LEGACY SYSTEMS COST MANAGEMENT PRACTICES AND PERFORMANCE AT NAIROBI CITY WATER AND SEWERAGE COMPANY
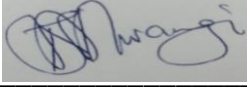
NELSON MWANGI NJIHIA

D61/7216/2017

A RESEARCH PROJECT PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A DEGREE OF MASTER OF BUSINESS ADMINISTRATION, UNIVERSITY OF NAIROBI

NOVEMBER, 2021

DECLARATION

This is my original work and has not been presented to any university for examination.

Signed: _____Date: _____17/11/2021

NELSON MWANGI NJIHIA

D61/7216/2017

This research project has been submitted for examination with my approval as the University Supervisor.

Sign _____Date: _17/11/21_____

PROF. KATE LITONDO

ACKNOWLEDGEMENT

This study was accomplished through the support and backing from various persons to who I am greatly indebted to. First, my gratitude to the Almighty God, that I was able to undertake and complete my studies. My special thanks to my supervisor, Prof. Kate Litondo for modeling this project into a meaningful form, her consistent and insightful reviews, guidance and encouragement. My gratitude goes to my family, parents, colleagues for their invaluable support, encouragement and their understanding.

DEDICATION

This research project is dedicated to my family

TABLE OF CONTENTS

LIST OF TABLES

ABREVIATIONS AND ACRONYMS

BSC   Balanced Score Card

ICT   Information Communication and Technology

IHOs   International Humanitarian Organizations

NCWSC   Nairobi City Water and Sewerage Company

NGOs   Non-Governmental Organizations

SME   Small and Medium Enterprises

SMS   Short Message Service

SPSS   Statistical Package for Social Sciences

TAM   Technology Acceptance Model

TRA   Theory of Reasoned Action

WASREB   Water Services Regulatory Board

ABSTRACT

Although technology is critical for many companies and institutions, determining if updates or full replacement is the best option can be complicated. Transitioning to a modern system without having a detrimental effect on the organization or draining money can be difficult. Upgrading technology and moving away from a legacy system will cost an organization in a variety of ways. Maintaining legacy systems that have outlived their utility, on the other hand, is usually much more expensive. The costs of hanging on to older structures and using obsolete technologies have a financial and risk effect on businesses. Thus the main intention of this research project was analyzing how legacy systems cost management practices affects the performance of Nairobi City Water and Sewerage Company (NCWSC). The following objectives were used; to determine the extent to which legacy systems cost management practices have been adopted at NCWSC, to establish the relation between legacy systems cost management practices and performance at NCWSC and to establish the challenges facing legacy systems cost management practices adoption at NCWSC. The research adopted the system theory of profound knowledge, technology acceptance model and the Process approach theory. A descriptive survey design was employed in the study. The study population was the 997 management staff at NCWSC. The sample size was 286 arrived at using Yamane formula. Questionnaires were used to collect primary data, which were sent by email through Google forms. The data was analyzed using descriptive statistics such as the mean and standard deviation as well as inferential statistics like correlation analysis and regression analysis. Restructuring, ordinary maintenance, migration and discarding showed a positive substantial impact on performance at NCWSC. Regression analysis found that the collective adoption of legacy systems cost management practices was responsible for 64.2 percent of the changes in performance at NCWSC. According to the findings of this survey, legacy systems cost management practices are critical for firms looking to enhance their performance. Managers as well as board members of NCWSC are advised to continue practicing restructuring, ordinary maintenance, migration and discarding in order to enhance their performance. It is also suggested that the management develop sound policies to assist them in overcoming the problems of legacy systems cost management practices.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Institutions and organizations depend on systems for them to operate and run smoothly. When these systems are utilized effectively the institutions tend to prosper both in the short and long-term (Plant, 2011). However, when these systems are no longer able to fulfill the current demands of the business environment then they are considered as legacy systems. Legacy systems are critical to the sustainability of business operations but organizations must decide at what cost (Brooke & Ramage, 2016). Alkazemi, Nour and Meelud (2013) proposed some measures to maintain the costs and they include restructuring, reengineering, ordinary maintenance, wrapping, migration, discarding among others. The decision on which practice to adopt should be based on a structured assessment of its influence on firm performance.

This study's theoretical basis was as follows. System theory of profound knowledge by Deming (2000) which advances that constant improvement of processes, growth in knowledge management and understanding of variations will eventually lead to improved performance in organizations. The second was the Technology Acceptance Model (TAM) by Davis (1989) which is a remodeled version of the theory of reasoned action (TRA) which specifically asserts how and why users accept and adapt information systems and the third theory is the Process Approach Model by Cameron (1986) which is concerned with the transformation of organization resources to produce goods and services.

NCWSC Limited was the subject of the current study. This is due to the fact that water shortage is a critical issue in Kenyan town areas, which has sustained to obtain large

populace as a due to rural-to-urban migration. Climate change, as well as inadequate land use in catchment areas, have complicated the problem. Regardless of the reality that Kenya's government has been implementing many reforms aimed at improving the consistency, effectiveness, and accountability of water segment organizations' service delivery, access to long-term water supply services remains a big problem. The mandate of NCWSC is supplying water as well as sewerage facilities to Nairobi inhabitants and others in the surrounding area. The company's main goal is to provide consumers with high-quality, dependable services at a reasonable price (NCWSC Strategic Plan, 2014/15 – 2018/19). Inability to manage legacy systems cots would jeopardize this goal and therefore the need to have in place effective legacy system cost management practices.

1.1.1 Legacy System Cost Management Practices

According to Brooke and Ramage (2016), there is no universal definition of a legacy scheme. Legacy systems, as described by Bakar and Razali (2013), are traditional information systems that are still in use in an entity. According to Gartner (2015), it refers to any business-critical software systems that are difficult to modify and whose failure may have a major effect on the business. According to Sommerville (2015), a legacy program or framework may be built on obsolete technology but is essential in daily operations. Vast majority present legacy systems were designed at a period computer processing as well as storage space remained very costly than today. As a result, performance often took precedent over a system's understanding or maintainability, resulting in unavoidable deterioration (Erlikh, 2016).

Weak documentation as well as version control, amongst many other things, may cause legacy systems to deteriorate, but as Aversano and Tortorella (2014) point out, whichever

the cause, such degradation eventually increases maintenance costs. This helps to understand why machine maintenance takes up such a large portion of an organization's overall IT budget. Legacy structures, according to Alkazemi et al. (2013), lack reflection of contemporary architectural advancements like focus on software recycle as well as the component libraries construction. The latest methods allow continuous system development and helps preventing systems from being legacy, resulting in high cost of maintenance.

Proposal of a number of legacy systems cost management practices has taken place. For instance, De Lucia, Fasolino, and Pompelle (2001) mention 'routine repair, redesigning, reverse engineering, reengineering, migration, commercial off-the-shelf software wrapping replacement, as well as discarding'. Authors agree existence of some uncertainty in the literature about the usage of some of these words, citing reengineering and migration as examples. Discard, outsource, wrap, carry on, freeze and reverse engineering are proposed by Aversano and Tortorella (2014) as possible solutions. The decision to implement a procedure must be made and endorsed by a diverse group of stakeholders within the company, and it cannot be based solely on technical considerations (De Lucia et al., 2001). Furthermore, according to Gartner (2015), the features of an entity that operates and supports the legacy system ought to be recognized. Organizational variables like change resistance and/or system sustenance weaknesses must be expressed in any potential system solution.

1.1.2 Organization Performance

Noyé (2002) describes performance as entailing attainment of goals that an organization sets out to achieve. Rolstadas (1998) believes that an organization's performance is a

complex relationship with the following seven criteria: efficiency, reliability, and productivity, and effectiveness, quality of work, creativity and profitability. Performance is therefore closely linked to the achievement of the above-mentioned criteria, which can be considered as performance goals. Even though there is no commonly settled upon meaning of performance, an organization ought to have objectives and measure all outcomes based on the set objectives.

To measure performance, organizations use various methods one of which is the Balanced Scorecard (BSC). BSC measures four aspects of an organization which are; consumer viewpoint, internal business perspective, economic perspective and perspective on technology and training (Kaplan & Norton, 2001). Conversely, systems helps organizations have coordinated and effective ways of communication. Therefore, systems are adopted to interconnect the organization's systems and processes while BSC is a way in which the efficiency and effectiveness are measured.

Organizational success, according to Ekwueme, Egbunike, and Onyali (2013), can be assessed utilizing four major buckets: effectiveness (whether an organization can attain its goal), efficiency (capacity of a firm to effectively utilize resources), and significance (the extent to which the organization's stakeholders believe that the organization's activities are consistent with their needs and desires) and, finally, financial viability (the level to which a firm is viable over a short and long term horizon as well as too the duration the organization has remained profitable). Performance indicators in government organizations such as Nairobi Water include timeliness, cost reduction, quality of services and flexibility (Sharma, 2012).

1.1.3 Legacy Systems Cost Management Practices and Firm Performance

Some empirical studies have observed that legacy systems cost management practices positively impact firm performance (Ashrafi & Murtaza, 2008;Chiware & Dick, 2008; Oliveira & Martins, 2011). According to other investigations legacy systems cost management practices have a minute impact on business performance (Brynjolfsson, 1995; Carr, 2003). Organizations are increasing their attention on legacy cost management practices in developing business solutions, improves organizational effectiveness and efficiency of decision making processes, improve productivity and service delivery to realize dynamic stability and be able to compete for the new markets (Molloy & Schwebks, 2015).

According to Anandaraja, Igbara and Anakwe (2002), legacy systems cost management practices in underdeveloped nations have been underutilized and as such, it does not make any significant impact in improving organizational performance among those using it. This statement attest to the fact that proper use of legacy systems cost management practices can lead to improved performances, utilization can bridge between legacy systems cost management practices adoption and performance. As noted by Subramani (2004) in a study which investigated supply chain relationships, organizational relationships that are specific to investments plays an important mediating function between patterns of legacy systems cost management practices appropriations and strategic performances.

1.1.4 Challenges Faced in Adoption of Legacy Systems Cost Management Practices

Al-fleit, Almalki and Zafar (2017) reveal a number of challenges that arise in any organization during the adoption of legacy systems cost management practices. The

challenges can also be categorized into challenges related to leadership, human challenges, technical challenges and other challenges. Lederer and Sethi (1991) indicate that top management in most organizations wants to be persuaded to implement any legacy systems cost management practice developed.

Aaltonen and Ikävalko (2002) expounds the management challenge to include, little or no support from top management for legacy systems cost management practice adoption, weak management roles in legacy systems cost management practice adoption, lack or inadequate support from top management in creation and implementing systems and poor coordination and communication to ensure responsibilities are well articulated. Wilson (1989) in an investigation of 500 firms in the United Kingdom found that not employing professional staff, inadequate resources for user training, the rapidly changing needs of the system users and inabilities by systems to fulfil the user's expectations as the main human challenges faced in implementation of legacy systems cost management practices.

Additionally, there has been a major problem of inadequate planning and financing adoption of legacy systems cost management practices in some organizations. Whereas there are increased pressures to raise money to invest in legacy systems cost management practices, there arises sometimes a problem to the organizations in planning proper and the financial resources as well as the human investments with regard to legacy systems cost management practices as an important business activity used to develop organization's program. The emerging possibilities of new technologies presents potential and far-reaching concerns that tend to challenge or can even undermine the assumption which the organization depends on to exist. As the organization reflects on why companies are initially started, they tend to differentiate a number of certain gaps

between the people and organizations in low-income areas (Ross, Hogaboam & Hannay, 2017).

1.1.5 Nairobi City Water and Sewerage Company Limited

In December 2003, the Nairobi City Water and Sewerage Company (NCWSC) was created. It is a Nairobi County Government entirely owned affiliate whose head office is located at Industrial area Kampala Road in Nairobi. Its main activity is providing sewerage as well as water amenities to Nairobi residents and the surrounding area. The Company's services are organized into eight functional directorates. Financial Services, Commercial service, Human Resources as well as Administration, ICT, Legal Services, Technical Services, Internal Audit as well as Managing Risk, and also the Managing Director's Office are the directorates that make up the company. NCWSC Strategic Plan, 2014/15 – 2018/19) divides the eight directorates into different divisions.

NCWSC employed 3,511 people as of July 2017. The estimated population in the company's jurisdiction being 4.2 million, whereas in totality 3.4 million are served. The total number of active versus inactive links is 604,649, with 582,502 active contracted customers and $9.6 million total income. (2018 WASREB Impact Study, Issue No. 10) Workers are stationed in seventeen places, most of them having multiple substations, but are geographically spread across Nairobi. The monthly income averages about Kshs.700 million. The Water Act of 2002 ushered in changes in the water sector intended to ensure that all Kenyans had access to safe drinking water as well as sewerage facilities. The Act, was however repealed by Water Act of 2016. The Act went into effect on April 21, 2017 with the publication of Legal Notice Nos. 59 and 60. The law clarifies institutional responsibilities in regulating, managing, and producing water resources and services. It

also brings the 2002 Water Act amendments into line with constitutional guarantees on the human right to water.

The organization is ISO 9001:2015 accredited, which assures customers of the company's quality control systems. NCWSC is dedicated to guaranteeing its stakeholders have access to water on a timely as well as reliable basis, and that the water provided to consumers is of the best quality possible. According to its vision and mission statement, the company aims to be a role model for other African water firms. To achieve this, the company needs to have in place best legacy systems cost management practices that will ensure higher organization performance.

1.2 Research Problem

Although technology is critical for many companies and institutions, determining if updates or full replacement is the best option can be complicated. However, when there is a substantial gap in desired functionality, as well as a negative effect on organizational sustainability, change is often the only choice. Transitioning to a modern system without having a detrimental effect on the organization or draining money can be difficult. Upgrading technology and moving away from a legacy system will cost an organization in a variety of ways. Maintaining legacy systems that have outlived their utility, on the other hand, is usually much more expensive (Madadipouya, 2015). The costs of hanging on to older structures and using obsolete technologies have a financial and risk effect on businesses. As a company continues to use obsolete legacy processes, it risks lowering protection, lowering enforcement, wasting time and money, and missing out on process improvement opportunities (Parto & Sofian, 2016).

Despite its outstanding success in providing sewerage as well as water amenities to Nairobi city residents, the Firm out of 88 providers of water amenities was 17th in Kenya in 2017. This was the least favorable ranking in comparison to prior years. The poor rating corroborated customer's complaints of supply fails concerning water supply (WASREB No.10,2018 Impact Report Issue). WASREB attributes non-revenue water and supply failure to credibility problems, where workers collaborate with clients to connect fraudulent connections to avoid paying for water. The operational and performance challenges mentioned indicates the existence of a problem which may be linked to legacy systems cost management practices employed in the organization. It is therefore necessary to conduct a study on the legacy system cost management practices being employed at Nairobi City Water and Sewerage Company and how this affects performance.

Several studies have been conducted locally but the studies have focused on other ICT issues without addressing the legacy systems cost management practices. Mobegi (2012) did an analysis of rural-based business ventures' ICT adoption and performance (Kibwezi district in Makueni County case study). The findings showed that adopting ICT plays a role in allocating of resources since it is automated. A study by Ndeda (2014) on procurement Information Systems (IS) and International Humanitarian Organizations (IHOs) performance in Kenya concluded that IS use enhanced cost effectiveness, on-time delivery, accurate and timely reporting of IHOs. Mjomba and Kavale (2015) studied impacts of ERP on the performance of Kenya power and lighting company and found a number of impacts. The impacts include reduction in the operation costs, efficiency in management, increased profitability, and competitive advantage. Although these studies

were conducted locally, they focused on different variables. Further, they were conducted in different contexts and which cannot be generalized in the current context.

Various studies and researchers have applauded the role of water service providers in Kenya, but a few if any have gone ahead to study on the influence that legacy systems cost management practices has had on the performance of these institutions. There has been no study on the legacy systems cost management practices and performance of NCWSC. Therefore, identifying, analyzing and applauding the role that legacy systems cost management practices has played in this organization, must be based on research. In respect of this, the question arises; how does legacy systems cost management practices affect the performance of Nairobi City Water and Sewerage Company?

1.3 Research Objectives

The study's objective was to examine the relationship between legacy systems cost management practices and performance of Nairobi City Water and Sewerage Company.

The specific objectives were:

i. To establish the extent of adoption of legacy systems cost management practices by Nairobi City Water and Sewerage Company

ii. To determine the relation between legacy systems cost management practices and performance of Nairobi City Water and Sewerage Company

iii. To establish the challenges being faced in adoption of legacy systems cost management practices by Nairobi City Water and Sewerage Company.

1.4 Value of the Study

Contributions of the research will be immense and significantly to theories on legacy systems cost management practices and firm performance. The study may contribute to future references for future academicians. The study may identify further areas of research by highlighting related topics resulting in identification of research gaps. The study contributes significantly to legacy systems cost management practices and organizational performance.

Policy makers will be enlightened by the findings of the study by showing them how legacy systems cost management practices influences performance of NCWSC and therefore identify the tools to be used by the regulators to boost the efficiency of other similar institutions that are a part of realizing the Vision 2030. More so the study will be aimed on assisting those firms that have not adopted legacy systems cost management practices at the moment. The management of these organizations will have the ability to identify legacy systems cost management practices which are appropriate to them so as to improve performance.

Findings will also form a basis for effective implementation of legacy systems cost management practices practice. The study will help practitioners in formulation and implementation of policies for improved performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The literature review relevant to the study is reviewed in this chapter in attempts to answer the research problem. The reason for the review is identifying the gap and increases the knowledge on ways that legacy systems cost management practices will facilitate achievement of better performance at Nairobi City Water and Sewerage Company.

2.2 Theoretical Literature Review

In this segment, theories that are pertinent to the relationship between legacy systems cost management practices and performance are reviewed. The theoretical basis is built on three theories of this study are discussed in this section and they are namely; system theory of profound knowledge, the technology acceptance model and the process approach model.

2.2.1 System Theory of Profound Knowledge

The system theory of profound knowledge by Deming (2000) provides a framework for thought processing for any leader who has a goal of creating a thriving organization. In this study, it was used to evaluate the relation between the adoption of legacy systems cost management practices and organizational performance. Constant seeking of new knowledge in an organization for continuous improvement, studying and understanding human behavior to gain knowledge for motivating, coordinating and managing people aimed at optimizing a system. Only then can an organization experience the benefits of legacy systems cost management practices. When management of an organization

appropriately applies the principles and practices of this theory, an organization can reduce organizational costs through elimination or reduction of waste, rework, staff turnover, and litigation while at the same time improving quality, maintaining customer loyalty, maintaining a satisfied workforce with a view of attaining improved performance which ultimately leads to profitability (Deming, 2000).

The theory proposes that a leader must understand a system they are managing in order to gain insight on how to improve it for the purpose of improved organizational performance. To optimize a system, there must be coordination and cooperation among system parts which is brought about by proper leadership. Legacy systems cost management practices plays an important role in ensuring coherence in system functionality. The theory is hence crucial in this study and helped find out how management in NCWSC have implemented legacy systems cost management practices and how it plays a role in Nairobi City Water and Sewerage Company to improve performance.

2.2.2 Technology Acceptance Model

In 1989 Davis developed this model and attempts to clarify how clients embrace and use a new concept or innovation. This model states that when a client is presented with an alternate innovation, certain factors that affect their decisions on the means and utilization time. This encompasses the perceived usefulness and convenience of the alternative innovation. TAM accepts the existing chain of actual conduct beliefs, intent and temperament. This was developed by social clinicians on the basis of the concept of the operation envisaged. Davis study recognizes tow important components that's is perceived usefulness and perceived convenience (Davis, Pallister & Foxall, 2002).

To a large extent this theory has influenced research on how technology is accepted. This study will apply TAM a part of three different aspects, primarily to establish how use of technology improves hierarchical administration conveyance to natives, how preparation of technology staff affects the use of technology in NCWSC and how the access to technology affects the utilization of technological innovation among NCWSC. This theory informs this study with regards to the benefits that emanate from the use of legacy systems cost management practices that is the perceived usefulness as well as the challenges experienced in the adoption of legacy systems cost management practices at NCWSC that is the perceived ease of use.

2.2.3 Process Approach Model

The process approach model focuses on how resources are converted to create goods or services in an organization (Thomas, Schermerhorn & Dienhart, 2004). This deals with the efficiency and effectiveness of an organization's internal systems and processes to optimize organizational performance. This looks at improved performance in an organization occasioned by relationships among all the staff which is built on honesty, trust and good will leading to seamless stream of information on both vertical and horizontal basis (Cameron, 1986). The model is relevant in the study since it looks at how processes in the organization are interlinked to bring about improved performance in organizations.

There are various tools that are used in organizations to operationalize performance one of which is balanced scorecard. Balance scorecard aims to measure how components of business strategy have been achieved (Kaplan & Norton, 2001). The performance areas assessed primarily by balance scorecard are financial, customers, internal business

processes and innovation including learning and growth. The use of balance scorecard helps an organization to measure the most important aspects of its operations to find out if it is performing as per set goals or not.

2.3 Legacy Systems Cost Management Practices

A variety of options have been suggested to reduce the cost of sustaining legacy systems. De Lucia et al. (2001, p. 642), for example, talk about "routine maintenance, reverse engineering, redesign, reengineering, relocation, wrapping, replacement of commercial off-the-shelf applications, as well as discarding." The authors agree that there is some controversy in the literature about the usage of some of these words, citing reengineering as well as migration as example.

''discard'', ''wrap'', ''outsource'', ''freeze'', ''carry on'', and ''reverse engineering'' are more precise alternatives proposed by Aversano and Tortorella (2014). Since outsourcing is unlikely to eliminate the need for one of the other solutions suggested, the claim that outsourcing is a viable option for maintaining legacy systems must be challenged. For a business-critical device, the feasibility of carry on as a solution for an indefinite time often appears to be doubtful. Furthermore, even the most stable old system would almost certainly need some kind of remediation at some stage. For example, if the number of people with the skills needed to support an outdated language is decreasing, some type of corrective action would be required.

The legacy system literature is consistent in understanding that the best choice for managing such systems must be based on a formal evaluation that includes economic As well as quality variables. The decisions must be made with input from a wide variety of

stakeholders within the organization, and they cannot be based solely on technical factors (Gartner, 2015). Additionally, research by Erlikh (2016) implies that the features of a company that operates and supports a legacy structure should be taken into account. Organizational variables such as resistance to change and/or system support weaknesses must be expressed in any potential system solution.

2.4 Challenges Facing Legacy Systems Cost Management Practices Adoption

Typically, implementation of legacy systems cost management practices is expected to assist in better management of resources, decrease workload, improve efficiency and boost work productivity. Considering the prevailing inefficiencies and conditions in developing countries these promises are exaggerated. International organization such as the World Health Organization and World Bank perform a significant part in influencing these promises since developing nations rely on them for both financial and technical aspects (Kuperman, 2018).

Esuh, Ossai and Adegoke (2014) looking at the technical angle of legacy systems cost management practices implementation found out that inability to transform and reconfigure business process to work well within the legacy systems cost management practices system was top at the technical challenges faced by organizations in legacy systems cost management practices implementation. Following closely were lack of requirements for information system and difficulties in upgrading the previous systems to new versions and having staff adapt accordingly. Aaltonen and Ikävalko (2002) adds to the list of other challenges facing legacy systems cost management practices implementation as follows: difficulties in aligning the legacy systems cost management practices strategy and an organization's business strategy, adopting legacy systems cost

management practices strategy behind schedule, inability to measure benefits from legacy systems cost management practices, expenses to be incurred in changing from one system to another, inadequate budgetary allocation for equipment and applications to be used in legacy systems cost management practices adoption. It is quite clear that adoption of legacy systems cost management practices has a myriad of challenges in any organization yet its importance to any business cannot be over emphasized.

Aaltonen and Ikävalko (2002) expounds the management challenge to include, little or no support from top management for legacy systems cost management practices, weak management roles in legacy systems cost management practices, lack or inadequate support from top management in creation and implementing systems and poor coordination and communication to ensure responsibilities are well articulated. Wilson (1989) in his study of 500 companies in the United Kingdom (UK) found that not employing professional staff, inadequate resources for user training, the rapidly changing needs of the digital system users and inabilities by systems to fulfill the user's expectations as the main human challenges faced in implementation of legacy systems cost management practices.

2.5 Legacy Systems Cost Management Practices and Firm Performance

Crotty and Horrocks (2017) outline the features of legacy structures and investigate why they are so expensive to operate and support. Three models for assessing and managing legacy system costs are investigated, and a new meta-model is suggested that examines the inconsistencies between the current models. The new meta-model is then tested on FinCo, a major UK financial services firm. Senior business as well as IT managers provide input data for the current meta-model, and the outcomes are compared to the

company's existing legacy system management plans. The paper continues by recommending changes to the company's existing legacy system management strategies as well as its long-term vision for legacy system management.

According to Brooke and Ramage (2016), evaluating future legacy system reform solutions can only be done as part of a systematic organizational study. That is, legacy system evaluation ought to take place within a context that incorporates both business and technological aspects. They agree that the business strategy should take the lead in this phase. As a result, they developed an inter-disciplinary approach that combines an organizational scenarios tool (on basis of organizational development perceptions) with a technical scenarios tool (on basis of software engineering ideas). The methods are used in an reiterative manner, allowing technological options to be compared to business requirements. As a result, it's a complex method that tries to replicate the dynamics of organizational change as closely as possible.

Gangadharan et al. (2013) proposes a set of criteria for deciding whether to decommission or maintain legacy systems. This collection of propositions is based on research and interviews with senior executives in organizations. The decision to decommission or retain a system is influenced by software features, implementation methods, system dependence, lock-in, system complexity, emerging technology, and system ownership. Conclusion was attained by introducing a framework to assist firms in seeking the accurate equilibrium between retiring legacy programs and keeping them operational.

Mjomba and Kavale (2015) studied effects of ERP on the performance of the Kenya power and lighting company. The researchers used descriptive research design and a

sample size of 125 respondents. They collected the data using questionnaires which the researcher developed and administered using research assistant and then evaluated through SPSS software and the outcomes of the research presented in frequencies using figures and tables using ANOVA. The research showed that the organizations experienced management efficiency, lowered operation costs, increased profitability, and competitive advantage. All the factors had immense impact on the performance of the organization.

Odhiambo (2013) examined ICT use in high schools in the district of Rachuonyo South, Homa-Bay, Kenya. 320 students, 24 teachers and 8 heads of high school were sampled in the research, and a questionnaire administered to them. The study revealed that ICT was an incredibly powerful tool in teaching and learning process. Students who are constantly exposed to ICT skills changed their views on both education and ICT. It also strengthened teachers ' efficiency and effectiveness in their work. The findings support existing knowledge on how ICT leads to efficiency and effectiveness in service delivery.

Gules et al. (2012) studied the impact supply chains and information technologies might have on business performance in Turkey. Case study approach is used to analyze this objective. More specifically the study was conducted on industries producing Fast Moving Consumer Goods. The authors modeled supply, production and distribution activities to be short, medium and long-term operations. Results showed that including information technologies in supply chains has a linear / direct effect on business performance at different criterions.

In view of the above, there exists studies on this area but a few if any have gone ahead to study on the influence that legacy systems cost management practices has had on the

performance of organizations. It is assumed that legacy systems cost management practices has been an enabler in the development and the implementation of the practices and strategies in NCWSC but lack of empirical studies implies that a study is needed to test this hypothesized relationship.

2.6 Conceptual Framework

This is a diagrammatic exhibition that outlines key concepts and variables and the linkages between them. The research aimed to determine the effect of legacy systems cost management practices on performance.

Figure 2.1: The Conceptual Framework

Independent Variables   **Dependent Variables**

| Legacy systems cost management practices | | Firm performance |

- Restructuring
- Ordinary maintenance
- Migration
- Discarding

- Timeliness
- Quality of services
- Proper records
- Proper control mechanisms
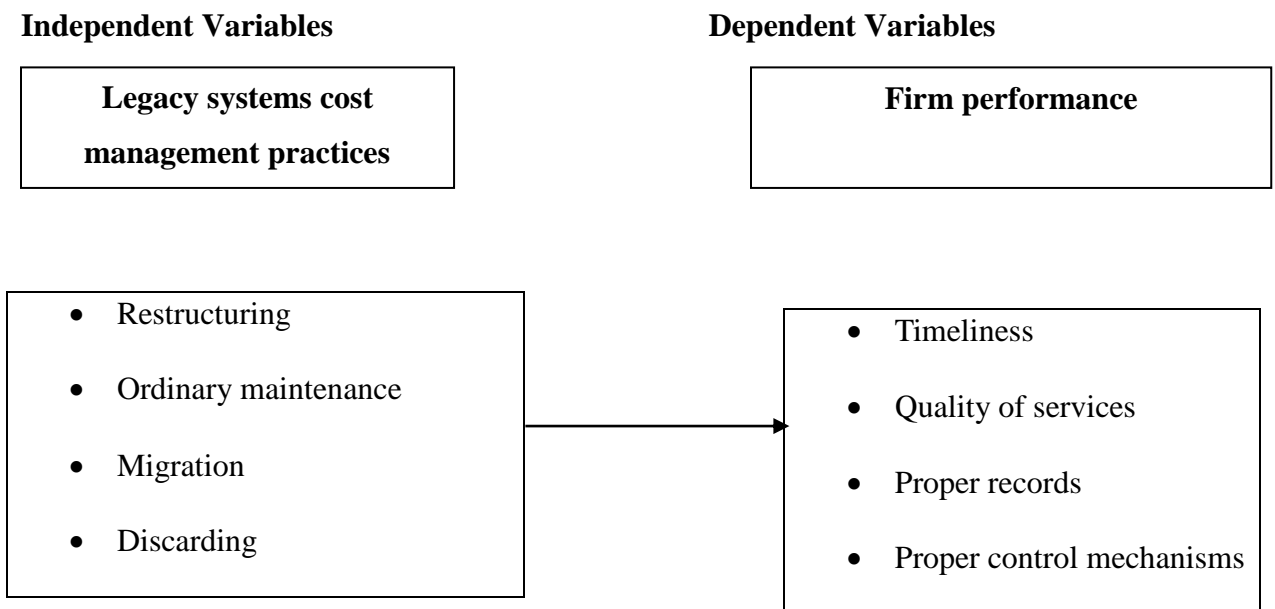
Source: Alkazemi, Nour and Meelud (2013)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

To ascertain the impact of legacy systems cost management practices on performance of NCWSC, the study must have a research methodology that outlines the procedure via which the study was carried. This chapter is separated into four segments: the research design, the data collection procedure, the study's population, and finally, the data analysis method.

3.2 Research Design

The research employed a descriptive research design. The aim of a descriptive study is establishing the "what and how" of a condition. The design was chosen because it permitted the researcher to use quantitative data so as to ascertain effect of legacy systems cost management practices on performance of NCWSC. The researcher was guided by the design in collecting information, summarizing it, presenting it and interpreting so as to get deeper clarity on the issues. Causal research design was also adopted to display the affiliation between legacy systems cost management practices and firm performance. The researcher chooses causal design as it helps to infer on the relationship between study variables and in this case legacy systems cost management practices and performance.

3.3 Population of the Study

Population refers to total subjects sharing common characteristics (Kothari, 2004). In respect of this study, the study's population was 997 management workers from the Nairobi City Water and Sewerage Company, as depicted by Table 3.1.

Table 3.1 Distribution of Population

Grade Ranking	No. of Employees
Senior managers (Directors and managers)	36
Middle level managers (Coordinators and Officers)	331
Supervisors	630
TOTAL	**997**

Source: NCWSC Human Resource Department (2021)

3.4 Sample and Sampling Techniques

The stratified random sampling method was used in this study. Cooper and Schindler (2013) stated this sampling method aids in the provision of statistical effectiveness rise on a sample, gives sufficient data for the analysis of the population while enabling diverse research methodologies utilized in diverse strata. This method permitted the investigator to split the sample into sufficient mutually exclusive strata. Workers were divided into groups based on their cadre.

The study adopted Yamane (1967) formula with assumption of 95% of confidence level to estimate the sample size.

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = sample size

N = size of population

e = precision level

1 = Constant

$$n = 997/1 + 997(0.05)^2$$

$$= 285.47 \approx 286 \ respondents$$

Substituting these values in the above equation gave 286 respondents that were used as current study's sample size. As displayed in Table 3.2, the sample size was as follows

Table 3.2 Sample Size Distribution

Grade ranking	Population	Sample Size	% Distribution
Senior managers	36	10	3.50
Middle level managers	331	95	33.22
Supervisors	630	181	63.28
TOTAL	**997**	**286**	**100**

3.5 Data Collection

Primary data collected using a structured questionnaire was used in this study. The research instrument was structured into four sections needing responses to different dimensions according to the Likert scale for ease of rating / response ranking, data analysis and closed with an open-ended section. The beginning had section A, which consisted of a brief background concerning the respondents biographic data. The second section, B, focused on degree of legacy systems cost management practices at Nairobi City Water and Sewerage Company. The third section, C, emphasized on performance of NCWSC. The fourth section, D focused on challenges facing legacy systems cost management practices at NCWSC. Google forms were adopted in the administration of the questionnaire.

3.6 Data Analysis

The questionnaire's primary data was checked, edited and coded. For background information, objective i and iii, descriptive statistics were conducted while objective II

23

was achieved by conducting regression analysis. Multiple linear regression model was applied in analyzing quantitative data because there was one dependent variable and several independent variables. This enabled establishing if there exist and association of the dependent variable with either single or various independent variables.

The following regression model was utilized:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

Where: Y = Firm performance

β_0 = regression equation intercept

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of regression

X_1 = Restructuring, X_2 = Ordinary maintenance, X_3 = Migration, X_4 = Discarding, ε =error term

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF RESEARCH FINDINGS

4.1 Introduction

The study's findings are presented in this section. The general information section, which includes the response rate and demographic data, is one of the sections in this chapter. The descriptive and inference statistics are also discussed in line with the research objectives in this chapter.

4.2 Response Rate

The responses received divided by the number of target participants are the rate of response in survey research. The completion rate is the response rate, denoted as a percentage. Table 4.1 contains information on the response rate in the investigation.

Table 4.1: Response Rate

Response Rate	Frequency	Percent
Returned	202	70.6
Unreturned	84	29.4
Total	**286**	**100**

Primary Data (2021)

As part of the study, 286 questionnaires were given to sampled staff. There were 202 questionnaires in total that were completed and returned. This resulted in 70.6 percent response rate. This was presented in Table 4.1. The other 84 questionnaires were not properly filled even after subsequent follow-up.

4.3 General Information

This segment outlines the findings on the descriptive statistics for the demographic outlines of all the participants and the firm's background information.

4.3.1 Gender

Gender specification was a requirement to the target population. Outcomes demonstrate that male participants' percentage was 66.8% whereas females were 33.1%. The fact that there female respondents were relatively a third of the target participants can imply that the NCWSC value gender diversity. This also implies that the study was able to get responses from both genders which enrich the study findings. Table 4.2 summarizes the findings.

Table 4.2: Gender

Gender	Frequency	Percentage
Male	135	66.8%
Female	67	33.2%
Total	**202**	**100%**

Primary Data (2021)

4.3.2 Scale in the Organization

Table 4.3 gives an illustration of the results of scale in the organization. Results illustrate that the most participants (66.3%) were in grade 4-5, 22.3% were in grade 1-3 while 11.4% were in grade 6-7. The outcomes suggest that data from all grades in the organization was obtained.

Table 4.3: Grade

Grade	Frequency	Percentage
6-7	23	11.4%
4-5	134	66.3%
1-3	45	22.3%
Total	**202**	**100%**

Primary Data (2021)

4.3.3 Department

The responders were requested to state their department. The outcomes are summarized in Table 4.4. The majority (39.1 percent) worked in the commercial department, 22.3% worked in the ICT department, 16.8% worked in the Audit and MDs office 10.9% work in the technical department while another 10.9 percent work in human resource. This shows that the data obtained from all the departments would help in arriving at conclusive results.

Table 4.4: Department

Department	Frequency	Percentage
ICT	45	22.3%
Commercial	79	39.1%
Technical	22	10.9%
Human resource	22	10.9%
Audit and MDs office	34	16.8%
Total	**202**	**100%**

Primary Data (2021)

4.3.4 Years with the Firm

Respondents had worked for their current organization for a variety of years. The amount of time spent with a firm can be used to determine how well they know internal processes, capabilities, or effectiveness. The results indicated that 55.5% had stayed for 8-13 years, 22.7% for above 18 years, 10.9% for 2-7 and another 10.9% for 13-18 years.

Table 4.5: Years with the Firm

Years	Frequency	Percentage
2-7 year	22	10.9%
8-13 years	112	55.5%
13-18 years	22	10.9%
Above 18 years	46	22.7%
Total	**202**	**100%**

Primary Data (2021)

4.3.5 Legacy System Cost Management Practices Adopted

The researcher was interested in establishing the legacy systems cost management practices adopted by NCWSC. The respondents indicated that they use for legacy system cost management practices namely; restructuring, ordinary maintenance, migration and discarding.

4.4 Descriptive Statistics

The descriptive conclusions for every variable under investigation are reported in percentages, means, as well as standard deviations in this part.

4.4.1 Legacy Systems Cost Management Practices Adoption

Table 4.6 shows the mean and standard deviation for the specific features of legacy systems cost management practices adoption.

Table 4.6: Descriptive Statistics for Legacy Systems Cost Management Practices Adoption

Statement	N	Mean	Std. Dev
Restructuring	202	2.96	0.86
Ordinary maintenance	202	3.07	0.97
Migration	202	3.17	0.89
Discarding	202	2.16	0.84
Average	**202**	**2.84**	**0.89**

Primary Data (2021)

The findings revealed that the most adopted legacy systems cost management practice is aspect is migration which is adopted to a moderate extent (Mean=3.17, std. dev=0.89). The findings further revealed that NSWSC has adopted ordinary maintenance to a moderate extent (Mean=3.07, std. dev=0.97). The findings also revealed that NCWSC

28

have adopted restructuring to a moderate extent (Mean=2.96, std. dev= 0.86). Additionally, findings discovered that discarding at NCWSC has been adopted to a little extent (Mean= 2.16, std. dev=0.84). On average, the results revealed that NCWSC have adopted legacy systems cost management practices to a moderate extent given by an average mean of 2.84 and a standard deviation of 0.89.

4.4.2 Firm Performance

The specific attributes mean and standard deviation of NCWSC performance are as outlined in Table 4.7.

Table 4.7: Descriptive Statistics for Firm Performance

Statement	N	Mean	Std. Dev.
All our services are offered within the set timelines	202	3.00	0.74
The cost of running our services has been reducing with time	202	2.51	1.01
The quality of our services has been increasing over time	202	3.28	0.80
The organization maintains proper records	202	3.40	0.75
The organization has proper control mechanisms over all payment processes	202	3.61	0.59
Average	**202**	**3.16**	**0.57**

Primary Data (2021)

The findings showed that NCWSC maintains proper records to a moderate extent (Mean=3.40, std. dev=0.75). The findings also show that at NCWSC, services are offered within the set timelines to a moderate extent (Mean=3.00, std. dev=0.74). Additionally, findings revealed that NCWSC has proper control mechanisms over all payment processes to a high extent (Mean=3.61, std. dev=0.59). Further, findings shown that the quality of services has been increasing over time to a moderate extent (Mean=3.28, std. dev=0.80). Finally, the results revealed that the cost of running business at NCWSC has

been reducing with time to a moderate extent (Mean=2.51, std. dev=1.01). The overall mean was 3.16 and the standard deviation was 0.57 suggesting that firm performance at NCWSC has improved to a moderate extent.

The respondents were also asked how long their department takes to resolve customer complaints. The results revealed that majority of the departments respond within 24 hours to customer complaints. The average turnaround time for commercial department was however 21 days. The respondents were also asked if the duration they take to respond is within the turnaround time. 72.2% said yes while 27.8% said no. The researcher further asked if the company records are up to date and 55.6% said yes while 44.4% said no. 83.3% of the respondents revealed that with the changes done in the system of operations, the controls are now automated.

4.5 Inferential Statistics

This part comprises the inferential statistics for all of the variables. Pearson correlations as well as multiple regressions were used as inferential statistics. To establish the association between all the variables Pearson correlation was utilized whereas regression was done to establish the association between Legacy systems cost management practices (materials management, production planning, distribution management and quality management) and NCWSC services' performance.

4.5.1 Correlation Analysis

The correlation analysis assisted in signifying the association between the dependent and independent variables. This involved the r coefficient as well as whether the association is positive or negative. This is as exemplified in Table 4.8.

The correlation outcomes demonstrate a strong, positive and significant association between restructuring and NCWSC performance as reflected by a 0.724 Pearson correlation coefficient and a 0.000 P-value. Results of correlation too establish a strong, positive as well as substantial association between ordinary maintenance and NCWSC performance as depicted by a 0.598 Pearson correlation coefficient and a 0.000 P-value.

The results also demonstrate a strong, positive and significant association between migration and NCWSC performance as reflected by a 0.761 Pearson correlation coefficient and a 0.000 P-value. Results of correlation too establish a strong, positive and substantial association between discarding and NCWSC services' performance as depicted by a 0.596 Pearson correlation coefficient and a 0.000 P-value.

Table 4.8: Correlation Results

	Firm Performance	
	Pearson 's correlation	P
Restructuring	0.724	0.000
Ordinary maintenance	0.598	0.000
Migration	0.761	0.000
Discarding	0.596	0.000

Primary Data (2021)

4.5.2 Regression Analysis

The regression analysis incorporates the model fitness, the Analysis of Variance (ANOVA) as well as the regression coefficients. This is as verified in underneath.

Table 4.9: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.801[a]	.642	.626	.515474

a. Predictors: (Constant), Discarding, Migration, Restructuring, Ordinary maintenance

Primary Data (2021)

Restructuring, ordinary maintenance, migration and discarding were adequate in explaining NCWSC services' performance as presented in Table 4.12. As indicated by an R square of 0.625, it implies that materials management, production planning, distribution management and quality management account for 62.5% in NCWSC services' performance variations with factors beyond the research explaining the difference. The other inference is that the model linking the variables relationships is satisfactory. The 0.791 R value implies presence of strong relationship between the predictor variables (restructuring, ordinary maintenance, migration and discarding) and performance of NCWSC services.

Table 4.10: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	20.357	4	5.089	22.209	.000[b]
1	Residual	45.142	197	.229		
	Total	65.499	201			

a. Dependent Variable: Firm performance
b. Predictors: (Constant), Discarding, Migration, Restructuring, Ordinary maintenance

Primary Data (2021)

Table 4.10 outcomes confirm the model appropriateness and this is depicted by 22.209 F statistic as well as 0.000 p value. This shows that restructuring, ordinary maintenance, migration and discarding are good predictors of NCWSC performance. The regression

analysis showed the magnitude of influence of restructuring, ordinary maintenance; migration and discarding have on NCWSC performance.

Table 4.11: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	2.481	.158		15.735	.000
	Restructuring	.104	.049	.186	2.108	.036
1	Ordinary maintenance	.366	.056	.622	6.538	.000
	Migration	.120	.041	.188	2.915	.004
	Discarding	.240	.044	.352	5.417	.000
a. Dependent Variable: Firm performance						

Primary Data (2021)

Conclusions depicted a positive significant effect of ordinary maintenance on NCWSC performance (β 0.366, P 0.000). Further, results demonstrated a positive substantial effect of migration on NCWSC performance (β 0.120, P 0.004). Finally, results revealed a positive substantial effect of restructuring on NCWSC performance (β 0.104, P 0.000)

The following model was generated:

$Y = 2.481 + 0.104X_1 + 0.366X_2 + 0.120X_3 + 0.240X_4$

Where

Y = Firm performance,

X_1 – Restructuring,

X_2 – Ordinary maintenance,

X_3 – Migration,

X_4 – Discarding

4.6 Challenges Facing Adoption of Legacy Systems Cost Management Practices

The mean and standard deviation for the specific challenges facing legacy systems cost management practices adoption are as Table 4.12 displays.

Table 4.2: Challenges Facing Legacy Systems Cost Management Practices

Statement	N	Mean	Std. Dev
Poor technical support from ICT vendors	202	3.05	0.85
Lack of technical knowhow among the staff	202	2.84	0.83
Integration challenges	202	3.33	1.01
Lack of top management support	202	2.88	0.87
Resistance to change	202	3.22	0.97
High system maintenance costs	202	3.38	0.68
Inadequate resources for user training	202	3.66	1.05
Poor coordination and communication	202	3.17	0.95
Financial constraints	202	3.33	1.10
Inability to transform and reconfigure business processes	202	2.88	0.87
Difficulties in upgrading the previous systems to new versions	202	3.28	0.87
Average	**202**	**3.18**	**0.91**

Primary Data (2021)

The results reveal that NCWSC are facing legacy systems cost management practices challenges to a moderate extent. This is evidenced by the fact that the mean scores for all of the listed challenges was 3.18 on a five-point Likert scale. The respondents agreed that they are facing poor technical support from ICT vendors, lack of technical knowhow among the staff, lack of top management support and change resistance to a moderate extent. The respondents also revealed that that they face high system maintenance costs, inadequate resources for user training, poor coordination and communication, inability to

transform and reconfigure business processes and difficulties in upgrading the previous systems to new versions to a moderate extent.

4.7 Discussion of Findings

This research sought to determine the degree of legacy systems cost management practices adoption at NCWSC and to determine how legacy systems cost management practices adoption impact performance at NCWSC. Further, the study also sought to establish challenges facing NCWSC in adopting legacy systems cost management practices. Legacy systems cost management practices adoption was broken down into restructuring, ordinary maintenance, migration and discarding while performance was operationalized in terms of timeliness, quality of services, proper records and proper control mechanisms. The findings indicate that legacy systems cost management practices has been adopted by NCWSC to a moderate extent and that this has significantly enhanced performance.

The research conclusions correspond with those of Crotty and Horrocks (2017) who outlined the features of legacy structures and investigate why they are so expensive to operate and support. Three models for assessing and managing legacy system costs are investigated, and a new meta-model is suggested that examines the inconsistencies between the current models. The new meta-model is then tested on FinCo, a major UK financial services firm. Senior business as well as IT managers provide input data for the current meta-model, and the outcomes are compared to the company's existing legacy system management plans. The paper continues by recommending changes to the company's existing legacy system management strategies as well as its long-term vision for legacy system management.

The conclusions are also support Brooke and Ramage (2016) who posits that evaluating future legacy system reform solutions can only be done as part of a systematic organizational study. That is, legacy system evaluation ought to take place within a context that incorporates both business and technological aspects. They agree that the business strategy should take the lead in this phase. As a result, they developed an inter-disciplinary approach that combines an organizational scenarios tool (on basis of organizational development perceptions) with a technical scenarios tool (on basis of software engineering ideas). The methods are used in an reiterative manner, allowing technological options to be compared to business requirements. As a result, it's a complex method that tries to replicate the dynamics of organizational change as closely as possible.

This was also supported by Gangadharan et al. (2013) who proposes a set of criteria for deciding whether to decommission or maintain legacy systems. This collection of propositions is based on research and interviews with senior executives in organizations. The decision to decommission or retain a system is influenced by software features, implementation methods, system dependence, lock-in, system complexity, emerging technology, and system ownership. Conclusion was attained by introducing a framework to assist firms in seeking the accurate equilibrium between retiring legacy programs and keeping them operational.

In regards to challenges facing legacy systems cost management practices adoption, the study revealed that NCWSC is facing poor technical support from ICT vendors, lack of technical knowhow among the staff, lack of top management support and change resistance to a moderate extent. The respondents also revealed that that they face high

system maintenance costs, inadequate resources for user training, poor coordination and communication, inability to transform and reconfigure business processes and difficulties in upgrading the previous systems to new versions to a moderate extent.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Presented in the chapter is summary, conclusion, as well as recommendations. The study's summary, conclusion, and suggestions for improvement are all presented in accordance with the study's research objectives. Recommendations for further research and limitations of the study are too offered in the chapter.

5.2 Summary of Findings

The research's main objective was determining legacy systems cost management practices adoption influence on NCWSC performance. The research was anchored on system theory of profound knowledge, the technology acceptance model and the process approach model. Firm performance was the dependent variable that was represented by timeliness, quality of services, proper records and proper control mechanisms operationalized using likert scale questions. The independent variables were restructuring, ordinary maintenance, migration and discarding. Descriptive survey design was adopted in the research. All management staff at NCWSC were included in the target population.

The sample size was arrived at using Yamane formula. A structured questionnaire was issued to target respondents via Google forms to obtain primary data. 202 questionnaires were obtained, yielding a response rate of 70.6 percent. Descriptive statistics, correlation, and regression analysis were utilized to analyze the data. The significance of each independent variable on performance was examined by a multivariate linear regression model and the t-statistic.

The research's first objective was assessing the extent of legacy systems cost management practices adoption at NCWSC. The findings show that NCWSC have embraced legacy systems cost management practices to a moderate extent. The fact that the mean scores for qualities linked to legacy systems cost management practices were around three on a five-point likert scale supports this. The descriptive analysis too discovered that NCWSC have adopted restructuring, ordinary maintenance, migration, and discarding as the legacy cost management practices.

The research's second objective was determining influence of legacy systems cost management practices adoption on performance of NCWSC. Conclusions depicted a positive significant effect of ordinary maintenance on NCWSC performance. The results also portrayed a positive significant effect of discarding on NCWSC performance. Further, results demonstrated a positive substantial effect of migration on NCWSC performance. Finally, results revealed a positive substantial effect of restructuring on NCWSC services' performance.

The research's third objective was to establish challenges facing NCWSC in adopting Legacy systems cost management practices. The study revealed that that NCWSC is facing poor technical support from ICT vendors, lack of technical knowhow among the staff, lack of top management support and change resistance to a moderate extent. The respondents also revealed that that they face high system maintenance costs, inadequate resources for user training, poor coordination and communication, inability to transform and reconfigure business processes and difficulties in upgrading the previous systems to new versions to a moderate extent.

5.3 Conclusions

For each of the research objectives, this segment summarizes the conclusions taken from the research results. The study concluded that legacy systems cost management practices have been adopted to a moderate level by NCWSC. This is reinforced by the reality that in a 5 point likert scale, all the selected measures of legacy systems cost management practices adoption had means of around three. Restructuring, ordinary maintenance, migration and discarding, have all been adopted at NCWSC.

The conclusion is that a positive substantial effect of ordinary maintenance on NCWSC performance exists. Discarding also has a positive effect on NCWSC performance. Another conclusion is that a positive substantial effect of migration on NCWSC performance exists. Finally, the study concludes that a positive substantial effect of restructuring on NCWSC performance exists.

The study also concludes that NCWSC is facing poor technical support from ICT vendors, lack of technical knowhow among the staff, lack of top management support and change resistance moderately. The respondents also mentioned that that they face high system maintenance costs, inadequate resources for user training, poor coordination and communication, inability to transform and reconfigure business processes and difficulties in upgrading the previous systems to new versions to a moderate extent.

5.4 Recommendations for Policy and Practice

The research revealed that ordinary maintenance influenced NCWSC performance positively. According to the findings, management of NCWSC should continue practicing ordinary maintenance as this will positively impact firm performance.

Correspondingly, the research suggests that other organizations in Kenya with legacy systems should consider adopting ordinary maintenance as this will enhance their performance.

The research revealed that discarding influenced NCWSC performance positively. According to the findings, management of NCWSC should continue practicing discarding as this will positively impact firm performance. Correspondingly, the research suggests that other organizations in Kenya with legacy systems should consider adopting discarding as this will enhance their performance.

The research revealed that restructuring influenced NCWSC performance positively. According to the findings, management of NCWSC should continue practicing restructuring as this will positively impact firm performance. Correspondingly, the research suggests that other organizations in Kenya with legacy systems should consider adopting restructuring as this will enhance their performance.

The research revealed that migration influenced NCWSC performance positively. According to the findings, management of NCWSC should continue practicing migration as this will positively impact firm performance. Correspondingly, the research suggests that other organizations in Kenya with legacy systems should consider adopting migration as this will improve performance.

5.5 Limitations of the Study

Primary data was utilized in this study. To minimize the number of likely outliers, a structured questionnaire was used in the research. This may, however, pose the issue of biased data collecting because the respondents in question are restricted in how and how

much they should provide. In this respect, the researcher made sure that the data collecting instrument enables complete data gathering which meets study aims as easily as feasible.

In addition, several of the respondents were skeptical about participating in the research. The researcher rectified this issue by obtaining required permission, authorization and permissions from the authorities concerned, including the University. In addition, ethical concerns were taken into account. Finally, the researcher stated willingness to share the study with interested participants.

The focus was on some of the characteristics that are thought to influence performance at NCWSC. The research centered on five explanatory variables in particular. Nevertheless, there are additional factors that are expected to influence the performance at NCWSC. Others are external, political interference, whereas some are internal, like organization culture, process improvements, as well as top management support.

5.6 Suggestions for Further Research

The R^2 showed a variation of 64.2% which implies that other variables not considered in this study explains 35.8% of changes in firm performance. As a consequence, future study may concentrate on other variables that are likely to influence firm performance such as top management support and the type of systems in place. Policymakers would be able to devise and firmly implement an effective apparatus to improve performance by determining how each of the factor influences firm performance.

This research focus was on legacy stems cost management practices adoption effect on performance at NCWSC. As a result, for comparative purposes, comparable research can

be conducted across firms in various sectors such as manufacturing, tourism, insurance, banking, investment, commercial, as well as service firms, among others.

Finally, this research relied on a multiple linear regression model, which has drawbacks, such as errors and misleading results when a variable is changed. Future academics should investigate the many relationships between legacy stems cost management practices adoption and firm performance using models like the Vector Error Correction Model (VECM).

REFERENCES

Alkazemi, B.Y., Nour, M.K., & Meelud, A. Q. (2013). Towards a framework to assess legacy systems, *IEEE International Conference on Man and Cybernetics*, 12(1), 924–928

Aaltonen, P., & Ikävalko, H. (2002). Implementing strategies successfully: *Integrated Manufacturing Systems, 13(*6), 415-18

Aversano, L., & Tortorella, M. (2014). An assessment strategy for identifying legacy system evolution requirements in eBusiness context, *J. Softw. Maintenance Evol.: Res. Practice 16* (4) 255–276

Ashrafi R. & Murtaza, M. (2008). Use and impact of ICT on SMEs in Oman. *Electronic Journal Information Systems Evaluation*, 11(3), 125-140

Bakar, A., & Razali, R. (2013). *A preliminary review of legacy information systems evaluation models*, in: International Conference on Research and Innovation in Information Systems (ICRIIS), IEEE Conference Publications [Online], pp. 314–318

Brooke, C., & Ramage, M. (2016). Organisational scenarios and legacy systems, *International Journal of Information Management,* 21(5), 365–384

Burns, N. & Burns, S. (2008). *The Practice of Nursing Research: Conduct, Critique and Utilization*: 5th Edition: St Louis, Elsevier Saunders

Brynjolfsson, E. (1995). The productivity paradox of Information Technology. *Communications of the ACM*, 35

Brynjolfsson, E. & Hitt, S. (1996). Information Technology and Productivity: A review of the literature. Advances in computers, *Academic Press, 43(2),* 180-212

Cameron, K. S. (1986). A study of organizational effectiveness and its predictors, *Management Science*, 32, 87–112

Carr, N. (2003). IT doesn't matter. *Harvard Business Review*, 13(2), 121-129

Chiware, E. & Dick, A. (2008). The use of ICTs in Namibia's SME sector to access business information services. *The Electronic Library*, 26(2), 145-150

Crotty, J., & Horrocks, I. (2017). Managing legacy system costs: A case study of a meta-assessment model to identify solutions in a large financial services company, *Applied Computing and Informatics, 13*(2), 175-183,

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–339.

De Lucia, A., Fasolino, R., Pompelle, E. (2001). *A decisional framework for legacy system management*, in: IEEE International Conference on Software Maintenance, IEEE Conference Publications, pp. 642–651 [Online].

Deming, W. E. 1. (2000). *The new economics: For industry, government, education* (2nd ed.). Cambridge, Mass. MIT Press.

Erlikh, L. (2016). Leveraging legacy system dollars for e-business, *IT Professional, IEEE J. Mag. 2*(3), 17–23

Esuh, Ossai, L. I., Adegoke, O. (2014). The challenges and difficulties of information system development: A case study of PERHEBAT

Gangadharan G.R., Kuiper E.J., Janssen M., Luttighuis P.O. (2013). IT Innovation Squeeze: Propositions and a Methodology for Deciding to Continue or Decommission Legacy Systems. IFIP Advances in Information and Communication Technology, 402. Springer, Berlin, Heidelberg.

Gartner, (2015). *Legacy application or system*, Gartner IT Glossary, 2015 [Online].

Kaplan, R. S. & Norton, D. P. (2001). Transforming the balanced scorecard from performance measurement to strategic management: Part I. *Accounting Horizons* 15(1): 87-104.

Kapurubandara, M. & Lawson, R., (2006). Barriers to adopting ICT and e-commerce with SMEs in Developing Countries: An exploratory study in Sri Lanka

Kuperman, G. J. (2018). Health-information exchange: why are we doing it, and what are we doing? *Journal of the American Medical Informatics Association*, 18(5), 678-682.

Madadipouya, K. (2015, June). A review on the strategic use of it applications in achieving and sustaining competitive advantage. *International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT)*, 6(2), 21-30

Mobegi, W. (2012). *An analysis of rural-based business ventures' ICT adoption and performance (Kibwezi district in Makueni County case study)*, Unpunlished MA project, University of Nairobi

Noyé, D. (2002). Manager les performances. Les Basic d'INSEP consulting, https://books.google.co.ke/books?id=JHdcwBjVLwMC

Odhiambo, S.O. (2013). Use of information communication technology in teaching and learning processes in secondary schools in Rachuonyo south district, Homa-Bay county, Kenya, University of Nairobi

Oliveira, T. &Martins, M. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal Information Systems Evaluation, 14*(1), 110-121

Plant, R. (2011). A system for speaking IT truths to CEOs, *Harvard Business Review*, 220(1), 1-12

Ross, J., Hogaboam., G. A., & Hannay, L. (2017). Predictors of teachers' confidence to implement computer-based instruction: *Journal of Educational Computing Research*, 21 (1), pp.75-97.

Sommerville, I. (2015). *Software Engineering*, 10th ed., Pearson Education, Harlow

APPENDICES

Appendix I: Research Questionnaire

Instructions

Data to be obtained in this survey will be purely used for academic purposes and will be used in partial fulfillment of a Masters Research project to study the impact of Legacy systems cost management practices on performance of Nairobi City Water and Sewerage Company. All information obtained will be strictly confidential. There are 4 sections.

SECTION A: BACKGROUND INFORMATION

Respondents General Information

1. **Gender**

   Male [ ]

   Female [ ]

2. **Scale in the organization**

   o   Grade 6-7 [ ]

   o   Grade 4-5 [ ]

   o   Grade 1-3 [ ]

3. **Department where you work (tick one)**

   o   ICT   [ ]

o   Commercial   [ ]

o   technical   [ ]

o   Human resource   [ ]

o   Audit and MDs office   [ ]

4. **Years of experience in the organization**

o   2-7 year [ ]

o   8-13 years [ ]

o   13-18 years [ ]

o   Above 18 years [ ]

5. Which legacy system cost management practice has been adopted in your

department?

……………………………………………………………………………………

……………………………………………………………………………………

**SECTION B: LEGACY SYSTEMS COST MANAGEMENT PRACTICES
ADOPTION**

6. Kindly indicate the extent to which you feel the company has adopted the following

legacy systems cost management practices in your organization. Use the following scale:

1- No extent, 2-Low extent, 3-, Moderate extent, 4- High extent, 5- Very high extent

	Statement	1	2	3	4	5
1	Restructuring					
2	Ordinary maintenance					

		1	2	3	4	5
3	Migration					
4	Discarding					
5	Others, Specify and rate accordingly					

PART C: FIRM PERFORMANCE

7. Kindly indicate the extent to which you agree the legacy cost management practices mentioned above have impacted on the organization performance by using the following scale:

Use 1 – No Extent, 2 – Low Extent, 3 – Moderate Extent 4 – High Extent, 5- Very High Extent

	Statement	1	2	3	4	5
1	All our services are offered within the set timelines					
2	The cost of running our services has been reducing with time					
3	The quality of our services has been increasing over time					
4	The organization maintains proper records					
5	The organization has proper control mechanisms over all payment processes					
6	Others, Specify and rate accordingly					

8. How long does the department take to resolve customer complaints? …….. Days

9. Is this within the turnaround time?

Yes [ ]

No [ ]

If no, explain ………………………………………………….

10. Are the records in the company up to date?

Yes [ ]

No [ ]

If no, explain ………………………………………………….

11. With the changes done in the system of operations, are the controls now

Automated [ ]

Manual [ ]

PART D: CHALLENGES FACING LEGACY SYSTEMS COST MANAGEMENT PRACTICES

11. In a scale of 1 to 5, indicate the extent to which you feel the company is facing the following challenges when implementing legacy systems cost management practices where 1= No extent, 2=low extent, 3=Moderate extent, 4=High extent and 5=Very high extent

	Statement	1	2	3	4	5
1	Poor technical support from ICT vendors					
2	Lack of technical knowhow among the staff					
3	Integration challenges					

4	Lack of top management support					
5	Resistance to change					
6	High system maintenance costs					
7	Inadequate resources for user training					
8	Poor coordination and communication					
9	Financial constraints					
10	Inability to transform and reconfigure business processes					
11	Difficulties in upgrading the previous systems to new versions					
12	Others, Specify and rate accordingly					

Thank you for your participation