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*Original Article*

# Single-Prime versus Multi-Prime Contracting: Impact on Performance Metrics in Road Infrastructure Projects - A Kenyan Case Study

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## ABSTRACT

This study explored the difference in performance metrics between single-prime contracting methods and multi-prime contracting methods in terms of Cost and overall performance (project's financial, timeliness, overall quality, compliance with Safety and utilization of resources) as they are used in road infrastructure in Nairobi City County in Kenya. The study employed primary data collection using a Semi-structured Likert-Scaled questionnaire to collect data from professionals who have been involved in both contracting and methods of road construction in the County over the past 10 years. The study targeted a sample size of 385 out of which 267 respondents (69.4%) participated in the study. Purposive and snowball sampling methods were used to recruit and select the study participants. The Cronbach's alpha for contract cost overruns is 0.933, indicating the excellent reliability of the tool used to collect the data. With a Cronbach's alpha of 0.615, overall contract performance demonstrated acceptable reliability. Inferential analysis of data collected 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-prime projects tend to have higher 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 study concludes that multi-primes perform 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.

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## INTRODUCTION

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 [1]. The 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 [2].

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. 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 [3]. 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. 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 [4].

The single-prime contracting method is characterized by a 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 scheduling, coordination quality control and safety management. Additionally, single-prime contracting are fixed-price contract 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 [3]. 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.

 

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Lastly, in single-prime contracting, the GC, takes responsibility for quality, ensuring that all quality standards are met and that any legal obligation and liabilities bind just the client and the GC.

Conceptually and in practice, single-prime contracting differs from the Design-Bid-Build (DBB) concept in that DBB is a traditional project delivery method where the project is divided into three distinct phases: design, bid, and build. The owner first hires a designer to complete the design. Once the design is complete, the project is put out to bid, and a separate contractor is selected to build the project. In this approach, the design is completed before the construction phase begins, the owner holds separate contracts with the designer and the contractor and the construction contractor's bid is based on a complete set of construction documents [5]. The main difference between the two concepts is that in prime contracting, a single contract binds the owner and the prime contractor, whereas DBB involves separate contracts for design and construction. In terms of project management in prime contracting, the prime contractor manages all aspects of the project, while in DBB, the owner or a project manager often coordinates between the designer and the contractor. Prime contracting can offer more flexibility in managing changes during construction compared to the fixed nature of DBB.

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). 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 [6].

In multi-prime contracting, the owner contracts directly with multiple speciality contractors (e.g., electrical, plumbing) rather than a single GC. The owner or a construction manager typically coordinates the work of these contractors. This method can be cost-saving because the client has 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 [7]. According to [8] however note that multiple prime (MP) contracting attracts the 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 [7]. 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 (United Nations 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 [9].

Notably, multi-prime contracting differs from management contracting, in the sense that in management contracting, the owner hires a construction manager to oversee the entire project who is responsible for managing the construction process and hiring subcontractors on behalf of the owner. The owner holds contracts with the management contractor and possibly with the trade contractors. The management contractor acts as an agent of the owner, providing expertise and oversight. The owner or the manager may hold direct contracts with subcontractors. The main difference therefore lies. The fact is that in multi-prime contracting, the owner holds multiple contracts with speciality contractors, while in management contracting, the owner primarily contracts with a management contractor who then

 

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manages subcontractors. Additionally, in management contracting, the management contractor plays a more comprehensive role in overseeing the entire construction process, often from the design phase through completion. In multi-prime contracting, the owner or a construction manager takes on this coordination role. Multi-prime contracting provides the owner with more direct control over individual contractors but requires more coordination effort. Management contracting centralizes coordination under the management contractor, potentially simplifying management for the owner [7].

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 [10]. 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 delays and budget escalations. 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 [10]. The two primary 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 [11]. These overruns not only increase the financial burden on the government but also delay the benefits that such infrastructure is supposed to deliver to the public. 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 SGR project faced criticism over quality concerns, with reports of subpar materials being used, which compromised the longevity and safety of the infrastructure [12].

Despite the extensive 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. 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 aimed 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. The main objective was therefore to determine whether single-prime or multiple-prime contracting can mitigate cost overruns by road contractors in 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

 

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sector, facilitating better decision-making and strategic planning for future projects.

## LITERATURE REVIEW

Infrastructural developments in Kenya have been at their peak and this has led to the rise of large construction projects in the country, especially in Nairobi. Due to this boom in construction, there has been a 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 the delivery of various large projects and this has resulted in an increase in construction costs and even further having an impact on the quality [13]. This can partly be attributed to the contracting method employed in the execution of the projects [14, 15]. 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 [11]. Notably, the project was implemented through a single-prime contracting of three contractors.

Most of the large infrastructural developments are Vision 2030 flagship projects and to realize this a mechanism must be put in place to ensure that the projects are delivered within the budget. Single-prime contracting has been the prevalent conventional way of contracting method in Kenya [16]. This is where the client or the developer chooses one contractor to execute the various phases of the work. Due to the rise in upcoming large construction projects, there has been a need to have the projects delivered on time and within the expected costs and quality of output.

Research carried out by [7] focused on multi-prime contracting, as an alternative to general contractor 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 a general contractor contract which is single-prime (SP) contracting, results from the research show that there was a reduction in the construction costs but not as much as expected (8% reduction). The schedule and defects were not so different from those under a GC contract.

Research carried out by [17] shows that technical factors lead to cost overruns, including lack of experience, the size of the project, mistakes in design, overall price fluctuations, and inaccurate estimations. It is noted that the size of the project would lead to cost overruns and the contracting methods can facilitate addressing these issues. According to [18], 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 include lack of ability to obtain adequate working capital, insufficient organization, inadequate engineering competence and poor workmanship. It is evident that from this study that lack of capacity would lead to poor performance thus finding a contracting method that would remedy this situation.

According to [7], there have been significant debates as to whether the use of MP contracts or GC contracts is the most appropriate in construction projects. Generally, general contractors prefer to apply GC contracts, whereas speciality 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 [19]. In contrast, the speciality contractors argue that GC contracts result in higher costs and lower quality [7], with GC contracts resulting 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 [20], understanding the factors that can impact potential performance allows project managers to focus on managing performance more effectively.

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

 

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of 207) of 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. 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 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 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 [13, 21]. Time and cost overruns in road construction projects in Kenya under Kenya National Highways Authority. 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 [22].

The delays and cost overruns are critical parameters in the measurement of the performance of prime contracts 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 the budget of construction projects not only in Nairobi City County but also in Kenya at large.

## MATERIALS AND METHODOLOGY

This research was designed to evaluate the project that has been undertaken with the two-contracting method. To have proper analysis data collected from more than one respondent in any selected case, the participants are to have met the required experience and knowledge with the issues of research.

The population of the research comprised project Architects of active construction projects, Project Engineers and Project Managers in Nairobi City County. According to KURA there have been 26 road construction in Nairobi Cunty in the last between 2012 and 2022, with 14 of them at least 95% completed [23]. 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 will include Engineers from road agencies, Contractor Representatives, Consultants, Administrators, Construction managers, Construction Technicians and Architects.

The research employed purposive, snowball and convenient sampling since it allowed for the use of cases that have desired information in regard to the aims of the study. Snowball sampling was used to sample the specific individuals who were directly involved in the projects. Following the complexity of the scenarios (for completed construction), convenient sampling was adopted to sample the hard-to-reach population (professionals 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 professional 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. Case study sampling was also used as an

 

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investigative mechanism so as to identify the suitable method of contracting. [24], defined a sample as a representative part of a population. According to [25], the sampling procedure is the process of selecting a specific number of respondents for a study. In this study, the most appropriate sampling technique is Cochran's formula. Here's an explanation of Cochran's formula and how to use it:

Cochran's Formula: n= $\frac{z^2 * p(1-p)}{e^2}$

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 ≈385

The study therefore expected to achieve 385 responses from completed road construction projects in Nairobi between 2012 and 2022

**Table 1: Sampling Framework**

| 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** |

While the study expected 385 participants, only 267 participants were willing and ready to participate in the study without coercion. Therefore, 267 questionnaires were successfully filled and returned, yielding a response rate of 67.01%. According to [26], although a bigger sample size yields more accurate results of analysis, 50% is adequate. The data collected was analyzed using SPSS (Statistical Package for Social Scientists) version 26. The sample size for the study included 93 Engineers, 6 Managers, 62 Contractors/representatives, 16 Administrators, 31 Architects, 22 Foremen, and 37 Other employees were considered for the study totalling 267 respondents.

## RESULTS AND DISCUSSION

The Cronbach's alpha for contract *cost overruns* is 0.933, which indicates excellent reliability. This suggests that the items measuring contract cost overruns have a high degree of internal consistency. With a Cronbach's alpha of 0.615, construct *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.

**Table 2: Reliability Test Statistics**

| Construct | Cronbach's Alpha | N of Items |
|---|---|---|
| Contract Cost Overruns | 0.933 | 5 |
| Contract Performance | 0.615 | 5 |

### Demographic Characteristics of Participants

The findings show that female respondents were 72 representing 28.2%, male respondents were 177 representing 69.4% while a minority of 2.4% identified with other gender not disclosed. The majority of the participants were aged between 26 and 35 years (31.4%), followed by 36-45 years

 

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(23.3%). The age groups 18-25 years and 46-55 years had equal distribution of 17.4%. The study further investigated the highest education achievement of information the respondents, the 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, the majority (38.8%) 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 invalid 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 [27], a higher level of education and long experience are critical in understanding the dynamics, frameworks, concepts and the landscape in which a professional provides services. The argument positioned is that education and experience are imperative because they expose people to a large scope of knowledge and understanding necessary for comprehensive acumen.

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

**Table 3: Demographic Characteristics of Participants**

| | | 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 the 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** |

 

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| | | Frequency | Percent | Valid Percent |
|---|---|---|---|---|
| **Age** | | | | |
| 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** | |

**Descriptive Statistics**

***Cost Performance***

Data collected on 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 below. The results show that "*Cost Overruns*" Mean ($\bar{x}$) = 3.30, Standard Deviation ($\sigma$) = 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, $\sigma$ = 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 (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, $\sigma$ = 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, $\sigma$ = 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, $\sigma$ = 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 ($\sigma$=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. The results were summarized as covered in Table 4 below.

 

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**Table 4 Construction Costs**

| | N | Mean ($\bar{x}$) | Std. Deviation (σ) |
|---|---|---|---|
| The projects have experienced cost 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 cost management practices have been efficient | 258 | 3.17 | 1.020 |
| **Construct Mean ($\bar{x}$)** | | **3.4** | |

***Overall 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 to 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. Regarding compliance with 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.

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 5.

**Table 5: Overall Contract Performance**

| | N | Mean | Std. Deviation |
|---|---|---|---|
| Financial Performance | 258 | 3.41 | 0.658 |
| Time performance | 255 | 3.00 | 0.831 |
| Overall Quality of Output | 258 | 3.67 | 0.694 |
| Project's Compliance with Safety Standards | 255 | 3.53 | 0.781 |
| Project's Utilization of Resources | 258 | 3.91 | 0.625 |
| **Construct Mean ($\bar{x}$)** | | 3.504 | |

 

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**Inferential Statistical Analysis**

***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-prime projects tend to have higher costs. This finding corroborates 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 [4, 27 ].

**Table 6: Mann-Whitney U Test-Ranks**

| | Contacting Method of the Most Recent Project | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| Mean of Construction Costs | Single-prime | 147 | 42.14 | 6,194.58 |
| | Multi-prime | 102 | 40.97 | 4,178.94 |
| | ***Total*** | ***249*** | | |
| Overall Contract Performance | Single-prime | 147 | 39.32 | 5,780.04 |
| | Multi-prime | 102 | 45.87 | 4678.74 |
| | **Total** | **249** | | |

**Table 7: Mann-Whitney U Test-Statistics**

| | Mean of Construction Costs | Overall Contract Performance |
|---|---|---|
| Mann-Whitney U | 771.500 | 701.500 |
| Wilcoxon W | 2192.260 | 1,926.680 |
| Z | 0.572 | 1.228 |
| Asymp. Sig. (2-tailed) | 0.017 | 0.019 |

**Overall Contract Performance**

***Independent Sample t-test - Mean differences***

This study employed an independent samples t-test to compare single-prime and multi-prime contracting methods across two key variables: Construction costs, and Overall contract performance. The sample consisted of 49 single-prime projects and 34 multi-prime projects. Table 8 summarizes the results of the analysis.

**Table 8: 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 | 0.5339 | 0.07626 |
| | Multi-prime | 102 | 3.3735 | 0.5379 | 0.09224 |
| Overall Contract Performance | Single-prime | 147 | 3.4571 | 0.4743 | 0.06776 |
| | Multi-prime | 102 | 3.5632 | 0.4239 | 0.07268 |

**Contract 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.

 

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A study by [28] in the Journal of Civil Engineering and Architecture 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, [29] 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, [4] Journal of Construction Engineering and Management, and [30] in the Journal of Management in Engineering 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 [27] 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.

**Contract 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 0.09572) 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 [30]. 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 [31]. 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. The results of the analysis are summarized in Table 9.

 

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**Table 9: Independent Sample t-Test Statistics**

| | | 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 Diff. | Std. Error Diff. | Lower | Upper |
| Mean of Construction Costs | Equal variances assumed | 0.034 | 0.854 | 0.461 | 81 | 0.006 | 0.05504 | 0.11952 | -0.1828 | 0.2929 |
| | Equal variances are not assumed. | | | 0.460 | 70.795 | 0.005 | 0.05504 | 0.11969 | -0.1836 | 0.2930 |
| Overall Contract Performance | Equal variances assumed | 0.465 | 0.497 | -1.046 | 81 | 0.030 | -0.10609 | 0.10143 | -0.3079 | 0.0957 |
| | Equal variances are not assumed. | | | -1.068 | 75.886 | 0.029 | -0.10609 | 0.09937 | -0.3040 | 0.0918 |

## CONCLUSIONS AND RECOMMENDATIONS

On objective I, this study concludes that multi-primes perform 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. The conclusions of this study notwithstanding, the choice between single-prime and multi-prime contracting should be based on 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.

This study recommends that in the wake of increasing road construction projects being launched in the country, deliberate consideration should be made to evaluate all the aspects of road infrastructure so that the best contracting methods are employed to take care of all the dimensions of the projects. The study indicates that the multi-prime contracting method performs better than single-prime overall, and in terms of cost, and therefore recommends that government agencies should consider multi-prime contracting methods in equal magnitude as a single-prime contracting method.

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.

 

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**APPENDICES: DATA COLLECTION TOOL**

**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 the 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 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 contract under which you have worked in your last project

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| The projects have experienced cost overruns. | | | | | |
| 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 cost management practices have been efficient. | | | | | |

 

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**Section C: 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 ……. | | | | | |

**REFERENCES**


1. Sanderson, M., et al., *New models of contracting in the public sector: A review of alliance contracting, prime contracting and outcome-based contracting literature.* Social Policy & Administration, 2018. **52**(5): p. 1060-1083.
2. Matthews, R. and J. Parker, *Prime contracting in major defense contracts.* Defense Analysis, 1999. **15**(1): p. 27-41.
3. Bartholomew, S.H., *3. The Prime Contract—An Overview*. Construction Contracting, 2022.
4. Rojas, E.M., *Single versus multiple prime contracting.* Journal of construction engineering and management, 2008. **134**(10): p. 758-765.
5. Gransberg, D.D. and K.R. Molenaar, *Critical comparison of progressive design-build and construction manager/general contractor project delivery methods.* Transportation research record, 2019. **2673**(1): p. 261-268.
6. Malii, J. and E. Irandu, *Nairobi-Thika highway improvement project: An environmental assessment.* 2013.
7. Kim, K., *Project performance evaluation of multi-prime contracts in comparison with general contractor contracts.* Journal of Asian Architecture and Building Engineering, 2017. **16**(3): p. 613-618.
8. Kim, K., et al., *A Model for Predicting Management Costs of the Multiple Prime Contract.* Korean Journal of Construction Engineering and Management, 2014. **15**(2): p. 44-52.
9. Fernandez, R.F. and B. Calas, *The Kibera Soweto East Project in Nairobi, Kenya.* Les cahiers d'Afrique de l'est, 2011. **44**: p. 129-146.
10. Office of the Auditor General, *Report of the Auditor-General on the Financial Statements of Kenya Railways Corporation for the Year Ended 30 June 2018*. 2019, Republic of Kenya.
11. African Development Fund, *Kenya Nairobi-Thika Highway Improvement Project Project Completion Report (PCR)*. 2019, African Development Bank Group and Republic of Kenya.
12. Kenya Institute for Public Policy Research and Analysis (KIPPRA), *"Quality Issues in Kenya's Road Construction Projects."*. 2020.
13. Gituro, W., & Mwawasi, S, *Time and cost overruns in road construction projects in Kenya under Kenya National Highways Authority.* ORSEA JOURNAL, 2017. **6**(1).
14. Mweresa, J., *Impact of Increasing Building Construction Costs on Effective Implementation of Public Projects: A Case Study of the Projects Initiated By the Ministry Of Public Works within Nairobi County–Kenya.* Unpublished Bachelor's Project, University of Nairobi. http://erepository.uonbi.ac.ke/bitstream/handle/11295/28925/Talukhaba_An%


 

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20investigation% 20into% 20factors% 20causing% 20construction% 20project% 20delays% 20in% 20Kenya. pdf, 2013.

15. Oyieyo, P.A., C.M. Rambo, and A. Ndiritu, *Ranking the prevalence of construction cost overrun risk factors in completion of public-private partnership projects: A case of the Sondu-Miriu hydro-electric power project in Kenya.* International Journal of Research in Business and Social Science (2147-4478), 2020. **9**(5): p. 351-356.
16. Kenya, T.c.A.o., *The Construction Industry Analysis of The State of Competition.* . 2017.
17. Memon, A.H., et al., *Factors affecting construction cost in Mara large construction project: perspective of project management consultant.* International Journal of Sustainable Construction Engineering and Technology, 2010. **1**(2): p. 41-54.
18. Ofori, G., *Developing the Construction Industry in Ghana: the case for a central agency.* A concept paper prepared for improving the construction industry in Ghana. National University of Singapore, 2012. **13**(1): p. 3-18.
19. Holland, R.E., *Single versus multiple prime contracting.* Journal of construction engineering and management ASCE, 2020. **134**(10): p. 758-765.
20. Dissanayaka, S.M. and M.M. Kumaraswamy, *Comparing contributors to time and cost performance in building projects.* Building and Environment, 1998. **34**(1): p. 31-42.
21. Muriungi, T.M., *The role of participatory monitoring and evaluation programs among government corporations: a case of Ewaso Ngi'ro North Development Authority.* International Academic Journal of Social Sciences and Education, 2015. **1**(4): p. 53-76.
22. Oloo, R.O. and D.P.K. NGUGI, *Challenges Facing Timely Completion Of Road Projects Managed By Kenya National Highways Authority.* Strategic Journal of Business & Change Management, 2016. **4**(2): p. 45-50.
23. Kenya Urban Roads Authority. *Urban roads status data*. 2024; Available from: https://kura.go.ke/urban-roads-status-data/.
24. Etikan, I. and K. Bala, *Sampling and sampling methods.* Biometrics & Biostatistics International Journal, 2017. **5**(6): p. 00149.
25. McCready, W.C., *Applying sampling procedures.* The psychology research handbook: A guide for graduate students and research assistants, 2006. **2**: p. 147-160.
26. Mugenda, O.M. and A.G. Mugenda, *Research methods: Quantitative & qualitative approaches*. Vol. 2. 2003: Acts press Nairobi.
27. Oyetunji, A.A. and S.D. Anderson, *Relative effectiveness of project delivery and contract strategies.* Journal of construction engineering and management, 2006. **132**(1): p. 3-13.
28. Cakmak, P.I. and E. Tas, *A Comparative Analysis of Owner-Contractor Agreements in the Turkish and US Construction Industry.* Journal of Civil Engineering and Architecture, 2014. **8**(4).
29. Riecke, V.R., *Public construction contracting: Choosing the right project-delivery method.* Popular government, 2004. **70**(1): p. 22-31.
30. Molenaar, K.R. and A.D. Songer, *Model for public sector design-build project selection.* Journal of construction engineering and management, 1998. **124**(6): p. 467-479.
31. Konchar, M., & Sanvido, V., *Comparison of US project delivery systems.* Journal of construction engineering and management, 1998. **124**(6): p. 435-444.

 