ONLINE PROJECT REGISTRATION SYSTEM (OPRS) AND PERFORMANCE OF CONSTRUCTION PROJECTS IN KENYA: A CASE OF NATIONAL CONSTRUCTION AUTHORITY APPROVED BUILDING PROJECTS IN CENTRAL NYANZA REGION

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2023

DECLARATION

This project proposal is my work and has not been presented for a degree award in any university.

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L50/39285/2021

The research project proposal has been presented for examination with my approval as the university supervisor and moderator respectively.

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TABLE OF CONTENTS

DECLARATION ..... **ii**

TABLE OF CONTENTS ..... **iii**

LIST OF TABLES ..... **vii**

ABBREVIATIONS AND ACRONYMS ..... **viii**

CHAPTER ONE **1**

INTRODUCTION **1**

1.1 Background of the Study 1

1.1.1 Online Project Registration System (OPRS) 4

1.1.3 OPRS and Performance of Construction Projects in Kenya 7

1.2 Research Problem 8

1.3 Research Objectives 10

1.4 Value of the Study 10

CHAPTER TWO **12**

LITERATURE REVIEW **12**

2.1 Introduction 12

2.2 Theoretical Review 12

2.2.1 Delone and McLean Information Success Model (ISSM) (1992) 12

2.2.2 Technology Acceptance Model (TAM) (Davis et al, 1989) 14

2.2.3 Resource-based Theory (Barney, 1991) 15

2.3 Online Project Registration System (OPRS) 16

2.3.1 Project Management Information System Use and Performance of Construction projects 16

2.3.3 Project Management Information System use and Contractors, Skilled Workers and Site Supervisors 18

2.3.4 Project Management Information System Information Quality and Performance of Construction projects 21

2.4 Empirical Studies 22

2.5 Conceptual Framework 29

2.6 Summary of Literature Review and Knowledge Gaps 31

2.6.2 Knowledge Gaps 31
CHAPTER THREE 43
METHODOLOGY 43
3.1 Introduction 43
3.3 Target Population 43
Table 2: Sample Frame 44
3.4 Sample Design 44
3.5 Data Collection 44
3.6 Data Analysis 45
3.7 Operationalization of Variables 46
CHAPTER FOUR 48
DATA ANALYSIS, PRESENTATION AND INTERPRETATION 48
4.1 Introduction 48
4.2 Questionnaire Response Rate 48
4.3 Respondents Demographic Characteristics 48
4.3.1 Respondents Gender Distribution 48
4.3.2 Respondents Age Brackets 49
4.3.3 Education Level of Respondents 49
4.4 Performance of the Online Project Registration System 50
4.5 Online Project Registration System Technical Characteristics 51
4.6 Online Project Registration System Use and Performance Construction Projects 52
4.7 Online Project Registration System User and Performance Construction Projects 53
4.8 Contractors, Skilled Workers, Site Supervisors and Performance Construction Projects 54
4.9 Online Project Registration System Quality of Information and Performance Construction Projects 55
4.10 Performance of Construction Projects 56
4.11 Correlation Analysis 57
4.12 Regression Analysis 59
CHAPTER FIVE 61

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS 61
5.1 Introduction 61
5.2 Summary of Findings 61
5.2.1 The System Use 61
5.2.2 The System User 61
5.2.3 Contractors, Site Supervisors & Skilled Workers 62
5.2.4 Quality of Information 62
5.3 Discussion of Findings 62
5.4 Conclusions of the Study 63
5.5 Recommendations of the Study 64
5.6 Suggested areas for further Research 64
REFERENCES 66
APPENDICES 72
Appendix I: Questionnaire 72
Appendix II: Krejcie and Morgan Table 76

LIST OF FIGURES

Figure 1: D&M IS Success Model (Delone& MacLean (2003). 13
Figure 2: Technology Acceptance Model (TAM) (Davis, Bagozzis and Warshaw 1989)15
Figure 3: PMIS Levels of Technology (Ogero 2014) 17
Figure 4: Conceptual Framework (Author, 2023) 30

LIST OF TABLES

Table 1: Knowledge Gaps 42
Table 2: Sample Frame 44
Table 3 Operationalization of Variables 47
Table 4 Distribution of Respondents by Gender 48
Table 5 Respondents Age Brackets 49
Table 6 Education Level of Respondents 49
Table 7 Years of Service with Employer 50
Table 8 Performance of the Online Project Registration System 51
Table 9 Online Project Registration System Technical Characteristics 52
Table 10 OPRS Use and Performance Construction Projects 53
Table 11 OPRS user and Performance Construction Projects 54
Table 12 Contractors, Skilled Workers, Site Supervisors and Performance Construction Projects 55
Table 13 Quality of Information and Performance Construction Projects 56
Table 14 Performance of Construction Projects 57
Table 15 Correlations 58
Table 16 Model Summary 59
Table 17 ANOVA[a] 59
Table 18 Regression Coefficients[a] 60

ABBREVIATIONS AND ACRONYMS

AAK	Architectural Association of Kenya
ASP	Application Service Provider
AU	Africa Union
BORAQS	Board of Registration of Architects & Quality Surveyors
CAGR	Compound annual growth rate
CNR	Central Nyanza Region
EAC	East African Community
EBK	Engineers Board of Kenya
EPRA	Energy & Petroleum Regulatory Authority
ERP	Enterprise Resource Planning
H&S	Health & Safety
ICPMK	Institution of Construction Project Managers of Kenya
ICT	Information Communication & Technology
IEK	Institution of Engineers of Kenya
KPI	Key Performance Indicators
KPLC	Kenya Power & Lightning Company
MDAs	Ministries, Departments & Agencies
MIS	Management Information Systems
NBI	National Building Inspectorate
NCA	National Construction Authority
NCC	Nairobi City Council
NEMA	National Environmental Authority
OPRS	Online Project Registration System
PLS-SEM	Partial Least Square Structural Equation Modeling
PMIS	Project Management Information System
PMS	Project Management System
RCIS	Register of Contractors Information System
ROI	Return on Investment

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The construction industry is one of the pillars of a country's economic growth and development. Historically, social-economic development and industrialization have been linked to infrastructural projects. According to the United Nations Agenda 2030: Sustainable development goals, the construction industry will play a role under goal 9 which touches on infrastructure and innovation, and also goal 11 on sustainable cities and communities. The construction industry globally experienced steady growth in the year 2021 across many countries. The global growth index is projected to decrease from 6.1% in 2021 to 3.1% in the years 2022 and 2023 due to the COVID-19 pandemic and Russia's invasion of Ukraine(Deloitte, 2021). Besides, the construction industry has demonstrated resilience but it must tackle the issues of the rising cost of living, supply interruptions and adopt sustainable engineering for its future growth. As of 2021, the market value of the industry was valued at US$ 7.28 trillion with a projection of US$14.41 trillion by the year 2030(Deloitte, 2021). Noteworthy, population growth, urbanization, decarbonization, and digital transformations across economies will be the profound drivers of the industry.

In Africa, the construction industry is valued at $380.5 billion with an estimated CAGR of more than 7.5% by 2028. This growth is premised on Africa Agenda 2063 of the African Union which seek to transform the socio-economic dynamics of the continent. The Agenda's flagship projects on infrastructure, education, science, technology, and culture as well as efforts to secure peace in the continent will improve standards of living, quality of life, and the well-being of its citizens (AU, 2023). In addition, the East Africa Vision 2050 aspirations of improving trade among EAC member states through quality transport networks and infrastructural development will solemnly rely on efforts made to promote reforms in the construction industry (EAC, 2015).

In Kenya, the construction sector's contribution to the economy is substantial and critical. The sector is enshrined in Kenya's Long term development blueprint: The Kenya Vision 2030. The construction sector is an enabler to the realization of the vision's pillars of social, economic prosperity, and political stability. It is important to point out that the Big Four Agenda sits very well within the global, continental, regional, and national development contexts. At the global stage, it aligns with the SDGs while at the national level is an extract of Vision 2030. The initiatives of improving manufacturing, food security universal healthcare, and affordable housing all depend on the construction industry as an enabler of socio-economic development (Omamo et al., 2018).

In 2018, the industry recorded a growth rate of 6.3% and added Ksh. 545.6 billion shillings to the gross domestic product (NCA, 2019). The construction industry is an indicator of economic performance, the sector facilitates trade, and the flow of information and reduces poverty and inequalities among the population by spurring economic development. According to Price Waterhouse Cooper's report of 2018, the construction industry is a major creator of employment where every 10 jobs directly related to construction; another 10 jobs are created in the local economy (PWC, 2018).

Urbanization is the major driver of the construction industry in Kenya. The World Bank report (2015), estimates that 32.8% of Kenyans live in urban towns, and by 2030, the figure could hit 60% due to rural-urban migration in search of employment. This notwithstanding, the construction industry has been under pressure on housing, infrastructural amenities, and ensuring a safe built environment. As a result, the National Construction Authority (NCA) was enacted by an act of Parliament No 41 of 2011 to "regulate the construction industry and coordinate its development" (NCA, 2023). This is so because building failure and collapses are the major challenges facing the construction industry in Kenya. According to NCA, the frequency and severity of building collapses have increased rapidly from one case in 1996 to twenty cases reported in 2015. This has been attributed to poor regulation, unethical practices, and the use of redundant technologies (NCA, 2019). Senaratne and Jayarathna (2012), in their study, argued that the changing economic and construction environment dictates that organizations and construction companies must adopt new construction technologies for their

competitiveness and survival. As a result of this, the Authority shall contribute to the construction industry by setting standards and promoting research and training aimed at the standardization of materials and labor required in the construction industry. Equally, in its regulatory role come up with technologies that improve the ease of doing business in the country. The Online Project registration system (OPRS) system was introduced to try and exterminate these incidences by regularizing project registration and project quality assurance process.

The OPRS system deployed by NCA has targeted the "DeLone and McLean Information Success Model (ISSM) (1992)". "The model identified "six components of IS success; system quality, information quality, use, user satisfaction, individual impact, and organizational impact" (Ngari, 2017, p.18). Davis (1989) in his Technology Acceptance Model (TAM) asserts that IS system success is dependent on its perceived ease of use and perceived usefulness. His self-efficacy and response efficacy influence IS adoption and utilization in an organization. Information systems that require little or no effort to operate and are deemed useful at work have a higher success rate. For instance, OPRS system success is dependent on the ability to easily register projects, and weed out rogue contractors and unskilled workers while adhering to the six components of the DeLone and McLean Information Success Model.

(Kahura, 2013) asserts that many organizations are engaging in many projects as a competitive edge to remain relevant in their game. As a result, managers are required to integrate and coordinate various and highly complex projects to realize the expected objectives. Karimi et al., (2017) agree, "Complexity of worldwide organizations has given confidence to management scientists to search for extremely reliable and more dependable support tools that can assist project managers in managing challenges of highly complex projects". The advances in MIS have offered a lifeline to project managers in managing complex modern projects. PMIS tool has improved the overall project management in spheres of efficiency, effectiveness, and overall project performance. Empirical studies have shown that PMIS enhances "better project planning, scheduling, monitoring, and controlling, which consequently led to highly effective and efficient project management decision-making in each phase of project lifecycle" (Karimi

et al., 2017, p. 22). Besides, the literature hasn't shown the correlation between PMIS and overall construction project performance. Equally, no such research has been conducted at the National Construction Authority, hence the need for this study. Thus, the research problem addressed in this research work is the "Online Project Registration System and Performance Construction Projects in Kenya. A Case of the National Construction Authority Approved Projects in Central Nyanza Region, Kenya."

1.1.1 Online Project Registration System (OPRS)

Registration is a procedure by which the NCA record specific project and contractor data and issues a unique identification number that positively differentiates one project, entity, or person from another. The registration process can be categorized into manual or online registration. Manual registration involves the use of non-technological tools like pen and paper for data collation and processing. These manual systems (offline systems) don't require an internet connection for their operation (Yadeta, 2016). According to (Demir, 2017), an online system is a web-based system that is connected to the global internet and its resources can be accessed remotely. These systems are strategically aligned based on resource-based theory to support the organizational decision-making process and operations. Odede (2012) defines an online registration system as a form of registration that accepts lodging of documents in electronic format only. Equally, to satisfy Organizations' unique requirements, custom-MIS systems have gained prominence over the recent past. Custom MIS systems are systems tailored to execute the organization's preferences and specifications that are unique to its core business (Hawari & Heeks, 2010). Thus, the online project registration system (OPRS) is custom web-based software tailored to collate client information; allows online project registration of projects, skilled workers registrations, and site supervisor registrations, and processes online payment of fees.

According to Al-Mamary et al., (2014), information systems can be grouped as support business operations, management decision support systems, expert support systems, process control systems, and enterprise automation systems. These systems are implemented to integrate and support both operational and managerial decision-making

processes within an organization. Research has shown that organizations are implementing these systems to integrate the internal and external operations of companies to create synergy between the users and the information systems. Since the OPRS rollout in 2016, no research has been conducted by the authority to assess its effectiveness and efficiency in project registration, quality assurance, and skilled worker registration. As a decision-making system, little is known of the perceived ease of use and perceived usefulness among the registration officers, managers, and contractors in decision-making necessitating its study.

The utilization of information technology has been the significant scale of measurement through which performance is measured. Tahar et al., (2020), argues that information technology as an independent variable is premised on four independent variables namely, design implementation process, information system characteristics, individual differences, and task characteristics. The design implementation process refers to the process of introducing the information technology, user expectations, and support of management information systems. In this context, the variable is measured using the Technology Acceptance model to assess the impact on performance. The MIS characteristics impact the effectiveness and efficiency of the user. Previous research has shown that computer response time, accuracy, stability, security, and relevance have been measured to ascertain MIS effectiveness. This model is premised on the perceived ease of use and usefulness of the technology in executing tasks within the organization. In addition, systems are utilized by individuals, and their attitudes to the information system influence system utilization. Adhiambo, (2015) infers that system utilization indicates management information success.

It is thus essential to point out that, in this research, the resource-based theory, technology acceptance model, and Delone technological model are used as an impetus to analyze the impact of OPRS on the performance rate of construction projects.

1.1.2 Performance of Construction Projects

A project is "a series of activities aimed at bringing about specified objectives within a defined period and with a defined budget" (Bokonjić et al., 2018, p.11). Projects are constrained by key performance indicators (KPIs) to deliver a unique purpose. It is a

planned finite undertaking with a specific objective bounded by time, cost, and scope (Sammy, 2014). Construction projects are the main contributors to the creation of jobs and nations' development. Dixit, (2020) defines a construction project as “a temporary endeavor, with a definite timeline to follow”. Project Performance is “the overall measurement of whether a project has met objectives and requirements of scope, cost, and schedule’’(Hill, 2023). Ngari, (2017) defines project performance as project achievements and the “overall accomplishment of the project within project cost, time, and quality”. Project performance in this context infers the successful accomplishment of the project within the confines of cost, time, and quality without incidences of environmental degradation.

In the last decade, project performance has attracted a considerable amount of research occasioned by the inadequacy of the traditional financial-based approach and the emergency of non-financial approach performance measurement. The introduction of Return on Investment (ROI) by DuPont firm and pyramid ratios by General Motors Company provided instruments for gauging construction performance. The only dissatisfaction was that financial performance lags behind managerial actions whereas managers require current, up-to-date, and accurate information to make better decisions (Bassioni et al., 2004). Over the years, many performance frameworks have been developed. Kaplan & Norton (1992, 1993) advocated for a four-perspective approach to management: “financial, customer, internal processes, and innovation”. He asserts that a project is termed to have performed if it meets both the financial and non-financial obligations. For instance, a project must meet the quality required within the specific time and budget without degrading the environment (Oliveira et al., 2021).

Parmenter (2015) categorizes performance measurement into four categories; Key result indicators (KRIs), Result indicators (RIs), Performance indicators (PIs), and Key performance indicators (KPIs). Organizations use a mix of this matrix to assess their performance. The Key result indicators answer the “how” question whiles the Result indicators show what has been achieved. Besides, Performance indicators illustrate what to do and point to areas of improvement to increase productivity. From the groundbreaking work of Kaplan& Norton (1992, 1993) performance of projects has been

measured through the prism of the six-perspective balanced scoreboard. Performance has been measured from the lens of internal processes that encompasses the time of delivery, optimization of technology, and relationships with key stakeholders. In addition, financial focus, customer focus, environmental/community focus, employee satisfaction, learning, and growth constitute the scoreboard (Parmenter, 2015). Sutrisna et al., (2020), in their work "Exploring earned value management in the Spanish construction industry as a pathway to competitive advantage" states that a project is unique and the success rate varies from project to project. From a construction perspective, they allude that a project's success is a multidimensional construct, and success is measured by the project scope, quality of the building, and timely completion without cost overruns.

1.1.3 OPRS and Performance of Construction Projects in Kenya

Project performance is premised on the "iron triangle": cost, time, and quality. Several studies have revealed that there is empirical evidence linking management information systems utilization and project performance. In 2022, Albtoush et al., (2022) published a paper in which they described the critical success factors in construction projects in Jordan. In the research paper, they assert that the utilization of the Building Information Model (BIM) improved the Project design, project scheduling, and project monitoring by providing accurate and actionable information to project managers. Mithas et al., (2012) study on "information technology and firm profitability: mechanisms and empirical evidence" pointed out that there is a correlation between information system utilization and organizational performance. In the study, they believed that the use of IT systems improves customer satisfaction, and improves profitability while differentiating organizations from their competitors. Empirical studies have shown that companies that invest in IT systems adopt a vicious cycle model and learning use model where continuous use and investment leads to better management of IT infrastructure and massive leverage on its benefits to improve customer satisfaction, employee management, and inventory management(Mithas et al., 2012). In addition, Acosta-Prado and Tafur-Mendoza (2021), highlighted that the productivity of construction projects is IT-dependent. He asserts that IT revolutionized the decision-making process, accelerated

the dissemination of information, and improved better management of the workforce. Although there are questions on the cost of investment of these IT systems, research has shown that over a while, the payoff from their utilization has far-reaching effects on labor management, financial performance, and the overall quality of the project deliverables.

In Kenya, various MDAs have adopted different custom-MIS systems to improve their productivity and customer experience. For instance, the Kenya government rolled out the E-tender offered by the Competition Authority of Kenya and the Public Procurement Information Portal (PPIP) to enhance transparency during the tender evaluation and award process(CAK, 2023). According to MURAYA, (2018), e-tendering is instrumental in creating contractual relationships by reducing overhead costs, creating a central tender storage pool, and reducing significantly the tender cycle times. Equally, the Energy and Petroleum Regulatory Authority (EPRA), maintains an online register of its all accredited electrical engineers and technicians to assist in weeding out rogue ones from the construction sector (EPRA, 2022). These systems are no different from the OPRS system maintained by the National Construction Authority to streamline the registration of projects, accreditation of skilled workers and site supervisors' and aid in quality assurance. Despite these investments by MDAs, there is little to show compared to the collapses witnessed in the construction industry in Kenya hence the research on OPRS impact on the performance of construction projects.

1.2 Research Problem

The performance of construction in Kenyan projects has been marred by the frequency of collapses. In the past 2 decades, the frequency of collapses has increased from one collapse in 1996 to an average of 7 collapses in 2018 and five collapses in November 2022 with catastrophic consequences(Star, 2022) . According to a report on the Building Law & Regulation Review and Harmonization Committee (2009), building design flaws, incompetent contractors, lack of supervision, poor quality building materials, unapproved plans, and lack of professional supervision and corruption are the main causes of building collapses in Kenya. Further, Ayagu and Koech, (2019) pointed out that inadequate

concrete reinforcement, poor or no prosecutions for contractors contravening the building code, and corruption fuelled the building collapses.

Pre-establishment of NCA, registration, quality assurance, and regulation of the construction industry were domiciled in various MDAs such as public works, roads, and water. This proved to be a nightmare as there was no coordination and up-to-date register of construction contractors in Kenya. NCA's establishment was meant to bring sanity to the construction industry by streamlining its operations and coordinating it for social and economic development. To realize this objective, the authority introduced the OPRS system in line with its strategic plan for 2020-2025. It is important to note that, the integration of MIS systems into construction management is informed by international and national policies like the United Nations Agenda 2030, the Africa Agenda 2063, the East Africa Commitment 2050, and the Kenya Vision 2030(NCA, 2014).

Despite the many strides NCA has achieved in streamlining the construction industry there are still challenges if the recent building collapse is something to go by. The collapse of NCA approved two-story building in Mamboleo Kisumu in 2021 raised questions about the effectiveness of the OPRS system in providing quality and actionable information during quality assurance visits(NCA, 2019). In addition, the Central Nyanza region recorded other collapses in Manyatta Estate (5 fatalities(Star, n.d.), Imperial Hotel Kisumu collapse(The Standard, 2021), Ringa school building collapse in Homabay that were all attributed to poor construction workmanship and utilization of substandard materials in construction. Whereas the OPRS system ought to have flagged these flaws during the project registration process and the quality assurance phase, it didn't thus raising questions on its effectiveness. As a result of these compounding issues, it is necessary to investigate the effectiveness of the OPRS system in construction project performance.

Consequently, research has shown that there is an underlying link between MIS and organizational performance. Organizations with effective and efficient customer management information systems perform way better than those that don't (Getembe et al., 2022). Besides, empirical evidence has shown otherwise. Omiunu (2019) in his study, "Management Information and Accounting System and Organizational Performance in

Nigeria" found that there existed no statistically significant correlation between MIS and organizational performance. Besides, the studies didn't explore the impact of various types of MIS systems on institutional performance; most of those research studies were foreign and none had been conducted in the National Construction Authority, hence the need for this study. Thus, the research problem addressed in this research work is the "Online Project Registration System (OPRS) And Performance of Construction Projects in Kenya: A Case of National Construction Authority Approved Building Projects in Central Nyanza Region".

1.3 Research Objectives

The main objective of this research is to examine the relationship between the Online Project Registration System (OPRS) and the Performance of National Construction Authority Approved Building Projects in the Central Nyanza Region of the republic of Kenya.

The specific objectives are;

i. To investigate the extent to which the OPRS USE has been able to improve quality assurance in NCA-approved building projects in Central Nyanza Region.
ii. To determine ways in which OPRS USER influence the performance of NCA-approved building projects in Central Nyanza Region.
iii. To establish the extent to which OPRS USE has been able to reduce rogue contractors, incompetent skilled workers and site supervisors in NCA-approved building projects in Central Nyanza Region.
iv. To establish the extent to which OPRS INFORMATION influence performance of NCA-approved building projects in Central Nyanza Region.

1.4 Value of the Study

The research will create awareness of the role of the NCA concerning its mandate of regulation and coordination of the construction industry for social-economic development. It will expose the construction project performance gaps that need to be addressed and provide the NCA with a sense of what policies and procedures should be formulated to improve construction project performance. Besides, the research will assess

the performance index of the OPRS system against its intended purpose in registration, quality assurance, and weeding-out of skilled workers and site supervisors from construction sites by comparing it with past projects. This will show if the resources invested in the OPRS system have impacted the performance of the construction industry. The research shall highlight various avenues to boost construction project performance in future projects. It will address the multi-faceted performance challenges for the utilization of MIS systems in construction project management. This will help in coming up with a smooth regulatory framework for the management of the industry using management information systems. That framework will ensure that there exists a safe built environment in the country to safeguard the life and properties of its citizens.

Moreover, the study shall avail a detailed account of how the utilization of OPRS systems should be used to optimize the performance of construction projects. It shall act as a basis for further studies on the subject of other state corporations in the republic and beyond. The research will set a precedent for future research and references.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will be categorized according to the thematic areas of the study. It shall encompass the theoretical framework, conceptual framework, the empirical review, and a summary of the literature reviewed. It will equally highlight the key knowledge gaps in the literature.

2.2 Theoretical Review

This study is premised on the Information success model (IS). This model has been widely used in the evaluation of IS system success (Petter et al., 2013). Several studies have shown that; "success factors of various IS models" are employed to evaluate the performance of an information system(Ogero, 2014).

2.2.1 Delone and McLean Information Success Model (ISSM) (1992)

Based on the information "influence" theory of Mason and the communication research of Shannon and Weaver (1949), Delone and McLean synthesized research conducted in the 1970s and 1980s that led to the postulation of IS success Model in 1992. Shannon and Weaver categorized a communication system into two concepts: a technical aspect which entailed the accuracy and efficiency of the system and the semantic aspect which focused on the effectiveness of conveying the intended information to the receiver (Subaeki et al., 2019). The ISSM (1992) model, postulated six dimensions of measuring information system success namely; "System Quality, Information Quality, Information Use, User Satisfaction, Individual Impact, and Organizational Impact" (Ogero, 2014, p.17). Both the ISSM model and Shannon & Weaver (1949) share some key features. The system quality of ISSM relates to the technical success of IS and the information quality relates to the semantic success of the information system. Delone and McLean asserted that all six dimensions of information system success are interrelated and dependent on each other.

The IS model success has been analyzed using two models, the temporal, process model, and the causal or variance models. The process model asserts that the information system is first created, deployed, and used by employees to experience their usefulness and deduce the satisfaction or dissatisfaction from the system attributes This in return impact the employees' work conduct and their individual impact influences the overall impact on the organization. In contrast, the casual model strives to establish the interrelationships of the dimensions of the model and their associated impact either collectively or individually on the system's success (Jeyaraj, 2020).

While the model has been cited in many research publications, researchers have criticized its organizational impact measures, the criteria of selection of success dimension, and the complex multidimensional and interdependent nature of the IS System. Research has shown that it is prudent to determine the possible interactions amongst the success variables to isolate various effects of different independent variables. In the year 2003, the concept of service quality was added to Delone & McLean (ISSM) (1992) and later analyzed for interdependence and correlation of the dimensions to incorporate the criticism of other researchers and emerging internet technologies (Purwati et al., 2021). Figure 1 represents the ISSM model of Delone& MacLean (2003).

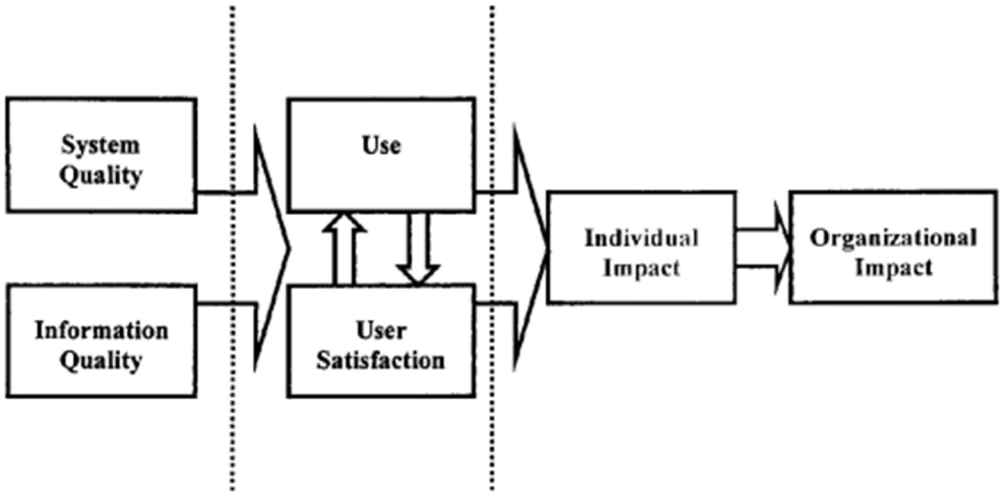

Figure 1: D&M IS Success Model (Delone& MacLean (2003).

2.2.2 Technology Acceptance Model (TAM) (Davis et al, 1989)

With the advancement in information, and communication technology in the last few decades and its incorporation into people's private and professional life, questions regarding its acceptability or rejection are evident. The quest of the research community to unravel this mystery resulted in the development of a technology acceptance model and its application. About a quarter century ago, Fred Davis guided by the theory of reasoned action and the theory of planned behavior, developed the Technology Acceptance Model that sought to understand factors that influence people's acceptance or rejection of technology (Marangunić & Granić, 2014)

Dauda and Lee (2015), asserts the information service theory/ Technology acceptance theory model, is premised on two main variables "perceived ease of use and perceived usefulness in a complex relationship between system characteristics (external variables) and potential system usage". He further asserts that factors like system interface, user training, and procedure of implementation have the potential of building perceptions towards a system.

Literature review of TAM by Y. Lee et al.,(2003), Legris et al.,(2003),Sharp(2006), and Chuttur(2009) unearthed inconsistencies in the model and proposed the inclusion of other variables to realize robust and broader applicability of the model. They noted that TAM utilization outside the context of validation required thoughtful and thorough consideration. They further proposed the perceived ease of use and perceived usefulness to be used as stronger determinants and the inclusion of volitional and mandatory use environments as areas of future study. Figure 2 below represents the schematic drawing of TAM.

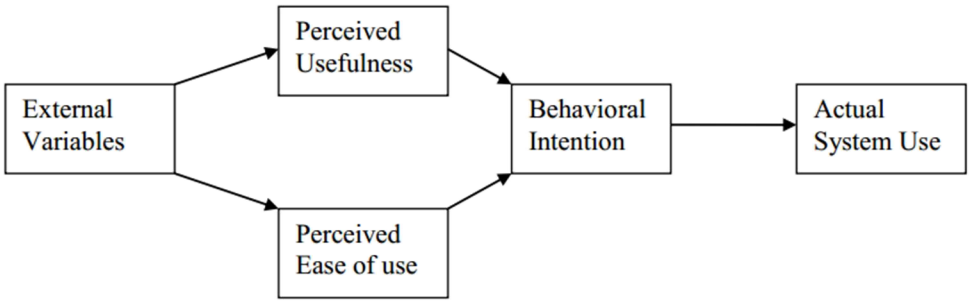

Figure 2: Technology Acceptance Model (TAM) (Davis, Bagozzis and Warshaw 1989)

2.2.3 Resource-based Theory (Barney, 1991)

Organizations over the past decade have invested in technology to survive and have a competitive edge. The resource-based theory is premised on costly-to-copy attributes of a firm aimed at yielding superior organizational performance. Caldeira and Ward (2001) argue that the competitive advantage of firms occurs when a firm, has a set of unique attributes and capabilities that are valuable, rare, imperfect imitability, and non-substitutability. The development of unique capabilities and competencies is based on the knowledge-based perspective and organizations develop core competencies by acquiring new skills and integrating technology into their processes (Miller, 2019).

The core competence concept of a firm is aimed at mechanisms of creating a robust accumulation of skills through learning high-level business capabilities. “A resource-based view of the firm accepts that attributes related to past experiences, organizational culture, and competencies” provide a basis for the acceptability of new technology to the firm (Caldeira & Ward, 2001, p.1). It is important to underscore the point that, for successful utilization and leverage of capabilities of a technological system, management acceptability is very important. Management should be able to understand and appreciate the need for such systems and work with functional managers to develop and coordinate IT systems in such a manner that inspires confidence in the employees and the customers.

2.3 Online Project Registration System (OPRS)

This is a versatile custom-online PMIS system that incorporates various functions undertaken by the National Construction Authority aimed at contributing to the performance of construction projects as discussed below.

2.3.1 Project Management Information System Use and Performance of Construction projects

According to Gunduz, a management information system doesn't necessarily denote a state-of-the-art system that can handle every project aspect since projects are unique in both quantity and quality. Projects are known to have a specific objective and the need for an information technology system is dependent on particular project attributes (Gunduz & Ahsan, 2018). The utilization of management information systems is aimed at providing experts and project managers with quality information for decision-making.

According to Ogero (2014), the PMIS system requirement is based on the unique information need of the project. The figure below illustrates the four key levels of PMIS needs based on project information requirements. From the diagram, the level of sophistication determines the level of technology procured by an organization. Projects with complex attributes may require systems of high sophistication that match their attributes. Importantly, in the project life cycle, the level of sophistication of projects might vary thus adequate feasibility study is mandatory before the procurement of a system.

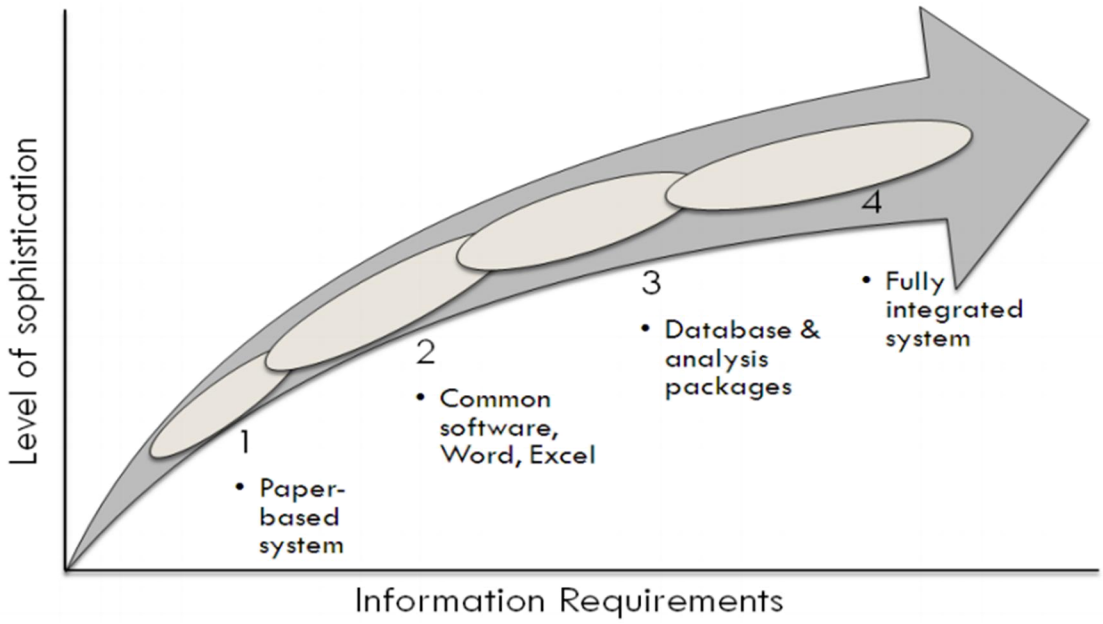

Figure 3: PMIS Levels of Technology (Ogero 2014)

Recent studies have shown that D&M IS Success Model supports the analogy that system use has individual impacts and organizational impacts that are critical in the measurement of system effectiveness. The utilization of the system and its information products influences the individual user in the execution of his work and this produces a ripple effect on the organization's performance (organizational Impact) (DeLone & McLean, 2016). Empirical studies have shown that there is a significant correlation between system use and individual impacts. System use is measured by determining the frequency of system use, dependency, patterns of usage, and the time spent on the system.

It is important to point out that; system quality is also statistically significant in determining system use. Systems characterized by ease of use attribute, reliability, information quality, relevance, portability, and integration improves the throughput and project performance (DeLone & McLean, 2003). For instance, the integration of the Internet of things (IoT) has proved vital in the regulation of construction companies in Kenya through efficient communication and compliance updates.

2.3.2 Project Management Information System User and Performance of Construction projects

Over the past few decades, the concept of user satisfaction has been subjected to many research studies as an indicator of IS system success. There are many indicators of measuring IS success but system user satisfaction is the most commonly used. This is due to the high degree of validity associated with it. Research has shown that user satisfaction is a surrogate indicator of IS system effectiveness. Skagne (2020) argues that IS literature over the years adopted two paradigms namely; outcome-oriented and process-oriented approaches. The outcome-oriented approach is based on the antecedents of the theoretical framework while the latter focuses on individual development theories from the field of marketing and psychology.

Vaezi et al., (2016), reviewed the work of Debons, Ramage, and Orien (1978) that used ten (10) different antecedents to measure system user satisfaction. Some of the attributes included "timeliness, reliability, accuracy, adequacy, access, cost, and assistance" (Vaezi et al., 2016, p.3). Lankton and McKnight (2012) in their paper used user expectations, performance, and disconfirmation as their attributes of IS measurement but productivity and reliability have taken precedence in the "history of user satisfaction" research. For Swanson (1974), system reliability refers to the response time, conciseness, clarity, and readability."(Vaez et al, 2016). Productivity, on the other hand, refers to the workload and time-saving nature of the system. Studies have shown that the utilization of management information systems in projects is driven by these factors. Systems that possess antecedents of "perceived ease of use" and "perceived usefulness" attributes influence user satisfaction. The outcome of the PMIS system in providing quality and actionable information guarantees IS system user satisfaction.

2.3.3 Project Management Information System use and Contractors, Skilled Workers and Site Supervisors

One of the core mandates of the NCA is to "regulate the construction industry and coordinate its development". The regulation of the construction industry is realized by enforcing the building code, registration of contractors, accreditation of construction

workers, and registration of projects as per section 17 of the NCA regulations 2014; "Section 17 Part (1); All construction works, contracts or projects either in the public or private sector shall be registered with the Authority in accordance with the Act. Section 17 Part (2); An owner shall make an application for registration of a project to the Authority in writing within thirty days from the date on which a tender for construction works, contract, or project is awarded to a contractor registered under this Act" (NCA, 2023).

Statute 16 of the NCA regulations 2014 defines a contractor as an individual or a corporate with valuable insights in regard to the erection, construction, or installation of structures below, on, or above the ground. Clients engage the services of contractors to leverage their experience to realize projects within the confines of budget, time, and quality. Stevens and Smolders (2022) argue that the registration of projects by regulatory agencies ensures the contractors adhere to the provided requirements before construction. Rohman et al., (2017) equally stipulates that contractors dully registered should only be awarded construction projects. The utilization of technology in the registration and mapping of projects is critical for quality assurance. The stringent requirements for the registration of projects and the utilization of rugged phones to track quality assurance visits improve project conformity and performance.

Consequently, Phillips and Martin (2021) in their book "Grenfell and Construction Industry Reform: A Guide for the Construction Professional" asserts that ignorance, lack of clarity on definite roles and responsibilities, and inadequate regulation and enforcement procedures underpinned the systemic construction failures. To mitigate on these failures, he further asserts that new legislation and change of culture in the industry must be put in place and more investment is done in increasing the level of competence for industry practitioners. According to the NCA construction Industry outlook report of 2019, poor workmanship rank first with 35% of the causes of building failures in Kenya (NCA, 2014). Workmanship is defined as the degree of skill with which a job is done (Dictionary, 2017). Alternatively, construction workmanship can be termed as the requisite skill a construction worker requires to realize a specific task. Realization of

project attributes within a specified budget, time, and scope is largely dependent on craftsman skills.

Workmanship is classified into two categories; quality workmanship and poor workmanship. Quality workmanship occurs when the tasks have been performed to the desired prescribed standard while poor workmanship is when the desired standard has not been achieved. The level of skill construction workers possess is a principal factor of production. According to NCA, the construction workforce is classified into the skilled, semi-skilled, and unskilled workforce. The utilization of technology in the management of the construction labor force is instrumental in improving project performance. The digitization of the workforce helps in the identification of training needs, ease of identification at the workplace, and role assignments in their area of specialization.

NCA is mandated to accredit construction workers and site supervisors under sections 19 and 20 of the NCA regulations 2014. Section 19 states: "The Authority shall "accredit and certify" all construction workers and construction site supervisors in accordance with the Act while section 20 states: "The Authority shall register skilled construction workers under one or more of the classes or works provided in the Third Schedule of the Act" (NCA, 2023). For one to be accredited, the authority requires proof of technical training and a recommendation from a registered professional or contractor in the construction industry.

In the bid to realize this mandate, the authority introduced the OPRS system with a skilled worker and site supervisor registration portal to ensure only workers registered under this category are mandated to work in construction sites in Kenya (NCA, 2023). This was aimed at regularizing the construction sector by weeding out poor workmanship and improving project performance.

Vance et al., (2014), Gogol (2020), and Quddus (2021) argue that project success is influenced by many factors. The use of Professional software to manage human resources is instrumental in assigning skilled workers to tasks that commiserate with their training, project on training needs, and in effect improve legislation and project performances.

2.3.4 Project Management Information System Information Quality and Performance of Construction projects

Project performance is hugely dependent on information quality since it the primary reference for decision-making. The quality of information can influence the outcome of a project either positively or negatively. According to Mala et al.,(2012) information quality must encompass all the dimensions of quality namely intrinsic, contextual, accessibility and representation of data consciously and consistently. A good PMIS system should provide construction professionals with useful information that is actionable in the decision making process. It is important to point out that; this actionable information is largely dependent on the system software. "Accuracy and timeliness" of the PMIS system are "critical determinants of information quality"(Ogero, 2014).

In huge projects, the amount of information available is tremendous and can overwhelm project managers. This might result in construction professionals' losing sight of critical information that might lead to poor decision-making. The utilization of PMIS software is important in harnessing relevant information required for day to day running of a construction project. According to the PMBOK the quality of information is important to the success of a project. A better understanding of the methodologies of project management is essential while experience in information management distinguishes a successful project from the others.

Quality information is the heartbeat for managing a project. Information must be accurately and precisely processed to promote effectiveness and high level of assurance in the decision making process. Accurate information improves the project planning by providing baseline for generation of project action plans, schedules, and other project related variables. Valuable information is important in promoting understanding; establish project objectives, goals, and strategies; develop mechanisms for controls; communicate status; forecast future performance and resources; recognize changes; and reinforce project strategies.

2.4 Empirical Studies

2.4.1 Project Management Information System Use and Performance of Construction projects

Munirat et al., (2014), conducted a study on "The Impact of Management Information Systems (MIS) On the Performance of Business Organizations in Nigeria." The study was conducted in the state of Abuja Nigeria utilized questionnaires and interviews to collect data. The population was selected randomly from the local SME owners in Abuja; 5 local governments were picked with 20 respondents from each totaling 100 respondents. The Z-test was used to statistically analyze the data to determine how an information system improves organizational performance. The study found that a lack of adequate MIS skills not only affects organizational performance but also impairs an organization's ability to compete favorably in the global market.

Equally, Barzegar et al., (2012) researched "The Role of Management Information Systems (MIS) to Increase Productivity in the Workforce (Case Study of Iran)." The study investigated the role of MIS in improving human resource productivity. The research population of 462 was selected and a sample size of 210 was selected randomly according to the Morgan table. The data collected was analyzed using descriptive methods and T-test. The research deduced that related information and ease of information communication impacted human productivity.

Khresat (2015) in the research "The Effect of Management Information System on Organizational Performance: Applied Study On Jordanian Telecommunication Companies" examined the relationship between MIS and project performance. The study utilized a population of all telecommunication companies in Amman city with 10 representatives from the 10 branches totaling to 100 respondents. The study adopted a cross-sectional survey and analyzed the data using Z-test. The study found out that the Jordanian companies' employees had a positive attitude towards MIS use. The study rejected the hypothesis that there existed no relationship between MIS and organizational performance in Jordanian telecommunication companies.

Adhiambo (2015) researched "Influence of Information Communication and Technology Tools on the Performance of Relief Aid Projects in Kenya: The Case of Red Cross

Organization in Nairobi County". The study sought to investigate the impact of technology on the performance of Red Cross projects in their Nairobi organization. The research utilized a sample size of 88 respondents working at Red Cross Nairobi and utilized questionnaires as the primary data collection tool. The studies utilized linear regression analysis to determine the correlation between the independent and dependent variables. The study established that various ICT tools influence project completion timelines, project quality, cost, and customer satisfaction. Regression pointed out a correlation between ICT project monitoring tools and project performance.

Ogero (2014) investigated the "Influence of Project Management Information System on Project Performance in the Construction Industry: A Case of Nairobi County, Kenya". The research adopted a descriptive survey design since it doesn't modify the situation under investigation to determine the cause-effect relationship. The study population was 98 with 80 construction firms selected according to the Krejcie and Morgan Table. Descriptive statistics methods were used to analyze the data and Karl Pearson's Product moment correlation to establish relationships between dependent and independent variables. The study found out that PMIS, quality information, PMIS utilization, and PMIS users had a huge significance on project performance with a p-value of zero.

Consequently, Orina (2018) conducted a study on "Influence Of Adoption Of Technology On Performance Of Kenya Power And Lighting Company; A Case of Kenya Power Embu Office". The study utilized the Cross-sectional descriptive survey design with a population of 86 employees working with the KPLC Embu branch and 600 high-power consumers. Questionnaires and interview schedules were utilized as primary data collection instruments and both inferential and descriptive statistics were used for analysis. The study noted that the adoption of Smart Meter Technology and the performance of KPLC had a positive correlation (p=0) so do the adoption of Billing technology and performance (p=0) ad MIS application and performance (p=0). Thus smart meter technology has improved KPLC service delivery, fraud detection, and both internal and external customer satisfaction.

Drawing from this empirical review, management information system (MIS) has a direct and positive impact on organizational and project performance in a competitive performance.

2.4.2 Project Management Information System User and Performance of Construction Project

Rahman et al., (2018) sought to investigate "Project Success in the Eyes of Project Management Information System and Project Team Members". The study utilized a quantitative deductive based approach to test the hypothesis "PMIS intention of use influence project performance". The study utilized a questionnaire to collect data from the education stakeholders in Pakistan. From the 179 respondents, regression analysis of the data postulated that PMIS intention of use had a mediating effect between the PMIS system and project performance.

In addition, Lee and Yu (2012) investigated the "Success model of project management information system in construction". He sought to validate the Application Service Provider (ASP-PMIS) model based on the D&M IS model in South Korea construction industry. The study adopted survey research design with a questionnaire as the primary data collection tool from the 253 construction managers and constructors. With the help of AMOS 18.0 software, structural equation modeling was utilized for hypothesis testing. The study found out that, effectiveness of ASP-based PMIS success model must encompass user satisfaction tools while taking into consideration user demands through periodical evaluations.

Nguyen et al., (2016) researched on "Information Systems Success: The Project Management Information System for ERP Projects" undertaken by the FPT Group in Vietnam. The research was based on the D&M IS model and the TAM model influence on PMIS for ERP projects. The research utilized survey approach where 160 participants (users of PMIS for ERP) in FPT projects responded to questionnaires. It was noted from the regression that PMIS use satisfaction determined the success of the projects. PMIS satisfaction equally had an influence of the perceived ease of use, usefulness ad quality of the system.

Ngari (2017) investigated “Factors influencing implementation of Management Information System projects in tertiary level academic institutions in Mombasa County, Kenya”. In her study, she sought to understand the influence of PMIS system user on project performance. The study adopted a descriptive research design ad utilized questionnaire to collect views from sample size of 90 derived from population sample of 143 respondents comprising managers, instructors’ and support staff. Frequency tables and central tendencies were utilized for analysis. The research utilized the Pearson coefficient to establish the relationship between the dependent and independent variable. The research found out that user perceived ease of use ad perceived PMIS usefulness in producing quality information impact the general performance of the project. Further, it was found out that system complexity is not significant but relevance of information generated and the ease of utilization by the user.

Kithome (2012) studied the “Factors influencing implementation of Management Information System projects in tertiary level academic institutions in Mombasa County, Kenya”. In the study, he utilized descriptive research design with a survey study of higher learning institutions in Mombasa. The study administered semi-structured questionnaire to the 109 tertiary institutions in Mombasa county and utilized SPSS tool for analysis. The research found out that implementation of MIS system was hugely dependent on skilled human resource to assist in project implementation. Lack of skill and negative perception impacted on success rollout out of the MIS systems.

Consequently, Kiptoo et al.,(2014) in his paper “Adoption MIS in Middle Level Training Institutions in Kenya” assessed the internal, external and personal factors that influence MIS uptake in middle level colleges in Kenya. The study utilized the case study approach with census method of sampling targeting a population of 160. Both descriptive and inferential statistics was used in data analysis. The research found out that 21.20% of personal factors impacted on MIS adoption. This was as a result of fear of job loss.

It is evident that there is a significant relationship between PMIS system user and project performance. The perceived ease of use and system perceived effectiveness greatly influence project performance.

2.4.3 Project Management Information System Use and Contractors, Skilled Workers and Site Supervisors

Utilization of competent construction workers has a direct influence on the performance of projects. Leje et al., (2020) investigated the "Impacts of Skilled Workers on Sustainable Construction Practices" in Nigeria. In the study, he assessed the impact of skilled labour force towards realization of sustainable construction projects. The study utilized the quantitative approach to assess the degree of agreement of list of registered professionals to the assertion. From a population of 576, 290 responses were recorded The Relative importance index (RII) was utilized to rank the comparison on a scale of 1-5 and Kendall's coefficient of concordance used for determination of agreement among the construction professionals. It was noted that, registered professional workers had a direct impact on project delivery, quality, and value of money towards sustainable construction as per the RII.

In government, construction project success is very fundamental. Literature has shown that, contractors contribute greatly to project success. Contractor attributes influence time cost overruns of construction projects. Alzahrani and Emsley, (2013) in the paper "The impact of contractors' attributes on construction project success: A post construction evaluation" in United Kingdom asserted that contractor registration improved evaluations perspective on safety and quality, environmental stewardship, technical aspects, past performance and size and type of projects undertaken before. Using literature review and self-administered survey, 512 surveys were sent out with 164 positive responses recorded. From the factor analysis and central tendencies analysis, the study noted that contractor registration provides a framework of assessing effectiveness of the contractor.

Hussain et al., (2020) investigated the "Impact of Skilled and Unskilled Labor on Project Performance Using Structural Equation Modeling Approach" in Pakistan. The research utilized the "partial least square structural equation modeling (PLS-SEM) approach" to assess the impact of skilled workers on construction projects. Survey research design was utilized with 400 questionnaires responded to by construction practitioners. The study found out that unskilled labour force has a negative influence on constructions project

performance whereas, skilled labour has a positive impact on success rate of construction projects.

Onchagwa (2021) investigated "the effectiveness of NCA in curbing malpractice in the construction industry in Kenya". In his research he adopted both qualitative and quantitative approach to collect data. The study targeted the 98 respondents 14 each from the KPDA, NEMA, AAK, NCC, ICPMK, BORAQS and EBK. By the use of SPSS v25, descriptive statistics, cross tabulations, Chi-square and Kruskal Wallis tests were used to test the data. The study noted that through registration of contractors and skilled workers, the NCA had improved the workmanship in the construction sector and reduced quack contractors.

In his research on "Influence of Regulatory Framework on Performance of Building Construction Projects in Nairobi County, Kenya" Ndumia (2015) sought to investigate the influence regulatory bodies BORAQS, NCA and NCC had on construction projects in Nairobi county. The research adopted a descriptive survey design with a sample size of 160 comprising 28 quantity surveyors and 132 contractors working in Nairobi Kenya. The research noted that, the regulatory framework of construction workers is paramount in effective delivery projects. They further noted that regulatory framework should encompass all professional bodies in order to streamline the construction industry within Nairobi and the whole republic.

Mbuvi (2021) investigated the "Influence of Informal Subcontracting on Health and Safety Performance on Construction Projects the Case of Nairobi City County". He sought to determine the health and safety (H&S) provisions influence on construction project performance using Occupational and Health act (OSHA 2007) and National Construction Authority Act (NCA 2011) as the reference. The study adopted a descriptive and qualitative survey approach where data was collected via structured questionnaires and interviews. The study pointed out that developers have a leading role in ensuring H&S policies are employed by contractors. Equally, it noted that effective registration and regulation of contractors, projects and construction workplaces are fundamental in mitigating informal subcontracting that has an inverse relationship to (H& S) standard and overall performance of construction projects.

2.4.4 Project Management Information System Information and Performance of Construction project

In this dynamic environment, project sustainability and profitability is pegged on the competitive performance of projects. To realize optimal level project performance, project managers have turned to PMIS for strategic alignments. Obeidat and Aldulaimi, (2016) in their paper "The Role of Project Management Information Systems towards the Project Performance: The Case of Construction Projects in United Arab Emirates" investigated the impact of quality information on project performance. The research adopted survey design with purposive sampling of 20 project manager in the UAE. The research found a correlation coefficient of (r=+0.72) between PMIS and project performance. It equally noted that quality of information ad user influence impact on the general performance of construction projects.

Son et al., (2016) researched on "Construction Professionals' Perceived Benefits of PMIS: The Effects of PMIS Quality and Computer Self-Efficacy". The study, investigated self-efficacy and PMIS quality using updated D&M ISSM model as theoretical foundation in South Korea. The study utilized a survey to test the model among 379 construction professionals. The empirical results suggested that perceived ease of use and system information usefulness impacted system utilization that in effect influenced the self-efficacy.

Karim (2011) investigated the "PMIS factors: An empirical study of the impact of Project management decision making (PMDM) performance" in the Kingdom of Bahrain. The study adopted a survey approach to assess the model among 170 project managers. The study found out that quality of information generated by PMIS contributes project performance at all phases of the project cycle.

Kahura (2013) investigated "The Role of Project Management Information Systems towards the Success of a Project: The Case of Construction Projects in Nairobi Kenya". The research adopted a case study approach to determine the relationship of PMIS and construction project performance. Purposive sampling was utilized I the selection of the sample from the population where questionaries' were filled by 44 respondents. The study found out that, the quality of information generated by the PMIS software informed

decision-making and it is availability and relevance determined the quality of decisions made.

Ogero (2014) equally investigated "Influence of Project Management Information System on Project Performance in the Construction Industry: A Case of Nairobi County, Kenya". Her research adopted a descriptive survey research design with a population of 98 and sample size of 80 as per the Krejice and Morgan table (1970). The research deduced that there is a strong positive correlation between quality of information and project performance. Actionable information from the PMIS helped project managers to effectively and professionally execute their tasks thus improving overall project performance.

Ngari (2017) concur with Ogero, (2014) on the impact of quality of information on project performance. In her work, on the influence of PMIS attributes on project performance in Embu Polytechnic, she utilized descriptive survey research design with questionnaire as a primary data collection tool. The objectives were tested using a sample size of 80 respondents and SPSS v20 utilized to analyze the data. The study found that the there was a strong correlation between quality of information ($p=0.00$) and project performance.

It is important to state that, the complexity of PMIS system is immaterial, rather the ability to generate quality information for quality decision-making.

2.5 Conceptual Framework

The conceptual framework depicts the relationships between the research variables. The independent variables are known as the "cause" variables whereas the dependent variables are termed the "effect" variables. The moderating variable is a variable that can "alter the relationship between the dependent and independent variables". It can strengthen, diminish or negate the direction of the relationship. The intervening variable explains the existence of the relationship. The conceptual framework below shows the relationships between, OPRS system use, System users, quality of information and contractors, skilled workers, and site supervisors as independent variables and construction project performance as a dependent variable.

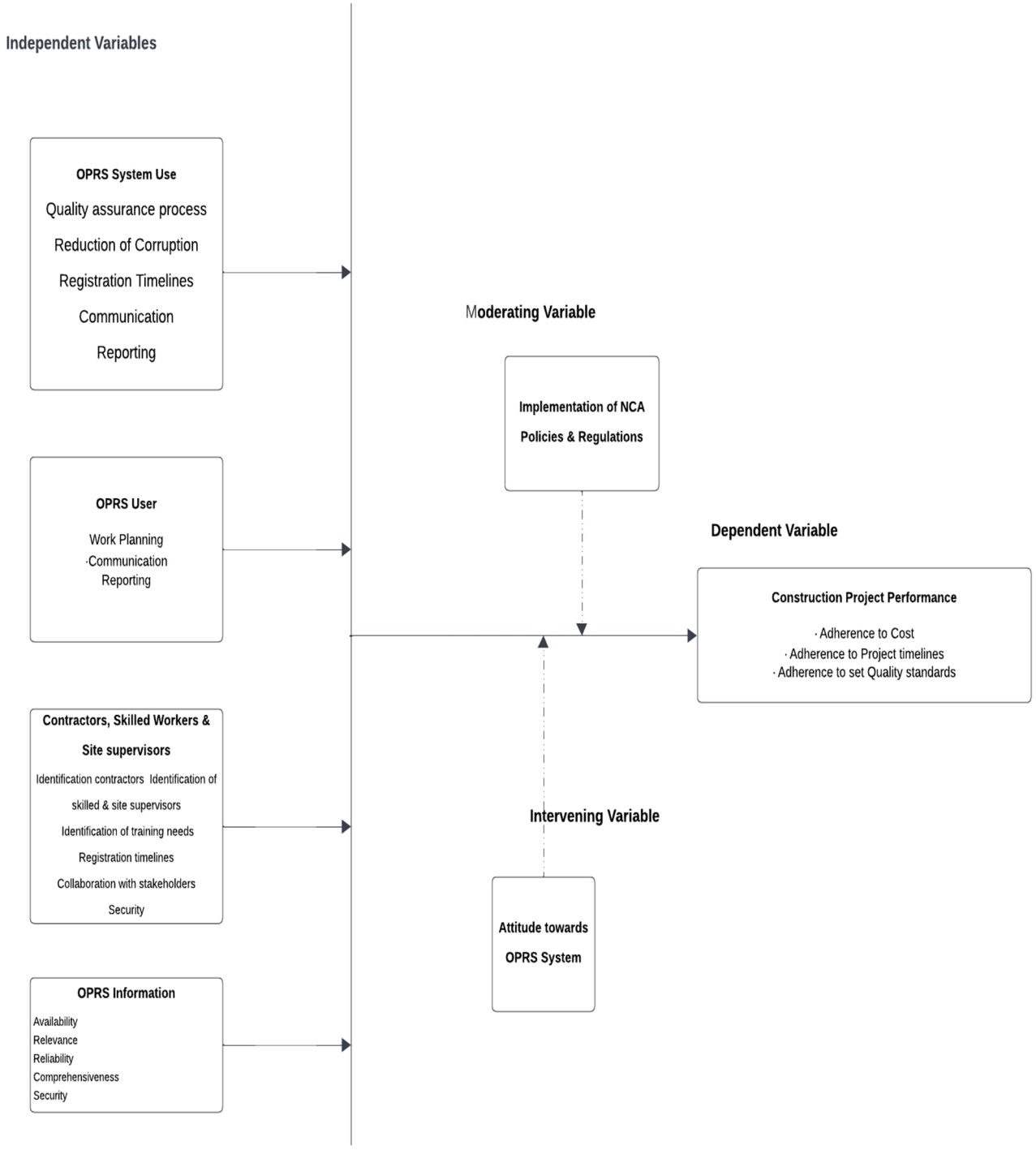

Figure 4: Conceptual Framework (Author, 2023)

2.6 Summary of Literature Review and Knowledge Gaps

2.6.1 Summary of Literature Review

Project Management Information Systems (PMIS) are critical components in modern organizations. Essentially, the survival of organizations in this highly competitive environment is pegged on the profitability and sustainability of projects. PMIS is essential in providing information on cost, and time performance to project managers, and the interrelationships of these parameters (M. A. Q. Obeidat & Aldulaimi, 2016). Bilir and Yafez, (2021) asserts that project success/failure is dependent on three factors namely requirement definitions", "requirement planning" and "top management support". However, he postulates that projects managed with the aid of technology have a 48% chance of being completed successfully on time and within budget.

In the construction industry, PMIS can be categorized into company-self-developed, application service provider (ASP) PMS systems, and specialized PMIS systems utilized in defined projects (Dhawale, 2016). Construction projects are complex in nature and require expertise from architectural, engineering, construction, and regulatory bodies. To improve on ineffectiveness and inefficiency in the coordination of these stakeholders, a robust PMIS system is required to aid project managers and regulators in decision-making.

Additionally, PMIS's major purpose is to facilitate smooth information flow among the project stakeholders. Efficient and effective communication ensures smooth information dissemination and systemic information management and as a result encourages the use of the system leading to a better construction management system.

2.6.2 Knowledge Gaps

Variable	Author year	Study title	Methodology used	Findings	Knowledge gaps	Focus of this study
System Use	Munirat et al., (2014)	"The Impact of Management Information Systems (MIS)	Survey research design	Lack of adequate MIS skills affects	The research didn't focus on	The study will focus on impact of MIS on

		On the Performance of Business Organizations in Nigeria"		organizational performance and also impairs an organization's ability to compete favorably in the global market	the construction industry in Nigeria	construction sector
	Barzegar et al., (2013)	"The Role of Management Information Systems (MIS) to Increase Productivity in the Workforce (Case Study of Iran)"	Descriptive research design	Related information & cost effectiveness affect human productivity	The research didn't focus on the perceived ease of use and perceived usefulness of PMIS system	The study shall infer the D&M ISSM and TAM theoretical foundation
	Khresat, (2015)	"The Effect of Management Information System on	Descriptive research design	Jordanian companies' employees	Questionnaire was administered to	Priority will be professionals in the

		Organizational Performance: Applied Study On Jordanian Telecommunication Companies"		had a positive attitude towards MIS use	customer service employees	construction industry
	Adhiambo, (2015)	"Influence of Information Communication and Technology Tools on the Performance of Relief Aid Projects in Kenya: The Case of Red Cross Organization in Nairobi County"	Descriptive research design	The is a positive correlation between ICT tools in monitoring and project performance	The study focused only on the monitoring function of project life cycle	The study shall investigate PMIS contribution at every stage of project cycle
	Ogero, (2014)	"Influence of Project Management Information System on Project Performance in the	Descriptive survey design	Quality information, PMIS use, and PMIS users had a huge significan	She focused on Nairobi County	The study will focus on the regulator National Construction Authority

		Construction Industry: A Case of Nairobi County, Kenya"		ce on project performance		
	Orina, (2018)	"Influence Of Adoption Of Technology On Performance Of Kenya Power And Lighting Company; A Case of Kenya Power Embu Office"	Cross-sectional descriptive survey design	Adoption of Smart Meter Technology and the performance of KPLC had a positive correlation	The study focused on the service industry	The study shall focus on the construction industry
System User	Rahman et al., (2018)	"Project Success in the Eyes of Project Management Information System and Project Team Members"	Quantitative deductive based approach	PMIS intention of use had a mediating effect between the PMIS system and project performan	The study didn't explore the factors influencing intention of use	The study shall focus on intention of use by using D&M IS model and TAM as theoretical foundation

				ce		
	Lee & Yu, (2012)	"Success model of project management information system in construction"	Survey research design	Effectiveness of ASP-based PMIS success model must encompass user satisfaction tools	The study was limited since it didn't expound of user satisfaction tools	The study shall review user satisfaction tools
	Nguyen et al., (2016)	"Information Systems Success: The Project Management Information System for ERP Projects"	Survey approach	PMIS user satisfaction determined the success of the projects	Focused on large projects within the FPT Group	Shall focus on both small scale and large scale projects in Central Nyanza region
	Kithome, (2012)	"Factors influencing implementation of Management Information System projects in	Descriptive research design	The system ease of use, availability and perceived effectiven	The study was conducted in tertiary institutions in Mombasa without a	Focus on users of OPRS at NCA and contractors within CNR

		tertiary level academic institutions in Mombasa County, Kenya"		ess impact project performance	good representative of construction professionals	
	Ngari, (2017)	"Influence of project management information systems attributes on project performance: A case of youth polytechnic development projects in Embu County, Kenya"	Descriptive research design	The system ease of use, accessibility and learn capacity & flexibility influence project performance	The research took a generic approach since it didn't consider specific PMIS system	This research will focus on the OPRS system by NCA
	Kiptoo et al.,(2014)	"Adoption MIS in Middle Level Training Institutions in Kenya"	Case study approach	Personal factors impact uptake and utilization of PMIS system	The study didn't consider professionals In the construction industry	Investigate what factors are more critical to project managers order to

						generate quality information
Contractors Skilled workers & Site supervisors	Leje et al., (2020)	"Impacts of Skilled Workers on Sustainable Construction Practices" in Nigeria"	Quantitative approach	Skilled workers improve organizational performance and construction efficacy, cost effectiveness and quality of construction projects.	The study focused on skilled labor impact alone in Nigeria	The study will investigate the impact of both skilled and unskilled labors in the context of CNR
	Alzahrani & Emsley, (2013)	"The impact of contractors' attributes on construction project success: A post construction evaluation"	Survey Approach	Construction project performance has a positive correlation with contractor attributes(	The study focused mainly on contractor attributes impact on construction projects	This study will include contractors and other stakeholders like skilled workers

				Past performances, quality, management and technical aspects and experience)		and site supervisors
	Hussain et al., (2020)	"Impact of Skilled and Unskilled Labor on Project Performance Using Structural Equation Modeling Approach"	Survey research design	Unskilled workers have a negative impact at construction phase of a project while skilled worker has positive impact resulting in project success	The study is limited in unobserved heterogeneity	This study will consider a larger sample size with relevant respondents in the construction sector

	Onchagwa, (2021)	"An Investigation of the Effectiveness of the National Construction Authority (Nca) in Curbing Malpractices in the Kenyan Construction Industry"	Survey research design	The NCA has reduced use of substandard building materials, improved workmanship and reduced quack contractors	The study didn't focus on the role of OPRS in the study	This study will focus on the actual role OPRS system in enhancing construction performance
	Ndumia, (2015)	"Influence of Regulatory Framework on Performance of Building Construction Projects in Nairobi County, Kenya"	Descriptive survey design	Regulatory framework of construction workers is paramount in effective delivery projects	The study was done in reference to building construction projects in Nairobi County only	This study will focus on Central Nyanza Region
	Mbuvi, (2021)	"Influence of Informal Subcontracting on Health and	Descriptive and qualitative Survey	Effective registration and regulation	The study focused on project performan	The study shall approach holistic

		Safety Performance on Construction Projects the Case of Nairobi City County"	research design	of contractors, projects and construction workplaces improves (H& S) standard and overall performance of construction projects	ce in the health and safety variables alone	project performance(health, safety, environmental and the iron triangle
Quality of Information	Obeidat & Aldulaimi, (2016)	"The Role of Project Management Information Systems towards the Project Performance: The Case of Construction Projects in United Arab Emirates"	Survey research design	Project performance in construction projects UAE is positively correlated with quality information output	The study was limited in that it didn't consider the how PMIS improves actual project management	This study will explore how OPRS improves project management on actual projects

				and user influence of PMIS		
	Son et al., (2016)	"Construction Professionals' Perceived Benefits of PMIS: The Effects of PMIS Quality and Computer Self-Efficacy"	Survey research design	Perceived ease of use and system information usefulness impacted system utilization that in effect influenced the self-efficacy	The study was foreign ad was conducted in South Korea	This study will focus on dynamics in Kenya and CNR to be particular
	Karim, (2011)	"PMIS factors: An empirical study of the impact of Project management decision making (PMDM) performance"	Survey research design	Quality of information generated by PMIS contributes project performance at all phases of the project cycle	The sample wasn't representative of professionals in the construction industry	The study respondents shall be all from the construction sector

	Kahura, (2013)	"The Role of Project Management Information Systems towards the Success of a Project: The Case of Construction Projects in Nairobi Kenya"	Case study approach	Quality of information generated by the PMIS software informed decision-making and it is availability and relevance determined the quality of decisions made	The study assessed PMIS use within private construction companies I Nairobi	This study will focus on construction regulator and private construction companies in CNR

Table 1: Knowledge Gaps

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was adopted for the study. It comprises the research design, target population, sample design, data collection, and data analysis.

3.2 Research Design

The research adopted a descriptive survey design. This design blends both the qualitative and quantitative data without modifying the variables under study to bring out accurate information. The design enabled the researcher to obtain raw opinions from system users; managers, compliance officers, and registration officers in their natural setting. This design was useful in decision making and it is cheap, requires little effort, and doesn't suffer from ethical scrutiny (Aggarwal & Ranganathan, 2019).

The descriptive survey design was appropriate for this study since the study was tied to groups derived from the sample population to collect information on various study variables. The different groups were subjected to similar questions relating to the different parameters of the study. The study ensured that different respondents described the variables under study.

3.3 Target Population

The target population of this study was 85 system users. The population included NCA managers, compliance officers, registration officers, and NCA-approved contractors working in the Central Nyanza region in Kenya. The table below shows the target population and sample size

Category	Target Population	Sample Size
Managers	6	3
Compliance Officers	32	27
Registration Officers	33	30
Contractors	14	10
Total	85	70

Table 2: Sample Frame

3.4 Sample Design

Turner (2020) defines sampling as; the "selection of a subset of a population of interest in a research study." The correct sample set is a function of many factors including the type of population under study, the purpose of the study, the variables under study, the research design adopted, and the proposed methods of data analysis. A sampling frame is the defined population from which samples are taken, for this kind of research design, a sample size larger than thirty (30) and less than five hundred (500) is appropriate.

The sample size of this study was 70 respondents. This was derived from the Krejcie and Morgan Table that asserts that a population of eighty-five (85) should have a sample size of seventy (70) respondents. Purposive sampling was used to select the sample from the population. Participants' representatives of the population were selected based on expert judgment and their roles in the organization.

3.5 Data Collection

The study blended both qualitative and quantitative data. The questions utilized the Likert scale to allow the respondents to rate the questions as per their agreement levels. Open and closed-ended questionnaires served as the primary source of data while the NCA website, county, and regional weekly progress reports, and media reports served as the secondary source of data. The questionnaire was structured into six parts from A-F. Part A collected respondents' bio data; part B collected the impact of system use on project performance, while part C collected the data on system user attitudes and the performance of construction projects. In addition, part D was based on OPRS system use and its impact on contractors, skilled workers and site supervisors. Part E assessed the OPRS quality of information and its impact on project performance. Finally, part F was on the impact of OPRS on construction project performance.

Additionally, the researcher adopted both virtual and face-to-face interviews where clarification is required. To enhance the response rate, the questionnaires were administered both physically and virtually. Equally important, the data collection instruments were checked for validity and reliability. The researcher adopted a drop-and-

pick approach in cases where the respondents were asked for permission and given time to fill out the questionnaires and collected at a later date. Respondents were guided on the importance of wholesomely filling out the questionnaires truthfully to ensure a higher response rate.

3.6 Data Analysis

The study utilized the Statistical Package for Social Sciences (SPSS) version 29 for analysis. The data was organized and edited to weed-out inconsistencies, repetitions, and errors that make analysis complex. The cleaned data was subjected to both qualitative and quantitative methods where quantitative data was corded to ensure the grouping of responses into distinct categories. Conceptualization content analysis was used to establish data categories by identifying relationships among the different categories of data to produce concrete conclusions. Descriptive statistics (mean, frequency distribution tables, and frequency) was used to analyze the data and Karl Pearson's Product moment correlation used to determine the relationship between the independent variables and dependent variables.

The research adopted a regression approach to establish the interactions between the variables. The regression equation that was adopted assumed the following equation.

$$\mathbf{Y= \beta0 + \beta1M1 + \beta2M2 + \beta3M3 + \beta4M4 + \varepsilon}$$

Whereby;

Y = Construction project performance

M1= OPRS system Use and quality assurance

M2= OPRS system User and construction performance

M3= OPRS system use and building contractors

M4= OPRS system use and construction workmanship

β0= Y intercept (insignificant influence)

β1, β2, β3, β4- Beta coefficients which have significant influence on the model

ε – Error Term

3.7 Operationalization of Variables

Variable	Indicator	Measurement scale	Data Collection Methods	Tools of Analysis	Data analysis
Quality information and Performance of Construction projects	Availability Relevance Reliability Comprehensiveness Security	Nominal	Questionnaire	Mean Range Correlation Regression	Correlation Regression
Project Management Information System user & Performance of Construction projects	Work Planning Communication Reporting	Nominal	Questionnaire	Mean Range Correlation Regression	Correlation Regression
Project Management Information System use & Performance of Construction projects	Quality assurance process Reduction of Corruption Registration Timelines Communication Reporting	Nominal	Questionnaire	Mean Range Correlation Regression	Correlation Regression

Performance of Construction projects	Adherence to Cost Adherence to Project timelines Adherence to set Quality standards	Nominal	Questionnaire	Mean Range Correlation Regression	Correlation Regression

Table 3 Operationalization of Variables

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter covers the data presentation and the interpretation of the findings. The main objective of the study was to establish the impact of online project registration system (OPRS) on the performance of NCA-approved building projects in the construction industry a case of the Central Nyanza Region. In addition, the study sought to investigate the online project registration system user, quality of information, contractors, skilled workers and site supervisors and online project registration system use on performance of building projects. The research findings are presented in tables.

4.2 Questionnaire Response Rate

The research had a sample of 70 respondents whereby only 45 responses were received. This constituted a response rate of 64.29%. According to Wu et al., (2022) responses above 50% and above are considered adequate thus 64.29% is even better.

4.3 Respondents Demographic Characteristics

The study sought to determine the respondent's background information which constituted respondents gender, age, education level and length they have worked with the National Construction Authority.

4.3.1 Respondents Gender Distribution

The study sought to ascertain respondents' gender distribution. The findings are as shown below

	Frequency	Per Cent
Male	29	64.4
Female	16	35.6
Total	45	100

Table 4 Distribution of Respondents by Gender

As depicted in table 4 above, majority of the respondents (64.4%) were male while the female constituted 35.6% of the respondents. It is evident that the 2/3 gender

representation was achieved depicting gender equity. These findings also indicate that majority of compliance officers and registration officers were male.

4.3.2 Respondents Age Brackets

The study also determined the age racket of the respondents. This was important to ascertain length the respondents have worked with NCA and interacted with the OPRS system. The findings were as depicted in the table below.

	Frequency	Per Cent
Below 25 Years	4	8.9
25-34 Years	21	46.7
35-45 Years	15	33.3
Above 45 Years	5	11.1
Total	45	100

Table 5 Respondents Age Brackets

The study findings show that 8.9% were aged below 25 years, 46.7% were aged between 25-34 years, and 33.3 % were aged between 35-45 years while 11.1% were aged above 45 years. These findings show that majority of NCA employees are aged between 25-45 years.

4.3.3 Education Level of Respondents

The study also investigated the academic level of respondents. This was important to determine the respondents' capability to utilize the online project registration system.

	Frequency	Per Cent
Post Graduate Degree	8	17.8
Degree	30	66.7
Diploma/Certificate	7	15.6
Secondary	0	0
Primary	0	0
Total	45	100

Table 6 Education Level of Respondents

It is evident from the table that respondents that are degree holders constituted the majority at 66.7% followed by masters' holders at 17.8% and diploma holders at 15.6%.

There were no respondents who indicated secondary and primary as their level of education.

4.3.4 Years of Service with Employer

The study sought to determine the duration each respondent had worked with its employer. This was important to determine respondents experience working with the OPRS system. The findings were as show in the tale below

	Frequency	Per Cent
Below 2 Years	5	11.4
3-5 Years	17	38.6
6-8 Years	13	29.5
Over 9 Years	9	20.5
Total	45	100

Table 7 Years of Service with Employer

The table shows that 11.4% had less than two years with employer, 38.6% between 3-5 years, 29.5% between 6-8 years while 20.5% had worked with employer foe over 9 years. It is evident that majority of the respondents had worked with employer for 3-5 years.

4.4 Performance of the Online Project Registration System

The study sought to investigate the general performance of the OPRS system in the organization. The respondents were tasked to rate the various aspects of performance of the system within NCA. The findings are as shown in table 8 below.

Range	1.00-1.80 Strongly Disagree	1.81-2.60 Disagree	2.61-3.40 Undecided	3.41-4.20 Agree	4.21-5.00 Strongly Agree
Accessibility					4.36
Ease of Use					4.50
Usefulness					4.41
Flexibility				4.13	
Availability				3.91	

System Integration	3.89	
Learning Ease		4.56

Table 8 Performance of the Online Project Registration System

From the findings the respondents rated the system as ease to use and ease to learn with means of 4.50 and 4.56 respectively. The respondents equally rated system usefulness at 4.41 while the accessibility and flexibility recorded a mean of 4.36 and 4.13 respectively. Availability was rated with a mean of 3.91 due to rampant downtime and system integration was the least rated with a mean of 3.89. From the data, it is evident that the OPRS system is important, ease to use and easy to learn. However, improvements are required on system availability, integration and flexibility.

4.5 Online Project Registration System Technical Characteristics

The study sought to establish the technical attributes of the online project registration system (OPRS). The respondents were asked to rate the system on various systems attributes and the findings were as shown below.

Range	1.00-1.80 Strongly Disagree	1.81-2.60 Disagree	2.61-3.40 Undecided	3.41-4.20 Agree	4.21-5.00 Strongly Agree
The OPRS data formats are simple and flexile to use					4.31
NCA OPRS is safe for storage of sensitive project data					4.27
OPRS is linked with sites of important stakeholders and is easily available on search engines					4.24
OPRS provider gives timely technical support for NCA				4.00	
Data captured in OPRS is easily					4.27

retrievable					
Data captured during QA is easily uploaded to OPRS					4.29
Project coordinates captured by rugged phones are accurate				3.98	

Table 9 Online Project Registration System Technical Characteristics

The study found out that the OPRS data formats were simple and flexible to use with a mean of 4.31. The data format received the highest ratings from the respondents of the seven attributes under investigation. Respondents further rated safe storage of data with a mean of 4.27, OPRS linkage to stakeholders' websites and search engines at 4.24 and OPRS provider timely support with a mean of 4.00. Additionally, ease of data Retrievability was rated 4.27, ease of data upload during quality assurance at 4.29 while the accuracy of the rugged phones coordinates was least rated with a mean of 3.98.

4.6 Online Project Registration System Use and Performance Construction Projects

The study sought to determine how the OPRS system use has impacted the performance of building construction projects within the Central Nyanza region. Respondents were asked to rate the various indicators and the findings were as shown in the table below.

Range	1.00-1.80 Strongly Agree	1.81-2.60 Agree	2.61-3.40 Undecided	3.41-4.20 Disagree	4.21-5.00 Strongly Disagree
OPRS has improved communication within compliance department		1.82			
OPRS use has improved proper quality assurance process management		1.84			
OPRS use has reduced the time required to register projects	1.80				

OPRS has reduced time required to perform construction audit		1.91			
OPRS has reduced corruption on project registration services		1.91			
OPRS system use has improved reporting of QA activities	1.70				

Table 10 OPRS Use and Performance Construction Projects

The OPRS impact on improving commutation within the compliance department was rated with a mean of 1.82(Agree). It was noted that the OPRS was highly rated (strongly agree) in improving reporting of QA activities and reducing the project timelines with a mean of 1.70 and 1.80 respectively. On improving process management during quality assurance, the OPRS was rated with a mean of 1.84(agree) while the impact of OPRS on reducing construction audit and mitigation of corruption were both rated with a mean of 1.91(agree) by the respondents.

4.7 Online Project Registration System User and Performance Construction Projects

The study sought to ascertain the extent to which system user influenced performance of building construction projects. The respondents rated various activities whose findings are presented in the table below.

Range	1.00-1.80 Strongly Agree	1.81-2.60 Agree	2.61-3.40 Undecided	3.41-4.20 Disagree	4.21-5.00 Strongly Disagree
Users have adequate knowledge and experience of OPRS use	1.76				
OPRS has improved user networking ability and interactivity with other users		2.02			
OPRS has improved work		1.89			

performance of workers in NCA					
User expectations have been meet through use of OPRS service delivery		1.87			
OPRS system is simple and easy to learn	1.67				

Table 11 OPRS user and Performance Construction Projects

From the table above, the respondents agreed with a mean of 1.76 that user knowledge and experience often affect construction project performance. The respondents' further agreed that the OPRS system has improved user networking ability and interactivity with other users with a mean of 2.02. In addition, the respondents agreed with a mean of 1.89 that the OPRS system has improved work productivity among NCA staff that has a direct correlation to the performance of the building construction projects. With a mean of 1.87, the respondents equally agree that the utilization of the OPRS system in service delivery has improved user satisfaction and quality of service offered by the National Construction Authority.

4.8 Contractors, Skilled Workers, Site Supervisors and Performance Construction Projects

The study sought to find out the influence of contractors, skilled workers and site supervisors on the performance building construction projects. The respondents were tasked with rating various indicators to ascertain their contribution to project performance. The findings were as shown below.

Range	1.00-1.80 Strongly Agree	1.81-2.60 Agree	2.61-3.40 Undecided	3.41-4.20 Disagree	4.21-5.00 Strongly Disagree
Improved identification of registered Contractors, skilled workers & site supervisors	1.71				

Improved identification of training needs of Contractors, skilled workers & site supervisors	2.07			
Improved registration timelines of construction projects	1.62			
Improved collaboration between regulator (NCA), contractors and construction professionals(Engineers, Architects, QS)	1.69			
Improved contractor data security and access	1.78			

Table 12 Contractors, Skilled Workers, Site Supervisors and Performance Construction Projects

According to the findings, the respondents strongly agree that the OPRS system has improved identification of registered Contractors, skilled workers & site supervisors with a mean of 1.76. It is important to point out that these construction workers influence the performance of projects they are involved in. The respondents equally agreed with a mean of 2.02 that the OPRS system has improved identification of training areas among the registered Contractors, skilled workers and site supervisors that is important for performance excellence.

Additionally, the respondents agreed with means of 1.62 and 1.69 that the OPRS system improved registration timelines of construction projects and collaboration between regulators (NCA), contractors and construction professionals (Engineers, Architects, Quantity Surveyors) respectively. They also agreed that contractor data security and access had improved as a result of utilization of the OPRS system.

4.9 Online Project Registration System Quality of Information and Performance Construction Projects

The study sought to determine the impact of the information generated by the OPRS system on construction performance. The respondents were tasked with rating various

indicators to ascertain level of agreement or disagreement. The findings were as presented below.

Range	1.00-1.80 Strongly Agree	1.81-2.60 Agree	2.61-3.40 Undecided	3.41-4.20 Disagree	4.21-5.00 Strongly Disagree
Availability	1.73				
Relevance	1.78				
Reliability	1.73				
Comprehensiveness	1.71				
Security	1.73				

Table 13 Quality of Information and Performance Construction Projects

The study findings showed that the information generated by the OPRS system was reliable with a mean of 1.73. Equally, the information was found to be comprehensive with a mean of 1.71, relevant in making decisions with a mean of 1.78 and easily available with a mean of 1.73. It was equally noted that the information generated is secure with the respondents rating it with a mean of 1.73. It is important to note that all the indicators were highly rated (Strongly Agree) that the OPRS system information impact the decision making process and thus the overall performance of the projects.

4.10 Performance of Construction Projects

The respondents were asked to rate the OPRS system impact on general construction project performance. The findings are show in table 14 below.

Range	1.00-1.80 Strongly Agree	1.81-2.60 Agree	2.61-3.40 Undecided	3.41-4.20 Disagree	4.21-5.00 Strongly Disagree
Meeting Quality Assurance Checks	1.51				
Monitoring service charter	1.53				

timelines	
Meeting quality specifications	1.56
Reporting construction progress	1.49

Table 14 Performance of Construction Projects

From the findings, it was noted that the respondents were satisfied with the ability of the OPRS system in monitoring service charter timelines. As a result it was rated with a mean 1.51(SA). Equally, whether OPRS system was able to meet building quality specifications, the respondents rated it highly with a mean of 1.53. Equally, the OPRS system was strongly rated in Meeting Quality Assurance Checks and Reporting construction progress with means of 1.53 and 1.56 (Strongly Agree) respectively.

4.11 Correlation Analysis

Correlation is the degree of association between two variables. It ranges from -1 and +1 where a positive value implies positive correlation while the negative sign implies negative or inverse correlation. By obtaining average per factor of all the data collected for each variable, OPRS use, OPRS user, OPRS information, contractors, skilled workers and site supervisors and construction project performance, Pearson Correlation was performed at 99% confidence interval and 1% confidence level 2-tailed. The findings were as shown in the correlation matrix below.

Correlations

		System use	System User	Contractors, Skilled Workers, Site Supervisors	Quality of Information	Performance of Construction Projects
System use	Pearson Correlation	1	.929**	.927**	.844**	.505**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001
	N	45	45	45	45	45

System User	Pearson Correlation	.929**	1	.902**	.837**	.495**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001
	N	45	45	45	45	45
Contractors, Skilled Workers, Site Supervisors	Pearson Correlation	.927**	.902**	1	.898**	.557**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001
	N	45	45	45	45	45
Quality of Information	Pearson Correlation	.844**	.837**	.898**	1	.769**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	45	45	45	45	45
Performance of Construction Projects	Pearson Correlation	.505**	.495**	.557**	.769**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	45	45	45	45	45

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

Table 15 Correlations

It was found that the Pearson correlation of system use and performance of construction project was moderately positive and statistically significant (r=.0.505, p<0.01). The system user and performance of construction project was also found to be positive and statistically significant (r=.0.495, p<0.01). The contractors, site supervisors and skilled workers and the information generated by the OPRS system were equally found to have a positive correlation(r=.557, p<0.01) & (r=0.769, p<0.01) respectively with performance of the construction projects.

The study findings show that the four independent variables have a positive impact on project performance. Based on p-values in all the relationships, the variables System use, System User, Contractors, Skilled Workers, Site Supervisors, and Quality of Information have a huge significance on the overall performance of construction project. It is important to note that the contractors, site supervisors and skilled workers, and quality of information had the most significance impact on the performance of building construction projects.

4.12 Regression Analysis

Regression analysis is a statistical estimation of the relationships of the dependent variable with one or more independent variables. It is utilized to illustrate the strength of relationships of variables and model future relationships among them. Regression analysis was performed OPRS use, OPRS user, OPRS information, contractors, skilled workers and site supervisors as independent variables and construction project performance as a dependent variable.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.833[a]	.693	.663	.51503	1.363

a. Predictors: (Constant), m4, m2, m1, m3

b. Dependent Variable: y

Table 16 Model Summary

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.993	4	5.998	22.613	<.001[b]
	Residual	10.610	40	.265		
	Total	34.603	44			

a. Dependent Variable: y

b. Predictors: (Constant), m4, m2, m1, m3

Table 17 ANOVA[a]

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.807	.172		4.682	<.001		
	m1	-.051	.238	-.060	-.212	.833	.095	10.530
	m2	-.202	.231	-.217	-.873	.388	.124	8.087
	m3	-.422	.265	-.461	-1.596	.118	.092	10.905
	m4	1.110	.157	1.416	7.058	<.001	.191	5.249

a. Dependent Variable: y

Table 18 Regression Coefficients[a]

From the findings the Pearson Correlation Coefficient R was found to be 0.833 that shows a strong and positive correlation among the three variables. The R-Squared (R^2) value of 0.693 shows that about 69.3% change in performance of construction projects is explained by m1, m2, m3 and m4 jointly while the remaining 30.7% is captured by the error term. This shows that the model is a good fit. The adjusted R-Squared value of 0.663 shows that about 66.3% change in project performance is explained by variables m1, m2, m3 and m4 jointly while 33.7% are part of the error term. This affirms that the model has a good fit. The fitted regression showed that there was a positive autocorrelation as indicated by the DW statistic value of 1.363.

The results (ANOVA) confirmed that the overall regression model was statistically significant. The F-statistic of 22.613 and its probability ($F=22.613$, $p<0.01$) were found to be significant at 5% level. It was noted that quality of information had positive impact on project performance with a coefficient of 1.10 and p value of $p<0.01$. System use, system user, and contractors, site supervisors and skilled workers had a negative and insignificant impact on construction performance.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings, discussions of core data findings, conclusions drawn from the study findings and recommendations of the study. The study conclusions and recommendations concentrated on addressing the objectives of the study.

5.2 Summary of Findings

The study sought to examine the impact of online project registration system (OPRS) and building project performance. The influence of OPRS system use, OPRS system user, contractors, skilled workers and site supervisors and quality of OPRS information was assessed to determine their influence on construction project performance.

5.2.1 The System Use

According to the study findings the respondents rated OPRS system use highly with a mean of 1.8389 and a standard deviation of 1.05663. However, most respondents the system isn't safe due to massive downtime. The respondents felt that system utilization had improved their work rate, keep track of construction projects within the region. It was equally noted that due to less human interactions, the system has reduced cases of corruption, improved communication between customers and the Authority. It was noted that the system plays a critical role in generating data used for construction audit. The respondents also asserted that the system utilization has improved project registration timelines and construction progress reporting.

5.2.2 The System User

From the study findings, the respondents agreed that the OPRS system had improved performance within the Authority. This was affirmed by the mean of 1.8400 and a standard deviation of 0.95594. Quality assurance decision making process has improved as a result of availability of quality information from the OPRS.

5.2.3 Contractors, Site Supervisors & Skilled Workers

The respondents agreed that the Contractors, Site Supervisors & Skilled Workers play a critical role in the performance of building projects. They rated their influence with a mean of 1.7733 and a standard deviation of 0.96916. They asserted that the OPRS had improved contractor and skilled workers identification, training needs and collaboration with built environment stakeholders.

5.2.4 Quality of Information

The OPRS quality of information was lauded by respondents with an excellent mean of 1.7367 and standard deviation of 1.13119. Its relevance and comprehensiveness were critical in making quality assurance decisions. Information's availability, reliability and security were important in improving project performance.

5.3 Discussion of Findings

The objectives of the study were to determine the contribution of the variables (system use, system user, quality of information and contractors, site supervisors and skilled workers on the performance of building construction projects. The study findings are discussed as per the study objectives to ascertain the direct or indirect relationship with building construction projects performance.

The OPRS system ease of use, response time, system integration with other built environment stakeholder is important in creating information necessary for decision making. It is important to state that, since the system is ease to use, the relevance and comprehensiveness of the information created by the OPRS finds meaning unlike systems that are complex and less flexible.

Whereas the system users agreed that the system is important in generation of reports, communication among the department, there were concerns that some members didn't embrace it due to rigidity. This negative attitude towards the OPRS system hindered its full utilization among the respondents. Equally, cases of corruption were noted where users intentionally derailed approvals of projects until clients followed up with kickbacks. These trends ended up complicating project registration procedures and many times severed the registration timelines.

The quality of information was found to be directly and strongly related to performance of building construction projects. Information security, availability, reliability, comprehensiveness, and relevance attributes are key to sound decisions that impact project performance. The actual utilization of OPRS will result in impacts on project performance. As Cleland asserts best information losses its value if it is not available to people who need it to make decisions and direct actions (Cleland, 2014).

It is important to point out that construction workmanship also plays an important role on overall project performance. It was noted that there was a strong and direct relationship between the contractors, skilled workers and site supervisors on building construction projects. The OPRS system had improved identification of these workers, security of data, access and collaboration with other professionals in the built environment. However, the respondents did flag that the OPRS system didn't identify the training needs of the contractors, skilled workers and site supervisors.

In summary for the OPRS to make an impact in realizing construction project objectives, the system must optimally produce sufficient and quality information. The system must be utilized in depth and breadth by compliance officers, registration officers, contractors, skilled workers, site supervisors and managers within the compliance department.

5.4 Conclusions of the Study

The main aim of study was to examine the relationship between the Online Project Registration System (OPRS) and the Performance of National Construction Authority Approved Building Projects in the Central Nyanza Region of the republic of Kenya. More specifically, one of the objectives was to determine the extent to which the OPRS USE had improved quality assurance in NCA-approved building projects. Another objective was to determine ways in which OPRS USER influence the performance of NCA-approved building projects. Another objective was to establish the extent to which OPRS USE had reduced rogue contractors, incompetent skilled workers and site supervisors in NCA-approved building projects. Finally, another objective was to establish the extent to which OPRS INFORMATION influenced performance of NCA-approved building projects in Central Nyanza Region.

From conclusions from previous research project management information system models continue to be authenticated and challenged. The findings of this study show that PMIS is far more advantageous in regulation of the construction industry more specifically the National Construction Authority. The improvements in effectiveness and efficiency in quality assurance were noted in project monitoring, project progress reporting and project registration. Equally important, apart from improving individual performance OPRS also improved the overall performance of construction projects within the Central Nyanza region.

It is important to note the baseline of project success is the quality of information generated by the project management information system. The information must be reliable and accurate to aid top notch decision making among its users. The complexity or simplicity of MIS system doesn't matter rather the quality of information and ability of user to decipher meaning out of it for decision making. Thus, there is a significant contribution of project management information system to the success of building construction projects.

5.5 Recommendations of the Study

It is recommended that:

1. The findings of this study show that organizations should adopt custom project management information systems in management of their projects. This is informed by the fact that PMIS guarantees effective management of projected based on quality information.
2. The study findings show that project management information systems are beneficial to users. It improves productivity within the organization in terms of communication, project scheduling, monitoring and effective decision making.
3. It is through extensive utilization of the system that quality of information generated impact on building construction projects performance.

5.6 Suggested areas for further Research

Future research on Online Project Registration system and building construction projects performance could:

1. To evaluate performance from the perspective of the client, that is, to assess the impact of OPRS on project deliverables in solving client issues and tangible benefits that accrue to the authority.
2. To evaluate the Online Project Registration system software from the perspective of cost, usability, and scalability

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APPENDICES

Appendix I: Questionnaire

This questionnaire consists of sections A-F. Kindly respond correctly and honestly based on your knowledge of the NCA OPRS system. Use a tick or fill in the space provided to give your feedback. If something is not clear on the questionnaire, kindly reach out for clarification so that true information is obtained. The information obtained is only for academic purposes and will be confidential. Your cooperation is highly needed and appreciated. Thank you.

SECTION A: GENERAL INFORMATION

1) Gender

- Male [ ]
- Female [ ]

2) What is your highest level of education?(Tick as applicable)

- Primary [ ]
- Secondary [ ]
- Diploma/ Certificate [ ]
- Bachelor's degree [ ]
- Postgraduate degree [ ]
- Others-specify……

3) What range does your age lie in?

- Less than 25 years [ ]
- Between 25 to 34 years [ ]
- Between 35 to 44 years [ ]
- 45 years and above [ ]

4) Years of service/working period with Employer (Tick where applicable)?

- Below 2 years [ ]
- 3 to 5 years [ ]
- 6 to 8 years [ ]

- Over 9 years [ ]

5) In your own words, describe the influence of OPRS system on project performance in Central Nyanza Region.

……

……

……

……

6) How will you rate the general performance of OPRS system in your organization on the following areas? Tick Appropriate

	1	**2**	**3**	**4**	**5**
	Very Low	**Low**	**Moderate**	**High**	**Very High**
Accessibility					
Ease of Use					
Usefulness					
Flexibility					
Availability					
System Integration					
Learning Ease					

7) How will you rate the OPRS system on the following technical factors? Tick Appropriate

STATEMENTS	**1**	**2**	**3**	**4**	**5**
The OPRS data formats are simple and flexile to use					
NCA OPRS is safe for storage of sensitive project data					
OPRS is linked with sites of important stakeholders and is easily available on search engines					
OPRS provider gives timely technical support for NCA					

Data captured in OPRS is easily retrievable					
Data captured during QA is easily uploaded to OPRS					
Project coordinates captured by rugged phones are accurate					

SECTION B: OPRS SYSTEM USE

Using a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 =strongly disagree; show to what extent you agree with the statements given below.

STATEMENTS	**1**	**2**	**3**	**4**	**5**
OPRS has improved communication within compliance department					
OPRS use has improved proper quality assurance process management					
OPRS use has reduced the time required to register projects					
OPRS has reduced time required to perform construction audit					
OPRS has reduced corruption on project registration services					
OPRS system use has improved reporting of QA activities					

SECTION C: OPRS SYSTEM USER

Using a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 =strongly disagree; show to what extent you agree with the statements given below.

STATEMENTS	**1**	**2**	**3**	**4**	**5**
Users have adequate knowledge and experience of OPRS use					
OPRS has improved user networking ability and interactivity with other users					
OPRS has improved work performance of workers in NCA					
User expectations have been meet though use of OPRS service delivery					
OPRS system is simple and easy to learn					

SECTION D: OPRS SYSTEM USE AND CONTRACTORS, SKILLED WORKERS & SITE SUPERVISORS

Using a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 =strongly disagree; show to what extent you agree with the statements given below.

STATEMENT	1	2	3	4	5
Improved identification of registered Contractors, skilled workers & site supervisors					
Improved identification of training needs of Contractors, skilled workers & site supervisors					
Improved registration timelines of construction projects					
Improved collaboration between regulator (NCA), contractors and construction professionals(Engineers, Architects, QS)					
Improved contractor data security and access					

SECTION E: OPRS QUALITY OF INFORMATION AND PROJECT PERFORMANCE

Using a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 =strongly disagree; show to what extent you agree with the statements given below.

STATEMENT	1	2	3	4	5
Availability					
Relevance					
Reliability					
Comprehensiveness					
Security					

SECTION F: IMPACT OF OPRS ON PERFORMANCE OF CONSTRUCTION PROJECTS

Using a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 =strongly disagree; show to what extent you agree with the statements given below.

STATEMENT	1	2	3	4	5
Meeting Quality Assurance Checks					
Monitoring service charter timelines					

Meeting quality specifications						
Reporting construction progress						

Appendix II: Krejcie and Morgan Table

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970