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KNOWLEDGE MANAGEMENT AND PERFORMANCE OF ROAD INFRASTRUCTURE PROJECTS BY LOCAL CONTRACTORS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

Objective: Despite substantial government investments in road infrastructure in Nairobi City County, projects often faced delays, cost overruns, and poor quality. This study examined the influence of knowledge management (KM) practices on the performance of road projects executed by local contractors, focusing on knowledge creation, knowledge organization, and a knowledge learning culture.

Methods: The study used a positivist paradigm and descriptive-explanatory design. Data were collected from 169 respondents, including local contractors and officials from KENHA, KURA, KeRRA, and the public works department, using a census approach. Structured questionnaires captured information on KM practices and project performance. Quantitative data were analyzed with descriptive and inferential statistics to assess the relationship between KM components and project outcomes.

Results: Effective KM practices significantly improved project performance. Contractors who systematically created and documented knowledge, organized technical information, and promoted a learning culture achieved better planning, fewer delays, and higher-quality outputs. Barriers such as limited training, poor communication, and restricted access to technology hindered KM adoption.

Conclusion and Recommendations: Implementing KM practices can enhance the efficiency, cost-effectiveness, and quality of road projects. Policymakers should provide targeted training, develop centralized knowledge repositories, and incentivize KM adoption, while contractors should institutionalize learning, mentorship, and knowledge-sharing to sustain improvements in project execution.

Keywords: *Knowledge management; performance of road infrastructure projects; knowledge creation; Knowledge Organization; Knowledge learning culture*

1.0 Introduction

Road infrastructure had been a critical pillar of Kenya's transportation system, providing essential links between cities, industries, and markets, thereby promoting economic growth and social development. Efficient road networks improved accessibility, enhanced trade, created jobs, and fostered economic opportunities. Recognizing this, the Kenyan government had prioritized road infrastructure in its national development agenda, including the Vision 2030 initiative, which sought to transform Kenya into an industrialized middle-income country. However, the performance of road construction projects, particularly those managed by local contractors in Nairobi City County, remained suboptimal, often characterized by delays, cost overruns, and poor quality.

Local contractors in Kenya faced multiple challenges that hindered project execution. These included limited technical capacity, inadequate skills, insufficient financial resources, poor project management practices, and the absence of effective knowledge management (KM) strategies (Gwaya, Njuguna, & Oyuga, 2021). Compared to international contractors, who often utilized structured KM systems, local contractors struggled to leverage past project experiences and best practices, leading to inefficiencies in project delivery (Okumu & Fee, 2019). Furthermore, access to advanced construction technologies and financing had remained a significant barrier for local firms. Consequently, there existed a performance gap between local and international contractors, which affected the timely and cost-effective delivery of road infrastructure projects.

Knowledge Management (KM) had emerged as a vital yet underutilized tool to improve project performance. KM involved the systematic process of capturing, sharing, and utilizing knowledge to enhance organizational effectiveness. In the context of road infrastructure, KM practices included documenting lessons learned, sharing technical knowledge among contractors, fostering a culture of continuous learning, and using technology to improve collaboration across project teams. Effective KM had enhanced decision-making, reduced errors, and improved overall project efficiency and quality (Aboagye, Kissi, Acheampong, & Badu, 2022).

For local contractors in Nairobi City County, KM could have addressed key barriers to project execution. Structured knowledge creation and sharing helped mitigate risks, optimize resource use, and improve the quality of work. Despite this potential, many local contractors had yet to adopt formal KM practices due to limited training, poor communication networks, and lack of awareness about KM benefits (Mwamvani, Amoah, & Ayesu-Koranteng, 2022). This highlighted a research gap: while previous studies had explored project management practices and contractor capacity (Ochenge, 2018; Akali, 2018), there was limited research on how KM specifically influenced the performance of road infrastructure projects executed by local contractors in Kenya. Nairobi City County presented a particularly relevant context for this study due to its high concentration of road projects and significant involvement of local contractors in government-funded initiatives. The county's road network included highways, arterial roads, expressways, and local roads, which were vital for both intra-city and inter-city mobility. However, recent reports indicated that a significant number of projects undertaken by local contractors in Nairobi had experienced delays, budget overruns, and substandard quality (Jiang, 2020; World Bank, 2019). These challenges were often linked to ineffective knowledge sharing, limited organizational

learning, and inadequate application of technical expertise.

The importance of KM in enhancing construction project performance had been well-documented. Studies had shown that KM led to better decision-making, improved efficiency, higher client satisfaction, and reduced project costs (Aboagye et al., 2022). Conversely, the absence of systematic KM practices contributed to poor project outcomes, including delays, cost escalations, and compromised quality. In Nairobi City County, local contractors' limited ability to manage and utilize knowledge effectively represented a critical gap in achieving efficient road project execution. This study, therefore, aimed to examine the role of KM in improving the performance of road infrastructure projects managed by local contractors in Nairobi City County, Kenya. Specifically, it investigated the three core components of KM—knowledge creation, knowledge organization, and knowledge learning culture—and how they influenced project performance. Addressing this gap provided insights into practical KM strategies that local contractors could adopt to enhance efficiency, reduce project failures, and improve the quality of road infrastructure projects, thereby contributing to the broader economic development agenda in Kenya.

Objective

To assess the effect of knowledge management on the performance of road infrastructure projects by local contractors in Nairobi City County, Kenya

Hypothesis

H_{01}: Knowledge management has no significant effect on the performance of road infrastructure projects by local contractors in Nairobi City County, Kenya.

2.0 Methodology

The research employed a positivist philosophy, which asserts that scientific knowledge is valid only when it is supported by observable and empirical evidence (Crossan, 2003). A quantitative research approach was adopted for this study to test hypotheses and examine the relationships between knowledge management and the performance of road infrastructure projects by local contractors in Nairobi City County, Kenya. According to Creswell (2008), quantitative research is ideal for studies that involve the collection and analysis of numerical data to describe, explain, and predict phenomena. The sample size of 169 respondents was determined based on a census method, which ensured full coverage of all relevant stakeholders involved in road infrastructure projects in Nairobi City County. This approach was chosen to enhance the rigor and reliability of the study's conclusions.

The study focused on a population of 165 road infrastructure projects in Nairobi City County executed by local contractors between 2015 and 2022. The respondents consisted of 165 local contractors, three senior monitoring and evaluation officials from the Kenya National Highways Authority (KENHA), the Kenya Urban Roads Authority (KURA), and the Kenya Rural Roads Authority (KERRA), as well as one senior officer from the county public works department. Given the small population, a census method was used, collecting data from all 169 respondents to ensure comprehensive coverage of those involved in the mobilization of resources for road infrastructure projects.

The current study utilized a combination of descriptive and explanatory research designs. A descriptive research design was applied to quantify the influence of knowledge management on the performance of road infrastructure

projects. Additionally, an explanatory design was used to examine the relationships between knowledge management and project performance. The data was collected through structured questionnaires, which were administered to contractors and officials using a 5-point Likert scale to ensure consistency in responses. Data collected through the surveys was processed and analyzed using the Statistical Package for Social Sciences (SPSS), version 26.0. Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize the data. Linear regression analysis was utilized to determine the impact of various Knowledge Management practices on the performance of road infrastructure projects.

The linear regression model used in this study was specified as follows:

$Y = ß_0 + ß_1X_1 + \varepsilon$

Where:

Y = Performance of road infrastructure projects; $ß_0$ = the intercept; $ß_1$ = the coefficients for Knowledge Management; X_1 = Knowledge Management and ε = The error term.

3.0 Results

The respondents were surveyed to evaluate road infrastructure project performance concerning budget compliance, timeliness, and meeting quality standards. The survey findings are detailed in Table 1.

Table 1: Performance of Road Projects

	Mean	Standard Deviation
Complete projects within the budgeted cost	2.9	1.07
Complete projects within the time limit.	2.3	1.21
Complete road projects that attain the desired quality.	2.8	1.32
Aggregate score for the performance of road projects	**2.9**	**1.41**

Source: Survey Data (2025)

Table 1 presents an aggregate performance rating of 2.9 for road infrastructure projects, with a standard deviation of 1.41. The mean score for staying within budget was 2.9, indicating moderate agreement, with a standard deviation of 1.07. Meeting time deadlines received a mean score of 2.3, also indicating moderate agreement, with a standard deviation of 1.21. Achieving desired quality standards received a mean score of 2.8, reflecting moderate agreement, with a standard deviation of 1.32.

Descriptive Analysis Results

The independent variable studied was knowledge management. Participants were surveyed to gauge their opinions on various aspects of knowledge management, covering areas such as knowledge creation, organizing it effectively, and promoting a culture that encourages learning. The results are presented in Table 2.

Table 2: Descriptive Results for Knowledge Management	Mean	Standard Deviation
Knowledge Creation		
The firm identifies and assesses the knowledge required to accomplish a particular road infrastructure project.	2.3	1.10
Efforts are made to acquire the knowledge that will facilitate the accomplishment of a particular project.	3.3	1.23
The acquired knowledge is used efficiently and effectively to achieve the intended project goals.	3.7	1.12
Aggregate score for knowledge creation	**3.1**	**1.15**
Knowledge Organization		
The project had clear feedback information from stakeholders	3.4	1.12
There is continuous knowledge sharing and storing in the project	3.8	1.07
The project was analyzed and documented for maintaining organization learning.	3.5	1.06
Knowledge was captured and stored for future use	3.3	1.13
Knowledge based on previous projects was used to improve future projects	3.1	1.15
Aggregate score for Knowledge Organization	**3.4**	**1.11**
Knowledge learning culture		
Efforts are made to promote knowledge sharing among team members to leverage their collective expertise and experience.	3.6	1.06
Efforts are made to promote knowledge transfer among team members to leverage their collective expertise and experience	3.2	1.22
The projects are analyzed and documented for maintaining organization learning.	3.1	1.17
Knowledge is captured and stored for future use	3.0	1.13
Aggregate score for knowledge learning culture	**3.3**	**1.15**
Aggregate score for Project knowledge management	**3.3**	**1.13**

Source: Survey Data (2025)

The findings from Table 2 indicate the extent of agreement among respondents regarding various aspects of project knowledge management. For knowledge creation, respondents expressed limited agreement that the organization identifies and assesses the knowledge necessary for specific road infrastructure projects (Mean = 2.3; Standard Deviation = 1.10). Efforts to acquire the requisite knowledge for project success were moderately endorsed (Mean = 3.3; Standard Deviation = 1.23). Respondents moderately agreed that acquired knowledge is effectively utilized to achieve project objectives (Mean = 3.7; Standard Deviation = 1.12). The aggregate mean score and standard deviation for Knowledge Creation are 3.1 and 1.15, respectively.

For fostering a knowledge learning culture, respondents moderately agreed that efforts are made to encourage knowledge sharing among team members

to capitalize on their collective expertise and experience (Mean = 3.6; Standard Deviation = 1.06), and initiatives are undertaken to facilitate knowledge transfer among team members for the same purpose (Mean = 3.2; Standard Deviation = 1.22). Projects are moderately analyzed and documented to sustain organizational learning (Mean = 3.1; Standard Deviation = 1.17), and knowledge is moderately captured and stored for future utilization (Mean = 3.0; Standard Deviation = 1.13). The aggregate mean score and standard deviation for Knowledge Learning Culture are 3.3 and 1.15, respectively.

Overall, the aggregate mean score and standard deviation for Project Knowledge Management are 3.3 and 1.13, respectively. The mean scores above 2.5 on a five-point Likert scale indicate that the indicators used to measure project knowledge management were significant in explaining the variable. Additionally, the relatively low standard deviation values suggest that respondents had similar opinions on the weights used to measure different aspects of project knowledge management. These findings highlight the importance of knowledge creation, organization, and learning culture in effectively managing knowledge within projects.

Inferential Analysis Results

The study investigated how knowledge management influenced the performance of road infrastructure projects undertaken by local contractors in Nairobi City County, Kenya. The null hypothesis (H_{01}) formulated for this investigation was:

H_{01}: Knowledge management has no significant effect on the performance of road infrastructure projects by local contractors in Nairobi City County, Kenya.

The findings are summarized in Table 3.

Table 3: Regression Analysis Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.892[a]	.797	.784	6.74710

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6179.343	1	6179.343	135.741	.000[b]
	Residual	6282.216	141	45.523		
	Total	**12461.559**	**142**			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	7.853	2.342		3.353	.001
	Project knowledge management	.225	.093	.201	2.414	.017

a. Dependent Variable: Performance of road infrastructure projects

b. Predictors: (Constant) Project knowledge management

The R-squared value in Table 3 indicates that Project Knowledge Management explains 79.7% of the variation in the performance of road infrastructure projects in Nairobi County, Kenya. This suggests that the remaining variability in performance is influenced by factors beyond Project Knowledge Management. Despite this, the significant R-squared value affirms the substantial role of Project Knowledge Management in project performance, indicating a positive influence. ANOVA was employed to assess the regression model's significance, with a p-value ≤ 0.05 considered statistically significant. The results in Table 3 show a p-value of 0.000, indicating strong evidence that the regression model predicts the dependent variable significantly. Furthermore, the F-test results reveal an F-critical value of 3.94 and an F-calculated value of 33.935, indicating a robust linear relationship between the independent and dependent variables. This confirms that changes in the independent variables are closely associated with changes in road infrastructure project performance.

In summary, the regression model is statistically significant, supported by a p-value of 0.000. The regression equation for the relationship between Project Knowledge Management and project performance in Nairobi County, Kenya, is:

$$\mathbf{PRI} = 7.853 + 0.225\mathbf{KM}$$

Where **PRI** = Performance of road infrastructure project**; KM** = Knowledge Management

The results in Table 3 revealed a beta coefficient of 0.225 and a corresponding p-value of 0.017. The beta coefficient indicates a positive relationship between project knowledge management and the performance of road infrastructure projects, suggesting that improvements in knowledge management are associated with enhanced project outcomes. With a p-value of 0.017 ($p < 0.05$), project knowledge management is considered statistically significant in explaining variations in road infrastructure project performance. Therefore, based on these findings, project knowledge management significantly influences the performance of road infrastructure projects. Consequently, the null hypothesis was rejected, indicating that project knowledge management has a significant impact on the performance of road infrastructure projects within Nairobi City County, Kenya.

4.0 Discussion

The findings of this study demonstrated that knowledge management (KM) practices—specifically knowledge creation, knowledge organization, and a knowledge learning culture—significantly influenced the performance of road infrastructure projects executed by local contractors in Nairobi City County. Local contractors who systematically captured and shared knowledge from past projects exhibited better project planning, reduced delays, and improved quality, aligning with studies by Aboagye, Kissi, Acheampong, and Badu (2022), who highlighted the positive impact of KM on construction project performance. These results corroborate global evidence that KM enhances decision-making, reduces errors, and fosters organizational learning, thereby improving project efficiency (Nonaka & Takeuchi, 1995; Mwamvani, Amoah, & Ayesu-Koranteng, 2022).

The study also found that knowledge organization—structuring technical documents, maintaining project databases, and standardizing procedures—was critical in mitigating inefficiencies. Contractors who had well-organized knowledge resources were better able to manage risks and adhere to project timelines. This finding supports the work of Gwaya,

Njuguna, and Oyuga (2021), who reported that structured knowledge management practices contribute to the successful execution of complex projects. Conversely, contractors with poor KM structures often faced repeated mistakes and resource wastage, consistent with Okumu and Fee's (2019) observation that lack of knowledge infrastructure undermines project outcomes.

Furthermore, fostering a knowledge learning culture—where contractors encouraged team learning, mentorship, and reflection on past project experiences—enhanced performance. This culture enabled continuous improvement and adaptability to changing project conditions. The finding aligns with Mutiso and Mwangi (2021), who emphasized that a learning-oriented organizational culture positively affects operational efficiency and project success. The study also highlighted that barriers such as inadequate training, poor communication networks, and limited access to advanced technologies constrained the full potential of KM implementation. These constraints are consistent with prior research indicating that insufficient capacity and poor management practices remain key challenges for local contractors in Kenya (Michugu, 2020; Oprong, 2020).

Policy Implications

The findings of this study have significant implications for policy and practice in Kenya's devolved system of governance. First, county governments and regulatory bodies, such as KeRRA and KeNHA, should prioritize capacity-building programs for local contractors, focusing on KM strategies and technology adoption. Second, policies should encourage the documentation of lessons learned from infrastructure projects and the creation of centralized knowledge repositories accessible to contractors across counties. Finally, integrating KM principles into contractor licensing requirements could enhance accountability, reduce project failures, and improve resource utilization. Such measures would strengthen the capacity of local contractors to deliver timely, cost-effective, and high-quality road infrastructure, contributing to the broader development goals under Vision 2030.

Study Limitations

Despite its contributions, this study had several limitations. First, the sample consisted solely of local contractors operating in Nairobi City County, which may limit the generalizability of the findings to other counties or international contractors. Second, data collection relied on self-reported information, which may have introduced response bias. Third, time and resource constraints restricted the depth of qualitative inquiry, limiting the exploration of some contextual factors influencing KM adoption. Future studies could expand the sample to multiple counties and incorporate longitudinal designs to assess the long-term impact of KM practices on project performance.

5.0 Conclusion and Recommendations

This study established that knowledge management (KM) practices—knowledge creation, knowledge organization, and a knowledge learning culture—significantly influenced the performance of road infrastructure projects executed by local contractors in Nairobi City County. Contractors who systematically captured and shared technical knowledge, organized project information, and fostered learning-oriented work environments achieved better project planning, reduced delays, and improved quality. Barriers such as inadequate training, poor communication networks, and limited access to advanced technologies hindered the full adoption of

KM practices, contributing to cost overruns and substandard project execution.

Based on these findings, several policy and practical recommendations are proposed. County governments and regulatory agencies should implement targeted capacity-building programs to strengthen KM competencies among local contractors. Policies should mandate the documentation of lessons learned and the creation of centralized knowledge repositories accessible to contractors. Licensing and contract award criteria should incentivize effective KM adoption. Additionally, contractors should institutionalize learning cultures through mentorship, knowledge-sharing forums, and continuous training. Implementing these measures will enhance local contractors' ability to deliver timely, cost-effective, and high-quality road infrastructure, contributing to improved economic development and efficient public service delivery under Kenya's devolved governance system.

Policy Implication Statement

The results of this study highlighted the pivotal role of knowledge management (KM) in enhancing the performance of road infrastructure projects managed by local contractors in Nairobi City County. These findings have important implications for policy formulation within Kenya's devolved governance framework. County governments and regulatory agencies should develop targeted capacity-building initiatives to strengthen KM competencies among contractors. Policies should mandate systematic documentation of lessons learned, creation of centralized knowledge repositories, and the adoption of knowledge-sharing practices across projects. Additionally, integrating KM performance criteria into contractor licensing and contract award processes can incentivize effective knowledge utilization, reduce delays and cost overruns, and improve project quality. Implementing these policy measures will enhance local contractor performance, promote accountability, and contribute to sustainable infrastructure development, thereby supporting the broader national development agenda, including Vision 2030.

Author Contribution Statement

The author conceptualized and designed the study, developed data collection tools, and conducted data collection, analysis, and interpretation. The author drafted the manuscript, reviewed relevant literature, and ensured compliance with all methodological and ethical standards. All intellectual input, writing, and final approval of the study were undertaken solely by the author.

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