INFLUENCE OF WORKS PROGRAMMING ON PERFORMANCE OF CONSTRUCTION PROJECTS, A CASE OF KIAMBU COUNTY

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Influence of Works Programming on Performance of Construction Projects, A Case of Kiambu County

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

Signature…… ……Date……

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This thesis has been submitted for examination with our approval as University supervisors.

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JKUAT, Kenya

DEDICATION

I dedicate this work to my late father David, My Mother Keziah, your care and support will always be cherished forever in my heart.

Special dedication goes to my dear wife Margaret for her prayers, moral support and encouragement during the period of writing my work. “A man can only be strong as those standing behind him”.

I would also like to dedicate this research to my children Abigail, Maxwell and Myles. May you live to undertake research at greater levels!

INSPIRATION

You can never rise up in life by pulling others down hence it is in my heart to desire that always I will add value to people.

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ABBREVIATIONS

ANOVA	Analysis of Variance
CDM	Construction Design and Management
CPM	Critical Path Method
CSI	Construction Specification Institute
ICT	Information Communication and Technology
KNBS	Kenya National Bureau of Statistics
NCA	National Construction Authority

ABSTRACT

The effective performance of any Construction Project to a large extent depends on how deliberate, well thought, planned and managed. Hence, the need for a computerized works programming. Effective works programming helps the project team to ensure that tasks and activities are done at the right time, within budget and quality specifications. Consequently, eliminating costs and time overruns and scope change. The purpose of this research is to investigate influence of construction work programming on performance of projects in Kiambu county. The research was guided by the following objectives: to investigate the influence of prevalence of work programming on project performance, to determine the influence of work programming on project performance and to assess the influence of knowledge of work programming on project performance in Kiambu County. The target population was 132 respondents, with a response rate of 77%. From data analysis, the study found that there was effective construction project delivery with high prevalence of working program applicability and knowledge of work programming techniques. The study rejected the null hypothesis that prevalence of working program applicability had no significant influence on effectiveness of construction project delivery in Kiambu County and Knowledge of work programming techniques had no significant influence on effectiveness of construction project delivery in Kiambu County. Therefore concluded, prevalence of working program applicability and Knowledge of work programming techniques influenced effectiveness of construction project delivery in Kiambu County. However, the study failed to reject the null hypothesis that adherence to the effective work programming had no influence on effectiveness of construction project delivery. Therefore, concluded that adherence to the effective work programming did not influence effectiveness of construction project delivery in Kiambu County. The objectives of the study were met as the researcher was able to answer the research questions by determining the factors that that significantly influenced effectiveness of construction project delivery in Kiambu County and to what extent and the ones that did not. The primary focus of the researcher in this study was to relook on the effects of construction work programming and performance of projects. So far, most studies focused on economic and human issues leading to unsuccessful completion of construction projects. In this study the researcher shifted the focus to injecting solution through integrating technology to enhance efficiency in real time monitoring and evaluation. The model is planning, control, reporting and proactive remedial action for performance of construction projects.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Project performance is one of the project success factors, it is a complex project process consisting of planning, monitoring, control, and support that is focused on fulfilment of product parameters and requirements related to the product (Głodziński, 2019). In Turkey 48% of projects are completed successfully against 45% which are completed with cost and time overrun or completely failed (Bilir & Yafez, 2021). Hence, it is critical to ensure proper planning, control and monitoring to ensure that the rate of project performance is heightened in order to minimize project failure, appreciating construction is critical in the global economy.

Construction accounts for a big proportion of natural resources consumption, hence, contributing largely to the global economy. The construction industry is the driver of the economy of any nation, contributing to 8-10 % of the GDP globally (Dixit, Mandal, Thanikal & Saurabh, 2019). In Ghana, the construction industry rates the highest contributor to the economy, contributing 13.7%of the total Gross Domestic Product (Boadu, Wang & Sunindijo, 2020). The management of large-scale construction projects involves controllable factors such as labour, materials, money, machines viz a vis time factor which is an uncontrollable factor. Hence, the need of PERT (program evaluation and review technique) and CPM (critical path method), to aid the project manager in to coordinate an array of activities, such as project initiation, planning, implementing, controlling, and closing projects (Bagshaw, 2021).

The main objective of CPM is to fulfil a client's requirement in order to produce a functionally and financially viable project. A construction manager holds the same responsibilities and completes the same processes in each sector. All that separates a construction manager in one sector from another is knowledge of the particular construction site. This may include different types of equipment, materials, subcontractors, and possibly locations. Lack of an effective work program has led to the

failure of many projects being completed on time (Lim, 2016). This has informed the need to investigate the effect of work programming on construction project management delivery.

Nonetheless, managing time in construction projects is becoming more difficult and complex, due to a large array of different people and organizations involved. Hence, the need for a programme which is a conceptualised display of provisions or allocated resources used to manage the timing and sequence of construction activities (Olubajo, Hughes & Schweber, 2019). This makes it impossible to employ manual tools that have been in use for decades. For many decades, methods such as the critical path method (CPM), the programme evaluation and review technique (PERT), the metra potential method (MPM), and Gantt charts have been applied in construction and have maintained their role for construction project planning. These simple techniques do not pay sufficient respect to the complex planning environment in construction and are solely suitable for the determination of time windows for project activities. In contrast, in construction, more difficult planning problems are faced (Sunke, Schultmann & Yang, 2009). Hence, the need for computerized work programming which can accommodate, bigdata technology in use currently.

To inject efficiency in project planning, design implementation and monitoring Management Information Systems rationalize the management of data required. Softwares make project management easier by simplifying and/or automating the execution of various project tasks. Modern PMIS applications allow project managers to focus their energy on strategic functions such as innovation, creativity, stakeholder relations, as repetitive rule-based tasks are computerized (Besouw & Bond-Barnard, 2021).

1.1.1 Performance of construction projects in Kiambu County

Performance of construction projects is the successful completion of construction projects after adherence to project scope, adherence to the project budget, adherence to the project schedule, hence customer satisfaction. The indicators include: time, cost, project organization, effective decision making and scope (Egwunatum, 2017). In addition, in

Jordan, they have considered factors such as: absence of disputes in the project, absence of defects in the construction project, adherence to codes and standards and accurate bill of and quantities. Hence, work programming would be critical in promoting performance through accurate planning and scheduling (Albtoush, Doh, Rahman & Al-Momani, 2022). In South Africa, these factors include: lack of capacity of contractors and construction methodology, poor planning and time management, scarcity of materials, poor leadership, fluctuation of cost of construction materials and lack of skills (Aigbabvoa, 2018). All in all, the factors that affect dismal performance in globally are planning related. Hence, work programing would enhance the performance of construction projects.

As highlighted at the global and regional level, the factors affecting performance of construction projects in Kenya are varied, yet planning related, they include: poor leadership, cash flow challenges and scope variation are the causes of poor performance of construction projects (Ndambuki, Kyalo & Kisimbii, 2019). In Kiambu County, proper planning in terms of time, resources, equipment and labour would guarantee effective performance of construction projects (Kisavi & Ngugi, 2019). The various studies highlight that adoption of work programing would heighten performance of construction projects.

1.1.2 Prevalence of work programming on performance of construction projects in Kiambu County

Prevalence of work programming is the frequency in programming that the construction projects employ to schedule, cost, budget and control the construction projects. One of the factors affecting the prevalence of work programing is resistance low or no Information Technology experience (Arnold & Javernick-Will, 2013). Poor designs and planning and lack of work programming prevalence is the root causes of cost overrun. Moreover, cost overrun is one of the major challenges of the performance of construction projects globally. In Dutch 62.2% of construction projects, with a mean of 18.6%. experienced cost overruns. In Philippines, the mean cost overruns of 5.4%. while in Palestine the mean of cost overrun was 14.6% (Herrera, Sánchez, Castañeda & Porras, 2020). In addition, cost overrun is a major challenge of the performance of construction

projects in Africa, in Tanzania average cost overruns of 44%. However, the challenge of cost overrun has found its roots in designs, poor planning and work programming activities (Herrera et al., 2020). Therefore, it is evident that there is low preference to work programming globally leading to dismal performance of construction projects.

It is one thing for construction companies in Kenya to desire heightening the performance of construction projects, and it is another thing to articulate the same. Construction projects that adopted work programing in the construction projects realized performing construction projects (Kinuthia & Were, 2015). Though work programming has the capacity to heighten the propensity of project success, its adoption has been low in Kiambu. More so, construction industry is the one with the lowest uptake of computers in Kiambu County with only 1% adoption compared to other Small and Medium enterprises (Thuo & Namusonge, 2017). The low uptake of Information Technology and Communication in the county is attributed to lack of training, dependence on experts and lack of knowledge in the field. Hence, this could translate to the level of adoption of work programming in the construction projects in the County.

1.1.3 Experience in work programming on performance of construction projects in Kiambu County

Experience in work programming is the competence developed by project stakeholders in adoption and use of work programming after overcoming resistance to change and embracing computerized work programming despite other competing priorities such as manual work programming, occupational culture and other available alternatives. Information Communication Technology in the construction industry has caught attention of scholars globally. Work programming under the Project Management-Based ICT Applications has found relevance with prevalence of 26.6% (Adwan & Alsoufi, 2018). Knowledge is critical in the uptake of Information Communication Technology in the construction projects. In South Africa failure to embrace Information Communication Technology by the construction industry has hindered the industry from delivering value to clients and performance of the construction projects (Aghimien et al., 2022). This is replicated in Kiambu, as the uptake of computerized work programming in Kiambu is 1% as compared to other Small and Medium enterprises (Thuo & Namusonge, 2017). The

low uptake of Information Technology and Communication in the construction projects could lead to dismal experience in work programming. Hence, translate to low performance construction projects.

1.1.4 Knowledge of work programming on performance of construction projects in Kiambu County

Knowledge of work programming is the information gained by construction projects in work programming through training, hence equipping them with technical skills, critical understanding and flexibility in operation of the work programming. Work programming under the Project Management-Based ICT Applications has found relevance with prevalence of 26.6% globally (Adwan & Alsoufi, 2018). Therefore, the lack of a fully developed system may deny the personnel in the construction industry the knowledge of the software. In South Africa barriers to digital technology deployment in the construction industry include: lack of knowledge and conservative digital culture in the construction industry. This has led to low adoption of technology (Aghimien et al., 2022). Hence, lack of knowledge has played a great role in the low uptake and usage of work programming in Africa.

Albeit, the fact that knowledge is foundational factor in every field, it is expensive in terms of time and cost. In adequate knowledge and high cost of training has hindered adoption of Information Communication Technology by Local Building Contractors in Kenya (Nyaga et al., 2016). Therefore, this translates to low use of work programming in the construction projects in Kenya, hence, affecting the performance of construction projects in the country. In Kiambu, the stakeholders in the construction industry has lacked Knowledge in the Information Technology and Communication. Worse still, adoption of computers in the construction industry is 1% as compared to other Small and Medium enterprises (Thuo & Namusonge, 2017). Hence, this could translate to low level of adoption of work programming in the construction projects, consequently, poor performance of construction projects in the County.

1.1.5 Work programming support on performance of construction projects in Kiambu County

Work programming support is the support accorded to the work programming stakeholders by external and internal consultants. For effective running of work programming, the services must be available, affordable, with frequent system upgrades and the support team must be responsive whenever they are required. The extent of support required in work programming for the various customers depend on the type of application. Tailor made soft-wares require more support than general application software (Bor & Chepnoen, 2018). In South Africa, peer support was found to be more applicable in the construction industry to systematically manage construction information (Adekunle, Aigbavboa, Akinradewo, Oke & Aghimien, 2022). Consequently, development of clarity of information required during the construction time. Hence, the construction professionals develop synergy so that they can support one another.

In order for all the stakeholders to grasp the concept of the work programming, there is need for initial investment in support and training of the stakeholders. In South Rift, Kenya reliability and inclusiveness of the software in the construction industry for easy adoption (Bor & Chepnoen, 2018). This would limit the reliability on experts for support, rather, the stakeholders would embrace peer support. This would enhance the uptake of computerized work programming in Kiambu which is still low, as compared to other sectors in the Small and Medium enterprises (Thuo & Namusonge, 2017). Enhanced adoption of work programming in the construction projects in the County would lead to heightened performance of construction projects in the County.

1.2 Statement of the Problem

The rate of project failure in the United Arab Emirates (UAE) construction projects is 50% (Ali & Hudin, 2022). In Kenya, construction project delay is a widespread phenomenon and reflects poor project time management practices. The widespread delays and disruptions in government sponsored projects is an issue that frustrates development in the country (Munyao & Gichunge, 2017). This is due to the fact that, managing time in construction projects is difficult and complex, due to a large array of different people

and organizations involved. Hence, the need for a programme which is a conceptualised display of provisions or allocated resources used to manage the timing and sequence of construction activities (Olubajo, Hughes & Schweber, 2019). For many decades, methods such as the critical path method (CPM), the programme evaluation and review technique (PERT), the metra potential method (MPM), and Gantt charts have been applied in construction and have maintained their role for construction project planning. These simple techniques do not pay sufficient respect to the complex planning environment in construction and are solely suitable for the determination of time windows for project activities. In contrast, in construction, more difficult planning problems are faced (Sunke, Schultmann & Yang, 2009). Hence, the need for a computerised work programming tool.

In addition, work programming involves past data estimates and simulated techniques can assist in developing accurate estimates for construction programmes (Olubajo et al., 2019). Progress made in executing a project is illustrated daily by comparing initial, actual and remaining durations with percentage completions in a construction programme (Olubajo et al., 2019). The study by Głodziński (2019) in Turkey on performance measurement of complex project employed a survey and found that telecommunications industry projects performance rates are 64%, while projects' performance rates in other sectors are 54%. The study employed a survey research design. The study by Ali and Hudin (2022) in United Arab Emirates on effect of technological orientation on project management process and infrastructure performance employing a survey found that computerization of project management had effect on project performance. The studies were conducted in other countries and not Kenya, hence, conceptual gap. There is methodological gap as the studies employed survey research design and this study adopted descriptive research design. In addition, the resource-based theory covers organizations in general and not construction projects, hence, theoretical gap. Consequently, the contextual, methodological and theoretical gaps warrant this study.

1.3 Research Purpose

The purpose of this research was to investigate influence of work programming on performance of construction projects in Kiambu County.

1.4 Research Objectives

The research is guided by the following objectives:

1. To investigate the influence of prevalence of work programming on performance of construction projects in Kiambu County.
2. To determine the influence of experience in work programming on performance of construction projects in Kiambu County.
3. To assess the influence of knowledge of work programming on performance of construction projects in Kiambu County.
4. To assess the influence of work programming support on performance of construction projects in Kiambu County.

1.5 Research Questions

1. What was the influence of prevalence of work programming on performance of construction projects in Kiambu County.
2. What was the influence of experience of work programming on performance of construction projects in Kiambu County?
3. What was the influence of knowledge of work programming on performance of construction projects in Kiambu County?
4. What was the influence of work programming support on performance of construction projects in Kiambu County?

1.6 Study Justification

As the economy of Kiambu County continues to grow, efficiency in the construction industry is critical in order to keep up with the rapid growth being experienced in the sector. Efficiency in the construction process is determined by, among other factors, the degree to which the process adheres to the work program provided. It is paramount to understand the relationship that exists between the work program and the success of a construction project so as to enhance the recent upsurge witnessed in the region. Literature in the field of construction has now and again expressed existent relationship between the quality of construction projects and adherence to work program. This

research will seek to clarify and establish the extent to which work programming is applied in project management delivery in Kiambu County and consequently, how it affects the quality of the projects.

1.7 Theoretical framework

Theoretical framework comprises of concepts, their definitions and reference on a relevant scholarly literature. This will reinforce the study by allowing the reader to assess assumptions and link the scholarly findings to the existing knowledge.

1.7.1 Resource-based theory

The proponent of Resource-based theory was Birger Wernerfelt in 1984, the Professor of Management and Marketing submits that organization's specific resources are scarce, priceless, can neither be substituted or imitated by the competitors. These resources spur the organization to have unmatched performance (Barney, 1991). The resources may be intangible and have the capacity to endow the organization with a competitive edge. Such resources are the organizations strategy and asymmetry in information. They give the organization a footing to maintain an unmatched competitive performance in the market. Nonetheless, the theory fails to clarify how the individual sections in an organization network to innovate novel resources. This study agrees with this theory as work programming is bound to bestow construction projects an edge in performance. Unlike, the manual contemporary practices and principles in projects planning and control that do adopt manual and tedious methods to plan complex projects. Work programming adopt computerised system that make project planning, control and monitoring feasible.

1.7.2 Geographical Scope

The geographical research scope of the study covered Kiambu County. The county is experiencing a recent upsurge in construction activities hence makes it a suitable area for the research study. This provides the researcher with an opportunity to sample a number of projects within the area hence facilitating the collection of comprehensive and representative data. The research will involve the collection of data in Juja, Ruiru, Kiambu, Thika, Lari, Kiambaa and Kikuyu.

1.8 Definitions of Significant Terms Used in the Study

Experience in work programming: Experience in work programming is the competence developed by project stakeholders in adoption and use of work programming after overcoming resistance to change and embracing computerized work programming despite other competing priorities such as manual work programming, occupational culture and other available alternatives.

Knowledge of work programming: Knowledge of work programming is the information gained by construction projects in work programming through training, hence equipping them with technical skills, critical understanding and flexibility in operation of the work programming.

Prevalence of work programming: Prevalence of work programming is the frequency in programming that the construction projects employ to schedule, cost, budget and control the construction projects.

Performance of construction projects: Performance of construction projects is the successful completion of construction projects after adherence to project scope, adherence to the project budget, adherence to the project schedule, hence customer satisfaction.

Work programming: work programming is the use of necessary project tools to schedule, budget, control, monitor and evaluate the project, through its life-cycle to guarantee effective and efficient project performance.

Work programming support: Work programming support is the support accorded to the work programming stakeholders by external and internal consultants. For effective running of work programming, the services must be available, affordable, with frequent system upgrades and the support team must be responsive whenever they are required.

1.9 Research Limitations

1. To overcome the time limitation in the study, the researcher employed sampling techniques to ensure representative and sufficient sample of the population was studied.
2. To ensure collection of quality data, the researcher engaged the senior staff to explain the questions in the questionnaires to the junior staff.

1.10 Research Significance

Data collected from the Kenya National Bureau of Statistics (KNBS) shows that the output of the Kenyan construction industry rose by 13.1 % in 2014 compared to 5.8% in the year 2013 (KNBS, 2016). Since the devolution of counties, Kenya has experienced a sporadic growth in the construction industry. According to an economic survey released in the year 2015, Kiambu County was listed among the fastest developing counties in Kenya in terms of infrastructures and housing (Gakuru, 2017). Construction was the best performing sector because of the increase in the funds allocation to roads and railways. Perhaps one of the most prominent features in the construction is organization of the works. Vis-à-vis to that, the owners and the workers at the site require effective coordination to facilitate project completion. One of the pillars of the vision 2030 entails rehabilitation and expansion of physical infrastructure. The need for proper and fast completion of construction projects is necessitated by the need for Kenya to attain Vision 2030 (Gakuru, 2017). In the past, a lack of sufficient planning has been heavily blamed for the failure of various projects. Additionally, the failure of some projects has been attributed to completion ahead of schedule. In that regard, the findings of this study research will also open doors for further research by discovering and recommending new fields of knowledge by explaining the effects programming have towards the delivery of projects in the construction industry.

1.11 Research Hypothesis

H_{o1}: Prevalence of work programming has no significant influence on performance of construction projects in Kiambu County.

H_{A1}: Prevalence of work programming has significant influence on performance of construction projects in Kiambu County.

H_{o2}: Experience in work programming has no significant influence performance of construction projects in Kiambu County.

H_{A2}: Experience in work programming has significant influence on performance of construction projects in Kiambu County.

H_{o3}: Knowledge of work programming has no significant influence on performance of construction projects in Kiambu County.

H_{A3}: Knowledge of work programming has significant influence on performance of construction projects in Kiambu County.

H_{o4}: Work programming support has no significant influence on performance of construction projects in Kiambu County.

H_{A4}: Work programming support has significant influence on performance of construction projects in Kiambu County.

1.12 Research Assumptions

1. All construction projects in Kiambu County use work programs.
2. The information collected in the research study is reflective of the entire construction industry in Kiambu County.
3. The information collected will be accurate.
4. There exists a correlation between work programming and the delivery of construction projects.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the relevant literature related to the study, founded on themes formulated from the objectives. The thematic areas include: Performance of construction projects in Kiambu County, prevalence of work programming on performance of construction projects in Kiambu County, experience in work programming on performance of construction projects in Kiambu County, knowledge of work programming on performance of construction projects in Kiambu County and work programming support on performance of construction projects in Kiambu County

2.1 Performance of construction projects in Kiambu County

Traditionally, performance of construction projects was measured in terms of time, cost and quantity indices. However, the stakeholders take is that over and above time, scope and cost factors, the value for money based on pre-contract plans and procedures as baseline and contraction actual progress should be put into perspective (Egwunatum, 2017). However, it is critical to consider other factors. The major factors that contribute to dismal performance of construction projects include: changes on design, user changes, unfriendly weather, unconducive site conditions, delays in delivery, fluctuations in economic cycles and increase in quantity. In addition, inefficiency due to poor contractor's skills, financing challenges and poor planning and decision-making (Khlaifat, Alyagoub, Sweis, & Sweis, 2019). Consequently, it may be appreciated that some of the factors that lead to construction performance failure are beyond human control while others could be solved through planning with superior tools such as construction work programming.

Different regions have set thresholds that could be used as indicators in determining performance of construction projects. Performance of construction projects has been dismal globally. In Australia, the cost overrun of Sydney Opera House project was one hundred million Australian dollars and a time overrun of ten years, due to poor

organization and decision making (Egwunatum, 2017). A study by Albtoush, Doh, Rahman & Al-Momani (2022) in Jordan on "critical success factors of construction projects in Jordan: an empirical investigation, employing a case study research design found that critical success factors of construction projects in Jordan include absence of disputes in the project, absence of defects in the construction project, adherence to codes and standards and accurate bill of and quantities. Hence, work programming would be critical in promoting performance through accurate planning and scheduling.

There are factors that lead to dismal performance of construction projects in Africa. In South Africa, factors that affect performance of construction projects include: lack of capacity of contractors and construction methodology, poor planning and time management, scarcity of materials, poor leadership, fluctuation of cost of construction materials and lack of skills (Aigbabvoa, 2018). Nonetheless, to overcome the challenges some African and other developing countries such as Nigeria, Ethiopia, Sri Lanka, Pakistan, Vietnam, and the Gaza Strip, have identified success factors and classified into five major components which include: quality, cost, time, contract and external related factors (Albtoush et al., 2022). All in all, the factors that affect dismal performance in Africa are planning related. Hence, work programing would enhance the performance of construction projects.

Moreover, the factors affecting performance of construction projects in Kenya are varied, yet planning related. A study by Ndambuki, Kyalo and Kisimbii (2019) on determinants of project implementation performance in building construction projects in selected parastatals in Kenya, identified that environmental, poor leadership, cash flow challenges and scope variation are the causes of poor performance of construction projects. However, a study by Nyangwara and Datche (2015), identified that structured practices and procedures and a capacity building would be effective in enhancing performance of construction projects. Consequently, it is evident that adoption of work programming would solve many problems in the construction industry and heighten performance of construction projects.

Contractors need to standardize their operations in order for them to comply with the various regulations. In Kiambu County, compliance of the various regulations ensures

sustained growth and standard way of operation (Wathua & Ndiritu, 2020). One of the methods that the contractors can adopt in order to guarantee standardization is use of work programming. In Kiambu County, proper planning in terms of time, resources, equipment and labour would guarantee effective performance of construction projects (Kisavi & Ngugi, 2019). The various studies highlight that adoption of work programing would heighten performance of construction projects.

2.2 Prevalence of work programming on performance of construction projects in Kiambu County

The first generation of software in construction industry was standalone tools such as work programming tools, with time world wide web-based applications were developed. Currently, there is need to integrate the work programming tools and web-based applications. However, In the year 2004 failure to integrate data from architecture, engineering, and construction costed the construction industry $15.8 billion. One of the factors affecting the prevalence of work programing is resistance low or no Information Technology experience (Arnold & Javernick-Will, 2013). Poor designs and planning and lack of work programming prevalence is the root causes of cost overrun. Moreover, cost overrun is one of the major challenges of the performance of construction projects globally. In Dutch 62.2% of construction projects, with a mean of 18.6%. experienced cost overruns. In South Korea, 95% of the construction projects experience cost overrun of 50%. In Philippines, the mean cost overruns of 5.4%. while in Palestine the mean of cost overrun was 14.6% (Herrera, Sánchez, Castañeda & Porras, 2020). Therefore, it is evident that there is low preference to work programming globally leading to dismal performance of construction projects.

Low prevalence to work programming also affects projects in Africa. Cost overrun is a major challenge of the performance of construction projects in Africa, in Tanzania average cost overruns of 44%. However, the challenge of cost overrun has found its roots in designs, poor planning and work programming activities (Herrera et al., 2020). A study by Obodoh, Mbanusi, and Obodoh (2016) on impact of project management software on the project failure rates in Nigerian construction industry, employed survey research design. The study found that work programming has substantial influence in reduction to

project failure rates in the Nigeria. n Construction Industry. Level of competition and changing trends of technology enhance the use of Project Management Software. The use of PM Software contributes immensely to the project success in Nigeria.

It is one thing for construction companies in Kenya to desire heightening the performance of construction projects, and it is another thing to articulate the same. The study by Kinuthia and Were (2015) found that construction projects that adopted work programing in the construction projects realized performing construction projects. However, the prevalence of adoption of work programing was 73% against 27% who did not adopt work programming, the major challenge being lack of training. A similar study by Nyaga, Alkizim and Mutai (2016) found that the 40% prevalence of using work programming was due to lack of finances and trained staff and high cost of training. Therefore, financing and training appear to be the major handles that lead to the low prevalence of work programming in Kenya.

Though work programming has the capacity to heighten the propensity of project success, its adoption has been low. A study by Thuo and Namusonge (2017) found that construction industry is the one with the lowest uptake of computers in Kiambu County with only 1% adoption compared to other Small and Medium enterprises. The low uptake of Information Technology and Communication in the county is attributed to lack of training, dependence on experts and lack of knowledge in the field. Hence, this could translate to the level of adoption of work programming in the construction projects in the County.

2.3 Experience in work programming on performance of construction projects in Kiambu County

Information Communication Technology in the construction industry has caught attention of scholars globally. Areas of interest being: Building-information-models (BIM), Modeling -Based ICT Applications, Decision-Based ICT Applications and Project Management- Based ICT Applications. Work programming under the Project Management-Based ICT Applications has found relevance with prevalence of 26.6%. Albeit, the successful implementation of the Work Programming, there are pending

improvements more so, integrating it with virtual communication tools, e-legal tools, data sharing and e-commerce (Adwan & Alsoufi, 2018). Therefore, the lack of a fully developed system may deny the personnel in the construction industry the experience of the software.

Knowledge is critical in the uptake of Information Communication Technology in the construction projects. A Study by Aghimien et al., (2022) in South Africa on barriers to digital technology deployment in value management practice employing a survey found that failure to embrace Information Communication Technology by the construction industry has hindered the industry from delivering value to clients and performance of the construction projects. However, the low adoption of technology is attributed to the high cost and complexity of the technology. In addition, lack of knowledge and the digital culture in the industry is conservative. Therefore, lack of knowledge has played a great role in the uptake and usage of work programming in Africa.

Experience in work programming has the capability of catalyzing project performance. A study by Thuo and Namusonge (2017) found that construction industry has the lowest uptake of computers in Kiambu County with only 1% adoption rate vis a vis other Small and Medium enterprises. The low uptake of Information Technology and Communication in the county, could lead to lack of experience in computing and hence, dismal experience in work programming. Hence, this could translate to low performance construction projects in the County.

2.4 Knowledge of work programming on performance of construction projects in Kiambu County

Information Communication Technology in the construction industry has caught attention of scholars globally. Areas of interest being: Building-information-models (BIM), Modeling -Based ICT Applications, Decision-Based ICT Applications and Project Management- Based ICT Applications. Work programming under the Project Management-Based ICT Applications has found relevance with prevalence of 26.6%. Albeit, the successful implementation of the Work Programming, there are pending improvements more so, integrating it with virtual communication tools, e-legal tools, data

sharing and e-commerce (Adwan & Alsoufi, 2018). Therefore, the lack of a fully developed system may deny the personnel in the construction industry the knowledge of the software.

Knowledge is critical in the uptake of Information Communication Technology in the construction projects. A Study by Aghimien et al., (2022) in South Africa on barriers to digital technology deployment in value management practice employing a survey found that failure to embrace Information Communication Technology by the construction industry has hindered the industry from delivering value to clients and performance of the construction projects. However, the low adoption of technology is attributed to the high cost and complexity of the technology. In addition, lack of knowledge and the digital culture in the industry is conservative. Therefore, lack of knowledge has played a great role in the uptake and usage of work programming in Africa.

Albeit, the fact that knowledge is foundational factor in every field, it is expensive in terms of time and cost. A study by Nyaga et al. (2016) on an Assessment of the Level of Adoption of Information Communication Technology by Local Building Contractors during Project Implementation found that in Kenya, in adequate knowledge and high cost of training hindered adoption of Information Communication Technology by Local Building Contractors. Therefore, this translates to low use of work programming in the construction projects in Kenya, hence, affecting the performance of construction projects in the country.

Knowledge in the Information Technology and Communication is critical in any industry. More so, in the construction industry which is a backbone of the global economy. However, the adoption of computers in the construction industry is slow compared to other sectors. Hence, the stakeholders in the industry has lacked Knowledge in the Information Technology and Communication and relied on experts for long. In Kiambu, there is over reliance on experts among the Small and Medium enterprises. Worse still, adoption of computers in the construction industry is 1% as compared to other Small and Medium enterprises (Thuo & Namusonge, 2017). Hence, this could translate to low level of adoption of work programming in the construction projects, consequently, poor performance of construction projects in the County.

2.5 Work programming support on performance of construction projects in Kiambu County

The extent of support required in work programming for the various customers depend on the type of application that the specific customer is using. In England, the work programming software in use vary. There is general use application software Application Service Provider and tailor-made work programming software. The tailor-made application is used by specific construction companies and they are more dependent on the service provider for support (Bor & Chepnoen, 2018). Hence, it may be appreciated that based on the specificity and uniqueness of the application, the more the support is required and dependence on the service provider.

Experts may get support on work programming from Information Communication Technology experts or peers who have had experience in the software. In South Africa, peer support was found to be more applicable. A study by Adekunle, Aigbavboa, Akinradewo, Oke and Aghimien (2022) on construction Information Management: benefits to the construction industry. On employing survey research design, descriptive and inferential data analysis techniques, the study found that, there is need for the experts to systematically manage construction information. Consequently, development of clarity of information required during the construction time. Hence, the construction professionals develop synergy so that they can support one another.

In order for all the stakeholders to grasp the concept of the work programming, there is need for initial investment in support and training of the stakeholders. Study by Bor and Chepnoen (2018) on influence of project management information system user knowledge on performance of construction projects in South Rift, Kenya employing descriptive research design, descriptive and inferential statistics data analysis found that, reliability and inclusiveness of the software in the construction industry was required and not complex systems. Hence, demand for less support by stakeholders to understand the work programming software and the processed data. Nonetheless, we appreciate that for the stakeholders to appreciate the system there must be training, support and upgrade of the system for the system to remain relevant.

Access to support in the Information Technology and Communication is critical in any industry. A study by Thuo and Namusonge (2017) found that there is over reliance on experts among the Small and Medium enterprises in Kiambu County, where adoption of computers in the construction industry is 1% as compared to other Small and Medium enterprises. Hence, this could translate to low level of adoption of work programming in the construction projects in the County. Consequently, poor performance of construction projects in the County.

2.6 Conceptual Framework

Ravitch and Riggan (2012) defines conceptual Framework as the graphical presentation of the linkage between the different identified variables within the study. It is a framework showing how the explanatory variables (independent variables) affects the response variables (dependent variables). In this study, the dependent variable will be the effectiveness of construction project delivery. Ravitch and Riggan (2012) further explain that the use of a conceptual framework is critical towards assessing the ability of the research to fulfil the purpose. The diagram below is a simple illustration of the relationship that exists between the independent and the dependent variable in this project. Simply, this is the conceptual framework of the project in a diagrammatical manner.

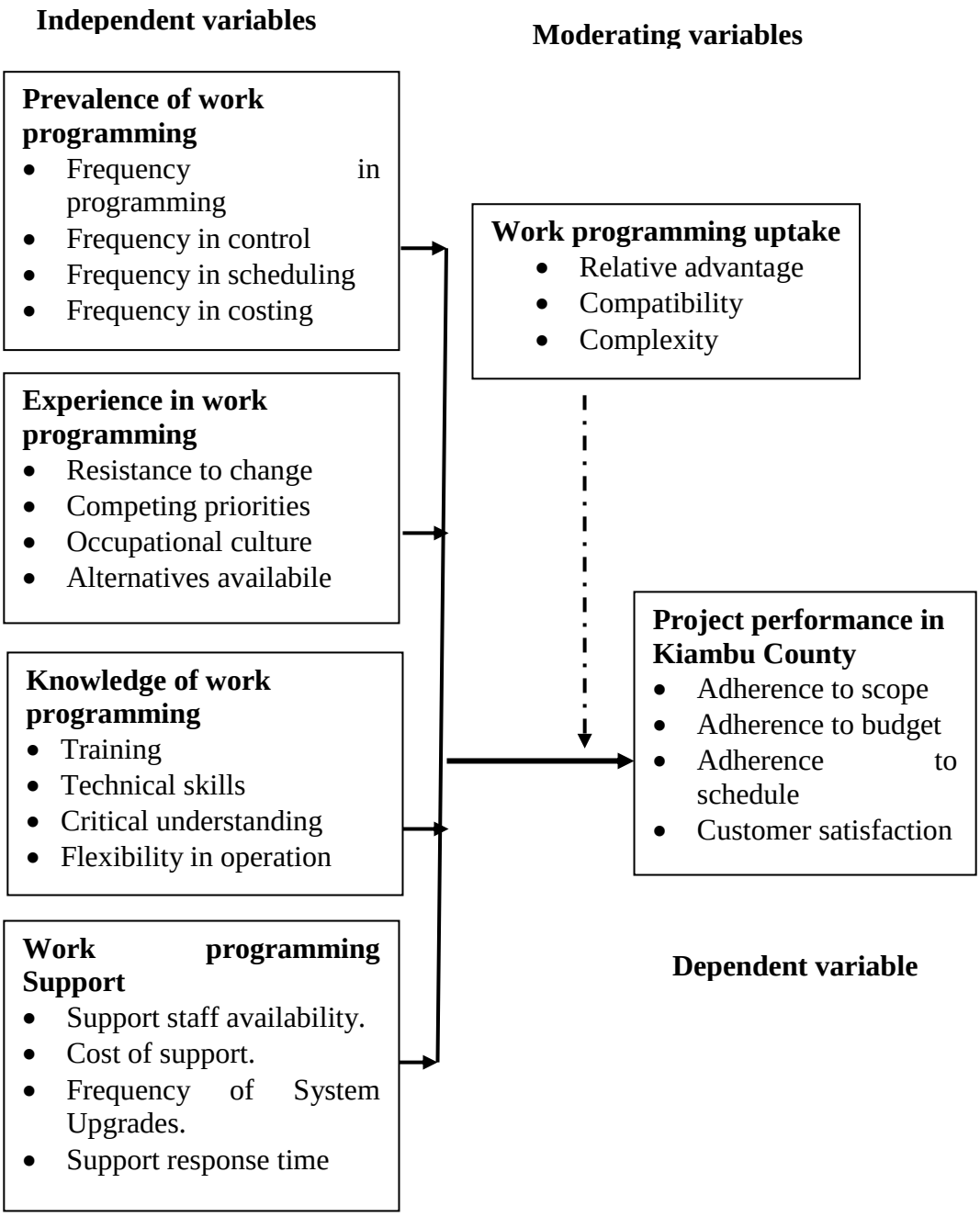

Figure 2.1: Conceptual Framework of Influence of Work Programming on Performance of Construction Projects

The conceptual framework in Figure 1, forms the schematic summary of this study. The composite predictor variable is work programming and the dependent variable is

performance of construction projects. Prevalence of work programming is the frequency in programming that the construction projects employ to schedule, cost, budget and control the construction projects. The relationship between prevalence of work programming and performance of construction projects was tested with the null hypothesis: prevalence of work programming has no significant influence on performance of construction projects in Kiambu County.

Experience in work programming is the competence developed by project stakeholders in adoption and use of work programming after overcoming resistance to change and embracing computerized work programming despite other competing priorities such as manual work programming, occupational culture and other available alternatives. The relationship between experience in work programming and performance of construction projects was tested with the null hypothesis: experience in work programming has no significant influence on performance of construction projects in Kiambu County.

Knowledge of work programming is the information gained by construction projects in work programming through training, hence equipping them with technical skills, critical understanding and flexibility in operation of the work programming. The relationship between

Knowledge of work programming and performance of construction projects was tested through the null hypothesis: Knowledge of work programming has no significant influence on performance of construction projects in Kiambu County.

Work programming support is the support accorded to the work programming stakeholders by external and internal consultants. For effective running of work programming, the services must be available, affordable, with frequent system upgrades and the support team must be responsive whenever they are required. The relationship between work programming support and performance of construction projects was tested using the null hypothesis: Work programming support has no significant influence on performance of construction projects in Kiambu County.

2.7 Knowledge Gaps

The following knowledge gaps were identified in the literature review

Table 2.1: Knowledge Gaps

Variable	Author (year)	Study title	Methodology used	Findings	Knowledge Gaps	Focus of Current Study
Performance of construction Projects	Albtoush et al., (2022).	Critical success factors of construction projects in Jordan: an empirical investigation	Case study	Performance factors for construction project can be classified into: time, cost, quality, contract and external factors.	The study used a case study. Hence, the study cannot be inferenced.	This study employed descriptive research design so that it could be inferenced.
Performance of construction Projects	Ndambuki et al., (2022).	Determinants of project implementation performance in building construction projects in selected parastatals in Kenya	Descriptive research design	Environmental, leadership, cash flow and scope variation	The study focused on parastatals' construction projects.	This study focused on projects by varied clients.
Prevalence of work programming	Obodoh et al. (2016)	Impact of Project Management Software on the Project Failure Rates in Nigerian Construction Industry	Survey research design	Poor prevalence of work programming contributes to project failure	The study focussed on projects failure	This study focused on performance of construction projects
Prevalence of work programming	Nyaga et al, (2016)	An Assessment of the Level of Adoption of Information Communication Technology by Local Building Contractors during Project Implementation	Descriptive research design	40% prevalence of using work programming was due to lack of finances and trained staff and high cost of training	The study focused on Kenya, which is a larger scope	This study focuses on Kiambu County
Experience of work programming	Aghimien et al, (2022)	Barriers to digital technology deployment in	Survey research design	Lack of experience is one of the factors contributing to failure of	The study employed survey research design,	This study employed descriptive research

		value management practice employing		embrace ICT by the construction industry.	hence, general questions in the study	design, hence, specific questions
Experience of work programming	Thuo and Namusonge (2017)	Determinants of Adoption and Usage of ICT by Small and Medium Enterprises in Kenya	Descriptive research design	Construction industry has the lowest uptake of computers in Kiambu County with only 1% adoption rate vis a vis other Small and Medium enterprises	The study focused on ICT in general	This study focused on work programming and performance of construction projects
Knowledge of work programming	Aghimien et al, (2022)	Barriers to digital technology deployment in value management practice employing	Survey research design	Lack of knowledge is one of the factors contributing to failure of embrace ICT by the construction industry.	The study employed survey research design, hence, general questions in the study	This study employed descriptive research design, hence, specific questions
Knowledge of work programming	Nyaga et al. (2016)	An Assessment of the Level of Adoption of Information Communication Technology by Local Building Contractors during Project Implementation	Descriptive research design	Inadequate knowledge and high cost of training hindered adoption of ICT by local Building Contractors	The study focused on Kenya, which is a larger scope	This study focuses on Kiambu County
Work programming Support	Adekunle et al. (2022)	Construction Information Management: benefits to the construction industry.	Survey research design	Systematic management of information help in building synergy among experts	The study employed survey research design, hence, general questions in the study	This study employed descriptive research design, hence, specific questions
Work programming Support	Bor and Chepnoen (2018)	Influence of Project Management Information System User Knowledge on Performance of Construction Projects in South Rift, Kenya	Descriptive research design	Reliability and inclusiveness of the software in the construction industry, hence, less support.	The study adopted purposeful sampling, hence, propensity for research and researcher bias.	This study focuses on Kiambu County

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 ntroduction

This chapter presents the research methodology that will guide the empirically process of tackling the research question and answering the question. The chapter describes the research paradigm, design, target population, sample size and sampling procedures, research instruments, validity and reliability of the instrument, data collection procedures, data analysis techniques, ethical considerations and operationalization of the variables

3.2 Research Philosophy

A paradigm is the philosophy shared by researchers and guides the study methodology (Brierley, 2017). This study adopts pragmatic paradigm as it is the preferred paradigm for social science research. The paradigm adopts socially constructed multiple realities, participatory approach, flexibility in adopting the methodology that work best in solving specific research problem and adopts value-bound and value-laden axiology (Kaushik & Walsh, 2019). This study preferred pragmatic paradigm as the study was pragmatic in nature and embraced multiple realities, mixed approach and rational and flexible approach in seeking to answer the research question.

3.3 Research Design

The study will employ a concurrent mixed method approach; descriptive cross-sectional survey and correlational design, to allow collection of quantitative data using questionnaires and qualitative data using interview guide and observation guide, for triangulation purpose (Gobble, 2015). The quantitative data will be used in testing the study hypotheses. In addition, quantitative data will be used in testing correlational relationship and linear relationship of work programming and performance of construction projects.

3.4 Population of the Study

A population can be defined as the complete set of subjects that can be studied: people, objects, animals, plants, organizations from which sample may be obtained (Shao, 1999). Frankfort-Nachmias (1996) describe the population as the entire group or set of cases that a researcher is interested in generalizing. Mugenda and Mugenda (1999), defines the target population as the population to which the researcher desires to generalize the result of a study. The targeted population was the property owners, maintenance managers in select towns in Kiambu County, and professional consultants in the construction industry. The property owners, the maintenance managers, and professional consultants in the construction industry were asked to fill questionnaires.

According to the lists of the county projects that were being undertaken in the county as at December 2017. I got the lists from the Quantity Surveyors Department office, and the table is as follows.

Table 3.1: Target Population

Sub County	Number of Construction Projects	Percentage (%)
Kabete Sub County	14	7.0
Lari Sub County	34	16.9
Kiambu Sub County	21	10.4
Kiambaa Sub County	10	5.0
Ruiru Sub County	24	11.9
Juja Sub County	11	5.5
Thika Sub County	22	10.9
Gatundu N Sub County	10	5.0
Gatundu S Sub County	14	7.0
Limuru Sub County	10	5.0
Kikuyu Sub County	15	7.4
Githunguri Sub County	16	8.0
Total	**201**	**100.0**

Table 3.1 indicates the study target population of 201 construction projects

3.4.1 Sample Size and Sampling Procedures

When the target population is large, studying the entire population is practically not feasible. However, in this case the universe is relatively manageable (Wambugu et al., 2015). Therefore, purposeful sampling procedure was employed to select the 6 out of 13 counties that is Kiambu, Juja, Thika, Kikuyu, Githunguri, and Ruiru. Then participants were identified through simple random technique.

Table 3.2: Sample size

Sub County	Number of Construction Projects	Percentage (%)
Lari Sub County	34	26
Kiambu Sub County	21	16
Ruiru Sub County	24	18
Thika Sub County	22	17
Kikuyu Sub County	15	11
Githunguri Sub County	16	12
Total	**132**	**100**

Table 3.2 indicates the 132 purposefully identified projects in the County for study.

3.5 Research Instruments

This study adopted questionnaires with closed ended questions with five-point likert scale questions with weights of 1-5. The weights of 1, 2, 3, 4 and 5 represent: strongly disagree, disagree, neutral, agree and strongly agree respectively. The questionnaire was organized in 6 thematic areas based on the study objectives, which include: demographic information, Performance of construction Projects, Prevalence of work programming, Experience of work programming, Knowledge of work programming and Work programming Support. In addition, they were administered to 132 respondents from the various sub-counties.

3.5.1 Pilot Testing of Instruments

Pilot testing facilitated the study to test the research design and determined study feasibility, authenticate reliability, validity and precision of the instruments. Internal

consistency reliability was tested to ensure satisfactory similarity among the instruments. Based on Classical test theory whose proponent is Melvin R. Novick (Novick, 1966), which states that the respondents' score is sum of true and an error score. Cronbach's alpha will be employed on the Split-half pilot testing to assess the reliability by relating the extent of shared variance, among the measurements making up the questionnaire to the amount of overall variance.

The pilot test, to pre-test the instrument was done by administering the questionnaires to 10% of 132 sample respondents. Hence, 13 respondents. who did not participate in the actual study to mitigate diffusion of treatment. Two groups were determined by respondents who were given odd and even numbers. Then, the respondents having odd numbers answered odd numbered questions and respondents having even numbers responded to even numbered questions. Results from each group was analysed for internal reliability. Cronbach Alpha coefficient was employed as it is the most appropriate while using Likert questions (Taherdoost, 2018). The analysis gave a result of 0.75, hence the instruments were found to be reliable.

3.5.2 Validity of Instruments

The content validity is tested based on professional subjective judgement. Therefore, the instruments were peer reviewed by fellow researchers and subjected to professional judgement of the supervisor. The instruments were analysed for relevance, straightforwardness and exactness and found to comprehensively measure qualities and all aspects of the variables. Construct validity of an instrument was tested based on its correspondence to other information as well as the theory and ascertained that it would assess the intended measurements.

3.5.3 Reliability of Instruments

Cronbach's alpha was assessed the reliability of the questionnaire by relating the extent of shared variance, among the measurements making up the questionnaire to the amount of overall variance. Therefore, reliable questionnaires should have covariance relative to the measurements' variance. Cronbach's alpha was employed to test the questionnaires

reliability using split-half reliability test. The range of Cronbach alpha (α) coefficient is 0 to 1, when there is no relationship in the scale items α = 0. However, when the value of alpha is 0.7 and above internal consistency is ok (Cronbach, 1951 The analysis gave a result of 0.75, hence the instruments were found to be reliable.

3.6 Data Collection

The researcher secured the recommendation letter from Jomo Kenyatta University of Agriculture and Technology, then administered the questionnaires to the participants.

3.7 Data Analysis Methods

Descriptive statistics involved: measures of frequency and percent, measures of central tendency; mean and measures of dispersion; variance and standard deviation. The inferential statistics was employed through Analysis of Variance where p value larger than 0.05 led to rejection of the null hypothesis, otherwise failed to reject the null hypothesis. The analysed data was presented in form of statistical tables and explanatory texts.

The regression model employed in inferential statistics was:

$$Y = \beta 0+\beta 1X1+\beta 2X2+\beta 3X3+ \beta 4X4+E$$

Where: X = (X1, X2, X3)

Where: Y = Performance of construction Projects (dependent variable)

β_0 = Constant

$\beta 1 \ldots \beta 3$ = Coefficients of independent variables

X1 = Prevalence of work programming

X2 = Experience of work programming

X3 = Knowledge of work programming

X4 = Work programming Support

3.8 Ethics

In the appendix section of this dissertation, a sample consent form has been provided. The participants in the study expressed their consent to participate in the study. Consent was important in the collection of data as individuals got to know the options they had with regards to their participation. In that respect, the individuals participated voluntarily. However, their participation was encouraged by explaining to them the benefits of participation.

3.9 Operationalization of Variables

The operational definitions of the variables are performed based on the objects as described by the Table 3.3.

Table 3.3: Operational Definition of Variables

Objectives	Variables	Indicators	Measurement scale	Data collection tools	Statistical analysis	Tools of Data Analysis
To investigate the influence of prevalence of work programming on performance of construction projects in Kiambu County	Prevalence of work programming	• Planning • Scheduling • Budgeting • Controlling	Ordinal Ordinal Ordinal Ordinal	Questionnaires	Descriptive and Inferential statistics	Percentages, Mean, Standard deviation, Variance, Person's R. and ANOVA
To determine the influence of experience in work programming on performance of construction projects in Kiambu County	Experience of work programming	• Resistance to change • Competing priorities • Occupational culture • Alternative availability	Ordinal Ordinal Ordinal Ordinal	Questionnaires	Descriptive and Inferential statistics	Percentages, Mean, Standard deviation, Variance, Person's R. and ANOVA
To assess the influence of knowledge of work programming on performance of construction projects in Kiambu County.	Knowledge of work programming	• Training • Technical skills • Critical understanding • Flexibility in operation	Ordinal Ordinal Ordinal Ordinal	Questionnaires	Descriptive and Inferential statistics	Percentages, Mean, Standard deviation, Variance, Person's R. and ANOVA
To assess the influence of work programming support on performance of construction projects in Kiambu County	Work programming Support	• Support staff availability. • Cost of support. • Frequency of System Upgrades. • Support response time	Ordinal Ordinal Ordinal Ordinal	Questionnaires	Descriptive and Inferential statistics	Percentages, Mean, Standard deviation, Variance, Person's R. and ANOVA
	Performance of construction Projects	• Adherence to scope • Adherence to budget • Adherence to schedule • Customer satisfaction	Ordinal Ordinal Ordinal Ordinal	Questionnaires	Descriptive and Inferential statistics	Percentages, Mean, Standard deviation, Variance, Person's R. and ANOVA

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Demographics

This details the demographic information of the respondents which include: age, level of education, exposure to the program, training and NCA category.

4.1 Respondents' Response Rates

The study assessed the total administered questionnaires vis a vis the correctly filled questionnaires.

Table 4.1: Respondents Response Rate

Questionnaires Administered	Correctly filled Questionnaires	Response rate
132	**102**	**77%**

Table 4.1 represents the total of 132 of questionnaires distributed to respondents. Out of the administered questionnaires 102 were well filled. This was equivalent to a response rate of 77%. According to Mugenda and Mugenda (2003), a 50% response rate is adequate, and a response rate greater than 70% is very good, making the response to be satisfactory. The response rate was made possible by good data collection procedures, where the researchers noted that the participants involved wanted the drop and pick method to allow the respondents ample time to fill the questionnaires.

4.2 Background Information

This entails the basic training, academic qualifications of the respondents and working exposure in construction project programming of the respondents

4.2.1 Basic Training Area of Respondents

The study investigated respondents based on their professional background.

Table 4.2: Basic Training of the respondents

Profession	Frequency	Percentage	Cumulative percentage
Construction Managers	19	19%	19%
Contractors	18	18%	37%
Site Agents	15	14%	51%
Architects	14	14%	65%
Civil and Structural Engineers	12	12%,	77%
Site Engineers	11	11%,	88%
Quantity Surveyors	7	6%	94%
Foreman	6	6%.	**100%**
Total	**102**	**100%**	

Table 4.2 details the respondents by their professions, construction managers and contractors formed the highest group with 19% and 18% respectively. This could be justified by the fact that every construction project needed a project manager and a contractor, hence, one could have had other training backgrounds, but indicated the profession they were operating during the time of the study. Quantity surveyors and foreman were the least at 6%. This could be justified by the fact that, the economic times demanded a lean staff, hence, some professionals were taking different roles to ensure a lean wage bill.

4.2.2 Academic Qualification

The study assessed the academic qualification of the respondents.

Table 4.3: Academic Qualifications of the respondents

Profession	Frequency	Percentage	Cumulative percentage
Diploma	10	10%	10%
Higher National Diploma	19	18%	28%
Bachelor's degree	59	58%	86%
Master degree	9	9%	95%
Doctorate Degree	5	5%,	100%
Total	**102**	**100%**	

Table 4.3 details academic qualifications of the respondents, bachelor's degree holders were the highest with 58%. This could be justified by the fact that, most roles that

needed to be performed required professionals with at least a degree. Doctorate degree holders were 5%, forming the minority. This could be justified by the fact that doctorate degree holders were in the executive positions. While degree holders were involved in the daily operations management.

4.2.3 Working Exposure in Construction Project Programming

The research also assessed the working exposure of the respondents in the field of Effective Construction Project Programming process on the County Government of Kiambu projects.

Table 4.4: Working exposure in Construction project planning

	Frequency	Percentage	Cumulative percentage
Up to 5 years	10	10%	10%
6-10 years	12	12%	22%
11-15 years	36	35%	57%
16-20years	26	25%	82%
Above 20 years	18	18%,	100%
Total	**102**	**100%**	

Table 4.4 the indicates the respondents experience in terms of the years they have served. Majority of the respondents at 35% had an experience of 11-15 years. This could be justified by the fact that this was the average age of the professionals. As after graduating at the age of 25 years, at the age of 36-40 years is the most active age. This also justifies why only 10% had an experience of 5 years, as these were young graduates. While those with the experience of above 20 years were either the directors or the group that was approaching retirement.

4.2.4 The NCA Category of the Employer

The study assessed the category of the company in the NCA cadre to help us in understanding their exposure, experience and what magnitude of the work that they could handle.

Table 4.5: NCA category in your firm

	Frequency	Percentage	Cumulative percentage
NCA 1	46	45%	45%
NCA 2	31	30%	75%
NCA 3	25	25%	100%
Total	**102**	**100%**	

Table 4.5 details the NCA category of the firms that are doing Construction on the County Government of Kiambu projects. The NCA categorization of the respondents were in descending order; NCA 1; 45%, NCA 2; 30% and NCA 3; 25%. This could be due to the registration fees and requirement per category, hence, limiting various constructors enrolling in different NCA categories.

4.2.5 Professionals who carried out the project planning in the firm

Different professionals carried out the project planning in different firms.

Table 4.6: Professional roles of staff who performed work programming

The study assessed the professionals involved in work programming and they included: administrators, project managers, project coordinator, construction manager, site agent and other categories.

Professionals	Frequency	Percent (%)	Cumulative (%)
Administrators	11	11.2	11.2
Project Managers	17	16.6	27.8
Project Coordinator	18	17.9	48.7
Construction Manager	22	21.4	67.1
Site Agent	28	27.1	94.2
Other	6	5.8	100
Total	**102**	**100**	

Table 4.6 indicates the professional roles of the staff involved in work programming. Site agents and construction managers formed the highest percentage at 27.1% and 21.4%. This could be justified by the fact that, they were the ones overseeing the projects, hence, they had to be involved in planning and controlling the project. Uncategorized group of professionals formed the lowest percentage at 5.8%, this could

be justified by the fact that, work programming is a complex task and requires proficient staff to populate, and interpret.

4.2.6 Education Background of the staff carrying out work programming

The study assessed the education background of the staff who were involved in work programming, they included; Quantity Surveyors, Construction Management, Civil/Structural Engineers, Construction Project Managers, and Architects.

Table 4.7: Education background

	Frequency	Percent (%)	Cumulative (%)
Quantity Survey	12	11.7	11.7
Construction Management	15	14.9	26.6
Civil/Structural Engineer	14	13.6	40.2
Construction Project Manager	9	8.6	48.8
Architect	10	10.2	59
Others	42	41	100
Total	**102**	**100**	

Table 4.7 indicate the education background of the staff involved in the work programming. Education background of the assorted category formed the largest group. This could be due to the fact that, the specialized professionals were not involved in the tactical and day to day operations of the project, but in the specialized strategic tasks. Construction project managers formed the least category with 8.6%. This could be due to the fact that they were performing the overall oversight of the project, hence, allowing other professionals to assist them in the repetitive role of work programming.

4.3 Performance of construction projects

The study assessed the performance of construction projects based on various aspects which included: balanced allocation of resources, efficient allocation of employees, reduced risks and errors and enhanced overall organization.

Table 4.8: Benefits of Work programming

The Rank Scale of 5-1 include: 5- Strongly Agree (SA), 4- Agree (A), 3- Neutral (N), 2- Disagree (D), 1- Strongly Disagree. (SD)

Resource Category	SA (%)	A (%)	U (%)	D (%)	SD (%)	Mean (%)
Balanced resources, reducing over allocations or overtime	24.5	35.3	13.7	16.7	16.3	**23.6**
Determines of predicts resources needed	29.4	26.5	24.5	14.7	14.4	**24.7**
Helps maintain the lowest uniform number of employee	14.7	18.6	34.3	19.6	19.2	**20.6**
Establish plans for material delivery	24.5	25.5	18.6	23.5	23.1	**23.4**
Reduced projects costs	19.6	27.5	31.4	13.7	13.5	**22.9**
Reduced costs of learning and improved learning curve	14.7	24.5	15.7	28.4	27.9	**20.2**
Enhanced overall organization strategic planning	19.6	25.5	22.5	16.7	16.3	**21.2**
Reduction of errors	29.4	16.7	22.5	17.6	17.3	**22.3**
Increased workers morale due to guaranteed job security	27.5	21.6	24.5	15.7	15.4	**22.9**
Others	7.8	17.6	28.4	30.4	29.8	**19.0**
Mean	**21.2**	**23.9**	**23.6**	**19.7**	**19.3**	**22.1**

Table 4.8 represent the respondents' opinion based on the performance of the projects. The average performance was 22.1%, this indicates dismal performance of the projects. This could be justified by the fact that many projects experienced various challenges such as late disbursement of finances due to cashflow challenges, late delivery of materials due to factors such as few loaders and traffic congestion, and over external factors that were beyond the constructors' capacity. Hence, on average 21.2% strongly agreed on the performance of the project. This would be due to cost overruns, cost overruns and scope changes experienced during the process of the construction project's life cycle.

4.4 Prevalence of work programming and performance of construction projects

The study assessed the prevalence of work programming based on the classifications of low, moderate, high and very high.

Table 4.9: Prevalence of Work Programming

Rating	Frequency	Percent	Cumulative %
None	11	10.8	10.8
Low	13	12.7	23.5
Moderate	17	16.7	40.2
High	36	35.3	75.5
Very high	25	24.5	100
Total	**102**	**100**	

Table 4.9 represented the respondents' opinion on the prevalence of work programming. The respondents who were of the opinion that the prevalence of work programming was high and very high were 35.3% and 24.5% respectively. This could be justified by the fact that most of the contractors were embracing work programming in the construction projects. However, those who were of the opinion that work programing was low and moderate were 12.7% and 16.7% respectively. This could be justified by the fact that, there were some projects that were employing manual methods of work programming.

4.5 Experience of work programming and performance of construction projects

The study sought to identify the experience in work programming.

4.5.1 Format of work programming practiced

The study differentiated the two formats of work programming to ensure inclusivity. Hence, considered computerized and manual format of work programming.

Table 4.10: Project Documentation Format

	Frequency	Percent (%)	Cumulative (%)
Manual	44	43.1	43.1
Computerized	41	40.2	83.3
Both of above	17	16.7	100
Total	102	100	

Table 4.7 detailed the respondents' opinion on the format of work programming that was employed in the construction projects. Majority of the construction projects embraced and were more experienced in manual programming at 43.1%, while those

who were experienced and embraced computerized programming were 40.2%. This could be justified by the fact that many projects had not adopted computerized work programming. In addition, 16.7% were adopting both the manual and computerized work programming. This would be justified by the fact that some projects were in the process of changeover and were running both systems parallel.

4.6 Experience in work programming and performance of construction projects

The study sought to identify the experience in work programming in the construction projects, based on the ratings: very high, high, moderate, low and none

Table 4.11: Experience in work programming

Level of Experience	Frequency	Percent (%)	Cumulative (%)
Very high	32	31.4	31.4
High	30	29.4	60.8
Moderate	28	27.5	88.3
Low	12	11.7	100
Total	**102**	**100**	

Table 4.8 indicates the respondents' opinion on the level of experience. Cumulatively 88.3% of the respondents indicated that they had experience in work programming. With the level of experience in work programming being very high, high and moderate comprising of 31.4%, 29.4% and 27.5% respectively. This could be justified by the fact that, whether they were practicing manual or computerized work programming, they had experience in either or both of the systems. However, 11.7% indicated that they had low experience in either of the work programming systems. These could have been new employees or staff in the lower cadre.

4.7 Knowledge of work programming and performance of construction projects

The study investigated on the knowledge of work programming among the construction projects under the study. The factors considered were training, technical skills, critical understanding, proficiency and flexibility in operation.

Table 4.12: Factors Influencing Work Programming

The Rank Scale of 5-1 include: 5- Strongly Agree (SA), 4- Agree (A), 3- Neutral (N), 2- Disagree (D), 1- Strongly Disagree. (SD)

Knowledge in Work Programming	**SA (%)**	**A (%)**	**N (%)**	**D (%)**	**SD (%)**	**Mean (%)**
Training	34.3	19.6	24.5	17.6	3.9	**24.2**
Technical skills	29.4	14.7	19.6	24.5	11.8	**21.7**
Critical understanding	39.2	19.6	14.7	19.6	6.9	**24.3**
Proficiency	39.2	24.5	19.6	14.7	2.0	**25.6**
Flexibility in operation	29.4	34.3	14.7	9.8	11.8	**24.0**
Mean	**34.3**	**22.5**	**18.6**	**17.2**	**7.2**	**24.0**

Table 4.9 represents the respondents' opinion on knowledge of work programming. Proficiency in work programming rated the highest being with an average of 25.6%. This could have been justified by the fact that, 56.8% agreed that the project staff had knowledge on work programming 22.5% and 34.3% agreeing and strongly agreeing respectively. This is justified as most projects had adopted work programming, whether manual or computerized.

4.8 Work programming support and performance of construction projects

The study investigated work programming support: the factors considered were: support staff availability, affordability of cost of support, frequency of system upgrades, support response time.

Table 4.13: Work programming support

The Rank Scale of 5-1 include: 5- Strongly Agree (SA), 4- Agree (A), 3-Neutral (N), 2- Disagree (D), 1- Strongly Disagree. (SD)

Support	**SA (%)**	**A (%)**	**N (%)**	**D (%)**	**SD (%)**	**Mean (%)**
Software support availability	9.8	9.6	9.4	9.2	9.1	**16.1**
Hardware support availability	24.5	24.0	23.6	23.1	22.6	**22.8**
Affordability of cost of support	29.4	28.8	28.3	27.7	27.2	**24.0**
Frequency of system upgrade	29.4	28.8	28.3	27.7	27.2	**23.7**
Support response time	9.8	9.6	9.4	9.2	9.1	**19.3**
Mean	**20.6**	**20.2**	**19.8**	**19.4**	**19.0**	**21.2**

Table 4.10 represents the respondents' opinion concerning work programming support. Compared to those who were of contrary opinion, those who agreed with work programing support were 40.8% against those who were disagreeing being 38.4%. This could be justified by the fact that, so long as the construction projects were embracing work programming, then, there must have been accessible support. Affordability of support at 24.0% and frequency of system upgrade at 23.7% rated the highest. This justifies the reason that many respondents were in support of accessible support. The reason being, if work programming support was unaffordable it could not have been accessible.

4.8.1 Work programming and Performance of construction project

Work programming was analyzed to assess the influence of predictor variables which included: prevalence of working programming, experience of working programming, knowledge of work programming and work programming support.

Table 4.14: Work programming and Performance of construction project

Variables	SA (%)	A (%)	U (%)	D (%)	SD (%)
Prevalence of working programming	17.6	24.5	24.5	20.6	12.8
Experience of work programming	12.7	18.6	24.5	25.5	18.7
Knowledge of work programming	17.7	24.5	24.5	20.6	12.8
Work programming Support	12.7	25.5	22.5	20.6	18.7
Mean	**15.2**	**23.3**	**24.0**	**21.8**	**15.8**

Table 4.11 represents the predictor variable; work programming. 38.5% of the respondents had a positive opinion about the predictor variable while 37.6% were of the centrally opinion. This could be justified by the fact that, most of the construction projects had not fully embraced computerized work programming, while another proportion were stuck with the manual work programming.

4.9 Coefficients of performance of construction projects and prevalence of working programming, experience of working programming, knowledge of work programming and work programming support

The study analyzed the coefficient of the dependent variable performance of construction projects and independent variables: prevalence of working programming, experience of working programming, knowledge of work programming and work programming support

Table 4.15: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.149	.075		-1.987	.050
	Prevalence of work programming	.523	.111	.493	4.722	.000
	Experience of work programming	.058	.084	.055	.686	.495
	Knowledge of work programming	.051	.092	.046	.553	.582
	Work Programming Support	.512	.096	.492	5.314	.000

a. Dependent Variable: Performance of construction projects

Table 4.12 indicates that the Beta values were positive, hence, absence of multi-collinearity. Prevalence of work programming and work programming support were strong predictors of performance of construction projects, while experience of work programming and knowledge of work programming had week prediction of performance of construction projects. This could be justified by the fact that knowledge and experience are indirectly related to the frequency in use of work programming.

Knowledge of work programming had a P-value of more than 0.05, hence, failing to reject the null hypothesis: Knowledge of work programming has no significant influence on performance of construction projects in Kiambu County. Hence, concluding that knowledge of work programming had no influence on performance of

construction projects in Kiambu county. This could be justified by the fact that knowledge of work programming was based on the information the respondents had on work programming and not actual use of work programming.

The P-value for prevalence of work programming, experience of work programing and work programming support was equal or less than 0.5, hence we reject the null hypothesis:

Prevalence of work programming has no significant influence on performance of construction projects in Kiambu County.

Experience in work programming has no significant influence performance of construction projects in Kiambu County.

Work programming support has no significant influence on performance of construction projects in Kiambu County.

And conclude that prevalence of working programming, experience of working programming, and work programming support had significant influence on performance of construction projects in Kiambu County.

Table 4.16: The model summary of performance of construction projects and prevalence of working programming, experience of working programming, knowledge of work programming and work programming support

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.982[a]	.964	.962	.266

a. Predictors: (Constant), Work Programming Support, Knowledge of work programming, Experience of work programming, Preference of work programming

Table 4.13 indicates that the coefficient correlation of the predictor variable on dependent variable was 0.982. This was an indication that there was a strong correlation between the predictor variable on dependent variable. The correlation of determination was 96.4%. Therefore, the predictor variables could predict 96.4% of

the dependent variable only 13.6% of the dependent variable could not be predicted by the predictor variable.

4.10 The ANOVA analysis of performance of construction projects and prevalence of working programming, experience of working programming, knowledge of work programming and work programming support

The employed model in the regression analysis was:

The $Y = \beta0+\beta1X1+\beta2X2+\beta3X3+E$

Where: X = (X1, X2, X3)

Where: Y = Effectiveness of construction project delivery (dependent variable)

β_0 = Constant

$\beta1 \ldots \beta3$ = Coefficients of independent variables

X1 = Prevalence of working program applicability

X2 = Adherence to the effective work programming

X3 = Knowledge of work programming techniques

Table 4.17: ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	181.916	4	45.479	645.090	.000[b]
	Residual	6.839	97	.071		
	Total	188.755	101			

a. Dependent Variable: Performance of construction projects

b. Predictors: (Constant), Work Programming Support, Knowledge of work programming, Experience of work programming, Preference of work programming

Table 4.14 indicates that the significance level is below 0.05. This is an indication that the independent variables had significant influence on the dependent variables.

4.11 Summary

The respondents' opinion on the average performance of the projects in Kiambu County was 22.1%, this indicates dismal performance of the projects. This could be justified by the fact that many projects experienced various challenges such as late disbursement of finances due to cashflow challenges, late delivery of materials due to factors such as few loaders and traffic congestion, and over external factors that were beyond the constructors' capacity. The respondents who were of the opinion that the prevalence of work programming was high and very high were 35.3% and 24.5% respectively. This could be justified by the fact that most of the contractors were embracing work programming in the construction projects. Majority of the construction projects embraced and were more experienced in manual programming at 43.1%, while those who were experienced and embraced computerized programming were 40.2%. Proficiency in work programming rated the highest being with an average of 25.6%. This could have been justified by the fact that, 56.8% agreed that the project staff had knowledge on work programming 22.5% and 34.3% agreeing and strongly agreeing respectively. Respondents' who agreed with work programing support were 40.8% against those who were disagreeing being 38.4%. This could be justified by the fact that, so long as the construction projects were embracing work programming, then, there must have been accessible support.

The regression analysis returned a P-value of equal or less than 0.05 for three of the variables (working programming, experience of working programming, and work programming support). Hence, rejecting 3 and failing to reject one of the null hypotheses relating to (knowledge of work programming). the coefficient correlation of the predictor variable on dependent variable was 0.982. This was an indication that there was a strong correlation between the predictor variable on dependent variable. The correlation of determination was 96.4%. Therefore, the predictor variables could predict 96.4% of the dependent variable only 13.6% of the dependent variable could not be predicted by the predictor variable.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussions

The purpose of this research was to investigate influence of work programming on performance of construction projects in Kiambu County. The purpose of the study was fulfilled by answering the study questions on: Performance of construction projects, prevalence of work programming and performance of construction projects, experience of work programming and performance of construction projects, knowledge of work programming and performance of construction projects and work programming support and performance of construction projects.

5.1.1 Performance of construction projects

The study found that average performance of construction projects was 22.1%, this indicates dismal performance of the projects. This concurs with the study by Aigbabvoa (2018) in South Africa, on factors that affect performance of construction projects. The study indicated that one of the factors leading to dismal performance was poor planning and time management. Hence, this justifies the fact that lack of work programming could lead to poor performance of construction projects. In addition, plans and procedures and contraction actual progress should be put into perspective to promote performance of construction projects (Egwunatum, 2017). Therefore, work programming is critical to ensure proper planning, scheduling, budgeting and control to ensure construction project control.

The coefficient correlation of composite work programming on performance of construction projects was 0.982. This was an indication that there was a strong correlation between the predictor variable on dependent variable. These findings agreed with a study by Albtoush, Doh, Rahman & Al-Momani (2022) in Jordan on "critical success factors of construction projects in Jordan: an empirical investigation, employing a case study research design found that accurate bill of and quantities is a

critical success factors of construction projects in Jordan. Hence, work programming would be critical in promoting performance through accurate planning and scheduling.

5.1.2 Prevalence of work programming and performance of construction projects

The respondents who were of the opinion that the prevalence of work programming was high and very high were 35.3% and 24.5% respectively. This could be justified by the fact that most of the contractors were embracing work programming in the construction projects. The low prevalence of work programming is a global issue. According to Arnold and Javernick-Will, (2013) factors affecting the prevalence of work programing is resistance low or no Information Technology experience. (Arnold & Javernick-Will, 2013). In addition, low prevalence to work programming also affects projects in Africa, leading to cost overrun in Africa, in Tanzania average cost overruns of 44%. However, the challenge of cost overrun has found its roots in designs, poor planning and work programming activities (Herrera et al., 2020). Hence, low prevalence of work programming is rampant at global and regional level, leading to dismal performance of construction projects.

5.1.3 Experience of work programming and performance of construction projects

This study found that majority of the construction projects embraced and were more experienced in manual programming at 43.1%, while those who were experienced and embraced computerized programming were 40.2%. Aghimien et al., (2022) in South Africa on barriers to digital technology deployment in value management practice employing a survey found that low experience in work programming was due to failure to embrace Information Communication Technology by the construction industry. The reason to low uptake of Information Technology in the construction industry was due to high cost and complexity of the technology. In addition, lack of knowledge and the averse digital culture in the industry. This is also supported by the findings of this study that, 16.7% were adopting both the manual and computerized work programming, which is still low.

5.1.4 Knowledge of work programming and performance of construction projects

Knowledge of work programming was low with the various indicators such as proficiency in work programming rating an average of 25.6%. This was supported by a study by Nyaga et al. (2016) on an assessment of the level of adoption of Information Communication Technology by local building contractors during project implementation found that in Kenya, who found that in adequate knowledge and high cost of training hindered adoption of Information Communication Technology by Local Building Contractors. Therefore, this translates to low use of work programming in the construction projects in Kenya, hence, affecting the performance of construction projects in the country. Also, echoed by Thuo and Namusonge (2017), who found that the stakeholders in the industry has lacked Knowledge in the Information Technology and Communication and relied on experts for long. In Kiambu, there is over reliance on experts among the Small and Medium enterprises. Worse still, adoption of computers in the construction industry is 1% as compared to other Small and Medium enterprises.

5.1.5. Work programming support and performance of construction projects

In this study, respondents who supported that there was work programing were 40.8%. This is supported by a study in South Africa, where peer support was found to be more applicable. A study by Adekunle, Aigbavboa, Akinradewo, Oke and Aghimien (2022) on construction Information Management: benefits to the construction industry. On employing survey research design, descriptive and inferential data analysis techniques, found that, there is need for the experts to systematically manage construction information. Consequently, development of clarity of information required during the construction time. Hence, the construction professionals develop synergy so that they can support one another.

However, contradicted by a study by Bor and Chepnoen (2018) on influence of project management information system user knowledge on performance of construction projects in South Rift, Kenya employing descriptive research design, descriptive and inferential statistics data analysis found that, reliability and inclusiveness of the software in the construction industry was required and not complex systems. Hence,

demand for less support by stakeholders to understand the work programming software and the processed data. Affordability of work programming support was supported by 24.0% of the respondents. Highlighting the views of that ready-made applications used generally for construction required less support as opposed to the tailor-made application software (Bor & Chepnoen, 2018).

5.2 Conclusion

The research data indicates that the construction sector in Kiambu County is conversant with work programming, but only a few construction projects in Kiambu County apply work programming. While the concept of project planning is crucial to the management of construction projects, it is evident that the project planning conducted for projects in Kiambu County does not include work programming. However, it is crucial to take note of the fact that work programming goes hand in hand with project planning. While project planning is the broader function, work programming, on the other hand, is a function under project planning. As such, the data on project planning indicates that all construction projects in Kiambu County apply project planning.

The various construction firms use different forms of project planning, with the written and unwritten format as the most common approaches to project planning. There is a wide range of factors affecting the implementation of work programs for construction projects in Kiambu County. Such factors include skilled labour, adoption of ICT, the presence of qualified personnel, the financial status of the contractor and contractor's capacity. These factors affect work programming in one way or the other, heavily impacting the dynamics of work programming in their firms. Overall, work programming is influencing the performance of construction projects in Kiambu County.

5.3 Recommendations

Work programming ensures that there is ease in planning and control when implementing construction projects. As such, there are three main recommendations.

5.3.1 Implementation of Work Programming at Firm-level

Usually, it is the construction firms that have to come up with effective work programs depending on the nature of the project. As such, it is the responsibility of the construction firms to ensure that they draft work programs for the construction projects they undertake in Kiambu County.

Effective work programming ensures the successful accomplishment of each project task, and this is key to the successful and timely completion of a given construction project. Thus, the construction firms in Kiambu should make work programming part of the project planning process.

5.3.2 The Use of Written Work Programs

There are different forms of work programs. Some of the most common include written and unwritten work programs. Construction firms responsible for construction projects in Kiambu County should be looking to incorporate written work programs to the project plan.

Written work programs are more formal, and they are also good for future reference.

This is unlike the unwritten work programs, which can be somewhat difficult to implement and refer to in the future. Written work programs are more effective, and they should be digitized for the purpose of future reference.

5.3.3 NCA Policy

The National Construction Authority, NCA, should make work programming a mandatory function to ensure compliance. Work programming is a critical function that can significantly improve operations in the construction industry in Kiambu County. As such, a work program should be a mandatory document like it is the case with other components such as structural plans, mechanical plans, and electrical plans, among others. Overall, using work programs should be part of compliance with industry standards. The use of work programs will enhance the quality of construction projects in Kiambu County.

5.4 Areas Recommended for Further Study

The following are the suggested areas for further study:

i. A study to investigate on: conflicts resolution strategies and how they could enhance successful completion on construction projects. Conflicts derail projects performance, but they could be used as catalysts to promote the performance of construction projects. Therefore, a study would be important to identify ways to maximize on conflicts in construction projects and reduce their negative impact.

ii. A study to investigate on: How the client technical team would be motivated to learn on the technical aspects of the project so that they could represent the client appropriately.

iii. A study to investigate on: common risks that derail projects performance and how they could be planned for well in advance in order to ensure timely and successful project completion.

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APPENDICES

Appendix I: Letter introduction

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

SCHOOL OF ARCHITECTURE AND BUILDING SCIENCES (SABS)

4th Jan 2019

Dear Respondent,

RE: REQUEST TO GIVE QUESTIONNAIRE IN YOUR FIRM/SITE.

I am a postgraduate student in the university mentioned above currently taking my masters of science in construction project management in the department of construction management. Am in my final year taking a research thesis titled "**AN INVESTIGATION INTO THE EFFECT OF WORK PROGRAMMING ON CONSTRUCTION PROJECT DELIVERY"** which aims at investigating the effect of work programming on construction management projects delivery, to determine the different types of works programs which are mostly applied, to establish the effectiveness of different work programs on project delivery and to investigate the prevalence of work programs in Kiambu County.

Please note that the information given will be treated as confidential and will only be used for the purpose of study. For personal information, only professional information will be required, and information such as contacts and name are not included in the questionnaire.

Kindly answer this questionnaire to the best of your knowledge.

Thanks in advance.

Yours faithfully,

MBURU PETER WAWERU,

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Appendix II: Questionnaire

TOPIC: AN INVESTIGATION INTO THE EFFECT OF WORK PROGRAMMING ON CONSTRUCTION PROJECT DELIVERY" A CASE STUDY OF COUNTY GOVERNMENT OF KIAMBU PROJECTS.

SECTION A: GENERAL INFORMATION

Kindly give the required information about yourself and the firm. Kindly put a **tick** (√) in the **box** [ ] next to the selected response.

1) **Kindly tick your role in this project.**

   [ ] Engineer [ ] Contractor [ ] Architect [ ] Quantity Surveying, [ ] Construction Manager, [ ] Site Engineer, [ ] Site Agent, [ ] Foreman, [ ] Others.

2) **Kindly tick your education specialization**

   [ ] Architecture, [ ] Construction Management, [ ] Quantity Surveyor [ ] Civil & Structural Engineering, [ ] Building Technology, [ ] Facility User [ ] Other.

3) **Working Exposure in this field of Work Programming?**

   [ ] Up to 5years, [ ] 6 to 10years, [ ] 11 to 15years, [ ] 16 to 20years, [ ] More than 20 years.

4) **Please check the NCA category that your firm belong to?**

   [ ] NCA 1, [ ] NCA 2, [ ] NCA 3

5) **Please indicate the number of full time staff in your firm.**

   [ ] Less than 20, [ ] 20-40, [ ] 41-60, [ ] 61-80, [ ] 81-100, [ ] More than 100.

SECTION B: PROJECT INFORMATION

1. **To what extent do you carry out the work programming for the following categories in your firm for different projects?**

   Kindly rate the nature of the projects that you have handled using a Likert scale where 5 denotes very complicated, and 1 denotes very simple.

   5- Very High, 4- High, 3- Moderately, 2-Low and 1- None

SN	Recourse Category	Very High	High	Moderately	Low	None
1	Equipment					
2	Labor/ Human Resources					
3	Materials.					

2. **What kind of project planning is carried in your firm?**

   [ ] Defined, Standard Written format, [ ] unwritten format, [ ] both of the above, [ ] other (state please

3. **To what extent does the top management support Project Planning through policies or guidelines from the head office?**

   [ ] Very High (VH), [ ] High (H), [ ] Moderate (M), [ ] Low (L), [ ] None (N)

4. **Who carries out the project planning in your firm?**

[ ] Directors from Head Office, [ ] Project Managers, [ ] Project Coordinator, [ ] Construction Manager, [ ] Site Agent, [ ] other (state)……..

5. **What is the highest level of education of the person who carries out the project planning in your firm?**

   [ ] Doctorate (PhD), [ ] Masters, [ ] Bachelors, [ ] Diploma, [ ] Certificate.

   [ ] Secondary Education, [ ], Primary Education, [ ] Short Term Training, [ ] None.

6. **What is the Education Background of the person who carries out the project planning in your firm?**

   [ ] Quantity Survey, [ ] Construction Management, [ ] Civil/Structural Engineer, [ ] Construction Project Manager, [ ] Architect, [ ] others State please……..

7. **The table below indicates reasons for doing an organized work programming. Kindly tick a number of each of the rank scale to show the level of significance of work programming process.**

   Rank Scale 5- Very Important (VI), 4- Important (I), 3- Fairly Important (FI), 2- Least Important (LI), 1- Not Important.

SN	**Aim of Understanding Resource Planning & Leveling**	**VI**	**I**	**FI**	**LI**	**NI**
1.	Identify the roles and key responsibility For each labor type					

2. Identify the number of people required to fill each role
3. Identify the Items of Equipment to be
4. Identify the types and quantities of Equipment
5.

8. To what extent do the following factors influence work programming in your firm?

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N).

SN	Influencing Factors of Work Programming	VH	H	M	L	N
1.	Adequacy of Labor					
2.	Adequacy of plants and equipment.					
3.	Compliance with safety procedures.					
4.	Contractor's ICT Compliance.					
5.	Presence of Qualified personnel.					
6.	Level of Project documentation					
7.	Financial Status of the Contractor					
8.	Weather					
9.	Prompt honoring of payments certificates					
10.	Types of Procurement systems					
11.	Others (State Please)……..					

SECTION C: PRACTISE OF WORK PROGRAMMING IN VARIOUS PROJECTS

4 How often is the progress in your projects affected by delayed supply of materials?

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N).

5 How often is the progress in your projects affected by lack of equipment on site?

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

6 How often is the progress in your projects affected by lack of labor on site?

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

7 To what extent do you carry out Work Programming for the following categories in your firm for different projects?

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

SN	Resource Category	Very High	High	Moderate	Low	None
1.	Equipment					
2.	Labor/ Human Resources					
3.	Materials					

8 What Kind of Work Programming is carried out in your firm?

[ ] Defined. Standard Written Format, [ ] Unwritten Form of Planning, [ ] both of the above, [ ] other (State please).

9 To what extent are the following Work programme Techniques used in your firm?

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

SN	Resource Category	VH	H	M	L	N
1	Doing Nothing					
2	Delay non-critical tasks within available float					
3	Extend non-critical task duration within the available					
4	Substitute recourse of equal or greater capability					
5	Delay critical path tasks					
6	Splitting tasks into non-sequential pieces					
7	Authorize Overtime					
8	Crashing					
9	Microsoft project					
10	Modify the scope					
11	Others (state please)					

10 According to your experience , what is the effectiveness of the above techniques

Rank Scale 5- Very Effective (VE), 4- Effective (E), 3-Fairly Effective (FE), 2- Least Effective (LE), 1- Not Effective (NE)

SN	Resource Category	VH	H	M	L	N
1.	Doing Nothing					
2.	Delay non-critical tasks within the available float					
3.	Extend non-critical task duration within the available					
4.	Substitute recourse of equal or greater capability					
5.	Delay critical path tasks					
6.	Splitting tasks into non-sequential pieces					
7.	Authorize Overtime					
8.	Crashing					
9.	Microsoft project					
10.	Modify the scope					
11.	Others (state please)					

11 The following challenges of Work Programming which had been identified in theory. Please indicate to what extent you agree with identified challenges.

Rank Scale 5- Strongly Agree (SA), 4- Agree (A), 3-Undecided (UD), 2-Disagree (D), 1- Strongly Disagree. (SD)

SN	Resource Category	VH	H	M	L	N
1	.Technical Incompetence; lack of knowledge					

2. Tedious exercise
3. Materials shortages or late delivery
4. Poor work definition ; inadequate project documentation
5. Project delays
6. Site storage constrains
7. Project risks and uncertainty
8. Contracts Disputes
9. Contractors ICT compliance challenges
10. Shortage of craftsmen and workers
11. Others (state please)

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9. The following are benefits of Work programming, which have been identified in theory.

Please indicate to what extent you agree with identified challenges.

Rank Scale 5- Strongly Agree (SA), 4- Agree (A), 3-Undecided (UD), 2-Disagree (D), 1- Strongly Disagree. (SD)

SN	Resource Category	VH	H	M	L	N
1.	Balanced resources, reducing over allocations or overtime					
2.	Determines of predicts resources needed					
3.	Helps maintain the lowest uniform number of employee					
4.	Establish plans for material delivery.					
5.	Reduced projects costs					
6.	Reduced costs of learning and improved learning curve					

7. Enhanced overall organization strategic planning
8. Reduction of errors
9. Increased workers morale due to guaranteed job security
10. Others (state please)

SECTION D: EFFECTIVENESS OF MONITORING AND PROGRAMMING IN PROJECTS

1. **To what extent do you think that proper work programming contributes to reduced costs of the project?**

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

2. **To what extent do you think that proper work programming contributes to reduced completion period of a project?**

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

3. **To what extent do you think that proper work programming contributes to improved quality of the project?**

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

4. **What are some methods to overcome the challenges of work programming?**

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

5. **Is work programming a contributor or hindrance to project success? How does work programming contribute to project success or failure?.**

Rank Scale 5- Very High (VH), 4- High (H), 3- Moderate (M), 2- Low (L), 1- None (N)

SECTION E: CHALLENGES OF WORK PROGRAMMING

1. **To what extend did the following factors lead to Construction Work Programs in your projects?**

Kindly rate the following factors of challenges of work programming based on your experience in the project in a scale of 1 to 5 where 1- Strongly Disagree, 2- Disagree, 3- moderately Agree, 4- agree, and 5- Strongly agree.

SN	Resource Category	SD	D	MA	A	SA
1.	Poor labor management during construction stage					
2.	Previous experience of contractor					
3.	Poor site management and supervision					
4.	Inadequate project preparation, planning, and implementation					
5.	Project complexity					
6.	Delays in issuing information to the contractor					
7.	Lack of coordination at the design stage					
8.	Incomplete design at the time of tender					
9.	Poor organizational structure					
10.	Clients late contract award					
11.	Others (state please)					

2. To what extent does the Construction Work Programs affects TIME overrun in your projects

2.1 Consultant related factors

Kindly rate the following factors of challenges of work programming based on your experience in the project in a scale of 1 to 5 where 1- Strongly Disagree, 4- Disagree, 3- moderately Agree, 4- agree, and 5- Strongly agree.

SN	Resource Category	SD	D	MA	A	SA
1.	Delay in doing inspection and testing					
2.	Delay in preparing interim payment certificates					
3.	Complexity of the project					
4.	Inadequate site investigation					
5.	Ambiguity of details in drawings					
6.	Misunderstanding owners requirements					
7.	Poor project management assistance					
8.	Insufficient estimation of original contract duration					
9.	Insufficient survey and data collection before design					
10.	Others (state please)					

2.2 Contractor related factors

Kindly rate the following factors of challenges of work programming based on your experience in the project in a scale of 1 to 5 where 1- Strongly Disagree, 2- Disagree, 3- moderately Agree, 4- agree, and 5- Strongly agree.

SN	Resource Category	SD	D	MA	A	SA
1.	Poor procurement of construction materials					
2.	Repeat/Repair works due to mistakes					
3.	Poor project planning and scheduling					
4.	Inexperienced/unqualified labor					
5.	Poor site management and supervision					
6.	Lack of contractors experience					
7.	Late delivery of materials					
8.	Unreliable subcontractors					
9.	Lack of proper equipment					
10.	Others (state please)					

2.3 Clients related factors

Kindly rate the following factors of challenges of work programming based on your experience in the project in a scale of 1 to 5 where 1- Strongly Disagree, 2- Disagree, 3- moderately Agree, 4- agree, and 5- Strongly agree.

SN	Resource Category	SD	D	MA	A	SA
1.	Delayed payments					
2.	Change orders					
3.	Design changes by owner/representatives during construction					

4. Poor communication with consultants and other parties
5. Delay in site delivery
6. Lack of able representative
7. Inadequate information during project feasibility study
8. Conflicts between joint owners
9. Others (state please)

2.4 External related factors

Kindly rate the following factors of challenges of work programming based on your experience in the project in a scale of 1 to 5 where 1- Strongly Disagree, 2- Disagree, 3- moderately Agree, 4- agree, and 5- Strongly agree.

SN	Resource Category	SD	D	MA	A	SA
1	Poor weather conditions					
2	Unreliable suppliers					
3	Escalation of local materials prices					
4	Price fluctuations					
5	Environmental/social/ political factors					
6	Delay in obtaining permits from the local authority					
7	Natural calamities/ Acts of God					
8	Delay in getting services such as water and electricity					
9	Change of government policies					
10	Others (state please					

Please give your views on the current programming trends in Kenya

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Thanks a lot for your time in answering this Questionnaire!