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RESOURCE MANAGEMENT PRACTICES AND PERFORMANCE OF ROAD CONSTRUCTION PROJECTS BY KENYA URBAN ROADS AUTHORITY IN NAIROBI CITY COUNTY

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Resource Management Practices and Performance of Road Construction Projects by Kenya Urban Roads Authority in Nairobi City County

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Abstract:

Purpose of Study: This study sought to examine the influence of resource management practices on the performance of road construction projects undertaken by the Kenya Urban Roads Authority in Nairobi City County, Kenya. Specifically, the study assessed how financial, material, human, and information resource management practices influence project performance, efficiency, and quality outcomes.

Methodology: The study adopted a descriptive, non-experimental research design targeting 15 road construction projects implemented between 2018 and 2024. The target population comprised 207 professionals, from whom 136 respondents were proportionately selected using Taro Yamane's formula. Primary data were collected through semi-structured questionnaires and analyzed using multiple regression analysis techniques.

Findings: The findings revealed that resource management practices significantly influenced road construction project performance, explaining 71.2% of the variation in performance ($R^2 = 0.712$). Financial resource management demonstrated the strongest positive influence ($\beta = 0.557$, $p < 0.001$), followed by material resource management ($\beta = 0.176$, $p = 0.006$), human resource management ($\beta = 0.147$, $p = 0.012$), and information resource management ($\beta = 0.128$, $p = 0.027$). The regression model was statistically significant ($F = 65.633$, $p < 0.001$). These results established that effective resource allocation, procurement, workforce management, and information coordination contribute significantly to improved project performance.

Conclusion: The study concluded that effective resource management practices significantly enhance road construction project performance. Financial resource management emerged as the most influential determinant. The study recommends strengthening financial controls, improving procurement systems, investing in workforce development, and integrating advanced information management technologies to enhance project efficiency, quality, and timely completion.

Keywords: *Financial Resource Management, Material Resource Management, Human Resource Management, Information Resource Management, Project Performance, Resource Management Practices.*

JEL classification: *J28, J24, M12, M54, G22*

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1. INTRODUCTION

The development of road networks has significantly contributed to broader infrastructural advancement, promoting economic progress, improving societal welfare, and enhancing the efficiency of transport systems globally. These programs go a long way to enhance access to required services, reduce transport costs, and ease the trade. With the aim of enhancing infrastructure, especially in developing countries of the world, efficient resource management practices have emerged as the top priority to complete quality projects on time. The effective resource management determines whether road construction projects will achieve their goals or not. On the contrary, insufficient resource management may greatly contribute to poor project outcomes, which inhibits economic growth and social development (Gharouni Jafari & Noorzai, 2021).

Road construction projects around the world have embraced advanced technologies and new ways of management in order to maximize resource utilization and guarantee the success of the project. To enhance the monitoring process and speed up resource distribution, the USA, China, and Germany invested in the latest technologies such as Geographic Information Systems (GIS) and Building Information Modeling (BIM). These advances have significantly enhanced the efficacy and quality of road building projects and they form a critical component in the development of infrastructure of the country. One example is in the U.S., where the LBJ Expressway was a large-scale project that used the public-private partnerships (PPP) to raise resources and guarantee the project is completed on time (Mohajeri et al., 2021). Likewise, in China, prefabricated materials and BIM technology have allowed building large road networks such as the Beijing-Shanghai Expressway to enhance efficiency and quality of projects (Yuan et al., 2018).

Road construction is one of the most critical activities in the United States that sustains the extensive highway systems in the country, which are also crucial in both internal and external trade activities. The U.S. has also been able to introduce the use of sophisticated technologies, including automated construction machinery and GPS, to better efficiency of projects and use of resources. Another notable advantage of the public-private partnerships is that, they have been used to fund major road projects such as the LBJ Expressway, where the government could save on spending and yet they get completed on time. The existing strong measures in the country against tracking and assessing the projects also contribute to the project implementation (Mohajeri et al., 2021).

Another, though not the only example of how resource management can lead to the success of road construction projects is China. Using centralized method of resource management, the Chinese government manages its extensive road projects including the Beijing-Shanghai Expressway, ensuring construction schedules are achieved. Prefabrication and green construction methods have even improved the performance of the project and sustainability measures are taken to make sure that the environmental impact is minimal. Also, it is possible to note that the special attention of China to the incorporation of smart transportation systems

is what guarantees that road projects will fulfill both economy-related and environmental goals in the long term (Yuan et al., 2018).

Resource management in Germany is equivalent to accuracy and efficiency. The Autobahn is another network that has demonstrated the level of excellence in the road construction in Germany with the use of Geographic information systems (GIS) playing a major part in the planning and monitoring of the project (Gharouni Jafari & Noorzai, 2021). Sustainability in road design through re-using materials and incorporation of green technologies is another significant attribute of the road construction projects in Germany. The Stuttgart 21 rail and road project showcases the way in which Germany embraces innovation and sustainability so that high quality and efficient delivery of the projects is achieved with minimum impact on the environment.

The road building projects in Africa help to boost social and economic development of the countries on the continent. Construction of roads is currently a big contributor to infrastructure development in Nigeria particularly in regards to rural urban linkages. The case of the Second Niger Bridge that links the eastern and western parts of Nigeria is an example that shows how the country relies on GIS and digital mapping technologies to streamline resource distribution and keep track of project progress (Leo-Olagbaye & Odeyinka, 2020). The role of public-private partnerships has been instrumental in providing adequate funds to such efforts even as corruption and mismanagement of resources is a challenge.

Another area where South Africa has focused its attention is on road construction as a part of its national development agenda which embraces green construction and community involvement in their projects. One of the brightest examples of South Africa using local resources and including green building principles in road projects is the Gauteng Freeway Improvement Project (GFIP) (Shackleton, 2018). Also, capacity-building programs guarantee training of the local workers to be able to manage the resources effectively, which leads to better project performance and sustainability. Openness during procurement and the participation of the community have also helped in enhancing the credibility of the people and in making road projects successful.

The construction of roads in Tanzania is crucial in intensifying trade and accessibility. The Dar es Salaam-Morogoro Expressway which is an African Development Bank (AfDB) project shows how Tanzania leveraged on foreign investment and donor funding to finance infrastructure projects in integrating GIS and drones to monitor project has achieved better resource management and accountability, which has seen projects being well implemented. Also, the emphasis on the training of the local labor has minimized the situation where the country depends on the expertise of other countries and improved the performance of the project in Tanzania (Makoye et al., 2019).

In Kenya, the Kenya Urban Roads Authority (KURA) oversees road development works in the urban areas. Resource management techniques are very important in ensuring that these projects are completed effectively, as their successful completion will greatly rely on the development strategy of Vision 2030 of a nation. Nonetheless, KURA has been challenged in

most of its resource management issues and this has caused delays, price increases and low-quality project delivery. As an example, delays were experienced in the Outer Ring Road project in Nairobi because of material procurement and labor management inefficiencies (Omondi & Kinoti, 2020). The problems highlighted by these issues are why there is a necessity to have more efficient resource planning and management in order to deliver high quality and on-time project delivery.

To overcome such a challenge, KURA has embraced the new technologies like GIS and BIM that enhance project planning, monitoring, and allocation of resources. Though these technologies seek to minimize any delay and increase the overall performance of the project, KURA has indicated that completion of road projects has increased by only a small figure, with it currently standing at about 73% compared to around 65% in the recent years (Omondi & Kinoti, 2020). This implies that there is an ongoing disconnect in the effective practice of resource management with most of the projects not achieving their completion goals. The fact that such slow progress has been witnessed is indicative of the fact that the allocation of resources and planning are still in issues that require to be resolved so as to attain the desired improvements.

Another imperative KURA has concentrated its efforts on capacity-building advances or programs to prepare local engineers and project managers with skills to effectively manage resources. Despite the efforts, there is still a huge gap in skilled labor, which adds up to the ineffective implementation of road projects. It has been reported that training programs have not yet completely closed the skills gap existing in the workforce, and timelines of project completion have actually only been reduced by approximately 9% over the last five years (Omondi & Kinoti, 2020). Such marginal progress means that more should be done to develop the human capital and create additional rigorous training programs based on the road needs.

In addition, community engagement during the planning of the projects has proved to have potential of enhancing project sustainability and public trust. The ability of the authority to align the road projects undertaken by KURA with the needs and priorities of local stakeholders has realized some good results such as increased connectivity in Nairobi. Nevertheless, the reality is that the effect is rather small, and the time spent on major routes can be reduced by only about 15 percent because of the implementation of several road projects (Omondi & Kinoti, 2020). This slight optimism signifies the fact that communities require better approaches in terms of project development and make sure that the infrastructure investments are sensitive towards the needs of the community.

Despite this development, KURA is still challenged with a lot of issues in the management of resources in road construction projects. The delays in material procurement and common use of materials of poor quality have resulted in delays in projects and low quality of roads, requiring regular repairs (Omondi & Kinoti, 2020). It was reported that about 32 percent of the finished road projects need a significant number of repairs within a year after construction, which is indicative of a severe lack of quality assurance and purchasing procedures (Omondi

& Kinoti, 2020). This pattern of relying on low-grade materials adversely affects project achievements and generates uncertainty regarding the sustainability of KURA-led projects.

Financial resources management problems also pose a challenge to KURA. Delay of funding and poor allocation of funds has caused budget overruns with approximately 41 percent of the projects having higher budgets than the original ones. The bureaucratic inefficiencies and corruption have limited the success of the public-private partnerships (PPP) that have been effective in other countries in Kenya. As an example, whereas partnerships have resulted in better results in such countries as the United States, in Kenya, the initiative had to go unimpeded, yet administrative obstacles hindered the projects, which weakened the work of KURA (Omondi & Kinoti, 2020).

In the future, KURA can overcome the gap in the performance of the project through further investment in capacity building, technological integration, and stakeholder involvement. Through these, KURA will be in a position to improve its resource management procedures and ensure its road construction projects are more aligned with national development priorities, and as such contribute towards the bigger Vision 2030 agenda. The experiences of the two countries can act as useful road maps to be used in future activities of KURA in the infrastructure development (Gruden & Stare, 2018).

1.1. Statement of the Problem

The fulfillment of scope requirements, adherence to timelines, cost management, and high compliance with quality requirements is necessary to achieve better performance in international road development projects. Ideally, road projects should be within the stipulated period, and budget, and produce high quality results that will exceed the expectations of the stakeholders. It is observed that good resource management practices can positively impact the performance of projects. Proper management of financial resources will provide sufficient funding and cost control, whereas proper management of material resources will provide the high-quality materials in time. Human resource management is efficient in recruiting, training and deploying skilled labor, and information resource management enhances proper data collection and relay, which leads to making informed decisions. All of these practices help projects go through without issues, achieve all of the set goals, and build sustainable infrastructure (Gruden and Stare, 2018).

Nevertheless, in the Nairobi City County, recent statistics gathered by the Kenya Roads Board (2022) suggests that KURA is facing serious challenges in performance. There were massive delay games as only 27% of the projects on the roads were done within their time schedule (Akali & Sakaja, 2021). Furthermore, Furthermore, KNBS (2023) found out that overrun cost and quality shortages are widespread, and only 32% of the projects remain within the cost and only 29% of projects reach the desired quality. Moreover, the Ministry of Transport (2022) emphasized that KURA has demonstrated signs of premature deterioration or defects on the roadnesses in about 71% of roads built by them in Nairobi City County in 3-5 years after construction, which is a crucial problem with resource management and project sustainability.

The available literature on resource management and project performance also reveals significant geographical, contextual, and conceptual gaps. To illustrate, Malala et al. (2020) assessed the efficacy of CDF initiatives in Kenya; however, this introduces a conceptual discrepancy, as the study focused on CDF interventions rather than road construction projects. On the same note, Nyangwara and Datche (2021) examined the performance of road projects in the Ministry of Land, Housing, and Urban Development in Coastal County. While valuable, this study presents both geographical and contextual gaps as it focused on a different ministry and region, leaving out the specific challenges faced by KURA in Nairobi County.

To address the identified gaps, the research centers on resource management practices and examines their impact on the performance of KURA projects in the Nairobi City County. This coverage is significant considering that Nairobi is the capital of Kenya, and the urban developments and Vision 2030 agenda heavily rely on the infrastructure projects. This research can help to fill the gaps of geographical, contextual, and conceptual contents that may exist in the current literature as it examines the management of financial, material, human and information resources in this particular context and thus aids in understanding what influences the performance of road projects within KURA. The study was guided by the following specific objectives:

I. To evaluate the effect of financial resource management practices on the performance of road construction projects by KURA in Nairobi City County, Kenya.
II. To investigate the influence of material resource management practices on the performance of road construction projects by KURA in Nairobi City County, Kenya.
III. To determine the effect of human resource management practices on the performance of road construction projects by KURA in Nairobi City County, Kenya.
IV. To examine the influence of information resource management practices on the performance of road construction projects by KURA in Nairobi City County, Kenya.

2. LITERATURE REVIEW

2.1 Theoretical Review

The study was based on resource-based view (RBV) model, agency theory, institutional theory and the theory of transaction cost economics. The RBV theory is one of the most important theories explaining the contribution of internal resources to the success of an organization whose origins can be traced back to the 1950s by the works of Edith Penrose. Penrose highlighted that firms are more than just collections of resources, and their unique capabilities significantly impact outcomes.

The Agency Theory is a notable theory in organizational economics which brings into focus the relationship between owners or stakeholders and agents (managers or employees). This is a theory formulated by Jensen and Meckling in 1970s which says that the agents have been given the responsibility of the management of resources on behalf of principals. The major issue however is the possibility of agency issues developing whereby the interests of the agents are unlikely to be similar to those of the principals. The agents can make selfish decisions

against the overall goals of an organization, which can cause inefficiencies and cost escalation (Jensen and Meckling, 1976). The theory will provide a framework in which to interpret the possible conflicts that can occur in the management of these financial resources in road projects where large amounts of money are involved.

Based on the sociological perspective, institutional theory is widely used in project management and examines the relationship between organizations and external institutions and norms to affect their project performance (Meyer and Rowan, 1977). The early researchers like John W. Meyer, Brian Rowan and Richard Scott proposed that organizations conform to external exertions of regulatory authorities, societal demands and culture to attain legitimacy and effective project deliverables. The external pressures play a crucial role in affecting the management of resources and the actual implementation of the projects in the context of road construction projects (Qiu & Chen, 2023). This notion is especially applicable to information resource management whereby organizations are often required to align their information management practices with industry standards, legal requirements and technology trends as a way to remain legitimate and competitive.

The fourth theory was transaction theory by Williamson (1979) that looks at the impact of transaction costs on the overall management and performance of road construction projects. Important factors in decision making touching on how various aspects of a project are handled are transaction costs such as search costs, negotiation costs and enforcement costs. The framework created by Williamson highlights the importance of balancing these transaction costs to improve project results and offers a theoretical prism on how controlling these costs can be used to affect the overall performance of a project. Through its focus on the intricacies of transaction costs, TCE can enable project managers to make wise decisions that can help reduce the possible delays and inefficiencies related to road construction projects (Ketokivi & Mahoney, 2020). Material resource management plays a crucial role in the management of procurement; allocation of materials and distribution may encompass a high cost of transactions.

2.2 Empirical Literature Review

Adewole and Musa (2020) undertook a study with the aim of validating the hypothesis that efficient financing of resources influences effective project management in Kano state, Nigeria. They carried out a paper review on resource budgeting and project management where they brought several papers so as to get a feel of current trends as practiced in organizations. A quantitative research technique was used, and the data collection tools used were surveys. According to the research done, it was revealed that implementing resource usage as per the plan and exercising controlled resource usage enhances success in projects. Therefore, based on the findings of the study, there is the need to expand the current literature on project management through conducting similar studies in other states in Nigeria. However, the study relies on literature review and the general recommendation for further research limiting the depth of practical applications and specific actionable strategies based on the findings.

Essel (2020) conducted an investigation into the effectiveness of financial management and its relationship with project success in Uasin Gishu County, Kenya. In this case, the samples were randomly and cluster obtained from 31 assorted projects yielding 87 top management employees based in the county. Questionnaires which formed the data gathering instruments were structured and the reliability of these instruments was determined using test-retest procedures with an Alpha coefficient >0. 7. The data was analyzed using an ex-post design, and in a descriptive and inferential way. At p 0.0: The hypotheses were tested through regression. 05. Budgeting was noted to have high effects on financial reporting and performance of the projects. Additionally, relying solely on a single theoretical framework might restrict the scope of its analysis.

Tadesse and Kumar (2020) set out to fill the gaps in the material management practices on building sites, especially in the UAE context, but they have also discussed the numerous factors that affect material management in property building construction projects. Their theoretical frameworks emphasized the pivotal role materials management plays in project planning/control. Their findings revealed that construction material and equipment usually represent between 60 to 70 percent of the total project costs, and that poor on site material management can have a significant effect on boosting costs, further supporting the argument that should be taken towards more efficient management strategies. An effective materials management system is thus needed to ensure the delivery of materials and equipment in time, which also benefits project planning, increases the productivity of labor, enhances efficient scheduling and reduces the total cost of the project.

Materials management is not only effective in increasing productivity and cost-efficiency but also the timely completion of the projects. Delays in construction are mostly explained by poor management of materials and equipment, thus the fact that there is need to strengthen the materials management practices in the construction industry. The paper has looked into the different materials management practices applicable to construction sites, their advantages and disadvantages. But the main focus of the study was on the construction industry of buildings and was in different global environments so the study results cannot be directly applied in the case of road construction projects which again means that more focused studies need to be done in this particular field.

Another survey by Ronald, Nathan and Jaya (2020) would aim to test the effect of material managements in Chinese construction projects. Some of the important aspects of the study were cost estimating, acquisition and holding cost of the tangible resources and the effect that they have on the project. In this research technique, there were survey questionnaires, structured interviews and documents review involving 200 contractors and 180 sub-contractors, 195 of these participants completed the study successfully. The were not statistically significant to zero, and the results indicated a positive correlation between the material cost estimation, the purchasing strategies, inventory control and project efficiency. The research suggested concentrating on cost management, hiring competent personnel to

handle cost management issues, adopting good inventory management system, capacity building and information technology that can enable efficient communication and faster supplier purchase orders. This study was also linked to one case which limits the extrapolation of its results especially to construction projects in Nairobi thereby the need to conduct more research to assess the efficacy of these measures in the construction industries in general.

In research carried out by Ahmed (2020) HRM practices had been used as a moderator where the researcher aimed at determining the effect of various factors on Bangladesh road construction. The sample consisted of 392 road construction employees, who filled in cross-sectional self-administered questionnaires Structured Equation Modeling with Partial Least Squares Analysis was used to analyze it. In testing the hypothesis, we found that training and development, the promotion and the job security had a big implication on the effectiveness of the road construction projects. The research advised managers and policy makers of road construction projects to realign their HRM practices to enhance the performance of the project through provision of a motivated skilled safe workforce. Though the research offers some important answers to HRM practices and its influence on road construction projects, the results are localized to Bangladesh, and might not be wholly applicable in other settings, like Nairobi City County.

Baakeel (2020) investigated the impact of enhancing Information and Communication Management (ICM) by using ICT in construction projects in Iraq. The study assessed existing ICM practices, identified associated problems, risks, and gaps, and proposed a technological system to improve project management performance. The results indicated that the proposed system's components could significantly enhance project management efficiency through better information and communication flow. However, the tendency of the study to be having a broad approach and a limited sample, limits its generalizability to other projects that are managed by KURA in Nairobi City County. Although useful in providing insight about the role of ICT in enhancing project management, the study has limited findings due to the small sample size and limited to a geographic area.

3. RESEARCH METHODOLOGY

The study used descriptive, non-experimental research design which was deemed to be appropriate because it enable one to observe and analyze the data without manipulation. This research targeted 15 road projects constructed by KURA within Nairobi City County between the year 2018 and 2024 as the unit of analysis. The unit of observation included 207 targeted respondents composed of Project Managers, Engineers, Architects, Supply Chain Managers, Site Managers, and Surveyors were the respondents for the study. Using Taro Yamane formula, 136 respondents were proportionately selected. Primary data was collected using a semi structured questionnaire. The study also used multiple regression analysis as shown in the following analytical framework:

$$\boldsymbol{Y = \beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 + \varepsilon}$$

Where: - β_0 – intercept

$\beta_1 \ldots \beta_3$ - Coefficients

X_1 – financial resource management

X_2 – material resource management

X_3 – Human Resource Management

X_4 – Information Resource Management

ε - Error term

4. RESEARCH FINDINGS

The study first presented the descriptive statistics on the four independent variables on material resource management practices

6.1 Resource Management Practices

Table 1
Descriptive Statistics

Descriptive Statistics	Mean	Std Dev
Financial Resource Management	3.0625	1.0028
Material Resource Management	**3.0325**	**1.1035**
Human Resource Management	**3.335**	**0.9823**
Information Resource Management	**3.14**	**1.1085**
Performance of Road Construction Projects	**3.7533**	**1.008**

With a mean score of 3.0625 (SD = 1.0028), the statement "The project operates within its allocated budget, accurately, adhering to timelines in ensuring efficient financial management throughout its duration" revealed a neutral opinion regarding whether projects operate within their budget. The project has been successful in mobilizing sufficient funds from various sources to meet its financial requirements indicating a neutral assessment of fund mobilization success.

The results indicate a significant presence of neutral perceptions of Material Resource Management practices. The study sought to ask the statement Material requisitions are processed efficiently for the project, Inventory levels are well-monitored and controlled, Effective waste management practices are in place for project materials and Procurement planning ensures timely availability of materials The respondents yielded a mean of 3.0325 (SD = 1.1035). This score indicating that respondents on average felt that there was effectiveness of procurement planning.

The results indicate neutral perceptions of Human Resource Management practices. The statement, the project hires qualified personnel efficiently, Employee compensation is fair and

competitive, Employees receive adequate training and development opportunities and The project offers clear and fair promotion opportunities were within the moderate agreement range with a mean of 3.335 (SD = 0.9823)., indicating that respondents were generally agreeing about the fairness and clarity in human resources management practices

The results show neutral perceptions of Information Resource Management practices. The statement Real-time data integration enhances project decision-making, information is shared efficiently across project teams, Information storage systems are secure and easily accessible and the software used supports effective project management scored a mean of 3.14 (SD = 1.1085), showing a moderate agreement information resource management practices are key in project performance.

The results suggest a moderate perception of project performance. The response item on real-time data integration into project decision-making, the road projects are not completed within the scheduled timelines and the quality of completed road projects do not meet the required standards had a mean of 3.68 (SD = 1.072), indicating agreement about not consistently meeting quality standards.

4.2 Regression Analysis

Table 2

Model Summary for Multi-Linear Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.844[a]	.712	.702	.504869035118141

Note. a. Predictors: (Constant), Information Resource Management, Material Resource Management, Financial Resource Management, HRM

Table 6 illustrates the positive and strong relationship between the variables under analysis because the R value of 0.844 and adjusted R-square value of 0.702 reveal that the two variables have a strong positive relationship.

Table 3

ANOVA for Multi-Linear Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66.917	4	16.729	65.633	.000^b
	Residual	27.019	106	.255		
	Total	93.936	110			

Note. a. Dependent Variable: Performance of Roads Projects

b. Predictors: (Constant), Information Resource Management, Material Resource Management, Financial Resource Management, HRM

Table 3, F-value of 65.633 and a p-value of 0.001, indicates that the regression model is statistically significant. This also indicates that the combination of the four predictor variables is the significant explanatory influence on the performance of road construction projects.

Table 4

Coefficients for Multi-Linear Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.310	.275		-1.127	.262
	Financial Resource Management	.602	.090	.557	6.710	.000
	Material Resource Management	.177	.064	.176	2.787	.006
	Human Resource Management	.158	.093	.147	2.702	.012
	Information Resource Management	.132	.059	.128	2.237	.027

Note. a. Dependent Variable: Performance of Roads Projects

The analysis shows that the regression coefficient of Financial Resource Management is 0.602, the standardized beta is 0.557, the t-statistic is 6.710, and the significant value is 0.000, which supports a strong statistically significant effect. This positive association which proves to be high implies that the better the practices adopted on financial resource management, the better the performance of road projects. Essel (2020) justified this by stressing efficiency of financial practices in improving project performances through improvements in indicators of performance, including timeliness, cost cruxes and quality deliverables, which he explained with reference to the performance logic (timecostquality constraints) and the resource management perspective.

The B of Material Resource Management is 0.177 with a Beta of 0.176 and a t -value of 2.787 and a significance value of 0.006. The stronger but less positive impact than that of the financial management means that material management is important but the impact is lower. This was confirmed by Ronald et al. (2020) who demonstrated that material planning and procurement has a contribution to deadline satisfaction but not influential as compared to financial practices. This is closely tied to the literature framing where the focus is placed on procurement and inventory systems to avoid delays, rework, and cost inflation (Muute & James, 2019; Ghaffar et al., 2020).

HRM has a B of 0.158 and a Beta of 0.147, with a t-value of 2.702 and a significance value of 0.012. The affirmative association provides a positive impact that a good HR practice including training and recruitment plays a significant role in project success. Khodeir and Nabawy (2021) discovered HRM methods, such as staff competence and morale, to constitute the underlying foundation of project performance. The estimated coefficient is positive and significant, which means that the enhancement of the recruitment quality and staff training, deployment, supervision, motivation, and performance monitoring, is linked to the quality of project outcomes. This is highly conducive to the argument that talented human resources, workforce training, and motivation to productivity, safety, quality regulation, and schedule consistency are important aspects in construction conditions (Herrera et al., 2020; Anwar and Abdullah, 2021). There is a positive significant effect of human resource management in the multiple regression model.

Information Resource Management has a B of 0.132 and a Beta of 0.128, t value of 2.237, and significance of 0.027. Despite the poor performance of the influence compared to other predictors, it is still significant, meaning that the effective information management can help in improving project outcomes. Njuguna (2018) emphasized that informed decision-making and efficiency of projects require adequate data management and information systems. The coefficient is positive and it is clear that an improved performance is linked to an improved data management, availability of information, communication systems and reporting processes. Although the effect size is lesser, the result is consistent with the literature that highlights information as a coordination tool that boosts planning, monitoring, and the ability to make detached decisions in time (Muute & James, 2019; Song et al., 2019).

5. DISCUSSION OF FINDINGS

5.1 Financial Resource Management and Performance of Road Construction Projects

The findings revealed that financial resource management had a positive and statistically significant influence on project performance ($\beta = 0.557$, $p < 0.001$). Financial resource management emerged as the strongest predictor among the four practices examined. This suggests that effective budgeting, timely mobilization of funds, expenditure monitoring, and financial accountability are essential for improving road construction project performance. Proper financial management enables project managers to allocate resources efficiently, minimize unnecessary expenditures, and maintain project implementation schedules.

These findings agree with Essel (2020), who established that effective financial management practices contribute significantly to project success through improved budgeting, financial reporting, and expenditure control. Similarly, Adewole and Musa (2020) emphasized that adherence to resource utilization plans enhances project implementation. The findings also support agency theory, which emphasizes accountability and effective oversight in managing resources entrusted to project managers. Consequently, strengthening financial management

systems within KURA could improve project completion rates, cost efficiency, and infrastructure quality.

5.2 Material Resource Management and Performance of Road Construction Projects

The study established that material resource management positively and significantly influenced road construction project performance ($\beta = 0.176$, $p = 0.006$). This finding indicates that effective procurement planning, inventory control, material storage, and waste management contribute to successful project implementation. Proper material management ensures that construction materials are available when required, reducing interruptions, unnecessary expenditure, and delays associated with shortages.

The findings are consistent with Tadesse and Kumar (2020), who emphasized that efficient material management improves construction productivity, scheduling, and cost control. Similarly, Ronald et al. (2020) established that material cost estimation, procurement strategies, and inventory management positively influence construction project efficiency. These findings further support transaction cost economics, which emphasizes minimizing procurement and coordination costs to improve organizational efficiency. Although material resource management demonstrated a smaller influence than financial management, its statistical significance highlights the importance of reliable supply chains, effective inventory monitoring, and transparent procurement procedures in enhancing KURA project performance.

5.3 Human Resource Management and Performance of Road Construction Projects

The findings demonstrated that human resource management had a positive and statistically significant influence on project performance ($\beta = 0.147$, $p = 0.012$). This suggests that employee recruitment, professional training, fair compensation, motivation, and performance monitoring contribute meaningfully to successful road construction projects. Skilled and motivated employees are better positioned to execute technical responsibilities, maintain construction standards, and coordinate project activities effectively.

These findings correspond with Ahmed (2020), who established that employee training, development, promotion, and job security influence road construction project effectiveness. Similarly, Khodeir and Nabawy (2021) highlighted the importance of workforce competence and effective human resource practices in construction project performance. The findings also align with the resource-based view, which recognizes employee knowledge, competencies, and capabilities as valuable organizational resources. Therefore, KURA should prioritize continuous professional development, appropriate workforce deployment, and employee motivation to improve operational efficiency and project outcomes.

5.4 Information Resource Management and Performance of Road Construction Projects

The study established that information resource management positively and significantly influenced project performance ($\beta = 0.128$, $p = 0.027$). Although it recorded the lowest standardized coefficient, its contribution remained statistically significant. This finding suggests that effective information sharing, secure data storage, integrated information systems, and timely communication facilitate project coordination, monitoring, and decision-making.

The findings are consistent with Baakeel (2020), who established that information and communication management systems enhance construction project efficiency. Similarly, Song et al. (2019) emphasized the importance of technological systems and effective information management in supporting resource utilization and organizational performance. These results also align with institutional theory, which recognizes the importance of organizational systems, standards, and technological practices in improving operational effectiveness. Accordingly, KURA should strengthen digital information management systems, promote real-time project reporting, and improve communication among project stakeholders. Such improvements could enhance transparency, minimize coordination challenges, and support timely project implementation.

Overall, the findings demonstrate that effective management of financial, material, human, and information resources is essential for improving road construction project performance. Financial resource management deserves particular attention because it demonstrated the strongest association with performance. Nevertheless, an integrated approach incorporating all four resource management practices is necessary to enhance project efficiency, quality, cost control, and timely completion.

6. CONCLUSIONS

The research demonstrated that financial resource management is a core determinant shaping the success of road construction projects. Best financial practices that include following budgets, mobilizing funds on time and financial reporting are the basis of project efficiency and success.

The research concluded that material resource management has positive influence on the performance of projects on the construction of roads but to a lesser degree compared with other resources. Although the material procurement, inventory management and waste management are very important, the contribution to the overall performance of the project is moderate. Good material management will also mean that the materials will be delivered in time, and delays are reduced by a shortage of materials hence help in delivering the project on time.

The human resource management also requires that the human resource be well managed in relation to recruitment, training and performance management which are imperative in ensuring that those objectives of the project are achieved. The researchers discovered that HRM practices had direct impacts on the efficiency, quality and timelines of construction projects on roads. The right and motivated staff will be critical in fulfilling project specifications, reduce time wastage and attain high work standards. This paper has brought to the fore the importance

of HR practices in improving the outcome of construction projects by increasing the competency and motivation among the staff.

The research came to the conclusion that information resource management has a significant impact on the performance of road project with a moderate effect as compared to financial and human resource management. The researchers discovered that proper information management such as data sharing, integration, and security would improve decision-making, project coordination, and efficiency. Although the impact of information management was not as strong as that of other resources, the results suggest that it is also a crucial factor in the maximization of project outcomes.

7. RECOMMENDATIONS

The study recommends that KURA should establish and enforce stronger financial management policies to keep an eye on budgets of a project, better financial reporting and refining fund mobilization strategies. Financial checkups and regular staff training to enhance financial control should be emphasized. Also, the use of improved financial management tools and technologies may help enhance the budgeting and reporting further, resulting in more effective allocation and use of funds which can in turn result in better project outcomes.

In order to better handle the management of the material resources, KURA ought to have a centralized approach to the management of the inventory and have it defined by clear cut rules of procurement. This will assist in avoiding shortages of the material, less wastage and ensure that the material reaches the sites of a project in time. To improve decision-making and streamline processes, as well as to avoid delays in completion of projects caused by material related problems, it is advisable to invest further in material tracking and forecasting systems.

KURA should focus on enhancing human resource management through investments in training and development initiatives that can ensure employees have the competencies to deal with the complexities of road construction projects. A clear policy should be implemented to guarantee equitable remuneration, career growth, and career progression among employees. By enhancing staff morale where reward and recognition systems are done well, productivity will be enhanced, staff turnover will be minimized and eventually overall performance of the project will be enhanced.

Regarding KURA recommendation, the information management practices need to be upgraded, and more developed system of project management and data integration is suggested. The training process related to the sharing of information platforms on a regular basis, as well as providing data security will assist in optimizing project processes. There is also the need to enhance availability and real-time updating of project information through policy to enable better decision-making and better coordinating project teams and resulting to better project success.

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