accountability by procurement officials.

This suggests that where LCC elements are applied, they contribute positively to cost efficiency in public procurement.

(b) Quality of Goods and Services

Table 4.6.6 Quality of goods and services

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		

Goods and services procured meet the required quality standards	1	1	3	9	9	4.04	1.07
Procurement evaluation emphasizes quality and durability	0	0	3	12	8	4.22	0.67

Most respondents agreed that procured goods meet required quality standards with a mean of 4.04 and standard deviation of 1.07 which indicates moderate variability, suggesting some differences in respondents' views. Moreover, there was a consensus on the importance of procurement focusing on quality and durability, with an average score of 4.22 and standard deviation of 0.67, indicating low variability, implying a high degree of agreement among the participants.

The results also validate Objective Two, showing that LCC improves the quality of purchased items.

In line with the Value for Money philosophy (Public Procurement Guidelines, 2015), this is an important objective since it requires balancing cost and quality.

Furthermore, in accordance with Systems Theory (General System Theory: Foundations, Development, Applications, 1950), quality improvement can be linked to systems integration in terms of their performances.

(c) Timeliness

Table 4.6.7 Timeliness

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Procurement processes are completed within planned timelines	0	1	10	7	5	3.70	0.88
Procurement delays rarely affect service delivery	1	7	5	7	3	3.17	1.15

Respondents had varying viewpoints concerning timely procurement procedures, although most respondents agreed with a mean of 3.70 and standard deviation of 0.88, which shows low variability implying a lot of agreement between respondents. Most respondents felt that delays do occur in service delivery despite their neutrality towards this topic, as shown by a mean of 3.17 and standard deviation of 1.15, which show moderate variability.

This partly fulfills Objective Two, implying that even though LCC has positive impacts on cost and quality results, it does not fulfill objectives related to reducing delays in procurement processes.

This implies that procedural and institutional constraints rather than cost constraints have an impact on procurement delays, which LCC and its theoretical underpinnings cannot solve.

This implies that even though LCC has positive impacts on cost and quality, it does not necessarily solve problems associated with procurement delays.

(d) Value for Money

Table 4.6.8 Value for money

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Procurement decisions ensure optimal use of public resources	1	1	5	10	6	3.83	1.03
Procured goods and services deliver long-term benefits to the organization	0	0	7	7	8	4.05	0.84

Procurement decisions are seen by the majority as ensuring that public funds are used optimally, where 3.83 is the mean while 1.03 represents the standard deviation, implying that there is variability in the responses obtained. Many also confirmed and agreed that procured goods and services deliver long-term benefits to the entity with a high mean of 4.05 and a standard deviation of 0.84 which indicates low variability, suggesting a high level of agreement among respondents.

These findings strongly support Objective Two, confirming that the application of Life Cycle Costing enhances value for money in public procurement.

This directly aligns with the Value for Money principle (Public Procurement Guidelines, 2015), as LCC ensures that procurement decisions deliver long-term economic and functional benefits.

The findings also support Systems Theory (General System Theory: Foundations, Development, Applications, 1950), as they demonstrate the importance of integrating multiple cost dimensions to achieve optimal procurement outcomes.

This strongly supports the argument that LCC contributes to achieving value for money in public procurement.

4.2.3 Challenges Affecting Adoption of LCC

Table 4.6.9 Challenges affecting adoption of LCC

Statement	Responses					Mean	Standard deviation
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
Limited knowledge of Life Cycle Costing affects its implementation	0	0	5	8	10	4.22	0.80
Lack of reliable cost data limits the use of LCC	0	2	3	10	8	4.04	0.93
Procurement staff lack adequate training in LCC techniques	0	4	7	6	6	3.61	1.08

Procurement policies emphasize lowest price rather than lifecycle cost	0	2	6	11	4	3.74	0.86
There is resistance to change from traditional procurement methods	0	3	2	10	8	4.00	1.00
Limited institutional support affects LCC adoption	0	1	8	9	5	3.78	0.85

The study identified several key challenges. Limited knowledge of LCC was identified as a major barrier with mean of 4.22 and a standard deviation of 0.80 which indicates low variability, suggesting a high level of agreement among respondents. There is also a lack of reliable cost data, which affects implementation and application of LCC, this scored a mean of 4.04 and a standard deviation of 0.93 indicating low variability, suggesting a high level of agreement among respondents. Inadequate training among procurement staff was highlighted and acknowledged by most respondents scoring a mean of 3.61 a standard deviation of 1.08 indicating moderate variability, suggesting some differences in respondents' views. Procurement policies emphasizing lowest price rather than lifecycle cost were also identified and most respondents also agreed with the mean of 3.74 and a standard deviation of 0.86 which indicates low variability, suggesting a high level of agreement among respondents. Resistance to change and limited institutional support further hinder adoption as most respondents agreed as

indicated by the mean 4.00 and standard deviation of 1.00 which indicates moderate variability, suggesting some differences in respondents' views. Also limited institutional support affects LCC adoption as most respondents agreed indicated by the mean of 3.78 and a standard deviation of 0.85 which indicates low variability, suggesting a high level of agreement among respondents.

The above findings respond to Objective Three that intended to determine challenges impeding the use of Life Cycle Costing in public procurement.

The stated challenges demonstrate the technical and institutional obstacles encountered in implementing LCC.

In relation to Principal-Agent Theory (The Theory of the Firm, 1976), the stated challenges create information asymmetry in decision making by procurement agents.

Also, based on the stated challenges, it can be seen that there are shortcomings in the institutional system in implementing Systems Theory as the processes of procurement cannot cover the whole cycle of the asset.

It is evident from the findings that technical and institutional constraints limit the implementation of LCC in public institutions.

4.2.4 Suggested Measures to Improve LCC Adoption

Some of the recommendations that were given include training procurement personnel, increasing awareness, use of IT systems, and policy formulation among others.

This shows the importance of capacity development as well as reform in the adoption of LCC.

4.3 Composite Correlation and Regression Analysis

4.3.1 Correlation matrix

Table 4.7.1 Correlation Matrix

Variables	Acquisition Cost	Operational Cost	Maintenance Cost	Disposal Cost	Procurement Effectiveness
Acquisition Cost	1.000	0.615	0.809	0.378	0.534

Operational Cost	0.615	1.000	0.708	0.179	0.322
Maintenance Cost	0.809	0.708	1.000	0.372	0.419
Disposal Cost	0.378	0.179	0.372	1.000	0.306
Procurement Effectiveness	0.534	0.322	0.419	0.306	1.000

From the results provided in Table 4.7, it can be seen that the correlation exists between all of the variables in Life Cycle Costing (LCC) and procurement effectiveness.

Acquisition cost reveals a positive moderate correlation ($r = 0.534$). This means that taking into account the initial and acquisition cost can lead to successful procurement outcomes.

Maintenance cost reveals a positive moderate correlation ($r = 0.419$). Thus, maintaining cost consideration in procurement process makes it possible to achieve better procurement performance.

Operational cost reveals a positive weak correlation ($r = 0.322$). It means that although operational cost is important, its effect on procurement effectiveness is relatively low.

Disposal cost shows a similar positive weak correlation ($r = 0.306$). In other words, it is important but not so important as the above-mentioned components.

Moreover, positive relations exist between all independent variables as well, especially between acquisition cost and maintenance cost ($r = 0.809$), and between operational cost and maintenance cost ($r = 0.708$).

In general, all of the components under study correlate positively with procurement effectiveness.

However, their influence on procurement outcomes differs from one another.

4.3.2 Regression Analysis

Regression results

$$PE = 1.912 + 0.431(ACQ) + 0.025(OP) - 0.055(MNT) + 0.112(DSP)$$

R-squared: 0.299

Coefficients

Constant: 1.912

Acquisition cost: 0.431

Operation cost: 0.025

Maintenance cost: -0.055

Disposal cost: 0.112

The analysis of regression was carried out to establish the impact of Life Cycle Costing on procurement performance.

From the result of the analysis, it is evident that the model accounts for about 29.9% ($R^2 = 0.299$) of procurement performance. This indicates that although Life Cycle Costing influences procurement performance, about 70.1% of the procurement performance is accounted for by other variables outside those used in the model, including institutional efficiency, procurement planning, legal requirements, supplier performance, among others.

This demonstrates that Life Cycle Costing influences procurement performance; however, it is not the only determining factor for procurement performance.

The regression coefficients indicate that:

Acquisition cost ($B = 0.431$) is the most significant variable positively affecting procurement effectiveness. A unit change in the degree of acquisition cost concern is accompanied by a change of 0.431 in procurement effectiveness, *ceteris paribus*. This suggests that cost concerns still play a major role in decision-making during procurement. Indeed, the above findings suggest that despite the introduction of LCC thinking, acquisition still dominates all other phases in LCC thinking. This suggests that

procurement decisions that consider acquisition-related costs significantly improve procurement effectiveness.

Disposal cost ($\beta = 0.112$) also has a positive effect, although relatively small, indicating that incorporating end-of-life considerations contributes positively but marginally to procurement effectiveness. Disposal cost is not a priority in procurement decisions and is mostly considered for regulatory compliance, not strategic planning.

Operational cost ($\beta = 0.025$) has a very weak positive effect, suggesting that its contribution to procurement effectiveness is minimal within this model. This suggests superficial integration of operational cost in decision-making and indicates that operational cost analysis is not systematically embedded

Maintenance cost ($\beta = -0.055$) shows a negative relationship with procurement effectiveness. This implies that higher emphasis on maintenance costs may be associated with reduced procurement effectiveness, possibly due to increased long-term cost burdens or inefficiencies in maintenance planning. Inefficient maintenance planning leads to High maintenance costs may reflect poor quality procurement decisions. Maintenance costs are reactive rather than preventive maintenance thus entities incur costs after procurement instead of planning ahead

The Multicollinearity effect, the maintenance cost is highly correlated with acquisition cost ($r = 0.809$), this may distort regression results.

Maintenance cost is not effectively managed as part of LCC, which weakens procurement effectiveness.

The difference between correlation and regression results for maintenance cost suggests that while it is positively associated with procurement effectiveness in isolation, its effect becomes negative when combined with other variables, indicating possible multicollinearity or inefficiencies in its application.

In general, it can be stated that the cost of acquisition is the most important variable that affects procurement performance, while other variables included in the Life Cycle Costing framework have minor or inconsistent impacts.

These findings partly validate the concepts of Life Cycle Costing, whereby correlation shows positive relationships between each Life Cycle Costing component and procurement performance; however, regression demonstrates that only the cost of acquisition plays an influential role.

It can thus be implied that, while procurement agencies consider different lifecycle cost components, their decision-making process is still dominated by the cost of acquisition factor. This implies the use of Systems Theory in a limited manner since not all lifecycle components are incorporated into the decision-making process.

There are some consequences for the Value for Money concept due to a tendency to prioritize acquisition costs. Moreover, the negative impact of the maintenance cost variable indicates certain inefficiencies, which can be related to Principal-Agent Theory.

4.4 Summary of Findings

It can be seen from the research results that the LCC approach is only partly implemented in the practice of public procurement. Acquisition and operation costs receive greater importance than disposal costs. The use of LCC helps increase efficiency, quality, and value for money. However, various obstacles prevent the full adoption of this approach.

CHAPTER FIVE

5.0 Introduction

In this chapter, an analysis of the results of the research, the conclusions made from the analysis, and the recommendations resulting from the empirical findings are presented. This work explores the impact of LCC adoption and use on procurement efficiency within public bodies. The presentation of results is carried out systematically with respect to the research objectives.

5.1 Summary of Findings

5.1.1 Adoption and Application of Life Cycle Costing

The results showed that the LCC approach is partly implemented in the practice of public procurement.

Cost acquisition is the most important factor, with procurement decisions based on the cost of procurement, but other factors like transportation, installation, and quality of suppliers are also taken into account to some extent.

Cost of operation, which includes energy costs, staffing costs, and other costs during the use of goods and services, is now widely acknowledged, implying the implementation of the concept of life cycle.

The factor of maintenance cost, involving the issue of warranty, spare parts, and service, is moderately used but inconsistently in procurement activities.

Finally, the cost of disposal is the least used component in public procurement practice.

In summary, the results suggest that despite the presence of various factors of LCC, their implementation is not systematic enough.

5.1.2 Influence of Life Cycle Costing on Procurement Effectiveness

In summary, Life Cycle Costing has been found to have a positive impact on the effectiveness of procurement. However, this impact is variable among the various dimensions.

- Cost efficiency has greatly improved due to better planning and reduced wastage through the application of lifecycle considerations into procurement decisions.

- Quality has significantly improved due to increased emphasis on durability and effectiveness in LCC procurement decisions.
- Timeliness is mixed due to the failure of lifecycle considerations to address issues of delay.
- Procurement value for money has significantly improved since LCC promotes procurement decision-making based on the value of long-term savings.

It is worth noting that correlation analysis indicated that acquisition cost ($r = 0.534$), maintenance cost ($r = 0.419$), operational cost ($r = 0.322$), and disposal cost ($r = 0.306$) positively correlated with procurement effectiveness.

In regression analysis, the model explained 29.9% of procurement effectiveness ($R^2 = 0.299$). This was attributed to acquisition cost ($\beta = 0.431$) being the most dominant factor while disposal cost ($\beta = 0.112$) had some minimal positive effect. Maintenance cost ($\beta = -0.055$) had negative effect and operational cost ($\beta = 0.025$) had insignificant effect.

5.1.3 Challenges Affecting Adoption

The study identified several key challenges limiting effective adoption of Life Cycle Costing:

- Limited knowledge and awareness of LCC among procurement practitioners
- Lack of reliable cost data for lifecycle analysis
- Inadequate training and technical capacity
- Procurement policies emphasizing lowest price rather than lifecycle value
- Resistance to change from traditional procurement practices
- Limited institutional support and weak implementation frameworks

These challenges highlight both technical and institutional barriers that hinder the effective integration of LCC into procurement systems.

5.2 Conclusions

5.2.1 Adoption of Life Cycle Costing

Life Cycle Costing has not been fully implemented in public procurement processes yet. While some elements of life cycle costing have already been considered, the

procurement process remains largely driven by the acquisition cost of goods and services, thereby adhering to the cost minimization principle.

The limited implementation of the life cycle approach in procurement processes implies that not all costs associated with an asset's life cycle are fully considered in such processes.

5.2.2 Influence of LCC on Procurement Effectiveness

Life Cycle Costing is found to have a positive effect on procurement performance especially with regard to increasing cost effectiveness, quality, and value for money.

However, its effects are inconsistent and constrained by partial adoption, as indicated by:

- Weak influence of operational and disposal costs
- Negative effect of maintenance cost due to poor planning or inefficiencies

This suggests that while LCC has strong potential, its benefits are not fully realized due to fragmented application and weak integration into procurement systems.

5.2.3 Challenges in LCC Implementation

From the study, it emerges that the use of Life Cycle Costing is greatly hindered by capacity constraints, institutional issues, and policy difficulties.

The absence of expertise, poor data systems, and procurement policies that emphasize purchasing at the lowest cost reduce the efficiency of implementing LCC. This results in the continued practice of conventional procurement methods.

5.3 Recommendations

5.3.1 Technical Recommendations

- Development of Standardized LCC Models and Tools

Standard LCC models should be developed by the public sector to facilitate the assessment process during procurement. The tool should have templates that will capture the costs associated with acquisition, operations, maintenance, and disposal.

- Capacity Building and Professional Training

Training courses should be regularly conducted to enhance the technical knowledge of procurement professionals regarding LCC analysis, financial modeling, and cost estimation.

- Integration of Digital Procurement Systems

It is important for governmental organizations to consider investment in digital procurement systems with the ability to collect, store, and analyze lifecycle cost data to guide decision making.

- Improved Maintenance Planning Frameworks

Maintenance planning needs to be included in the procurement process to minimize costs associated with the procurement process.

5.3.2 Policy Recommendations

- Amendment of the Procurement Guidelines to Ensure LCC

The regulatory agencies like PPDA ought to amend the procurement guidelines to ensure that life cycle costing is considered during procurement procedures.

- Switch from Low Cost to Value Procurement Strategies

It would be appropriate to focus on value procurement, meaning procuring items based on total cost of ownership as opposed to lowest cost.

- Enhanced Institutional Arrangements for LCC Implementation

Institutions in the government ought to come up with units that will take charge of implementing life cycle costing in procurement procedures.

- Introduction of LCC Compliance Audits

Routine audits must be carried out to determine the degree to which procurement organizations are using Life Cycle Costing concepts.

5.4 Areas for Further Research

The study was limited to one public organization and mostly explored the link between Life Cycle Costing and procurement performance. Future research needs to take into account:

- The Role of Other Variables in Determining Procurement Performance

Other variables that impact procurement performance need to be considered in future research.

- Comparison of LCC Practices in the Public and Private Sectors

Future researchers can compare how Life Cycle Costing is used in both sectors.

- The Long-Term Effect of Using LCC in Procurement

Future studies might explore how LCC impacts procurement performance if applied consistently over long periods.

- Effects of Digital Procurement Systems on LCC Usage

Future research can explore how digital procurement processes affect the use of LCC in procurement.

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APPENDICES

APPENDIX 1: QUESTIONARRE

How the adoption and application of Life Cycle Costing (LCC) influences procurement performance in public entities

Dear Respondent,

My name is Nomwesigwa Godwin, currently pursuing my bachelor's degree in Procurement and logistics management from Uganda Christian University. The research seeks to establish the impact of life cycle costing (LCC) and its effects on the procurement performance within public institutions. Life cycle costing involves the evaluation of the whole-life costs of an asset or service. This includes costs that occur at the various stages such as acquisition, operations, maintenance, and disposal.

The objective of this survey is to gather information on the use of life cycle costing techniques within the procurement process and their impacts on procurement performance in your institution.

This information will only be used for academic purposes and your information will be kept strictly confidential. You do not have to include your names or any other identifiable information.

Thank you very much for your time and assistance in this research.

SECTION A: Background Information.

1. Gender

Male ☐

Female ☐

2. Age Group

Below 25 ☐

25 - 34 ☐

35 - 44 ☐

45 and above ☐

3. Level of Education

Diploma ☐

Bachelor's Degree ☐

Master's ☐

PHD ☐

Other:

4. Job Title/ Position

Procurement officer ☐

Finance officer ☐

Contract manager ☐

Project Manager ☐

Administration ☐

Other:

5. Years of work experience

Less than 2 years ☐

2-5 years ☐

6-10 years ☐

Above 10 years ☐

SECTION B: Level of adoption of Life Cycle Costing (LCC)

(Consider 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree for responses)

B1: Acquisition Cost

Statement	1	2	3	4	5
Initial purchase price is the main factor considered during procurement evaluation					
Transport and logistics costs are considered during procurement planning					
Installation and commissioning costs are included in procurement evaluation					
Supplier quality is evaluated relative to					
acquisition cost					

B2: Operational Cost

Statement	1	2	3	4	5
Energy and utility costs are considered when selecting suppliers					
Operational costs are evaluated before awarding contracts					
Labor and consumables costs are considered during procurement planning					
Long-term operating					

expenses influence procurement decisions					
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B3: Maintenance Cost

Statement	1	2	3	4	5
Maintenance requirements are considered during procurement evaluation					
Expected repairs and servicing costs are considered when selecting suppliers					

Availability of spare parts and technical support influences					
procurement decisions					
Warranty and after-sales services are considered during procurement					

B4: Disposal Cost

Statement	1	2	3	4	5
Disposal or decommissioning costs are considered during procurement planning					

Environmental regulations influence disposal decisions					
Recycling or safe disposal costs are considered in procurement decisions					

Residual or salvage value of assets is considered during procurement planning					
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SECTION C: Procurement Effectiveness

(Consider 1 = Strongly Disagree , 2 = Disagree , 3 = Neutral, 4 = Agree, 5 = Strongly Agree for responses)

C1: Cost Efficiency

Statement	1	2	3	4	5
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Procurement decisions help minimize overall costs to the organization					
Procurement practices reduce unnecessary expenditure					

C2: Quality of Goods and Services

Statement	1	2	3	4	5
Goods and services procured meet the required quality standards					

Procurement evaluation emphasizes quality and durability					
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C3: Timeliness

Statement	1	2	3	4	5
Procurement processes are completed within planned timelines					
Procurement delays rarely affect service delivery					

C4: Value for Money

Statement	1	2	3	4	5
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Procurement decisions ensure optimal use of public resources					
Procured goods and services deliver longterm benefits to the organization					

SECTION D: Challenges Affecting Adoption of Life Cycle Costing

(Consider 1 = Strongly Disagree , 2 = Disagree , 3 = Neutral, 4 = Agree, 5 = Strongly Agree for responses)

Challenges Affecting Adoption of Life Cycle Costing

Statement	1	2	3	4	5
Limited knowledge of Life Cycle					

Costing affects its implementation					
Lack of reliable cost data limits the use of LCC					
Procurement staff lack adequate training in LCC techniques					
Procurement policies emphasize lowest price rather than lifecycle cost					
There is resistance to change from traditional procurement methods					
Limited institutional support affects LCC adoption					

SECTION E: Open-Ended Question

Description (optional)

In your opinion, what measures can improve the adoption of Life Cycle Costing in public procurement?

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