COMPARATIVE STUDY OF MULTI-PRIME AND SINGLE-PRIME CONTRACTING PERFORMANCE IN LARGE-SCALE ROAD CONSTRUCTION PROJECTS IN KENYA

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Comparative Study of Multi Prime and Single Prime Contracting Performance in Large Road Construction Project in Kenya

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DECLARATION

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

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DEDICATION

My wife Susan who God has used to propel me to this level, my son Ethan who is always by my side when doing this research, my parents and siblings who inspired me all through my study.

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ABBREVIATIONS AND ACRONYMES

AfDB	African Development Bank
GC	General Contracting
DBD	Design –Bid-Build
ICLG	International Comparative Legal Guides
MC	Main Contractor
MP	Multi Prime Contracting
SP	Single Prime Contracting
KenHA	Kenya National Highway Authority
KURA	Kenya Urban Roads Authority
KIPPRA	Kenya Institute for Public Policy Research and Analysis
SPSS	Statistical Package for Social Sciences
SGR	Standard Gauge Railway
SD	Standard Deviation

ABSTRACT

This study explored the performance difference between Single-prime and Multi-prime contracting methods in terms of cost, quality, timeliness, and overall performance as they are used in road construction in Nairobi City County. The study employed a comparative primary cross-sectional study with primary data collection using a semi-structured Likert-scaled questionnaire to collect data from professionals who have been involved in both contracting methods in roads construction in the County over the past 10 years. The study employed purposive and snowball sampling to select the professionals who were in active road construction projects in the county and professionals who had been involved in roads construction in Nairobi City County in the past ten years. The Study tool was tested for reliability and found to meet internal consistency requirements. The analysis of construction costs revealed a statistically significant difference between single prime and multi-prime (p = 0.006), suggesting that single prime projects costed slightly higher. The analysis also indicated no statistically significant difference in project timelines between the two contracting methods (U = 704.000, z = -1.208, p = 0.227). However, the higher mean rank for Multi-prime (45.79) compared to Single-prime (39.37) suggests longer time in Multi-prime projects. A statistically significant difference was observed in the quality of project output between Single-prime and Multi-prime contracting methods (p = 0.002). The significantly higher mean rank for Single-prime (38.91) compared to Multi prime (46.46) (p=0002) indicates that Multi-prime contracting is associated with higher quality project outputs. The difference in overall contract performance between the two methods was statistically significant (p = 0.019). Notably, despite the seemingly lower quality output, Multi-prime contracting showed a slightly higher mean rank (45.87) compared to Single-prime (39.32) in overall performance. The result suggests that single-prime contracting may actually be associated with marginally higher costs, lower quality, but shorter completion time, possibly due to the prime contractor's markup on subcontractor work. This study concludes that Multi-primes preforms better than Single-prime contracting methods in terms of cost and overall performance in large and complex road construction projects in Nairobi City County-Kenya Nairobi City County where a lot more technical expertise may be required.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

1.1.1 Overview of Prime Contracting Methods

Infrastructural developments in Kenya have been at their peak, and this has led to the rise of large road construction projects in the country, especially in Nairobi City County. Due to this boom in construction, there has been need to ensure that contractors fulfil their obligations that is to ensure that quality is achieved within the budget and time limits. There has been a delay in delivery of various large projects and this has resulted in an increase in construction costs and even further having impact on the quality (Gituro & Mwawasi, 2017). This can partly be attributed to the contracting method employed in the execution of the projects (Mweresa, 2013; Oyieyo et al., 2020). Reports on the Thika Superhighway for example highlight cost and time overruns and delays due to various factors, including scope changes and land acquisition issues (African Development Fund, 2019).

Prime contracting is a construction project delivery method where the owner hires a primary contractor, known as the prime contractor, to oversee and execute the entirety or a significant portion of the construction project. This approach can take various forms, including single-prime and multi-prime contracting. The prime contractor serves as the main point of contact and is responsible for managing all aspects of the project, including hiring and coordinating subcontractors, ensuring quality, adhering to schedules, and managing the budget (Sanderson et al., 2018). Prime contractor acts as the single point of contact for the project owner, simplifying communication and project management. The prime contractor is therefore responsible for the overall project execution, including managing subcontractors, procuring materials, and ensuring compliance with project specifications and regulations. Furthermore, the prime contractor assumes a significant portion of the project risks, including cost overruns, delays, and quality control issues and enters into a contractual agreement with the owner, which outlines the scope of work, timelines, costs, and other project details (Matthews & Parker, 1999; Bartholomew, 2022).

Multi-prime and single-prime contracting are two distinct approaches in construction project management, each with its own advantages, disadvantages, and typical use cases. In single-prime contracting, the owner contracts with one general contractor (GC) who is responsible for the entire construction project (Zhang et al., 2018). The GC oversees all aspects of the project, including hiring subcontractors, coordinating schedules, and ensuring the work meets specifications. In single-prime contracting, communication is simplified because the client deals with a single point of contact, the GC, simplifying communication and project management (Bartholomew, 2022). The GC assumes responsibility for the entire project, including quality control and scheduling. Consequently, the GC coordinates all subcontractors, potentially leading to more streamlined project completion and efficiency (Alleman et al., 2016). Notably, clients may have less control over subcontractor selection and pricing, potentially leading to higher costs. Additionally, there may be less transparency in subcontractor selection and pricing (Rojas, 2008). The construction of the Thika Road Superhighway is a prime example of single-prime contracting.

The single prime contracting method is characterized by single point of responsibility where the general contractor is solely responsible for managing the entire construction project, streamlined communication, where the owner communicates directly with the GC, and centralized project management as the GC oversees all the project management, including designing, biding, procurement, scheduling, coordination, quality control, and safety management. Additionally, Single-prime contracting are fixed-price contracts and therefore the GC accepts the responsibility of completing the project for a set amount, and assumes the majority of the risk associated with the construction process including cost overruns, delays and quality issues (Bartholomew, 2022). To achieve these, the GC takes charge of coordinating all sub-contractors, suppliers and workers, ensuring that each phase of the project progresses as expected. Lastly, in Single-Prime contracting, the GC, takes responsibility of quality, ensuring that all quality standards are met and that any legal obligation and liabilities binding just the client and the GC (Alleman et al., 2016).

In the construction of the Thika Super Highway, the Kenyan government contracted major construction firms, China Wu Yi, Sinohydro Corporation Limited and Shengli

Engineering as the main contractors for different lots starting from Uhuru highway to Muthaiga roundabout (Lot 1), then from there to Kenyatta University (Lot 2) and finally from Kenyatta University to Thika respectively (Lot 3). The contractors were procured in a DBB following successful design by Aurecon Group, COWI A/S, other local firms, and engineering consultants. These companies managed the entire project in their Lots, subcontracting specific tasks like electrical installations and road markings. This approach simplified management and allowed for a focused execution strategy, essential for the project's timely completion (Malii & Irandu, 2013).

In multi-prime contracting, the owner contracts directly with multiple specialty contractors (e.g., electrical, plumbing, HVAC) rather than a single GC. This method can be cost saving because the client have direct control over selecting contractors and negotiating prices. Additionally, greater transparency in the bidding and selection process for each trade. Moreover, since the owners can choose contractors based on specific expertise and performance, quality is potentially improved (Kim, 2017). Kim et al. (2014), however noted that multiple prime contracting attracts complexity of managing and coordinating multiple contractors, which can lead to scheduling conflicts and communication challenges. Additionally, the owner assumes more responsibility for project coordination and risk management (Kim, 2017). The Kibera Slum Upgrading Project in Nairobi illustrates the use of multi-prime contracting. This project aimed to improve housing conditions in one of Africa's largest informal settlements. The government, alongside international agencies like UN-Habitat, directly hired various local contractors for specific tasks, such as housing construction, sanitation infrastructure, and electrical installations. This method allowed the use of specialized contractors familiar with local conditions and needs, promoting better quality and cost management (Flores & Calas, 2011).

In comparison, it is easier for the client because the GC manages everything; however, in multiple -prime contracting, the client or construction manager must be involved more to coordinate multiple contracts. Secondly, in single prime contracting, the GC holds the primary responsibility for the project's success, including risks and liabilities while in multiple prime contracts, the owner shares more risk and responsibility, needing to manage multiple relationships and contracts. Lastly, in single prime

contracts, there is potentially higher costs due to GC markups and less owner control over subcontractor selection while in multiple prime contracting, there is significant potential for cost savings through direct contracts and more control over selection and pricing of subcontractors (Rojas, 2008; Kim et al., 2014). The argument notwithstanding, in general terms, multi prime contracting might wholesomely be cost-saving on the other hand, but only the other, it might be costly, managing the hiring and coordination of several sub-contractors (De Marco & De Marco, 2018).

Kim (2017), in his study, focused on multi-prime contracting, as an alternative to general contractor (Single-prime contract) contracts, in this study, two pilot building projects were executed under Multi-prime contracts with direct owner management. The project performance in relation to construction costs, schedule, defects, and participant satisfaction under the Multi prime contracts was compared to Single Prime (SP) contracting, results from the research shows that there was a reduction in the construction costs but not as much as expected (8% reduction). Schedule and defects were not so different from those under a GC contract.

In another research by Memon et al. (2011), technical factors were found to lead to cost overruns, including lack of experience, the size of the project, mistakes in design, overall price fluctuations, and inaccurate estimations. According to Ofori (2012), the problems affecting Ghanaian contractors and consultants were found to be the same as those noted generally in reports on construction industries in other third-world countries. The challenges identified, particularly influencing the performance of Ghanaian contractors, included a lack of ability to obtain adequate working capital, insufficient organization, inadequate engineering competence, and poor workmanship.

According to Kim (2017), there have been significant debates as to whether the use of MP contracts or GC (single prime) contracts is the most appropriate in road construction projects. Generally, general contractors prefer to apply single-prime contracts, whereas specialty contractors prefer MP contracts. General contractors argue that MP contracts result in higher bidding costs, increased administrative expenses, more change orders, higher claims, and poor quality (Holland, 2020). In contrast, the specialty contractors argue that single-prime contracts result in higher costs and lower quality (Kim, 2017), with GC contracts result in 2.75% - 9.54% higher

costs than MP contracts. Thus, previous research has attempted to determine the quantitative cost differences between MP and GC contracts. According to Dissanayaka and Kumaraswamy (2009), understanding the factors that can impact potential performance allows project managers to focus on managing performance more effectively.

Challenges in the Kenya Roads Construction Sector

In the road sub-sector, the frequency of cost and time overruns across projects in Kenya is significant. As of February 2007, 16.91% (35 out of 207) ongoing projects experienced cost overruns, amounting to Kshs. 7 billion. In terms of time overruns, 184 projects exceeded their originally agreed completion times set at the tender stage. On average, the actual completion time was more than double the time estimated during tendering (World Bank, 2007). Data from KeNHA on a few road construction projects have shown delays in completion. For example, the Rehabilitation and Construction of the Londiani-Fortenan Muhoroni Road (KeNHA 2010) was awarded on April 27, 2010, with a commencement order issued on June 22, 2010. The initial completion period was set at 24 months, with a completion date of July 19, 2012. However, the project was finished 8 months later than planned. Similarly, the Construction of the KCC (Sotik) – Ndanai – Gorgor Road (KeNHA, 2011) also experienced delays. The contract, initially scheduled to commence on September 7, 2011, and conclude by September 6, 2013, had its completion date extended to February 7, 2014, resulting in a time overrun of six months (Muriungi, 2015; Gituro & Mwawasi, 2017). The Homabay-Mbita road, situated in the Homa Bay and Suba Districts of Nyanza in Western Kenya, began construction on February 5, 2010, with an initial completion period of 30 months, targeting an end date of August 3, 2012. However, the completion date was first extended to October 23, 2013, and later further revised to January 13, 2014 (Oloo & Ngugi, 2016; KeNHA, 2013).

Justifications of the Study

The delays, cost overruns, and quality parameters are critical parameters in measurement of performance of prime contract involved in the delivery of the projects because the same have negative impacts not only on the contractors but the clients in

most cases in the government, the users and the environments. It is therefore imperative to examine the contract performance in light of time, cost and quality of output. By so establishing the variations in performance particularly, between single-prime and multi-prime contacting methods, this study aims to put on spotlight what would be the most ideal contracting method for sustainable quality, timeliness and adherence to budget of construction projects not only in Nairobi City County but also in Kenya at large.

1.2 Statement of Problem

Kenya's ambitious infrastructure development agenda, particularly in road construction, is pivotal for fostering economic growth, regional integration, and improved connectivity. Despite the strategic importance of these projects, they are frequently plagued by significant challenges, notably cost overruns, time delays, and inconsistent quality of outputs (Office of the Auditor General Kenya, 2019). These issues not only strain public resources but also impede the timely delivery and sustainability of infrastructure developments. Central to the execution of these projects is the choice of contracting methods, which can significantly influence their performance. Large infrastructure projects, such as the Standard Gauge Railway (SGR) and various road construction initiatives, have consistently faced various challenges. These challenges not only hinder the timely delivery of essential infrastructure but also inflate project costs, thereby impacting economic development and public trust in governmental efficiency (World Bank, 2018, Office of the Auditor General Kenya, 2019). The two common contracting methods employed in Kenya are multi-prime contracting and single-prime contracting.

Several studies and reports highlight the prevalence of cost overruns in Kenya's infrastructure projects. According to a World Bank study on infrastructure in Kenya, cost overruns are a common issue, with projects often exceeding their original budgets by substantial margins. A 2018 report by the African Development Bank (AfDB) indicated that cost overruns in Kenyan road projects could be attributed to factors such as poor project planning, underestimation of project costs, and frequent design changes during project execution (African Development Bank (AfDB) 2018). These inflations not only increase the financial burden on the government but also delay the benefits

that such infrastructure is supposed to deliver to the public. Cost overruns in projects has been attributed to the rise of overheads which are incurred once a project is in delays. The longer a contractor takes on a given project the higher the costs and its costs are directly or indirectly transferred to the client or the developer. This has led to the increase of construction cost (African Development Fund, 2019). Phase I of Standard Guage Railway project for examples was budgeted at approximately $3.2 billion, but the final cost was around $3.8 billion (Otele, 2021, World Bank, 2018, Office of the Auditor General Kenya, 2019).

Quality of output is another critical concern. A report by the Kenya Institute for Public Policy Research and Analysis (KIPPRA) in 2020 pointed out that many road projects suffer from substandard workmanship, leading to roads that deteriorate quickly and require frequent repairs. Factors contributing to quality issues include inadequate supervision, use of substandard materials, and lack of adherence to construction standards. For instance, the Standard Gauge Railway (SGR) project faced criticism over quality concerns, with reports of subpar materials being used, which compromised the longevity and safety of the infrastructure (Kenya Institute for Public Policy Research and Analysis (KIPPRA), 2020).

Most construction contracts in Kenya have suffered extended periods of delivery, operational setbacks and monitoring and control issues (Oloo & Ngugi, 2016, Muriungi, 2015, African Development Fund, 2019). The bigger the project the higher risk to project delays, this adversely affects the project delivery time and may also result to litigation and arbitration issues in the project which might cost to the project implementation as has been the case with Aror Kimwarer Dam project (Odhiambo, 2024).

Despite the theoretical advantages of both approaches of contracting, there remains a significant gap in empirical evidence comparing their actual performance in the Kenyan context. Despite the use of both contracting methods in Kenya, there is a paucity of comprehensive studies comparing their performance outcomes in large road construction projects. Specifically, there is limited empirical evidence on how these methods influence cost efficiency, project timelines, and the quality of completed works. Understanding which approach better mitigates these challenges is crucial for

policymakers, contractors, and stakeholders aiming to enhance the efficiency and quality of Kenya's infrastructure development (Dean, 2012). Kwatsima (2016) conducted a research on the identifying the causes of projects delay in large engineering projects. The study showed that lack of experienced contractor for large projects was one of the main factors. This is an indication of limited contractor capacity to undertake large construction project.

Given the substantial investments in Kenya's road infrastructure, understanding the effectiveness of these contracting strategies is crucial for optimizing project delivery and resource utilization. This study aims to fill this gap by conducting a comparative analysis of multi-prime and single-prime contracting performances in large road construction projects within Nairobi City County, Kenya. By examining cost overruns, time delays, and quality outcomes, this research seeks to identify which contracting method offers superior performance. The findings provide valuable insights for policymakers, construction managers, and stakeholders in the Kenyan infrastructure sector, facilitating better decision-making and strategic planning for future projects.

1.3 Research aims and Objectives

1.3.1 Main Objective

The main aim of this study was to evaluate the performance difference between single prime and multi-prime contracting methods used in large road constructions projects in Kenya.

1.3.2 Specific Objectives of the Study

i. To examine and compare the overall cost performance between multi-prime and single-prime contracting methods in large-scale road construction projects in Nairobi City County in Kenya.
ii. To examine and compare the timeline adherence performance between multi-prime and single-prime contracting methods in large-scale road in Nairobi City County in Kenya.
iii. To investigate and compare the quality performance between multi-prime and single-prime contracting methods in large-scale road construction projects in Nairobi City County in Kenya.

1.4 Research Questions

i. How does the overall cost efficiency of multi-prime contracting compare to that of single-prime contracting in large-scale road construction projects in Nairobi City County in Kenya?
ii. How does the project timeline adherence of multi-prime contracting compare to that of single-prime contracting in large-scale road construction projects in Nairobi City County in Kenya?
iii. How does quality performance of multi-prime contracting compare to that of single-prime contracting in large-scale road construction projects in Nairobi City County in Kenya?

1.5 Justification and Significance of Study

The study intended to investigate the performance difference between multi prime contracting and single prime contracting methods in executing large-scale road construction projects. This research provides an analytics examinations of cost, timeline and quality performance in road construction projects which has always impacted the socio-economic benefits drawn from investments in roads infrastructure. The findings of this study therefore benefits various parties

Government and the Public Sector Clients

The evidence that multi-prime contracting delivers superior cost and quality outcomes provide a data-driven basis of reviewing public procurement policies and guideline, enabling more informed selection of contracting methods for large-scale road infrastructure projects.

Policy Makers

For policy makers, particularly those in the Ministry of Roads and Transport and the Public Procurement Regulatory Authority (PPRA). Can leverage these findings to develop clearer procurement frameworks and standard criteria that guide the selection of contracting methods based on project priorities, whether cost efficiency, quality, or time.

Contractors

For contractors and project managers, the study's revelation that single-prime contracting is more time-efficient while multi-prime delivers better quality outcomes equips industry practitioners with evidence to advise clients more accurately during project panning structure their bids strategically, and align their delivery models with clients expectations.

Scholars and the Academic Community

This study addresses a notable gap in empirical construction management research within the African context, providing a methodological foundation and baseline data upon which future comparative studies, across other Kenyan counties, different project scales, or other Sub-Saharan African Countries, can be built, ultimately contributing to a more nuanced and contextually grounded body of knowledge on construction procurement performance.

1.6 Scope of Study

The study was limited to the comparative analysis of performance of multi-prime and single-prime contracting methods, with a specific focus on cost, timelines and quality with a consideration of projects implemented between 2012 and 2022. The study involved assessment of performance of road projects executed using multi prime and also roads projects executed using single prime contracting. Additionally, the study was confined to Nairobi City County's large-scale road infrastructure construction and sampled road constructions professionals and consultants. The study evaluated their responses to find out between the two contracting methods which one perform better in terms of cost, timeline sand quality.

1.7 Limitations of the Study

This research covered large road projects that have been executed over a fifteen-year period. Due to the limited availability of eligible projects, the coverage area involved selected projects in Nairobi City County only. Additionally, the study relied on self-reported data from road construction professionals and therefore, there was the risk of bias. The study thus employed a structured questionnaire with closed-ended Likert

scale items, which minimizes the opportunity for socially desirable responses compared to open-ended self-reporting.

CHAPTER TWO

LITERATURE REVIEW

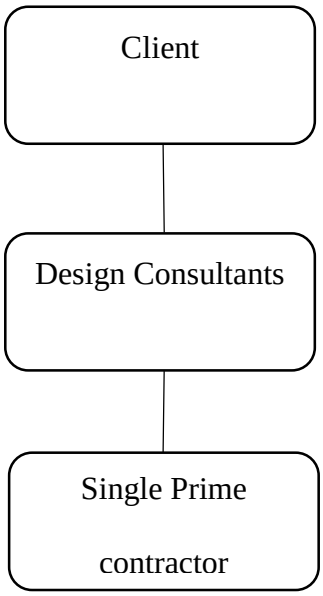
2.1 Introduction

This chapter provides for related theories to multi-prime contracting in the execution of construction projects. It presents the summary of research findings of other researchers who conducted related studies, which also provides a theoretical basis in the discussion of conventional single prime contracting and Multi-prime contracting. The chapter explores the need for multi-prime contracting and the advantages and disadvantages of the two contract delivery methods as documented by other authors.

2.2 Single Prime Contracting

2.2.1 Overview

Single prime (SP) contracting is considered to be predominant in Kenyan construction industry. It is widely known as general contracting. Kim (2017) defines a general contractor (GC) as one responsible for overseeing various trades, or subcontractors performing one trade. The General contractor who is also known as the Main Contractor (MC) is responsible for day-to-day activities for the whole project and the trades and all the sections in the project. In this delivery method the one contractor provides a single point of communication to the design team and responsible for all the sub-contractors and even the various trades in the project. Single prime contracts offer centralization of responsibility in the execution of the contract. In this contract, the client users services of a single contractor (GC) who takes care of all the aspects the project from design to completion. Figure 2.1 represents a simple linear hierarchy of the Single-prime contracting structure with three levels. The first levels, (Clinet) is the project owner who initiates and funds the projects. The second levels (design consultant) is responsible for the design and technical specifications. Lastly, the single prime (bottom) is the one main contractor who holds the primary contract and is responsible for delivering the entire project. The structure suggests a sequential, top-down contractual relationship, where the client engages design consultants separately, and a single prime contractor is appointed to execute the works.



Contractual Relationship/obligation ————

Working Relationship/obligation ----------

Figure 2 1 Single Prime Contracting

2.2.2 Advantages of Single Prime Contracting

Single-prime contracting, where the owner contracts with a single general contractor responsible for the entire project, is a widely used method in the construction industry. This approach has several advantages which impact project execution, management, and outcomes.

One of the most significant advantages of single-prime contracting is the simplification of project management and coordination. The owner deals with only one contractor who is responsible for managing all subcontractors and coordinating their activities. This streamlined coordination reduces the complexity of managing multiple contracts and simplifies the overall administrative process (Rojas, 2008).

Secondly, Single-prime contracting provides clear accountability as the general contractor is solely responsible for the project's delivery, including timelines, costs, and quality. This clarity ensures that there is a single point of responsibility, reducing the likelihood of disputes over who is at fault for delays or quality issues (Riecke,

2004). The owner can hold the general contractor accountable for all aspects of the project, leading to more efficient problem resolution.

Thirdly, with only one contract to manage, the administrative burden on the owner is significantly reduced. This simplification includes fewer procurement processes, contract negotiations, and oversight activities. As a result, the owner can allocate fewer resources to contract management, reducing administrative costs and complexity.

Additionally, in single-prime contracting, the general contractor assumes a significant portion of the project risks, including cost overruns, delays, and quality control. This risk transfer can be advantageous for the owner, who is protected from many of the uncertainties and potential issues that can arise during the construction process. The general contractor is incentivized to manage risks effectively to protect their profit margins and reputation.

In another study, Cakmak and Tas (2014), noted that Single-prime contracts can offer opportunities for cost savings through negotiated pricing. The general contractor can leverage their relationships with subcontractors and suppliers to obtain better rates and discounts. Additionally, the overall project cost can be more predictable, with fewer surprises, as the general contractor consolidates costs and contingencies within a single contract.

Furthermore, single-prime contracting method can lead to a more streamlined project timeline. The general contractor has control over the schedule and sequencing of work, enabling them to optimize the workflow and minimize delays (Riecke, 2004). This control can help ensure that the project is completed on time, as the contractor is motivated to meet the agreed-upon deadlines.

2.2.3 Disadvantages of Single-Prime Contracting

One of the primary disadvantages of single-prime contracting is the potential limitation in specialization. In multi-prime, for example, the specialties of the contractors are predetermined before hiring, but in single prime, the need for specialized trades is not clearly cut out; it is the contractor's responsibility to work around it. This markup can increase the overall cost of the project compared to multi-prime contracting, where

these markups might be lower or eliminated (Cakmak & Tas, 2014). The owner might end up paying a premium for the convenience of single-point responsibility. Single-prime contracting can sometimes result in less competitive pricing. Since the general contractor manages all subcontractor relationships and pricing negotiations, there is less transparency and potentially fewer competitive bids for specific segments of the work. This lack of competition can lead to higher prices compared to a multi-prime approach where each contract is competitively bid. For very large or complex projects, the general contractor's overhead costs can become substantial. These costs include project management, supervision, and administrative expenses, which are all factored into the overall contract price (Rojas, 2008). As the project size and complexity increase, so do these overhead costs, potentially making the single-prime method less cost-effective for large-scale projects.

Second, in a single-prime contract, the owner has less direct control over the selection and management of subcontractors. The general contractor makes these decisions, which may not always align with the owner's preferences or standards (Cakmak & Tas, 2014). This reduction in control can lead to dissatisfaction if the subcontractors do not meet the owner's expectations regarding quality or performance.

The entire project's success heavily depends on the performance of the general contractor. If the general contractor fails to manage the project effectively, it can lead to significant issues such as delays, cost overruns, and quality problems (Riecke, 2004). The owner has limited recourse in such situations, as changing the general contractor mid-project can be complex and costly.

2.3 Multi-prime Contracting

2.3.1 Overview

According to Gordon, (1994) Multi-prime (MP) is defined as more than one contractor holding contracts directly with the owner to perform specific parts of the same project. This is a method where the client or owner hires one designer for the whole project and then have it divided into sub-projects and each is awarded to different single prime contractor.

This is where a client divides a project into portions and then enters into separate contract for each portion. This is where the contractors are hired directly by the client for different project phases either concurrently or consecutively. This method allows for phased construction which make it faster and cheaper. Figure 2.2 summarizes multi-prime contracting. At the top, there is the client, who is the project owner. They hold direct contractual relationship with all parties. The second levels represents the design consultants engaged directly by the client for design and technical oversight. At the base, there are three prime-contractors, each hired directly and independently by the client, typically responsible for different scope or packages of works.

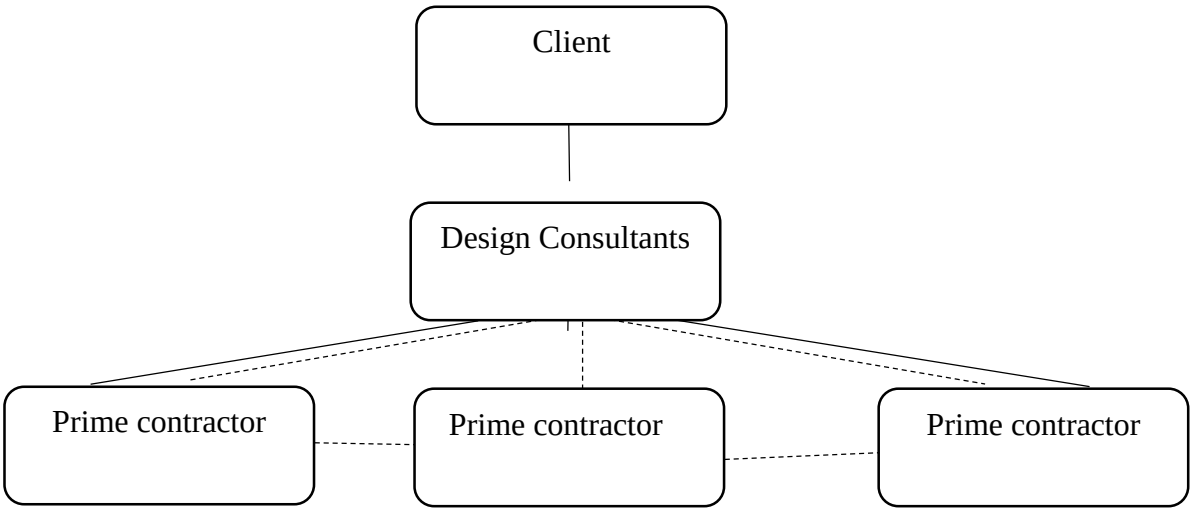


Figure 2.2 Multi Prime Contracting

This method is can be used for projects that are to be delivered speedily. It is one of the best methods that can be employed in the fast-tracking of projects or if there is an emergency situation. There are contractors that are known for various special works which could be a discrete package in an entire project and awarding these contractors separately would ensure that quality and effective project delivery since the contractors would work together though by specialization.

2.3.2 Advantages of Multi-prime Contracting

Multi-prime contracting, a project delivery method where the owner contracts directly with multiple specialty contractors rather than a single general contractor, presents several advantages, especially in large and complex infrastructure projects like road construction. These advantages include enhanced specialization, improved flexibility, potential cost savings, better schedule control, and increased owner involvement.

One of the advantages of multi-prime contracting is the ability of the client to engage contractors who are specialists in their respective fields. This approach ensures that each aspect of the project is handled by experts with specific knowledge and experience in their domain, such as electrical, plumbing, or structural work. Specialized contractors bring a higher level of expertise, which can lead to better quality work and innovative solutions tailored to the unique challenges of the project (Kim, 2017).

Multi-prime contracting provides greater flexibility in managing the project. Since the owner has direct contracts with multiple contractors, adjustments can be made more easily to individual parts of the project without needing to renegotiate a single overarching contract. This flexibility is particularly beneficial in large road construction projects where unforeseen issues such as geological surprises or unexpected utility conflicts may arise (Roth, 2017). The ability to quickly respond to these changes can prevent delays and additional costs.

By directly contracting with specialty contractors, the owner can potentially reduce costs associated with general contractor markups and overheads. In a single-prime contract, the general contractor often includes a markup on the subcontractors' prices to cover their coordination efforts and risk management. In a multi-prime arrangement, these markups can be minimized or eliminated, leading to cost savings. Additionally, competitive bidding for each contract package can drive down prices and ensure that the owner gets the best value for each aspect of the project (Nam & Kim, 2016).

Furthermore, Multi-prime contracting can offer better control over the project schedule. Since the owner directly oversees multiple contractors, they can more effectively coordinate the sequence of work and manage the interdependencies

between different trades. This direct oversight helps in identifying and addressing potential bottlenecks early, ensuring that critical path activities are prioritized and managed efficiently (Kereri & Gad, 2015). Consequently, this method can lead to a more streamlined construction process and timely project completion.

Kim (2017) adds that Multi-prime contracting necessitates a higher level of owner involvement in the project. While this may seem like a disadvantage in terms of increased responsibility, it also means that the owner has greater control over the project's execution. This increased involvement allows the owner to ensure that their specific requirements and standards are met, leading to a final product that aligns more closely with their vision and needs. Additionally, it allows for more direct communication between the owner and the contractors, reducing the likelihood of misunderstandings and miscommunications that can lead to errors and rework.

In a multi-prime contract, risks are more evenly distributed among the contractors (Nam & Kim, 2016). Each contractor is responsible for their own segment of the work, which can lead to a more balanced approach to risk management. If one contractor encounters issues, it is less likely to impact the entire project compared to a single-prime arrangement where the general contractor's problems could have a cascading effect. This distribution of risk can lead to a more resilient project execution plan. With multiple contractors directly accountable to the owner, there is increased transparency and accountability. Each contractor is responsible for their specific part of the project, which can lead to a higher level of commitment and performance. This clear delineation of responsibilities ensures that contractors are more likely to focus on delivering high-quality work within their scope, knowing that their performance is directly observable by the owner (Kim, 2014).

2.3.3 Disadvantages of Multi-prime Contracting

While multi-prime contracting offers several advantages, it also comes with a set of significant challenges that can complicate project management and execution. These disadvantages include increased complexity in coordination, higher administrative burden, potential for disputes, difficulty in managing schedules, higher risk for the owner, potential for scope gaps, and challenges in quality control.

The complexity associated with multi-prime introduces avenues of conflict in project coordination. Managing multiple contractors requires meticulous planning and communication to ensure that each contractor's work is aligned and does not interfere with others. This complexity can lead to scheduling conflicts, overlapping responsibilities, and difficulties in coordinating the sequence of work, especially in large-scale projects like road construction where various trades must work in a synchronized manner (Kim, 2014).

Second, the administrative burden on the owner is significantly higher in a multi-prime contracting arrangement. The owner must manage multiple contracts, which involves more paperwork, procurement processes, and contract negotiations. Each contract requires detailed oversight, including ensuring compliance with terms, monitoring performance, and handling payments (Kim, 2014). This increased administrative workload necessitates a robust project management team with the capability to handle these responsibilities effectively.

Nam and Kim (2016), argues that with multiple contractors working on the same project, the potential for disputes increases. Each contractor may have different interpretations of the project scope, specifications, and timelines, leading to conflicts. Disputes can arise over issues such as delays caused by one contractor affecting another's schedule, disagreements over quality standards, or coordination problems. These conflicts can lead to project delays, additional costs, and, in some cases, legal disputes, further complicating project execution. Consequently, managing the project schedule becomes more challenging with multiple contractors. Coordinating the activities of several contractors to ensure that the project progresses smoothly requires precise scheduling and continuous monitoring. Delays from one contractor can have a cascading effect, causing subsequent delays for other contractors (Gehrig, 2009). The complexity of managing such interdependencies increases the risk of time overruns, which can negate one of the potential benefits of the multi-prime method.

In a multi-prime contracting arrangement, the owner assumes a greater level of risk compared to a single-prime contract. The owner is directly responsible for coordinating all aspects of the project, including resolving conflicts between contractors, managing delays, and ensuring that each contractor's work is completed

on time and within budget. This increased risk requires the owner to have substantial project management expertise and resources to mitigate potential issues effectively (Molenaar et al., 2014).

Another disadvantage is the potential for scope gaps between different contractors. With multiple contracts, there is a risk that some aspects of the work might fall between the cracks if they are not clearly defined in the scope of work for each contractor. These gaps can lead to incomplete work, additional costs to address the missing elements, and disputes over who is responsible for the overlooked tasks. Ensuring that all work is adequately covered requires detailed and thorough contract documentation (Molenaar et al., 2014).

Furthermore, maintaining consistent quality across multiple contractors can be challenging. Each contractor may have different standards, practices, and levels of expertise. Ensuring that all contractors adhere to the same quality standards requires rigorous oversight and frequent inspections (Nam & Kim, 2016). The owner must implement a robust quality control system to monitor the work of each contractor, which can be resource-intensive and time-consuming. Besides this setback, there is need for enhanced management oversight. The owner must either have a highly capable in-house project management team or hire an external construction manager to handle the increased complexity (Mitropoulos & Sanchez, 2016). This additional layer of management adds to the overall cost of the project and can sometimes lead to conflicts over authority and responsibility between the owner's team and the contractors.

2.4 Factors to Consider in Multi-prime Contracting

2.4.1 Scope

Construction megaprojects can be broken down into smaller and more manageable sub-projects. This would assist in facilitating timely execution and completion. Single prime contractors in Kenya, especially the ones involved in large projects, always start the projects and mid-way they feel overwhelmed and the tasks seem insurmountable.

According to Weijde (2008), a well-defined project scope is key to the successful completion of a project as per the required quality and within budget and time limit.

In reference to project management, scope definition is done the pre-planning phase, this effort is proven to be an effective way of increasing the chances of project success while significantly decreasing the risks that could arise during project implementation. It is observed that projects that have a well-defined scope in pre-planning phase are not likely to encounter scope creep, schedule slippages, cost overruns, and poor quality of deliverables (Morris, 2005).

This can be actioned by breaking down the bigger project into smaller subprojects which would make the work more operational towards achieving the required quality of project within budget and time limits or even in a fast track mode. Below are the key steps to in breaking down scope into smaller sections, understand the megaproject considering the cost, budget and timelines, establish step by step activities and tasks in the various subprojects, establish a logical order of completing the sub-projects, develop timelines for completing the activities and tasks in various subprojects and the master project and develop an effective plan that would help you manage the time, cost so as to archive the quality required in the project.

The scope definition of the various sub-projects is key to ensuring that the various contracts and contractors are well managed without facing significant coordination challenges. If Multi-prime contracts are not properly pre-planned and executed, construction delivery could yield cost and schedule overruns due to issues over contractors' responsibilities and disagreements, especially scope of work (Kuprenas & Rosson, 2000). Interfaces in the sub-projects should be well identified during the stage of scoping and well apportioned so as to ensure that there is reduction of conflict during the execution.

2.4.2 Contract Sum of the Project

Contract sum is the amount agreed upon with the contractor and it is entered into a contract. The contract sum or value can be of consideration to look into multi prime contracting especially for government projects. A case where the contract sum would

be too big, the government can decide to break down the project into sections then give it to various contractors so as to help in the distribution of income to a lot of contractors. There are projects that involves large contract sums that if awarded to one contractor there would not be equality or rather wealth

2.4.3 Time Constraints/Concerns

According to Gaturu et al. (2014), the completion of projects in a timely manner is often a critical factor and measure of project success, and the success of any project is highly dependent on its completion time from start to delivery of results. Kariungi (2014) also stated that completion of projects within schedule is a major contribution towards the competitive edge in organizations. This is based on the realization that the achievement of the targeted objectives is determined by the ability to deliver the targeted output within the stipulated time.

It is widespread that most large construction projects suffer extension of time and delay in completion due to contractor failures and having a multi-prime contracting delivery would help mitigate these delays and extension of time (Amoatey & Ankrah, 2017).

2.4.4 Management and Coordination in Multi-prime Contracting

Management and supervision of multi-prime contracting is difficult and the coordination work to ensure that there is a good working relationship among the contractors in executing their respective sub-projects is not easy. For successful results or rather if the project is complex the client could hire a construction manager so as to manage the scope of the various prime contractors. This can also be applied if the client through the design team do not possess the ability to supervise the various contracts (Monti, 1997). For proper planning a construction manager needs to come in during the initiation of the project and ensure that all the necessary measures are taken to deliver the project with little or no conflict and within budget and the expected timeframe (Kuprenas & Rosson, 2000). The construction manager can also introduce internal coordination meetings with the various contractors at various steps of the projects and this would reduce conflict and solve any issues that might arise during the execution of the project (Kim, 2014).

2.5 Contractor Capacity Building

Contractor capacity is the ability to possess all required documents and qualify for the desired category and class of works. This is where the contractor is well equipped with resources that can enable them to carry out a given class of works (Gacheru, 2015). Contractor capacity building is whereby there is an endeavor to ensure that the contractors are endowed with all the required resources so that they can be in a position to undertake various classes of projects. This is also enhancing the skills, knowledge, and abilities of contractor firms.

According to Gacheru (2015), capacity building involves money, material, methods and manpower. It is noted that methods used in undertaking large construction road projects can also enhance capacity building for the contractors. In some types of projects the local and petty contractors have limited capacity to undertake them due to technology, skills, human resource and funds to facilitate the project. Construction methods have been in question on how they intend to increase the contractor capacity since the majority of our contractors do not possess the ability to undertake large projects. Capacity building is very important and to ensure that our construction industry grows then this must be looked into especially in 6the methods of engaging the contractors in the projects. Capacity is enhanced when people or firms come together to share knowledge, technology, skills and resources.

2.6 Multi-prime vs Single-prime

Table 2.1 below summarizes the comparison and contract between multi-prime and single prime contracting methods.

Table 2. 1 Summary of Comparison of Single-prime and Multi-prime Contracting

Dimension	Single-Prime Contracting	Multi-prime contractor
A. CONCEPTUAL/STRUCTURAL DIFFERENCES		
Definition	The client contracts with one general contractor who manages all subcontractors and delivers the entire project	The clients contracts directly and independently with multiple prime contractors, each responsible for a defined scope of work.
Contractual Relationship	The client holds a single contract; all other relationship are between the general contractor and subcontractors.	The client holds multiple simultaneous contracts, one with each prime contractor
Coordination Responsibility	The general contractor bears full responsibility for coordinating all trades and subcontractors	The client (or their representative/project manager) is responsible for coordinating between multiple prime contractors.

Owner Involvement	Relatively low, owner delegates project management and coordination to the general contractor.	High, owner is directly involved in managing multiple contractor relationships and interfaces.
Risk Allocation	Majority of risk (cost, time, quality) is transferred to the general contractor.	Risk is distributed across multiple contractors; owner retains greater coordination and interface risk.
Applicability	Best suited for projects where simplicity, speed of procurement, and risk transfer are priorities.	Best suited for large, complex projects where the owner has strong in-house management capacity
B. STRENGTHS		
Cost Management	Predictable overall cost; general contractor consolidates pricing and contingencies within one contract.	Owner has direct control over individual contract costs; eliminates general contractor markup on subcontractors.
Quality Control	GC is accountable for overall quality; incentivized to maintain standards to protect reputation.	Owner can set and enforce quality standards directly with each prime; greater direct oversight of outcomes.
Accountability	Clear single point of responsibility — easier to assign fault and resolve disputes.	Each prime contractor is directly accountable to the owner for their specific scope.
Administrative Simplicity	Fewer contracts, procurement processes, and negotiations for the owner to manage.	Greater owner control and flexibility to select best-in-class specialists for each work package.

Timeline Control	GC controls scheduling and sequencing, optimizing workflow to meet deadlines (Riecke, 2004).	Owner can run multiple work packages concurrently, potentially accelerating overall delivery.
Specialist Expertise	GC may leverage established subcontractor relationships for efficiency.	Owner can directly appoint the most qualified specialist for each discipline without GC intermediation.
C. WEAKNESSES		
Cost Efficiency	GC markup on subcontractors can increase overall project cost; limited owner visibility into subcontract pricing.	Managing multiple contracts increases owner's administrative and transaction costs.
Quality Outcomes	GC may priorities cost savings over quality when selecting and managing subcontractors.	Coordination failures between multiple primes can result in quality gaps at interface points.
Coordination Risk	GC may not always coordinate subcontractors optimally, leading to hidden inefficiencies.	High coordination burden on the owner; risk of disputes, delays and cost overruns at contractor interfaces.
Owner Control	Owner has limited visibility and control over subcontractors and day-to-day site activities.	Requires a highly capable owner or project management team; unsuitable where owner capacity is limited.
Dispute Resolution	Disputes between subcontractors are managed by GC, but can still escalate and cause delays.	Interface disputes between multiple prime contractors can be complex, costly, and time-consuming to resolve.

Flexibility	Less flexible — scope changes must go through the GC, potentially increasing variation costs.	Greater flexibility to modify individual contracts or replace underperforming contractors without affecting others.
D. COMPARATIVE PERFORMANCE (Evidence from Kenya Study)		
Cost Performance	Less cost-efficient — GC markups and limited competition among subcontractors can inflate costs.	Superior cost performance — direct owner-contractor relationships promote competitive pricing.
Time Performance	More time-efficient — centralized scheduling and single-point coordination reduces timeline variability.	Similar timelines; coordination complexity between primes can offset parallel working advantages.
Quality Performance	Lower quality outcomes relative to multi-prime in large road projects.	Superior quality outcomes — direct owner oversight and specialist contractors raise quality standards.
Overall Performance	Lower overall performance in large-scale road projects in Nairobi City County context.	Higher overall performance in large-scale road projects in Nairobi City County context.

2.7 Challenges Facing Contractors in Kenya

Road construction contractor Kenya operate under considerable financial and operational strain that significantly undermines projects performance and delivery. Chief among these challenges is the persistent problem of delayed payments by the government clients. Delayed payments to contractors have long been identified as a key driver behind stalled road projects, jobs losses, and rising construction costs, forcing many firms to slow down works, retrench staff, or rely on expensive short-term borrowing to stay afloat (Mbua & Sarisar, 2014). The scale of this problem is substantial, accumulated pending bills reached over KSH, 524 by mid-2015, significantly affecting small and medium enterprises and development activity, with 875 contracts stalled across the country (Dawan Africa, 2015). Compounding financial pressure, over seventy percent of road projects initiated in Kenya are likely to escalate in time, with the top causes of delay identified as client payment failures, slow decision-making and bureaucracy within client organization, and inadequate planning and scheduling (Seboru, 2015).

Beyond cash flow challenges, road construction contractors in Kenya also face regulatory,, competitive, and operational hurdles. All contractors, including foreign firms are required with the National Construction Authority (NCA), comply with local content requirements under the Public Procurements and Asset Disposal Act (PPADA), and adhere to environmental and occupational health and safety legislation (ICLG, 2015). Local contractors particularly struggle to compete with well-capitalized foreign firms on large-scale roads projects, while the volatility of construction material prices, including cement, steel, and fuel, further erodes contractor profitability and project budget predictability. These longstanding confidence, and left many firms unable to complete ongoing contracts (Dawa Africa, 2025), underscoring the urgent need for procurement and payment reforms in Kenya’s construction sector.

2.8 Summary and Knowledge Gaps

The literature review examined the conceptual foundation, structural characteristics, and comparative performance of single-prime and multi-prime contracting methods in construction. Single-prime contracting, in which the owner engages one general contractor to manage the entire project, was found to offer notable advantages including simplified coordination, clear accountability, reduced administrative burden, effective risk transfer, and more streamlined project timelines (Riecke, 2004; Rojas, 2008; Cakmak & Tas, 2014). Multi-prime contracting, on the other hand, where the owner contracts directly with multiple specialist prime contractors markups and enabling direct engagements of best-in-class specialists. However, the literature also revealed that multi-prime contracting places a substantially higher coordination and administrative burden on the owner and introduces greater interfaces risk between contractors. As summarized in the comparative table (Table 2.1), the two contracting methods present distinct trade-off across cost, time, quality, accountability, and risk allocation dimensions, with neither method being universally superior. Rather, the choice between them depends on the specific priorities of the project, the capacity of the owner, and the broader procurement environment.

Despite the growing body of literature on construction project delivery and contracting methods globally, a significant knowledge gap exist regarding the comparative performance of single-prime and multi-prime contracting methods, particularly in the context of age-scale road construction projects in developing countries. While existing studies have examined general contractor performance metrics in Western and Asian contexts, empirical evidence specifically comparing how these two contracting methods differ in terms of cost efficiency timeline adherence, and quality outcomes within the Kenya construction environment remains scarce. Kim (2017) for example compared Multi-prime and Single-prime in South Korea (Developed economy) and limited the scope of comparison to Cost. This paucity of context-specific knowledge limits ability of public sector clients, policy makers, and industry practitioners in Kenya to make evidence-based decisions when selecting contracting methods for large-scale road infrastructure projects. It is this gap that the present study sought to address.

2.9 Conceptual Framework

The conceptual framework is an illustration of the relationship between the independent variables (Cost, Time, and Quality of construction works) and the dependent variable (Contract Performance). The framework considered the type of contracting method (multi-prime vs. single-prime) as a moderating variable that might influence the relationship between the independent and dependent variables. The independent variable were project cost, project time and quality. Cost variable measured the extent of cost overruns and the overall budgetary efficiency of the project. Measures the financial efficiency of the project, focusing on cost overruns and adherence to the budget. Time variable assessed the time overruns and the adherence to project timelines. Quality variable evaluated the quality of the construction work, considering factors like durability, compliance with standards, and satisfaction of stakeholders. Contract variable represents the overall success and efficiency of the construction project, encompassing aspects of cost, time, and quality. The moderating variable were the contracting method (multi-prime vs. single-prime) which were considered moderates the relationship between the independent variables and the dependent variable, influencing how cost, time, and quality affect contract performance. Figure 2.1 summarizes the conceptual framework

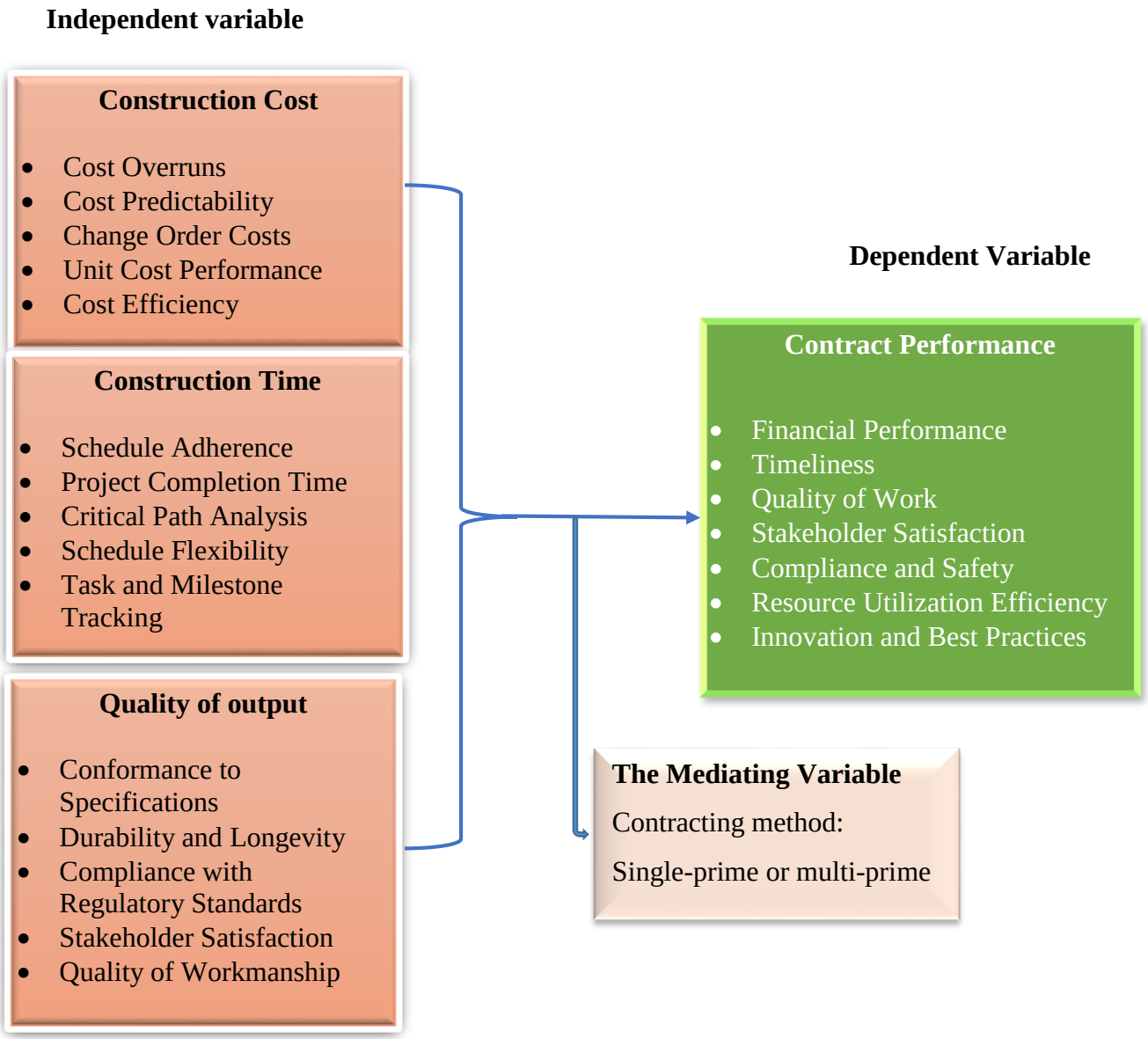


Figure 2.3: Conceptual Frame

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology used to collect data and to analyze it. Specifically, it highlights the research design adopted, study population, the techniques used in sampling, validity and reliability of information.

3.2 Research Design

This study adopted a cross-sectional comparative case study research design A cross-sectional design involved the collection of data from a population or sample at a single point in time, rather than tracking changes over an extended period as would be the case in a longitudinal study (Creswell, 2014). This approach was deemed appropriate for this stud as it allowed the researcher to capture the experiences, perceptions, and documented performance outcomes of road construction professional regarding both single-prime and multi-prime contracting methods within a defined timeframe, without the need for prolonged data collection periods.

The comparative case study dimension of the design refers to the systematic examination and analysis of tow or more cases, in this instance, single-prime and multi-prime contracting methods, with the explicit purpose of identifying similarities, differences, and patterns across the cases (Yin, 2018). Rather than studying one contracting method in isolation, the comparative approach enabled the researcher to draw direct, evidence-based contrasts between the two methods across the performance dimension of cost, time, and quality. Together, the cross-sectional and comparative case study elements provided a robust and structured framework for generating empirical insights into how these contracting methods perform in the specific context of large-scale construction projects in Nairobi City County in Kenya.

3.4 Research Strategy

This research adopted a case study which used quantitative research strategy. For gathering of more information from questionnaires the two strategies was employed so as complement to each other and facilitate in depth evaluation which would not have been covered if only one strategy was employed (Bryman, 2012). This strategy aimed at gathering in-depth information from the respondents and questionnaires

3.5 Population, Sample and Sampling

3.5.1 Target Population

According to Borg et al (2009) target population is a universal set of research of all members of actual or imaginary set of people, events or objects to which an investigator wishes to generalize the result. The target population for this study were large road construction projects that have been constructed using multi-prime contracting and single-prime contacting within Nairobi City County. The population of the research comprised project Engineers from road agencies, Contractor Representatives, Consultants, Administrators, Construction managers, Construction Technicians and Architects in Nairobi City County. According to KURA there have been 26 road construction in Nairobi County between 2012 and 2022, with 14 of them at least 95% completed (Kenya Urban Roads Authority., 2024). Together with the Expressway, there have been at least 27 roads under construction in Nairobi County between 2012 and 2022. This study therefore sampled road construction professionals who have been involved in the projects as identified by KURA. These professionals included Engineers from road agencies, Contractor Representatives, Consultants, Administrators, Construction managers, Construction Technicians and Architects. The study picked the period between 2012 and 2022 so that it is able to realize the sample size, and also get vast scope of experiences cutting across different economic timelines.

3.5.2 Sampling and Sampling Techniques

The research employed convenient sampling, involving purposive and snowball techniques. These techniques allowed the use of cases that have the desired information in regard to the subject matter of the study. Snowball sampling was used to sample the specific individual who were directly involved in the projects. Following the complexity of the scenarios (for completed construction), purposive sampling was adopted to sample the hard-to-reach population (professional who were involved in the completed projects). The contractors (As published by KURA) of the projects were contacted and asked to refer the researcher to the specific professionals of interest. The professionals who were reached to and accepted to participate were also asked for references. This was done until the study exhausted all the participants who were accessible and willing to participate in the study. Kochari (2016) defined a sample as a representative part of a population. According to Ngulube (2003) sampling procedure is the process of selecting a specific number of respondents for a study. In this study the most appropriate sample size calculation technique was Cochran's formula. This formulate was adopted because the targeted population size was indefinite Here's an explanation of Cochran's formula (equation 3.1)

$$n = \frac{z^2 * p(1-p)}{e^2} \quad \text{.....3.1}$$

Where: n = sample size

Z = z-score corresponding to the desired confidence level (1.96 for 95% confidence level)

p = estimated proportion of the population with the attribute in question (= 0.5)

e = desired margin of error (e.g., 0.05 for ±5%)

Cochran's Formula: $n = \frac{1.96^2 * 0.5(1-0.5)}{0.05^2}$

$$n = 384.16$$

The study therefore expected to achieve 385 responses from completed road construction projects in Nairobi between 2012 and 2022. The sample size formulas provided the number of responses that the study would expect in ideal situation. Many researchers commonly add 10% to the sample size to compensate for persons that the researcher might be unable to contact and non-response. In this study however, the sample size was maintained at 385 was distributed as summarized in Table 3.1.

Table 3. 1 Sampling Frame

Category	n	Percentage
Engineers from road agencies	135	34.9
Contractor Representatives	89	23.3
Consultants	54	14.0
Administrators	22	5.8
Construction managers	45	11.6
Construction Technicians	9	2.3
Architects	31	8.1
Total	**385**	**100**

3.6 Data Collection

The researcher used primary data collection method. The data was collected through semi-structured questionnaires from road construction professionals such as Engineers from

road agencies, Contractor Representatives, Consultants, Administrators, Construction managers, Construction Technicians and Architects. The questionnaire included structured and non-structured questions (Refer Appendix II). It was structure to facilitate easier processing and analysis of data.

3.7 Data Analysis

The research generated quantitative data. The Statistical Package for Social Sciences (SPSS) version 26 was used to tabulate the data in a way that allowed analysis. SPSS was suitable since it covers most of statistical and graphical data analysis it has also proven over time to be systematic. Descriptive statistical metrics such as percentages, mean score, and standard deviation and frequencies were used to study the dispersion. Statistical methods were employed to analyze the cost, timeline schedule and comparison of the quality of output of the two contracting methods. Both Mann-Whitney U Test and Independent Sample t-test - Mean differences were employed to examine the performance differences between Single-prime and Multi-prime contracting methods based on the four variables namely, cost overruns, project timelines, quality of output and overall performance. For the analysis, the study used methods and techniques such as narratives, and tables, in the presentation so as to get the meaning of the data and facilitate easy understanding. From the analysis conclusions was drawn and recommendations made.

3.8 Test for Reliability and Validity

Reliability is the extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials (Maxwell, 2012). Reliability ensures that the data collected is consistent and is what it is intended to achieve from the research. This study used the Cronbach's alpha coefficient test to examine the internal consistency of the study tool. To achieve this, pilot test was administered so as to ensure that there was internal consistency and that the respondents would not have any difficulty in responding to the questionnaires. The reliability test statistics are summarized in Table 4.1 and shows

that the four constructs met the reliability test thresholds with regards to the resultant Cronbach's alpha coefficients.

Validity is defined as the degree to which a test or a measuring device is truly measuring what it is supposed to measure. According to Creswell (2013), validity is the degree to which the results are obtained from analysis of data actually represent the phenomenon under study. This study adopted face validity and therefore sought for expert opinion and pilot testing to establish the clarity, and relevance of the questions in the study tool. The experts assessed whether the tool appeared relevant in terms of measurement of what it was intended to measure. Their recommendations were considered employed to revise the few statements in the constructs which seemed to be cloudy.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis of the data that was collected from the various respondents. It presents the analysis and the interpretations of the data in line with the research questions. The data analysis was based on the objectives of the study where the information from the respondents were analyzed so as to establish the difference in performance between single-prime contracting and multi-prime contracting. This data analysis provides the descriptive statistics including means and standard deviation, and inferential statistics.

4.2 Response Rate

While the study expected 385 participants, it however realized 267 participants. Consequently, the study closed data collection with 267 questionnaires having been successfully filled and returned, yielding a response rate of 67.01%. This did met the threshold considered sufficient as recommended by Mugenda and Mugenda, (2013). Accordingly, Mugenda and Mugenda (2013), bigger the sample size yields more accurate the results of analysis. The data collected was analyzed using SPSS (Statistical Package for Social Scientists) version 26. The sample size for the study included 93 Engineer, 6 Manager, 62 Contractors/representatives, 16 Administrators, 31 Architects, 22 Foremen, and, 37 other employees were considered for the study totaling to 267 respondents.

4.3 Reliability Statistics

Reliability analysis was conducted to assess the internal consistency of the constructs used to measured the variable in this study, including contract cost overruns, construct quality performance, and timeline schedules performance as well as contract overall performance. Cronbach's alpha coefficient of 0.7 was used as the reliability threshold, with values closer to 1 indicating perfect reliability. According to Berthoud (2000, pg 169) a minimum level of 0.60 is ‘good’, The Cronbach's alpha for construct *cost overruns* is 0.933, which

indicates excellent reliability. This suggests that the items measuring contract cost overruns have high degree of internal consistency. With a Cronbach's alpha of 0.615, construct time *performance* demonstrates acceptable reliability. This level of internal consistency is generally considered adequate for exploratory research, but further refinement of the scale could enhance its reliability. The Cronbach's alpha for the *quality of construct output* is 0.713, indicating good reliability. This suggests that the items in this construct are consistently measuring the intended concept and are suitable for inclusion in further analysis. A Cronbach's alpha of 0.815 for overall contract performance indicates good reliability. This suggests that the items may not be adequately capturing the construct, and revisions to the scale may be necessary to improve its internal consistency. The results are summarized in Table 4.1.

Table 4. 1: Reliability Test Statistics

Construct	Cronbach's Alpha	N of Items
Contract Cost Overruns	0.933	5
Quality of contract output	0.713	6
Contract time performance	0.615	5
Contract Overall Performance	0.815	5

4.3 Demographic Characteristics of the Respondents

The Table 4.2 below shows how the respondents were distributed by their age, gender, education, years of experience and the type of contracting method employed in the project they represented. The findings show that female respondents were 72 representing 28.2%, male respondents were 177 representing 70.6% while a minority of 1.2% identified with other gender not disclosed. Majority of the participant were aged between 26 and 35 years (31.4%), followed by 36-45 years (23.3%). The age groups 18-25 years and 46-55 years has equal distribution of 17.4%. The study further investigated the highest education achievement of information the respondents, majority of whom were bachelor's degree

holders (45.3%), followed by Masters degree holders (38.4%). 10.5% had doctorate degrees while the minority (5.8%) identified with other education achievements not specified. In terms of years of experience in their trades of practices, majority (38.8%) had had been in their fields for 4-6 years, followed by 1-3 years, (29.4%) and 21.2% who had between 7 and 10 years of experience in valid responses. A small proportion of 10.6% had been in their fields for ten or more years. With regards to the category of the contracting method employed in the projects they worked on, 59.0% represented single prime contracting while 41.0% represented multi prime contracting among the valid responses. From the demographic characteristics, it was observable that the participants were fairly educated and experienced such that they would be adequately informed to understand the two contracting methods under study. According to Oyetunji, and Anderson, (2006), higher level of education and long experience are critical in understanding the dynamics, frameworks, concepts and the landscape in one a professional provides services. The argument positioned is that education and experience are imperative exposes people a large scope of knowledge and understanding necessary for comprehensive.

Observably, majority of the participants (59.0%) represented single prime contracting method, with 41.0% representing multi-prime contracting. This observation indicates that there is a possibility of more preference for single-prime contracting method than multi prime contracting.

Table 4. 2: Distribution by Demographics

		Frequency	Percent	Valid Percent
Age				
Valid	18-25 Years	45	17.4	17.4
	26-35 Years	81	31.4	31.4
	36-45 Years	60	23.3	23.3
	46-55 Years	45	17.4	17.4
	56 and above Years	24	10.5	10.5
	6	3	1.2	1.2
	Total	**258**	**100.0**	100.0
Gender				
Valid	Male	177	68.6	69.4
	Female	72	27.9	28.2
	Other	3	2.3	2.4
	Total	255	98.8	100.0
Missing	System	3	1.2	
Total		**258**	**100.0**	
Education				
Valid	Bachelor's degree	117	45.3	45.3
	Masters's Degree	99	38.4	38.4
	Doctorate	27	10.5	20.9
	Other	15	5.8	5.8
	Total	**258**	**100.0**	**100.0**
Years of Experience in Construction Industry				
Valid	1-3 Years	75	29.1	29.4
	4-6 Years	99	38.4	38.8
	7-10 Years	54	20.9	21.2
	More than 10 Years	27	10.5	10.6
	Total	**255**	**98.8**	**100.0**
Missing	System	3	1.2	
Total		**258**	**100.0**	
Contacting method of the Most recent Project				
Valid	Single Prime	147	57.0	59.0
	Multi prime	102	39.5	41.0
	Total	249	96.5	100.0
Missing	System	9	3.5	
Total		**258**	**100.0**	

4.4.1 Descriptive Statistics

4.4.1.1 Construction Costs

Data about construction costs as perceived by the participants in either single prime or multi-prime contracting was collected on a scale of 1-5 (1- Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree) (Refer to Appendix I) and the results of the score of the participants based on the Likert scale have been summarized in Table 4.3. The results show that "*Cost Overruns,*"

Mean ($\bar{x}$) = 3.30, Standard Deviation (σ) = 1.052, N = 258, suggesting a slight tendency towards agreement that cost overruns occur in the projects. The high standard deviation indicates varied experiences or perceptions among respondents. The mean score, $\bar{x}$= 3.30 for cost overruns suggests that they are a common occurrence in construction projects, regardless of the contracting method. This aligns with the widespread industry challenge of managing project costs effectively.

The mean on "*Cost predictability*" $\bar{x}$ = 3.43, σ = 1.122, N = 258, indicates a moderate level of agreement regarding cost predictability. However, the high standard deviation suggests significant variability in respondents' experiences with predicting costs. With a mean, $\bar{x}$ =3.43 and the highest standard deviation (σ =1.122), cost predictability emerges as a significant challenge. This variability might indicate that some projects are more successful than others in predicting costs accurately, possibly due to project-specific factors or differences in contracting methods.

The mean on the question "*Change Order costs*" $\bar{x}$ = 3.95, σ = 0.766, N = 258 indicates agreement that change order costs are a significant factor. The lower standard deviation suggests more consistency in this perception across respondents. The high mean score ($\bar{x}$=3.95) for change order costs highlights this as a critical factor contributing to cost overruns. This suggests that both Single Prime and Multi-Prime contracting methods face challenges in managing changes to the original scope of work.

On the question of "*Project stayed within expected unit cost*", the mean, $\bar{x}$ = 3.18, σ = 0.959, N = 252 mean suggests a slight tendency towards agreement that projects stay within expected unit costs. The standard deviation indicates some variability in experiences. The mean $\bar{x}$= 3.18 for projects staying within expected unit costs indicates moderate success in this area. However, there's clearly room for improvement in cost control practices. Efficiency of Cost Management Practices $\bar{x}$ = 3.17, σ = 1.020, N = 258. This score indicates a neutral to slightly positive perception of the efficiency of cost management practices. The relatively low mean ($\bar{x}$ =3.17) and high standard deviation (σ=1.020) for the efficiency of cost management practices suggest that respondents have

diverse experiences with cost management effectiveness. This could indicate inconsistencies in the application of cost management strategies across projects or contracting methods.

Table 4. 3: Construction costs

	N	Mean ($\bar{x}$)	Std. Deviation (σ)
The projects have experienced costs overruns	258	3.30	1.052
The costs of the projects have been less predictable	258	3.43	1.122
The change order costs experienced have been significant	258	3.95	.766
The projects have exceeded the expected unit costs	252	3.18	.959
The costs management practices have been efficient	258	3.17	1.020
Construct Mean ($\bar{x}$)		**3.4**	

4.4.1.2 Construction Timelines

The study examined various aspects of construction project timelines using a 5-point Likert scale, where 1 represents "Never" and 5 represents "Always". The results provide insights into the frequency and effectiveness of different project management practices and outcomes. On the question of "*Project Adherence to Planned Schedule*" (Mean, $\bar{x}$= 2.72, SD, σ= 0.766). The mean score of 2.72 suggests that projects adhered to their planned schedules between "Rarely" and "Sometimes". The relatively high standard deviation indicates variability in responses, implying that experiences differ considerably among projects or respondents. On the question of "*Project completion within planned timeframe"* the mean, $\bar{x}$=2.65, SD, σ= 0.589) suggest that the projects are completed within the planned timeframe slightly less often than they adhere to the planned schedule.

The lower standard deviation suggests more consistency in responses for this measure. On the third question, "*Effectiveness of Critical Path Analysis*", the Mean, $\bar{x}$ =2.66, SD, σ= 0.545) suggest that Critical Path Analysis is perceived to be effective between "Rarely" and "Sometimes", with a mean, $\bar{x}$ =2.66. The low standard deviation indicates general agreement among respondents on this point. The fourth question of the construct "*Project Schedule Flexibility*" produced a mean score, $\bar{x}$ =2.58, SD, σ= 0.789) which suggest that project schedules were perceived as flexible "less often" than other measures. The high standard deviation indicates diverse opinions on schedule flexibility. Finally, the question on "*Effectiveness of Task and Milestone Tracking"*, (Mean, $\bar{x}$ =3.08, SD, σ= 0.672), suggested that task and milestone tracking was perceived as effective more "often" than other project management aspects, falling between "Sometimes" and "Often".

The overall mean of 2.7 across all measures indicates that positive project management outcomes and effective practices occur slightly more often than "Rarely" but less often than "Sometimes". This suggests room for improvement in various aspects of construction project management. The effectiveness of task and milestone tracking stands out as the most positively perceived aspect, while project schedule flexibility appears to be the least common. The relatively high standard deviations across most measures indicate considerable variability in project performance in terms of timelines, which could be due to other factors.

These findings highlight the challenges in construction project management, particularly in adhering to schedules. They also suggest that while certain project management tools (like task and milestone tracking) are perceived as more effective, there may be opportunities to improve the application of others, such as critical path analysis.

Further research could explore the factors contributing to the variability in responses and investigate strategies to improve project adherence to schedules and budgets in the construction industry. The results are summarized in Table 4.4.

Table 4. 4: Contract Timelines Performance

	N	Mean ($\bar{x}$)	Std. Deviation (σ)
Project Adhere to Planned Schedule	255	2.72	.766
Project are completed within Planned Timeframe	258	2.65	.589
Effectiveness of Critical Path Analysis	258	2.66	.545
Project Schedule is Flexible	258	2.58	.789
Effectiveness of Task and Milestone Tracking	258	3.08	.672
Construct Mean (x̄)		**2.7**	

4.4.1.3 Quality of Output

This study examined the perceived quality of project outputs under Single Prime and Multi-Prime contracting methods. Data was collected using a 5-point Likert scale (1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly Agree) across six key quality indicators. The results provide valuable insights into the perceived quality outcomes of construction projects under these contracting methods.

On the question of "*Project Incorporated Innovative Practices*", the mean (x̄) = 3.33, Std Dev (σ) = 0.789, N = 258, shows the lowest mean score among all quality measures and indicate neutrality of the participant. The result suggests that participants have a slightly positive view of the incorporation of innovative practices in projects, leaning towards a neutral stance. The notably lower score for innovative practices (3.33) suggests this as an area where both contracting methods might need room for improvement. This could indicate a tendency towards more conservative, tried-and-tested approaches in construction projects, possibly at the expense of innovation.

On the second question "*Project Conforms to Specifications*" The mean, x̄ = 4.01, σ = 0.642, N = 258 indicates strong agreement that projects conform to specifications. The relatively low standard deviation suggests consistency in this perception across respondents. The results of the analysis on the "*Outcomes are Durable and Long-lasting*"

$\bar{x}$ = 4.08, σ = 0.723, N = 258 indicating very strong agreement that project outcomes are perceived as durable and long-lasting. On the question of "*Outcomes Comply with Regulatory Standards*" The mean, $\bar{x}$ = 3.86, σ = 0.722, N = 258 shows that the respondents generally agreed that project outcomes complied with regulatory standards, though less strongly than for specifications conformity and durability. The mean of "*Stakeholder Satisfaction*" question, $\bar{x}$ = 4.02, σ = 0.756, N = 255 also shows strong agreement regarding stakeholder satisfaction with project outcomes, suggesting high perceived quality from a stakeholder perspective. Quality of Workmanship $\bar{x}$ = 4.00, σ = 0.577, N = 255 respondents strongly agree about the high quality of workmanship, with the lowest standard deviation indicating high consistency in this perception.

The highest scores are observed in durability ($\bar{x}$ =4.08), stakeholder satisfaction ($\bar{x}$ =4.02), conformity to specifications ($\bar{x}$ =4.01), and quality of workmanship ($\bar{x}$ =4.00). These represent traditional measures of construction quality and suggest that both contracting methods are perceived to perform well in these fundamental aspects. The overall mean ($\bar{x}$ =3.88) nevertheless indicates that the participants in the study were either neutral and almost agreed that the projects qualities in the two contracting methods were good. Table 4.5 summarizes the results.

Table 4.5: Contract Project Quality Output

	N	**Mean ($\bar{x}$)**	**Std. Deviation (σ)**
Project incorporated Innovative Practices	258	3.33	.789
Project Conform to Specifications	258	4.01	.642
Outcomes are Durable and Long-lasting	258	4.08	.723
Outcomes Comply with Regulatory Standard	258	3.86	.722
Stakeholder Satisfaction	255	4.02	.756
Quality of Workmanship	255	4.00	.577
Mean of Construct		**3.88**	

The high overall quality perception suggests that both Single Prime and Multi-prime contracting methods can deliver high-quality project outcomes. This challenges the notion that one method is inherently superior to the other in terms of quality delivery. While traditional quality aspects are well-addressed, there's a clear opportunity for enhancing innovative practices in construction projects, regardless of the contracting method used. The results indicate that a holistic approach to quality, encompassing technical aspects (durability, specifications), regulatory compliance, and stakeholder satisfaction, is being achieved. The consistency in quality perceptions suggests effective quality management practices are in place. Project managers should focus on maintaining these high standards while exploring ways to foster innovation.

4.4.1.4 Overall Contract Performance

This study evaluated the overall contract performance in construction projects by asking participants to rate various aspects of performance on a Likert scale from 1 (Very Poor) to 5 (Excellent). The aspects assessed included financial performance, time performance, overall quality of output, compliance with safety standards, and utilization of resources. Table 1 summarizes the results, presenting mean scores and standard deviations for each performance aspect. The mean, $\bar{x}$= 3.41 on financial performance indicates that financial performance was rated as "*Moderate*" to "*Good*." The relatively low standard deviation of σ=0.658 suggests consistency in perceptions of financial performance across projects, indicating generally satisfactory financial outcomes. On measurement time performance, the mean, $\bar{x}$=3.00, time performance was rated as "*Moderate*." The standard deviation σ=0.831 points some variability, suggesting that while some projects met time expectations, others experienced delays.

Performance in terms of overall quality of output, mean score $\bar{x}$= 3.67 suggests that the overall quality of output was rated between "*Moderate* " and " *Good* " The standard deviation σ=0.694 reflects moderate variability, indicating that most projects were perceived to deliver high-quality outputs, with some variability in performance. Regrading compliance to safety standards of the outputs, the participants on average

(arithmetic mean), $\bar{x}$= 3.53 indicates that compliance with safety standards was rated between "*Moderate* " and "*Good*." The standard deviation σ=0.781 shows some variability, indicating differences in adherence to safety standards across projects. On utilization of resources with a mean, $\bar{x}$=3.91, resource utilization was rated closest to "*Good*," suggesting efficient and effective use of resources in most projects. The low standard deviation σ=0.625 indicates consistent perceptions of high resource utilization efficiency.

Overall Performance

The average performance, mean, $\bar{x}$=3.504 ratings across all attributes suggest that the construction projects generally performed well, with particular strengths in resource utilization and quality of output. However, there are areas for improvement in time performance and, to a lesser extent, financial performance. The results are summarized in Table 4.5.

Table 4. 6: Overall Contract Performance

	N	Mean	Std. Deviation
Financial Performance	258	3.41	.658
Time performance	255	3.00	.831
Overall Quality of Output	258	3.67	.694
Project's Compliance with Safety standards	255	3.53	.781
Project's Utilization of Resources	258	3.91	.625
Construct Mean (x̄)		**3.504**	

4.4.2 Inferential Statistics

The data on the variables of the study was collected in categories, making them categorical variables measured in ordinal scale. Additionally, the comparison was made between only two groups (Single prime contracting and Multi-prime contracting). Consequently, the

data could not be tested for normality to guide on the sample t-tests. Inferential statistics was thuS executed by running **Mann-Whitney U Test** to compare the performance of the two contracting methods under study based on Construction Costs, Construction Project Timeline, Quality of Project Output and overall contract performance (financial, quality, timeliness, compliance with safety standards and resource utilization). A Mann-Whitney U Test was employed to analyse the data from 83 construction projects (49 Single Prime and 34 Multi prime). The results provide valuable insights into the relative strengths and weaknesses of each contracting method. The analysis was summarized as captured in Table 4.6 and 4.7 below.

Mann-Whitney U Test

Table 4. 7 Mean Ranks

	Contacting method of the Most recent Project	**N**	**Mean Rank**	**Sum of Ranks**
Mean of Construction Costs	Single Prime	147	42.14	6194.58
	Multi prime	102	40.97	4,178.94
	Total	***249***		
Construction Project Timeline	Single Prime	147	39.37	5,787.39
	Multi prime	102	45.79	4,670.58
	Total	***249***		
Quality of Project Output	Single Prime	147	38.91	5719.91
	Multi prime	102	46.46	4,738.92
	Total	***249***		
Overall Contract Performance	Single Prime	147	39.32	5780.04
	Multi prime	102	45.87	4678.74
	Total	**249**		

Table 4. 8 Test Statistics

	Mean of Construction Costs	Construction Project Timeline	Quality of Project Output	Overall Contract Performance
Mann-Whitney U	771.500	704.000	495.000	701.500
Wilcoxon W	2192.260	1929.000	1090.000	1926.680
Z	.572	-1.208	-1.152	1.228
Asymp. Sig. (2-tailed) (p-value)	.017	.227	.002	.019

a. Grouping Variable: Contracting method of the Most recent Project

4.4.2.1 Construction Cost

The analysis revealed a statistically significant difference in construction costs between Single Prime and Multi-prime contracting methods (U = 798.00, z = 0.326, p = 0.017). The mean rank was higher for Single-prime (42.71) compared to Multi prime (40.97), suggesting that Single-rime projects tend to have higher costs. This finding corroborates with some industry assumptions that Multi-prime contracting methods are associated with some cost savings through increased competition among subcontractors. This suggests that organizations need to carefully evaluate the cost implications of their contracting choice and not assume that Multi-prime would automatically lead to lower costs. The results of the study corroborate with some scholarly works. Nam and Kim (2016), for example noted that multi-prime enable the client to directly contract with specialty contractors, and thus they can potentially reduce costs associated with general contractor markups and overheads as compared to single-prime where the single prime contractor negotiates with the multiple specialty contractors. Additionally, competitive bidding for each contract package can drive down prices and ensure that the owner gets the best value for each aspect of the project (Kim, 2017; Alleman et al., 2016).

4.4.2.2 Construction Project Timeline

The analysis indicated no statistically significant difference in project timelines between the two contracting methods (U = 704.000, z = -1.208, p = 0.227). However, the higher mean rank for Multi-prime (45.79) compared to Single-prime (39.37) suggests a trend towards longer timelines in Multi-prime projects, although not reaching statistical significance. This trend aligns with the complexity often associated with managing multiple prime contractors, potentially leading to longer project durations (Kim, 2014). While not statistically significant, the trend towards longer timelines in Multi-prime projects warrants consideration. This could be related to the increased complexity of managing multiple contractors, suggesting that organizations opting for Multi-prime should invest in robust project management practices to mitigate potential delays.

This view is further supported by Sanderson et al. (2018), who argued that centralized scheduling authority vested in a single general contractor under single-prime arrangements enables more efficient sequencing and workflow optimization, theoretically making single-prime contracting more conducive to timeline adherence. Similarly, Beard et al., (2001) noted that the absence of a single coordinating entity in multi-prime projects frequently gives rise to scheduling conflicts and interface delays that cumulatively extent project durations. On the divergent side, however, the lack of statistical significance in the present study's findings challenges the conventional assumptions that single-prime contracting is categorically more time-efficient than multi-prime. Gordon (1994) similarly contended that multi-prime contracting can support faster project delivery by enabling parallel execution of multiple work packages simultaneously, rather than the sequential subcontracting process that a general contractor typically employs.

4.4.2.3 Quality of Project Output

A statistically significant difference was observed in the quality of project output between Single-prime and Multi-prime contracting methods (U = 681.500, z = -1.424, p = 0.002). The significantly lower mean rank for Single-prime (38.91) compared to Multi-prime

(46.46) indicates that Multi-prime contracting is associated with higher quality project outputs. This finding is particularly noteworthy and may be attributed to the competitive determination of the various contactors in Multi-prime contracting, potentially leading to higher quality standards. The significant advantage of Multi-prime contracting in project quality output is a crucial finding. It suggests that organizations prioritizing high-quality deliverables might lean towards Multi-prime contracting. This advantage could be due to clearer lines of responsibility and more dedication to outcompete fellow contractors in the same project.

The findings that multi-prime contracting yields significantly superior quality outcomes compared to single-prime contracting with a higher mean rank of 46.46 against 38.91 for single-prime, both converges with and diverges from existing literature in notable ways. This finding aligns with the position advanced by Rojas (2008), who argued that multi-prime contracting enables owners directly engage specialist contractors for each work packages, resulting in higher technical precision and quality standards than when a general contractor intermediates and potentially prioritizes cost saving over quality in subcontractor selection. Similarly, Konchar and Snvido (1998) observed that projects with more direct owner-contractor engagement tended to produce better quality outcomes, lending support to the present study's finding that the competitive dynamic among multi-prime contractors on the same projects drives each firm to perform at a higher standard to distinguish itself. However, this finding diverges from the perspectives of Kim (2017), who contended that the unified accountability structure of single-prime contracting, where one contractor bears full responsibility for overall projects quality gaps emerging at the interfaces between different contractors. The divergence from this school of through may be explained by the specific context of large-scale road construction, where the technical complexity and scale of discrete work packages demands specialist expertise that a single general contractor's subcontractor management structure may not consistently deliver, thereby giving multi-prime arrangements a distinctive quality advantage in the Kenyan road construction environment.

4.4.2.4 Overall Contract Performance

The difference in overall contract performance between the two methods was statistically significant (U = 701.500, z = -1.228, p = 0.019). Interestingly, despite the seemingly lower quality output, Multi-prime contracting showed a slightly higher mean rank (45.87) compared to Single-prime (39.32) in overall performance, though this difference did not reach statistical significance. This suggests that factors other than quality might be influencing perceptions of overall performance in Multi-prime projects. The significant advantage of Multi-prime contracting in overall performance, combined with its construction costs, presents a strong case for this method. However, this must be balanced against the longer times and lower quality associated with Multi Prime projects.

Independent Sample t-test - Mean differences

This study employed an independent samples t-test to compare Single Prime and Multi-prime contracting methods across four key variables: Construction costs, Construction project timelines, Quality of project output, and Overall contract performance. The sample consisted of 49 Single Prime projects and 34 Multi prime projects. Table 4.9 summarizes the results of the analysis.

Table 4. 9: Group Statistics

	Contacting method of the Most recent Project	N	Mean	Std. Deviation	Std. Error Mean
Mean of Construction Costs	Single Prime	147	3.4286	.5339	.07626
	Multi prime	102	3.3735	.5379	.09224
Construction Project Timeline	Single Prime	147	2.6990	.3311	.04730
	Multi prime	102	2.7990	.3642	.06246
Quality of Project Output	Single Prime	147	3.8449	.3221	.04602
	Multi prime	102	3.9588	.2868	.04918
Overall Contract Performance	Single Prime	147	3.4571	.4743	.06776
	Multi prime	102	3.5632	.4239	.07268

Table 4. 10 Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std.Error Difference	Lower	Upper
Mean of Construction Costs	Equal variances assumed	.034	.854	.461	81	.006	.05504	.11952	-.1828	.7929
	Equal variances not assumed			.460	70.8	.005	.05504	.11969	-.1836	.6930
Construction Project Timeline	Equal variances assumed	.751	.389	-1.299	81	.020	-.10004	.07699	-3.2532	.5531
	Equal variances not assumed			-1.277	66.6	.006	-.10004	.07834	-1.864	.4564
Quality of Project Output	Equal variances assumed	1.515	.222	-1.656	81	.102	-.11393	.06879	-2.2508	.2307
	Equal variances not assumed			-1.691	76.0	.095	-.11393	.06735	-2.2481	.3202
Overall Contract Performance	Equal variances assumed	.465	.497	-1.046	81	.030	-.10609	.10143	-4.3079	.9573
	Equal variances not assumed			-1.068	75.9	.029	-.10609	.09937	-1.3040	.9187

Construct Costs

The analysis of construction costs revealed a statistically significant difference between single prime ($\bar{x}$ = 3.4286, σ = 0.53385) and multi-prime ($\bar{x}$ = 3.3735, σ = 0.53785) contracting methods; t(81) = 0.461, p = 0.006. The mean difference of 0.05504 (95% CI: -0.18277 to 0.29285) indicates that single prime projects had slightly higher construction costs than multi-prime projects. The result suggests that single prime contracting may actually be associated with marginally higher costs, possibly due to the prime contractor's

markup on subcontractor work. This result thus corroborates the Mann-Whitney U test results, which also noted a similar trend.

A study by Cakmak, and Tas (2014), found that Single Prime contracts often resulted in higher costs due to increased markup and overhead. The prime contractor typically adds a markup on all subcontractor work, which can significantly increase the overall project cost. Additionally, Riecke, (2004) argued that Single-prime contracting can reduce competition among subcontractors. The prime contractor often has established relationships with certain subcontractors, potentially leading to less competitive pricing. The same observation has been accounted for by other researchers. Rojas, (2008), and Molenaar and Songer (1998) noted that Single Prime contractors often include a risk premium in their bids to account for the overall project risk they're assuming. Such risk premiums can lead to higher initial bids compared to Multi-prime contracts, where risk is more distributed. Oyetunji and Anderson (2006) added that the lack of direct owner control in Single prime contracts can sometimes lead to increased costs, as owners have less ability to directly influence subcontractor selection and pricing.

For construction managers, these finding imply that the selection of a contracting method should be preceded by a rigorous cost-benefit analysis, as the contracting structure has a demonstrable bearing on the final cost of the project. For policy makers, the finding provides empirical justification for developing procurement guidelines that factors in the cost implications of contracting method selection, particularly for publicly funded road infrastructure projects where fiscal accountability is paramount.

Construct Timelines

Regarding project timelines, a statistically significant difference between single prime ($\bar{x}$ = 2.6990, σ = 0.33108) and multi-prime ($\bar{x}$ = 2.7990, σ = 0.36418) methods; t(81) = -1.299, p = 0.020 it was observed. The mean difference of -0.10004 (95% CI: -0.25323 to 0.45315) indicates that multi-prime projects in our sample tended to take longer timelines. This result suggests that the coordination complexities inherent in multi-prime contracting

may indeed lead to longer project durations. The additional time might be attributed to the need for more extensive coordination among multiple prime contractors and the potential for conflicts or delays at the interfaces between different contractors' scopes of work.

Past researches in the same field have acknowledged the complexity of Multi-prime contracting, justifying the observable trends in longer timelines as compared to single prime contracting. The potential for faster timelines in Single-prime contracting is often attributed to streamlined communication and decision-making processes, as well as the prime contractor's ability to coordinate and optimize the overall schedule (Rojas, 2008). Multi prime contracting on the other hand involves multiple contractors and in most cases with overlapping trades which breaks the seamlessness. This complexity can lead to scheduling conflicts, overlapping responsibilities, and difficulties in coordinating the sequence of work, especially in large-scale projects like road construction where various trades must work in a synchronized manner (Kim, 2014).

For construction managers, this finding underscores the importance of aligning the contracting strategy with project's timelines sensitivity, where strict deadline adherence is critical, the contracting method should be selected with timeline performance evidence in mind. For policy makers in roads infrastructure, the finding suggest that standard procurement frameworks should incorporate time performance benchmarks linked to contracting method selection, especially for road projects with fixed completion deadlines tied to funding conditions or national development targets.

Construct Quality of Output

The analysis of project output quality showed no statistically significant difference between single prime ($\bar{x}$ = 3.8449, σ = 0.32214) and multi-prime ($\bar{x}$ = 3.9588, σ = 0.28675) projects; t(81) = -1.656, p = 0.102. The mean difference of -0.11393 (95% CI: -0.25081 to 0.2307) suggests a slight trend towards higher quality in multi-prime projects, but this difference was not statistically significant. This finding is interesting as it indicates that the contracting method may not significantly impact the final quality of the project output.

It suggests that other factors, such as the expertise of the contractors, the quality of oversight, or the specifications of the project, may have a more substantial influence on the final quality than the contracting method itself.

The findings of this study partly coincide with those of past studies indicating that Multi prime contracting is associated with higher quality of output. Some of the explanation is these studies include the perceived higher degree of specialization in the case Multi prime contracting. Oyetunji and Anderson (2006) found that Multi prime contracting allows for the selection of specialists for each aspect of the project, potentially leading to higher quality in specific areas. Additionally, other studies observed that Multi-prime contracting often involves more direct owner involvement, which can lead to improved alignment with owner quality expectations (Minchin et al., 2013). Moreover, the involvement of multiple prime contractors creates a system of checks and balances, potentially catching and addressing quality issues more effectively (Kim, 2017).

Other studies have, however, noted contrary trends. Konchar and Sanvido (1998), for example, argued that Single prime contracting leads to better quality due to centralized responsibility for the entire project. The prime contractor has a holistic view of the project, potentially leading to better integration of different elements. Molenaar et al. (1999) suggested that Single-prime contracting simplifies quality control processes, as there's a single point of responsibility for overall quality. Having one prime contractor may lead to more consistent application of quality standards across the project (Ibbs et al., 2003).

In the interest of construction managers, these findings imply that quality outcomes are likely influenced by other project-specific factors beyond the contracting structure, such as supervision intensity, contractor competence, material management, and site conditions. For policy makers, these findings cautions against assuming that a change in contracting method with automatically improve quality outcomes, and points instead to the need for robust quality assurance regulations, mandatory inspections, and enforceable quality standards that apply uniformly across all contracting arrangements.

Construct Overall Performance

Lastly the study compared the overall performance based on (financial performance, timeliness, overall quality, resource use and compliance with safety standards). In terms of overall contract performance, the analysis established a statistically significant difference between single prime ($\bar{x}$ = 3.4571, σ = 0.47434) and multi-prime ($\bar{x}$ = 3.5632, σ = 0.42378) methods; t(81) = -1.046, p = 0.030. The mean difference of -0.10609 (95% CI: -0.30790 to 0.9573) indicates that multi-prime contracting demonstrated slightly better overall performance. This result is particularly intriguing as it suggests that despite potentially longer timelines, multi-prime contracting may offer advantages that contribute to better overall project outcomes. These advantages could include more specialized expertise, better risk distribution, or increased owner control over the project.

Comprehensive analysis of single prime and multi-prime contracting methods across four key performance indicators yields several important insights: The significantly lower costs associated with multi-prime contracting challenge prevailing notions about the cost-effectiveness of single prime methods. This could be due to increased competition among prime contractors or the elimination of markup on subcontractor work. While multi-prime projects showed longer timelines, they also demonstrated better overall performance. This suggests a potential trade-off between time efficiency and other performance aspects that project owners should consider. The lack of significant difference in project quality between the two methods indicates that quality outcomes may be more dependent on factors other than the contracting method, such as contractor expertise or project management practices. The superior overall performance of multi-prime contracting, despite longer timelines, suggests that this method may offer advantages in terms of project control, risk management, or specialized expertise that outweigh the time disadvantage. These results highlight the complexity of choosing between single prime and multi-prime contracting. The decision should consider the relative importance of different performance indicators for each specific project.

While this study focused on Single-prime and multi-prime contracting methods, a broader conceptualization of these findings against other established contracting methods further illuminates the comparative performance landscape. In terms of cost performance, Design-Build (DB) contracting has been widely recognized as delivering cost saving through the integration of design and construction responsibilities under one entity. This integration reduces design errors and costly variations during construction (Konchar & Sanvido, 1998); however, the present study study's findings that multi-prime contracting contract packages can be equally be effective in containing costs compared to the integrated but potentially monopolistic pricing structures of Design-Build. Regarding time performance, Construction Management at Risk (CMAR) is generally regarded as the most time-efficient delivery method, as it allows construction to commence before design is fully completed through a fast-tracking approach (Beard et al., 2001). The present study's finding that single-prime contracting is more time-efficient that multi-prime is consistent with this hierarchy, as both single-prime and CMAR share the characteristics of centralized scheduling authority, whereas multi-prime's decentralized structure introduces coordination complexity that can extend timelines. On quality performance, Integrated Project Delivery (IPD), which aligns the Interests of the owner, designer, and contractor through shared risk and reward mechanisms, has been argued to produce the highest quality outcomes of all delivery methods by fostering early collaboration and collective problem solving (American Institute of Architects, 2007). Nonetheless, the present study's findings that multi-prime contracting yields superior quality outcomes compared to single-prime suggest that direct owner oversight and specialist contractor engagement ca n serve as an effective substitute for the collaborative quality-driving mechanisms embedded in IPD, particularly in the Kenyan road construction context where full IPD adoption remains limited by market maturity and contractual framework constrain.

Implications for Project Management

The results highlight the complex trade-offs involved in choosing a contracting method. While Multi prime appears to offer cost advantages and better overall performance ratings, Single Prime excels in quality output. Project managers and stakeholders must carefully weigh these factors based on project priorities. The inverse relationship between quality and cost across the two methods suggests that projects prioritizing high-quality outcomes might lean towards Single Prime contracting, while those with stricter budget constraints might favor Multi prime approaches. The similarity in project timelines suggests that effective management practices can overcome the potential coordination challenges in Multi-prime projects. This emphasizes the importance of strong project management skills, regardless of the contracting method chosen. The discrepancy between quality outputs and overall performance ratings underscores the need for a comprehensive approach to evaluating project performance, considering multiple factors beyond just quality, timeliness or cost.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section of the thesis presents the conclusion made from the findings, the limitations and the recommendation based on the conclusions.

5.2 Conclusion

This study provides empirical evidence on the comparative performance of Single-prime and Multi-prime contracting methods in construction projects. The findings reveal significant differences in costs, quality output, and overall performance, while project timelines remain similar. These results challenge some conventional perception about contracting methods and highlight the complex nature of project success.

Objective I- To contrast the total cost-effectiveness of multi-prime and single-prime contracting approaches in large-scale road construction in Nairobi City County in Kenya.

The study found statistically significant difference between single prime ($\bar{x}$ = 3.4286, σ = 0.53385) and multi-prime ($\bar{x}$ = 3.3735, σ = 0.53785) contracting methods; t(81) = 0.461, p = 0.006. The mean difference of 0.05504 (95% CI: -0.18277 to 0.29285) and the mean ranks was higher for Single-prime (42.71) compared to Multi prime (40.97) indicating that single prime projects were associated with slightly higher construction costs than multi-prime projects. This study therefore concludes that multi-primes preforms better than Single-prime contracting methods in large road construction projects in Nairobi City County-Kenya Nairobi City County.

Objective I- To compare the duration of projects and their adherence to the original timetable using multi-prime and single prime contracting techniques in large roads in Nairobi, county Kenya

The study found that Single-prime contracting took relatively shorter time (Mean rank =39.37) compared to multi-prime contracting (mean rank 45.79), suggests a trend towards longer timelines in Multi-prime projects. Independent sample t-test found a statistically significant difference between Single-prime ($\bar{x}$ = 2.6990, σ = 0.33108) and multi-prime ($\bar{x}$ = 2.7990, σ = 0.36418) methods; t (81) = -1.299, p = 0.020. The study therefore concludes that Single-prime contracting method is more time efficient as compared to Multi prime contracting method.

Objective III – To examine the performance results and work quality achieved using multi-prime and Single-prime contracting techniques on large road construction projects in Nairobi City County, Kenya

This study found significantly lower mean rank for Single-prime (38.91) compared to Multi-prime (46.46) ((U = 681.500, z = -1.424, p = 0.002) indicating that Multi-prime contracting is associated with higher quality project outputs. The study therefore conclude that Multi prime contracting methods is superior in quality outcomes than Single prime.

The conclusions of this study notwithstanding, the choice between Single-prime and Multi-prime contracting should be based on a careful consideration of project priorities, balancing the need for quality outputs against cost constraints and overall performance expectations. The study underscores the importance of aligning contracting methods with specific project goals and organizational capabilities.

These findings contribute significantly to the body of knowledge in construction management and offer valuable insights for project managers, stakeholders, and policymakers in the construction industry. Future research directions suggested by this study could further refine our understanding of the nuanced impacts of contracting

methods on project outcomes, ultimately leading to more informed decision-making in the construction industry.

5.3 Recommendations

5.3.1 Recommendations from Study

This finding of this study generates practical recommendations directed at key stakeholders in the road construction industry in Kenya. First, given that multi-prime constructing demonstrated superior cost and quality performance outcomes, the Kenya National Highways Authority (KeNHA), Kenya Rural Roads Authority (KeRRA), and Kenya Urban Roads Authority (KURA) should consider adopting multi-prime contracting as the preferred procurement approach for large-scale road construction projects, particularly there cost efficiency and quality of output are the primary performance priorities. However, this recommendation must be accompanied by a parallel investment in strengthening the owner's internal project management and coordination capacity, since multi-prime contracting places a significantly higher coordination burden on the client organization.

Second, since single-prime contracting demonstrated superior time efficiency, public roads agencies should consider retaining single-prime contracting arrangements for projects where strict deadline adherence is non-negotiable, such as projects tied to donor funding disbursement timelines, election-cycle commitments, or time-sensitive national development milestones. This suggests that a hybrid, context-sensitive procurement policy is more appropriate than a universal preference for either method.

Third, the Public Procurement Regulatory Authority (PPPA) should review and revise existing public procurement guidelines to incorporate explicit, evidence-based criteria for contracting methods selection in road construction. Current procurement frameworks in Kenya do not adequate differentiate between contracting methods based on project-specific performance priorities, and this study's findings provide a compelling emperical basis for such reform. Procurement guidelines should specify the conditions, project size,

complexity, owner capacity, performance priorities, under which each contracting method is most appropriate.

Additionally, road construction clients adopting multi-prime contracting should invest in dedicated project management offices (PMOs) or engage experience construction management firms to oversee contractor coordination, interface management, and scheduling. The study's findings that multi-prime projects trend towards longer timelines, even is not statistically significant, suggest that coordination risk is real concern that must be proactively managed through structured governance arrangements.

Lastly, contractors operating under multi-prime arrangements should develop robust internal quality management systems and invest in staff capacity to meet the higher quality standards that direct owner oversight demands. The competitive dynamic inherent in multi-prime contracting, where multi-prime contractors work alongside each other on the same project, should be leveraged as a performance driver rather than a source of conflict.

5.3.2 Recommendations for Future Studies

Third, future studies should investigate the moderating role of owner capacity on the relationship between contracting method and project performance. This study's findings suggest that the effectiveness of multi-prime contracting may be contingent on the project management capability of the client organization, yet this variable was not explicitly measured. A study that directly tests owner capacity as a moderating variable would add significant theoretical and practical value.

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APPENDICES

Appendix I: Research Questionnaire

Section A: Demographic Information

1. **Age:**

- ☐ 18-25 [ ]
- ☐ 26-35 [ ]
- ☐ 36-45 [ ]
- ☐ 46-55 [ ]
- ☐ 56 and above [ ]

2. **Gender:**

- ☐ Male [ ]
- ☐ Female [ ]
- ☐ Other [ ]

3. **Highest Level of Education:**

- ☐ High School [ ]
- ☐ Diploma [ ]
- ☐ Bachelor's Degree [ ]
- ☐ Master's Degree [ ]
- ☐ Doctorate [ ]
- ☐ Other (please specify): _____

4. **Years of Experience in Construction Industry:**

- ☐ Less than 1 year [ ]
- ☐ 1-3 years [ ]
- ☐ 4-6 years [ ]
- ☐ 7-10 years [ ]
- ☐ More than 10 years [ ]

Which type of contract have you been working under

Single prime contracting [ ]

Multi prime contracting [ ]

Section B: Construction Cost

On a scale pf 1-5 (1- Strongly agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly disagree), how would you rate the statements below in regards to the contract under which you have worked in your last project

	1	2	3	4	5	Mean
The projects have experienced costs overruns	24	48	84	30	24	
The costs of the projects have been predictable						
The change order costs experienced have been significant						
The projects have stayed within the expected unit costs						
The costs management practices have been efficient						
mean						

Section C: Construction Time

On a scale pf 1-5 (1- Never, 2= Rarely, 3=Sometimes, 4=Often and 5=Always), how would you rate the statements below in regards to the contract under which you have worked in your last project

	1	2	3	4	5
The projects adheres to the planned schedule					
The projects were completed within planned timeframe					
Critical Path Analysis is used in the projects					
The projects have stayed within the expected unit costs					
The schedules of the project is accommodative of changes					
Tasks and Milestones are effectively tracked					

Section D: Quality of Output

On a scale of 1-5 (1- Strongly agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly disagree), how would you rate the statements below in regards to the quality of the outcomes of the contract under which you have worked in your last project

	1	2	3	4	5
The project effectively incorporated innovative practices					
The projects conformed to the specified quality requirements					
The outcomes of the projects are durable and long lasting					
The project complied with regulatory standards					
The stakeholders of the project are satisfied with the outcomes					
The quality of workmanship was up to standards					

Section E: Contract Overall Performance

On a scale of 1-5 (1= Very Poor, 2=Poor, 3=Moderate, 4=Good, and 5=Excellent), how would you rate the statements below in regards to the contract performance of the contract under which you have worked in your last project

	1	2	3	4	5
The project's financial performance was ……..					
The project's timeliness was …….					
The project's overall quality was …….					
The project's compliance with Safety was …….					
The project's utilization of resources was …….					

Appendix II: Transmittal Letter

INTRODUCTORY LETTER

Date: 21/01/2018

Dear Sir,

RE: MSc. COMPARATIVE STUDY OF MULTI PRIME AND SINGLE PRIME CONTRACTING PERFORMANCE IN LARGE ROAD CONSTRUCTION PROJECTS IN KENYA

I am a student at the Jomo Kenyatta University of Agriculture and Technology in the Department of SMARTEC pursuing an MSc Construction Engineering and Management and currently conducting a research titled '***Comparative study of multi prime and single prime contracting performance in large road construction projects in Kenya***'

The main aim of this study is to determine whether multiple prime contracting was the best delivery method for road projects in Kenya.

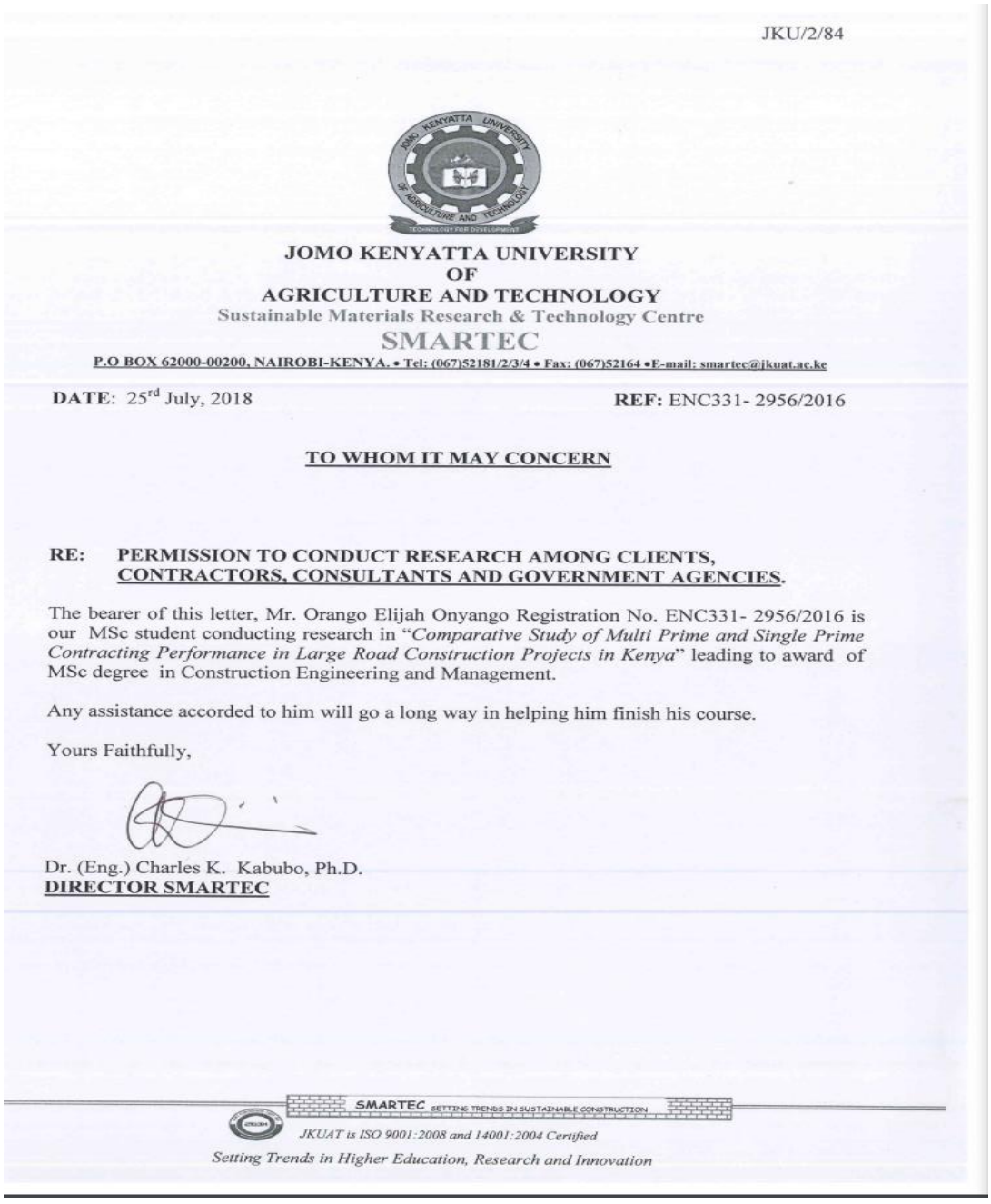
Kindly answer the questions in the attached questionnaire as objectively as possible. Indicate your answer to each question by filling in the space provided or ticking in the correct answer as appropriate. All the information gathered here will be treated in confidence and will be used for academic purposes only.

Thank you in advance for your kind cooperation and time.

Yours faithfully,

Elijah Orango (Reg. No: ENC-331/2956/2016) – Cell phone No. 0753 082 150

Appendix IV: Introduction Letter



JKU/2/84

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DATE: 25rd July, 2018 **REF:** ENC331- 2956/2016

TO WHOM IT MAY CONCERN

RE: PERMISSION TO CONDUCT RESEARCH AMONG CLIENTS, CONTRACTORS, CONSULTANTS AND GOVERNMENT AGENCIES.

The bearer of this letter, Mr. Orango Elijah Onyango Registration No. ENC331- 2956/2016 is our MSc student conducting research in "*Comparative Study of Multi Prime and Single Prime Contracting Performance in Large Road Construction Projects in Kenya*" leading to award of MSc degree in Construction Engineering and Management.

Any assistance accorded to him will go a long way in helping him finish his course.

Yours Faithfully,

Dr. (Eng.) Charles K. Kabubo, Ph.D.
DIRECTOR SMARTEC

SMARTEC SETTING TRENDS IN SUSTAINABLE CONSTRUCTION
JKUAT is ISO 9001:2008 and 14001:2004 Certified
Setting Trends in Higher Education, Research and Innovation

Appendix V: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **493088**

Date of Issue: **11/July/2024**

RESEARCH LICENSE

This is to Certify that Mr.. ORANGO Onyango ELIJAH of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Baringo, Bomet, Bungoma, Busia, Elgeyo-Marakwet, Embu, Garissa, Homabay, Isiolo, Kajiado, Kakamega, Kericho, Kiambu, Kilifi, Kirinyaga, Kisii, Kisumu, Kitui, Kwale, Laikipia, Lamu, Machakos, Makueni, Mandera, Marsabit, Meru, Migori, Mombasa, Muranga, Nairobi, Nakuru, Nandi, Narok, Nyamira, Nyandarua, Nyeri, Samburu, Siaya, Taita-Taveta, Tanariver, Tharaka-Nithi, Transnzoia, Turkana, Uasin-Gishu, Vihiga, Wajir, Westpokot on the topic: Comparative study of multi prime and single prime contracting performance in large road construction project in Kenya for the period ending : 11/July/2025.

License No: **NACOSTI/P/24/37269**

493088

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

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