

# EFFECT OF PHYSICAL RESOURCE CAPABILITY ON PERFORMANCE OF ROAD CONSTRUCTION PROJECTS FUNDED BY EMBU COUNTY GOVERNMENT IN KENYA

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**Abstract:** In Kenya, county governments have financed road construction projects that have taken longer to complete than anticipated, with most of them going over budget and providing work of lower than expected quality. In Embu, some road construction projects have stagnated, while others are dropped before they can be completed successfully. There is an opportunity cost associated with this situation since taxpayer money was wasted when it could have been put to better use supporting the expansion of Kenya's economy overall. Concerns have also been raised regarding the lack of physical resources, misappropriation of funds, shortage of human resources, and incapacity to invest in cutting edge information and communication technologies in road construction projects funded by the Embu County Government. The purpose of this study was to determine how the performance of road construction projects funded by the Kenyan county government of Embu was impacted by the physical resource capabilities. Descriptive survey and correlation designs were used in this investigation. The seven (7) road construction projects that the Embu county government started in 2017 and that haven't finished as of 2023 served as the analytical unit. The target population consisted of 70 community leaders who were selected from particular areas within the seven (7) construction projects funded by the Embu County Government, 30 workers from the planning department of the county government of Embu, and 67 contractors and supervisors. A total of 167 respondents made up the observation unit. Using stratified random sampling, a scientific method was used to determine the sample size of 117. Responses to the questionnaire were gathered, and data was analyzed using (SPSS) version 24 under the guidance of regression analysis, means, and standard deviations. The findings showed that the majority of respondents mentioned that the county had equipment that was only somewhat necessary to complete the construction projects in the county. According to the study, physical resource capacity should be distributed according to task and efficiency requirements, with more machines being used during peak hours and fewer machines during slower periods.

**Keywords:** Physical resource capability, Project Performance.

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## 1. INTRODUCTION

Since road construction projects require significant financial outlays, both in developed and developing nations, their successful completion is essential to the general expansion of the economies (Tagoe, 2023). When road construction projects are completed on schedule, within budget, and to the client's satisfaction while adhering to quality standards, they are clearly implemented successfully. Thus, time, quality, budget, and scope are the primary project implementation indicators.

Effective road construction project implementation, according to Ferneira & Fernandes (2017), is highly dependent on the resource capacities that the project organization possesses. The presence of distinct resource capacities, such as financial, human, and physical resources Road construction projects are implemented successfully thanks to information and communication technologies (ICT) (Eliwa et al., 2022)

The effectiveness of road infrastructure projects implemented by decentralized organizations has been a prominent issue in many nations across the globe. (Zakayo 2017). These initiatives have produced varying results in various countries. (Fazekas & Toth, 2018) emphasize the importance of devolved road systems in Italy. The management of road infrastructure projects has been impeded by various challenges pertaining to financial, human, physical, and information and communication technology resources (Chen et al., 2022). European nations have viewed road construction projects as essential to their economic development, despite differences in budgetary allotments for road infrastructure projects among various nations and regions. Resource capacities have been prioritized by nations like England, Germany, France, Portugal, and Spain in an effort to improve the effectiveness of their national road construction projects (Chen et al., 2022)

More than 15% of road construction projects in the Czech Republic face difficulties with completion time, quality, budget, and cost overruns as a result of the country's numerous devolved administrations (Pinha & Ahluwalia, 2019). However, there has been a thoughtful advancement in the capacities of financial, human, and information and communication technologies, which has helped to execute a number of road construction projects between 2019 and 2022. Due to the improvement of these nations' diverse resource capacities, physical infrastructure development has significantly increased in the Czech Republic, Singapore, and Russia (Balate, 2019). Thus, it is clear that the ability to manage finances, people, information and communications technology, and physical resources has been essential to a number of road construction projects in different areas and nations.

Evidence from South East Asia by Juan & Banca (2017) highlights the fact that competent project managers, sound project governance, and sufficient funding are necessary for the effective planning, execution, and management of good road projects, all of which have remained challenges in the region. This suggests that resources play a crucial role while accounting for everything. Resources and capacities have been crucial in how Asian road development projects are presented. According to Rahman et al. (2020), the proficiency of project managers, the accessibility of labor and materials, and the efficiency of the relevant authority tasked with overseeing project performance are critical elements influencing the successful completion of road projects in Malaysia. Development initiatives have benefited from the contributions of human, financial, ICT, and physical resource capabilities.

For road projects under devolved entities, Nigeria also faced the problem of project delays and completion rates. Due to project cost overruns brought on by the decentralization of road infrastructure, project completion costs increased in comparison to original budgets (Omoregie & Radford, 2016). In Nigeria, delays in seven out of ten road construction projects can be attributed to poor resource allocation, time management, and quality control. Due to a number of reforms that resulted in devolved units, road project identification, funding, and performance have increased significantly in Tanzania (Tsekpo & Hudson, 2015). However, important county governments have been left behind in their usual ranges of familiarity of improvement, which has led to irregular characteristics in regional project advancements that are connected to lacking funds.

The road construction industry in East Africa, such as Uganda, is rife with projects that were finished with notable variances in cost, scope, and completion time. Two such projects, Kanoni-Sembabule-Villamaria (120 KM) and Hima-Katunguru (58 KM), were examined because of performance irregularities totaling approximately Ushs 322 billion (US 87,278 million). (Mwelu et al. 2019). Most road construction projects are completed roughly in accordance with the requirements, but they frequently run over budget and encounter delays. When a road project goes beyond its initial schedule, it results in a delayed increase in project costs, which negatively impacts the project's outcomes and the beneficiaries' ability to receive services.

Information technology and human resource capability are important when implementing road construction projects in Kenya, as noted by King'oo et al. (2020). Research by Chepkole & Deya (2019) suggested that project implementation is driven by financial and human resource capability. In 2022, the World Bank conducted a study to assess implementation of government-funded projects in Kisii, Nandi, Kwale and Murang'a, and counties, supported by the governments of the Netherlands and the International Monetary Fund (IMF). The findings revealed that only 21% of these projects were successfully completed with effectiveness and efficiency between 2019 and 2022. Notably, in these counties, there was a 48.25% failure rate specifically associated with the re-carpeting of existing roads in poor condition. However, the 2020 Devolution Annual Report, a joint initiative of the UNDP and Kenyan Government acknowledged significant improvements in infrastructure projects following the enactment of Kenya's new constitution.

Contrastingly, a 2016 report from the devolution ministry indicated that the implementation of projects across the counties faced a 55% failure rate due to various issues such as inadequate financial allocations and inefficient utilization of available resources. This corresponds with a 2019 report from the Kenyan government, revealing that 49.21% of scheduled county development projects faced hindrances that prevented their realization. As per Musyoki's findings in 2018, 21% of county projects have successfully achieved efficient implementation, 45% are encountering challenges, and the remaining projects have either been abandoned or failed. Thus, the purpose of this study is to ascertain how resource capabilities affect road construction project performance in Kenya's Embu County.

Resources encompass both tangible and intangible assets that are effectively managed by an organization. These assets serve as the foundational elements that are integrated and utilized to accomplish objectives. Managing the combination of resources, rather than their isolated utilization, is a crucial aspect of organizational management. Individual assets constitute components within a broader set of resources, collectively providing the potential for achieving outcomes, (Mukami et al., 2021). The various types of resources are as follows: physical assets, which include things like buildings, machinery, and tools; financial assets, which include cash, commitments made to budgets, and other liquid instruments; technological assets, which include things like computers, software, networks, databases, communication systems, and satellites; human resources, which include things like bodies, minds, and emotions; social assets, which include things like connections, networks, trust, customs, friendships, and reputation; and organizational assets, which include things like information, formal and informal systems, procedures, structures, management expertise (Mambwe, Mwanaumo, Nsefu&Sakala, 2020). Capabilities refer to the ability to utilize a blend of resources via collective organizational practices to attain objectives (Winterton & Cafferkey, 2019). Hence, resource capabilities serve as essential foundations for the performance of road construction projects.

## STATEMENT OF THE PROBLEM

Road construction projects have proven difficult to implement successfully on a national, regional, and worldwide scale, impacting both developed and developing nations. This problem is especially noticeable in developing nations like Kenya, where the performance of road construction has been marked by poor quality standards and cost overruns in several counties. (Musyoki, 2018). The county government of Embu has started a number of road construction initiatives. Most of them, though, have not been fully implemented and have fallen short in terms of budget, completion rate, quality, and time. For example, the Embu-Kibugu-Manyatta-Kianjokoma-Runyenjes-Ugweri-Siakago-Kiritiri-Makima-Karaba road project, which was started in 2017, has had two revisions made to its initial costs. As a result, the project has not yet met its goals, with less than half of its phases completed.

Furthermore, the 12.8 km Embu-Kibugu road project 2018–2022, whose original cost was 120% higher, has not yet been completed. The construction of the Embu-Siakago ring road in Embu County and the Kyeni-Kathanjurû-Karurumo road projects have been delayed for nearly a year. Since they began in 2017, numerous revisions have been made to the project's initial budget, schedule, and quality standards. Despite the two projects having stalled at 80% completion rate in 2022, their planned actual costs have exceeded (Embu County Integrated Development Plan 2018-2022). Road construction projects across many counties have been the subject of numerous complaints regarding misappropriation of funds, inadequate human resources, political instability, ineffective succession and leadership transition plans, ineffective physical resources, and the inability to invest in cutting edge information and communication technologies. However, because there is a dearth of empirical research on the relationship between resource capabilities and road construction project performance, it is unclear how important resource capabilities are to project performance.

The reviewed empirical studies show gaps in the science. For example, (Solodkiy & Gorev, 2018) concentrated on Russia to identify factors that contribute to a road project's successful completion. It was observed that the nation's effective road project implementation is attributed to a high adoption rate of contemporary technologies. However, the study was conducted in Russia and focused primarily on determinants, resulting in conceptual and contextual gaps, respectively (Ferreira & Fernandes, 2017) aimed to ascertain resources' and capabilities' relationship to firm-level performance. According to the study, it is not feasible to conclude that a capability's rarity enhances a firm's ability to compete. (Hailemariam, 2020) conducted research on resource flexibility and its effects on project duration and costs. Nzuki and Mutuku (2023) examined the impact of communication on the Kenya Urban Roads Authority's implementation of road construction projects in Nairobi City County, Kenya. Their findings indicated that communication significantly improved the authority's road development projects in Nairobi City County, Kenya..

## 2. LITERATURE REVIEW

### Theoretical Literature Review

#### Resource Based View Theory

This theory was first put forth by Penrose (1959), and it was later developed by (Barney, 1991). The theory posits that project organizations can maintain their competitiveness by strategically utilizing their resource endowment. With effective resource management, a business can gain a competitive advantage, according to the theory. According to the theory, organizations must improve and develop their key and core competencies when working on projects. The theory posits that project organizations can exploit opportunities and mitigate potential environmental threats by strategically utilizing their internal strengths and weaknesses (Nadezhina & Avduevskaja, 2021).

This theory suggests that the resource attributes and capabilities that an organization acquires for a project have an impact on the entity's competitiveness. (Kumari, 2019) states that an organization's capabilities are the experience, skills, and knowledge of its personnel that enable it to use its resources more efficiently and produce better results. With the help of this theory, project managers can ascertain whether the organization has enough capabilities and resources to sustain itself. Seldom found resources help an organization stay competitive because not many rival companies have them. Physical resources are known as tangible resources, and they can include a project organization's equipment and brand (Tonini, 2021).

This theory is used to underpin human and financial resources and it is expected that their effective use can improve project performance. Successful performance of a road construction projects require allocation of adequate financial resources which are part of the larger project organizational resources. The study will leverage this theory to establish how project managers of construction projects can harness financial resources to increase the good organization of road construction projects in Embu County

#### Empirical Literature Review

Gaster, (2019) conducted study in Bangladesh to investigate the impact of physical resources, such as technological devices, on the service delivery of firms. Utilizing previous literature related to firms in Bangladesh, the study found that incorporating both computer hardware and software contributed to the quality of services delivered. The use of technology devices increased service delivery speed, minimized errors through digital processing, and allowed for serving a larger number of customers within a shorter time frame. In summary, innovations in service delivery and embracing technological devices are recommended for effective and efficient performance. Nevertheless, the research had a contextual limitation since it was carried out in Bangladesh. And a methodological gap due to the use of collected and analyzed secondary data.

Kaseje, (2019) examined the contribution of financial and physical resources to the efficiency of service delivery in public healthcare facilities in Embu County, Kenya. Adopting a primary data collection technique involving 30 stakeholders, the research discovered that the enhancement of physical resources may not lead to a substantial improvement in service delivery, primarily because of constraints in meeting the conditions necessary for sustainable competitive advantage. The proposed study will focus on physical resources in road construction projects in Embu.

Borman et al., (2018) assessed the impact of physical resources on service delivery in Canadian firms. This includes 30 institutions and utilizing questionnaires for data collection, the study found that while physical resource capability is crucial, it minimally contributes to an organization without the technical support gained from human resources at the managerial level. The study focused on Canadian firms, presenting a contextual gap.

Muchiri & Maundu, (2018) conducted research in Nairobi, focusing on the impact of physical resources on service provision in Nairobi County. Using a qualitative research design with 50 stakeholders, the study found that physical resources, including business premises and equipment, play a significant influence on service delivery, though some participants mentioned insufficiencies in physical resources. The intended research seeks to employ a combination of quantitative and qualitative research approaches for a more comprehensive exploration of findings.

## 3. RESEARCH METHODOLOGY

Descriptive survey and correlation designs were used in this investigation. The seven (7) road construction projects that the Embu County Government started in 2017 and that haven't finished as of 2023 served as the analytical unit. The target population consisted of 70 community leaders who were selected from particular areas within the seven (7) construction

projects funded by the Embu County Government, 30 workers from the planning department of the county government of Embu, and 67 contractors and supervisors. There were 167 responders in the entire observation unit. Using stratified random sampling, a scientific method was used to determine the sample size of 117. Regression analysis and means and standard deviations were used to guide the analysis of the data collected from respondents via the questionnaire in SPSS version 24.

#### 4. FINDINGS

Participants were asked to assess the degree to which they agreed with statements related to physical resource capabilities on project performance on a scale of 1-5. The findings were summarized in Table 1.

**Table 1: Physical Resource Capability**

	Mean	SD
The county is equipped with the tools needed to complete the construction projects there.	3.12	.72497
The equipment used for building roads is in good working order.	3.04	.44521
The equipment available to the county is adequate to upgrade the road system.	2.78	.46116
The infrastructure needed to support road construction is positioned carefully.	3.10	.53996
There is high-quality road construction equipment in Embu County.	3.53	.45280
<b>Aggregate Score</b>	<b>3.21</b>	

**Source: Field Data (2023)**

Aggregate score of 3.21 indicates that the county government of Embu does not have the physical resource capabilities to handle road projects. Most participants in the study noted that the county possessed machines of moderate necessity for conducting construction work ( $M=3.12$ ,  $SD=0.72497$ ). The road construction machinery was reported to be in moderately satisfactory conditions ( $M=3.04$ ). Nonetheless, a majority of respondents expressed the view that the machines within the county were insufficient to improve the road network ( $M=2.78$ ,  $SD=0.46116$ ). The findings further indicated that the facilities to support road construction were not strategically placed and the road construction equipment's were of low quality. The study agrees with Gaster (2019) incorporation of quality equipment results in achievement of the quality of services delivered in a project. This is due to the fact that using technology devices speeds up service delivery, reduces error because most work is done digitally, and eventually serves a large number of clients in a short amount of time.

Kaseje, (2019) concurred that the physical resources of a company might not significantly enhance organizational service delivery because a company's services are more easily replicated by rivals due to limitations in meeting the requirements for a sustainable competitive advantage, such as inimitability, rarity, and non-substantiality. Furthermore, a study by Borman and Oppler (2018) assessed how physical resources affected the provision of services in Canadian businesses. and found that, despite the crucial attributes of a firm's physical resource capability, there is a limited contribution to the organization when these resources lack the technical support provided by human resources at the managerial level.

According to (Gaster (2019), the inclusion of high-quality equipment is instrumental in achieving the delivery of quality services in a project. This is attributed to the fact that the use of technological devices enhances service delivery speed, minimizes errors through digital processes, and allows for serving a large number of customers within a short timeframe

#### Results of Inferential Analysis

**Table 2: Correlation Analysis**

		Physical Resource	Human Resource	Financial Resource	ICT	Project Performance
Physical Resource	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	97				
Project Performance	Pearson Correlation	.594**	.617**	.704*	.734**	1
	Sig. (2-tailed)	.000	.000	.011	.005	
	N	97	97	97	97	97

The correlation between project performance and physical resource capability was significant and strong ( $P=0.594$ ,  $sig<0.05$ ) at 95% confidence interval.

## Regression Analysis Results

**Table 3: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.887 <sup>a</sup>	.787	.774	1.48037

The adjusted R<sup>2</sup> also referred to as the coefficient of multiple determinations. This measure indicates the proportion of variability in the dependent variable that is accounted for or explained either independently or collectively, by the independent variables. Consequently, four independent variables (physical resource capability) examined factors, as indicated by the adjusted R-square of 77.4%, clarify 77.4% of the variation in performance observed in road construction projects in Kenya. This implies that other factors not addressed in this study contribute to 22.6% of the sustainability of water projects.

**Table 4: Analysis of Variance**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	635.424	1	158.856	102.326	.000 <sup>b</sup>
	Residual	147.483	95	1.552		
	Total	782.907	96			

The p-value is 0.000b, which is below 0.05. Consequently, the model holds statistical significance in forecasting how physical resources impact the performance of road construction projects in Embu County, Kenya. The calculated F-value at a 5% significance level was 102.326. As the calculated F-value exceeds the critical F-value (with a p-value of 158.856), it suggests that the overall model was statistically significant.

**Table 5: Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	14.040	3.270		4.294	.000
	Physical resource capability	0.781	.153	0.336	5.100	.000

$$Y = 14.040 + 0.781X_1$$

The coefficient (Beta=0.781, sig=0.000) indicates a positive and statistically significant effect on road construction projects.

This suggests that improvements in physical resource capability lead to a corresponding increase in the performance of road construction projects, aligning with prior research by (Gaster, 2019; Borman & Oppler, 2018) in different contexts.

## 5. CONCLUSIONS

The study's conclusions regarding physical resource capability emphasize that effective utilization of physical resources contributes to organizations meeting task specifications efficiently. Project managers should be attentive to machine shortages or learning criteria, mitigating potential resource tensions or negative effects. Planning for physical resource capability necessitates assigning machines to tasks based on factors like capacity, size, and location, ensuring the right machine for each job.

## 6. RECOMMENDATIONS

Allocate resources based on job and efficiency requirements, adjust the number of machines during busy hours and fewer machines during slower times, plan efficiently to meet project needs, focusing on optimal asset utilization and consider the satisfaction and confidence of workers operating machines.

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