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Project Resource Optimization and Successful Implementation of Road Construction Projects in Nairobi City County, Kenya

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ABSTRACT

Purpose: The general objective of the study is to examine the influence of project resource optimization on successful implementation of road construction projects in Nairobi City County, Kenya. Specifically, the study sought to determine the influence of resource allocation and capacity planning on successful implementation of road construction projects in Nairobi City County, Kenya. This study was anchored on; Resource-Based View (RBV) and Systems Theory.

Methodology: This study adopted a descriptive survey design, with road construction projects implemented by national road agencies (KURA, KeRRA, and KeNHA) as the unit of analysis and management employees involved in project implementation as the unit of observation. The target population comprised 695 respondents, including directors general, directors, procurement managers, project engineers, resident engineers, site engineers, and surveyors. Using Yamane's (1967) formula, a sample size of 254 respondents was determined. Data were collected through structured questionnaires administered to a systematically selected sample. A pilot study involving 10% of the respondents was conducted in Kiambu County. Collected data were coded and analyzed using SPSS software. Results were presented through frequency tables, pie charts, and bar graphs. Both descriptive and inferential statistics were applied, while multiple linear regression analysis was used to examine causal relationships among study variables.

Findings: The study concludes that resource allocation and capacity planning have a positive and significant effect on successful implementation of road construction projects in Nairobi City County, Kenya.

Unique Contribution to Theory, Policy and Practice: Based on the findings, the study recommends that the management of road construction projects in Kenya should prioritize the timely and equitable allocation of financial, human, material, and equipment resources based on project needs and implementation schedules.

Keywords: *Project Resource Optimization, Resource Allocation, Capacity Planning, Road Construction Projects*

Background of the Study

Road infrastructure is a foundational element of national development, enabling the efficient movement of goods, services, and people. Globally, roads account for over 80% of passenger traffic and 70% of freight transport, making them critical to economic activity and social inclusion (International Transport Forum, 2023). Well-developed road networks reduce travel time, cut transportation costs, and increase access to essential services such as healthcare, education, and employment. According to the OECD (2021), every dollar invested in road infrastructure can generate up to five dollars in economic returns through improved productivity and trade facilitation. Moreover, rural road development has been shown to significantly reduce poverty, especially in developing countries, by linking remote areas to markets and services. Despite their importance, road infrastructure gaps remain a major challenge, particularly in low-income regions. The World Bank (2023) reports that around one billion people globally still lack access to all-weather roads, limiting their economic and social opportunities. Poor road conditions also hinder supply chain efficiency and raise business costs in many developing countries. As climate change intensifies, there is a growing emphasis on building resilient and sustainable road systems, especially since road transport contributes over 25% of global CO_2 emissions (IEA, 2022).

Project resource optimization is the process of efficiently allocating and managing a project's available resources such as personnel, equipment, materials, and budget to maximize productivity and minimize waste. It involves analyzing resource availability, balancing workloads, adjusting schedules, and prioritizing tasks to ensure resources are used effectively throughout the project lifecycle (Sharad, 2023). The goal is to complete the project on time and within budget while maintaining quality, by avoiding resource conflicts, bottlenecks, and underutilization. Resource allocation is the process of assigning available resources to specific tasks or activities within a project, ensuring that each component has the necessary inputs to progress efficiently (Alkhlaifat *et al.,* 2024). This step requires a clear understanding of resource availability, project priorities, and task dependencies to distribute resources where they are most needed. Capacity planning involves forecasting the amount and type of resources required to meet project demands over time. It aims to ensure that the organization has the right capacity to handle current and future workload without bottlenecks (Candies & Muhire, 2024). This proactive approach helps avoid delays and cost overruns by aligning resource supply with project needs. This study sought to examine the influence of project resource optimization on successful implementation of road construction projects in Nairobi City County, Kenya.

Road construction projects in Nairobi City County, Kenya, play a crucial role in the region's urban development and economic growth. As the capital and largest city in Kenya, Nairobi faces rapid population growth, increased vehicle usage, and expanding urban sprawl, all of which put immense pressure on its transport infrastructure (Otieno, 2023). In response, the county

government, often in partnership with the national government and international agencies, has launched various road construction and rehabilitation projects aimed at decongesting traffic, improving connectivity, and enhancing safety for all road users (Kyalo & Mwaura, 2025). One of the most significant developments in recent years has been the expansion and modernization of major road corridors, including the Nairobi Expressway, which connects Jomo Kenyatta International Airport (JKIA) to (Westlands Ntinyari & Nyang'au, 2024). This public-private partnership project has not only reduced travel time but also introduced a toll-based model that could be replicated in future infrastructure projects (Kurgat & Odhiambo, 2022). Other initiatives, such as the ongoing expansion of Outer Ring Road and rehabilitation of feeder and estate roads, aim to provide efficient access to residential areas, business hubs, and industrial zones, thus promoting inclusive growth (Kirui & Maina, 2023).

Additionally, Nairobi has seen increased investment in non-motorized transport infrastructure as part of road construction projects. Sidewalks, pedestrian bridges, and cycling lanes are being incorporated to support safer and more sustainable urban mobility (Otieno, 2023). These efforts are aligned with broader urban planning policies under Kenya's Vision 2030 and the Nairobi Integrated Urban Development Master Plan (NIUPLAN), which emphasize infrastructure development as a driver of economic and social transformation (Kyalo & Mwaura, 2025). Despite the progress, challenges persist. Issues such as land acquisition delays, corruption, inadequate public participation, and environmental concerns often hinder the smooth implementation of projects (Westlands Ntinyari & Nyang'au, 2024). Furthermore, the city continues to grapple with the maintenance of newly constructed roads and ensuring quality control in construction practices. Addressing these challenges will be key to ensuring that road infrastructure development in Nairobi is both sustainable and equitable in the long term (Kurgat & Odhiambo, 2022).

Statement of the Problem

Road construction projects play a vital role in the economic and social development of any country, and Kenya is no exception. In Nairobi City County, improved road infrastructure enhances connectivity, reduces travel time, and promotes the efficient movement of goods and people (Kirui & Maina, 2023). This directly supports trade, boosts local businesses, and facilitates access to essential services such as healthcare and education. Moreover, road construction projects create employment opportunities, stimulate related industries like construction materials and equipment supply, and contribute to urban development (Otieno, 2023). As Kenya strives toward achieving Vision 2030 and the Sustainable Development Goals (SDGs), investment in road infrastructure is a key pillar for economic transformation and national integration (Kyalo & Mwaura, 2025).

However, the successful implementation of road construction projects is often hindered by several challenges that affect their efficiency and outcomes. Time adherence remains a major

challenge in road construction projects in Nairobi City County (Westlands Ntinyari & Nyang'au, 2024). The Kenya National Bureau of Statistics (KNBS, 2022) reports that 65% of infrastructure projects nationwide, including roads, exceed their planned timelines by at least 6 months, with an average delay of 8-14 months for road projects specifically (Kurgat & Odhiambo, 2022). The Nairobi Outer Ring Road project, for example, faced a delay of over 12 months, which increased overall project costs by approximately 28%. Contributing factors include land acquisition issues, which affect 55% of projects, and contractor-related delays, reported in 40% of cases. These setbacks lead to increased public inconvenience and economic losses estimated at KES 1.5 billion annually due to disrupted transport flows within the city (Kirui & Maina, 2023).

Budget overruns significantly affect road construction in Nairobi City County. According to the Kenya National Audit Office (KENAO, 2023), 48% of public infrastructure projects exceed their budgets, with overruns averaging 22%, translating to billions of shillings lost annually (Otieno, 2023). The rise in construction material prices has exacerbated the problem: cement prices rose by 18% and steel by 15% from 2020 to 2023. Labor costs also increased by 12% in the same period (Kyalo & Mwaura, 2025). The Thika Superhighway expansion project's budget increased by approximately 25%, from KES 30 billion to KES 37.5 billion, partly due to these factors. Additionally, nearly 35% of projects report inaccurate initial cost estimates as a cause of budget overruns, while 27% suffer from changes in project scope after commencement (Westlands Ntinyari & Nyang'au, 2024).

Setting clear, achievable objectives is a critical challenge for Nairobi's road projects. Research from the Kenya Institute for Public Policy Research and Analysis (KIPPRA, 2021) shows that, 30% of infrastructure projects fail or underperform due to poorly defined objectives (Kurgat & Odhiambo, 2022). About 40% of projects suffer from scope creep, where objectives change mid-project without proper realignment of resources. Furthermore, 25% of projects lack measurable performance indicators, making it difficult to track progress or evaluate success effectively. For example, several Nairobi road projects aimed at easing traffic congestion failed to reduce travel time by the expected 15-20%, achieving only a 5-8% reduction instead (Kirui & Maina, 2023). Poor stakeholder engagement also affects project objectives, with 33% of projects reporting conflicts between contractors, government agencies, and local communities that delay decision-making and execution (Otieno, 2023).

Project resource optimization refers to the effective and efficient use of available resources to achieve project objectives. Various studies have been conducted in different parts of the world on project resource optimization on project performance. For instance, Kurgat and Odhiambo (2022) researched on project resource optimization and performance of large scale water projects, Ntinyari and Nyang'au (2024) conducted a study on project resource optimization and performance of donor funded health projects and Otieno (2023) investigated on project resource optimization techniques and sustainability of gated community construction projects. However,

none of these studies focused on resource allocation and capacity planning on successful implementation of road construction projects in Nairobi City County, Kenya. To fill the highlighted gaps, the current study sought to examine the influence of project resource optimization (resource allocation and capacity planning) on successful implementation of road construction projects in Nairobi City County, Kenya.

Objectives of the Study

General Objective

The general objective of the study is to examine the influence of project resource optimization on successful implementation of road construction projects in Nairobi City County, Kenya

Specific Objectives

i. To determine the influence of resource allocation on successful implementation of road construction projects in Nairobi City County, Kenya
ii. To assess the influence of capacity planning on successful implementation of road construction projects in Nairobi City County, Kenya

Theoretical Review

Resource-Based View (RBV)

The Resource-Based View (RBV) theory founded by Barney (1991) is a strategic management framework that focuses on the internal resources and capabilities of a firm as sources of competitive advantage. At its core, RBV posits that a firm's unique bundle of resources and capabilities can enable it to achieve sustainable competitive advantage and superior performance in the marketplace (Kilinga, Singh & Ahmad, 2021). Unlike traditional strategic management approaches that primarily focus on external factors such as market dynamics and industry structure, RBV emphasizes the importance of internal factors in determining a firm's success. RBV theory entails identifying and leveraging a firm's distinctive resources and capabilities to create value and achieve strategic objectives (Mugisha, 2023). Resources can include tangible assets such as physical infrastructure, financial capital, and technology, as well as intangible assets such as human capital, intellectual property, organizational culture, and reputation. These resources are considered valuable if they enable the firm to exploit opportunities or neutralize threats in the external environment. Capabilities, on the other hand, refer to the firm's ability to effectively deploy and utilize its resources to perform specific activities and achieve desired outcomes (Otieno, 2023). This theory was used to determine the influence of resource allocation on successful implementation of road construction projects in Nairobi City County, Kenya.

Systems Theory

Systems Theory developed by Ludwig von Bertalanffy (1937) is an interdisciplinary framework that examines the relationships and interactions among the components of complex systems, emphasizing how these parts function together as a whole (Bakar, *et al*, 2021). Originating from various fields, including biology, engineering, and sociology, Systems Theory seeks to understand not just individual elements but also the dynamics that arise from their interconnections. It posits that systems can be found in various contexts—ranging from ecological and social systems to organizational and technological frameworks—and that these systems operate under specific principles that govern their behavior and evolution (Sharad, 2023). One of the core tenets of Systems Theory is the concept of holism, which asserts that the properties of a system cannot be fully understood by merely analyzing its individual components. Instead, it is crucial to consider the interactions and relationships that bind these elements together. This perspective is particularly relevant in complex systems where emergent properties—characteristics that arise from the collective functioning of the system—cannot be predicted by studying the components in isolation (Alkhlaifat *et al*., 2024).

Another important aspect of Systems Theory is the focus on feedback loops, which are the processes through which outputs of a system can influence its inputs. Feedback can be either positive, reinforcing growth or change, or negative, stabilizing the system by counteracting deviations from a desired state (yakarengo & Wanjiku, 2023). Understanding these feedback mechanisms is essential for analyzing how systems adapt to changes, respond to disturbances, and maintain equilibrium. For instance, in organizational settings, feedback loops can help managers assess the impact of their decisions and adjust strategies to align with evolving goals (Candies & Muhire, 2024). Systems Theory also emphasizes the importance of boundaries, which define the limits of a system and distinguish it from its environment. These boundaries can be physical, conceptual, or operational, and they play a crucial role in determining how a system interacts with external influences (Bakar, *et al*, 2021). Identifying and understanding these boundaries helps in analyzing how systems are influenced by external factors, such as regulatory changes, technological advancements, or societal shifts. This perspective is particularly useful in fields like public health, where understanding the interactions between healthcare systems and social determinants is essential for improving health outcomes (Sharad, 2023). This theory was used to assess the influence of capacity planning on successful implementation of road construction projects in Nairobi City County, Kenya.

Conceptual Framework

A conceptual framework is a structured system of ideas and theories that guides research by defining key concepts, relationships, and variables. It serves as a foundation for understanding and interpreting the phenomena under study, helping researchers to outline their hypotheses and design their methodology (Miles, Huberman & Saldana 2019).

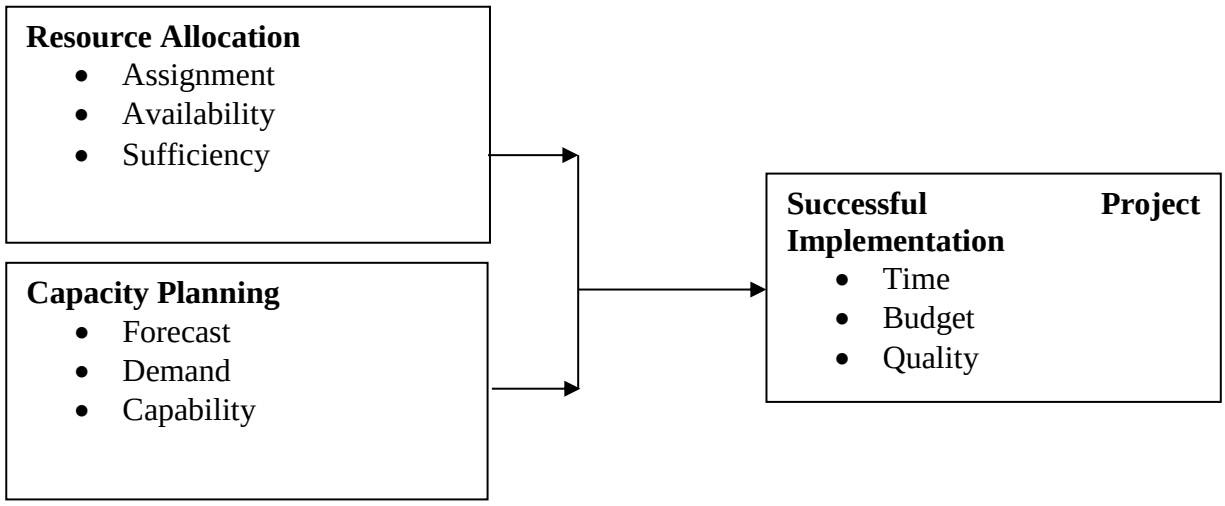


Figure 1: Conceptual Framework

Resource Allocation

Resource allocation is a critical aspect of project and organizational management that involves the strategic distribution and assignment of available resources—such as time, money, personnel, equipment, and materials—to various tasks or departments to achieve specific objectives efficiently and effectively (Hall, Smith & Mitton, 2020). It requires a clear understanding of project priorities, timelines, and deliverables, ensuring that limited resources are utilized optimally without wastage. Effective resource allocation also involves anticipating potential constraints or bottlenecks, adjusting plans dynamically, and making informed decisions to balance workload and prevent resource conflicts. Assignment refers to the process of designating specific resources—such as personnel, equipment, or finances—to particular tasks, activities, or roles within a project or organizational framework (Ouma & Kilonzo, 2020). This step is crucial because it ensures that every task has the appropriate resources allocated to achieve desired outcomes. Effective assignment considers the skills, experience, and capabilities of team members, as well as the nature and complexity of the task. For instance, assigning a highly skilled software developer to a critical coding task can improve efficiency and reduce errors.

Availability in resource allocation pertains to whether the required resources are accessible and ready for deployment at the needed time (Sadiq, 2020). It involves understanding current commitments, schedules, and workload capacities of resources such as human capital, machinery, or budgetary funds. For example, a project may require a particular machine that is already booked for another task, or an expert who is on leave. In such cases, project managers need to assess real-time resource calendars and constraints to avoid delays or overbooking. Sufficiency addresses whether the quantity and quality of allocated resources are adequate to

meet the requirements of the assigned tasks (Mubangizi & Kabanda, 2024). It goes beyond mere availability by evaluating whether the resources are capable of delivering the expected outcomes within the specified timeframe and standards. For instance, assigning two junior developers to a task meant for a team of experienced programmers might meet the availability requirement, but not the sufficiency standard. Assessing sufficiency involves a careful examination of scope, workload, and performance benchmarks. Insufficient resources can lead to overwork, decreased morale, subpar outputs, and potential project failure.

Capacity Planning

Capacity planning is a strategic process used by organizations to determine the production or resource capacity needed to meet future demands effectively (Alkhater, 2021). It involves forecasting workload requirements and ensuring that the organization has sufficient resources—such as personnel, equipment, time, and budget—to complete work efficiently without overloading or underutilizing assets. Capacity planning is essential for aligning operational capabilities with business goals, especially in dynamic environments where demand can fluctuate. The process typically includes analyzing current capacity, predicting future needs based on historical data and market trends, and identifying any gaps that could hinder performance (Gureh & Ondara, 2024). Forecast in capacity planning refers to the process of predicting future workload, resource needs, or customer demand based on historical data, trends, market analysis, and business projections (Owino & Omwenga, 2022). Accurate forecasting is the foundation of effective capacity planning because it provides the insight needed to prepare resources in advance. It involves analyzing past performance, seasonal fluctuations, economic conditions, and upcoming business changes to estimate future needs. For example, a retail company may forecast higher sales during the holiday season, which signals the need for increased inventory and staffing. Forecasting can be qualitative (based on expert judgment) or quantitative (based on statistical methods and data modeling). A reliable forecast helps organizations make proactive decisions about hiring, purchasing, production scheduling, and infrastructure investment, reducing the risk of resource shortages or excess capacity (Murithi & Muchelule, 2023).

Demand represents the amount of work, service, or product that customers or internal processes require within a specific time frame (Alkhater, 2021). In capacity planning, understanding demand is critical because it determines how much output is needed to meet customer expectations or operational targets. Demand can be influenced by various factors such as customer preferences, market trends, competition, promotions, or external events. Organizations must monitor both current and anticipated demand to respond effectively. If demand exceeds available capacity, it can lead to delays, missed opportunities, or customer dissatisfaction. Capability refers to the actual ability of an organization to meet its workload or production requirements using available resources, infrastructure, and processes (Mkutano, 2020). It reflects

the maximum output that can be achieved under current conditions, taking into account factors such as staff expertise, equipment performance, technology, and organizational efficiency. In capacity planning, evaluating capability involves assessing whether the existing setup can handle the forecasted demand without compromising quality or timelines. This includes examining operational bottlenecks, downtime risks, skill gaps, and other constraints.

Empirical Review

Resource Allocation and Project Implementation

Hall, Smith and Mitton (2020) conducted a study on the assessing and improving performance: a longitudinal evaluation of priority setting and resource allocation in a Canadian health region. The Resource Allocation Performance Assessment Tool (RAPAT) was implemented in a healthcare organization in British Columbia, Canada. The study found that implementation of RAPAT in the pilot organization identified strengths and weaknesses of the organization's PSRA process at the time of the original evaluation. The study concluded that while past studies have taken a cross-sectional approach, this paper introduces the first longitudinal evaluation of PSRA in a healthcare organization

Mubangizi and Kabanda (2024) conducted a study on the influence of resource allocation on strategic project implementation in Rwanda irrigation system: a case study of Kagitumba irrigation project. The researcher used stratified random sampling technique to select a sample size of 150 employees from the population of the employees of Kagitumba Irrigation Scheme. Primary data was collected using semi structured questionnaires. The questionnaires were administered by the help of research assistants in each and every department. The findings showed that strategic infrastructure development, strategic financial resource allocation, and strategic staff development, strategic information and communication technology and government regulations have a significant influence on affected the strategic project implementation of Kagitumba irrigation scheme. The study concluded that the goal of the study was to determine how resource allocation affected the strategic project implementation of Kagitumba irrigation scheme in Rwanda

Ouma and Kilonzo (2020) conducted a study on the effect of resource allocation planning: impact on public sector procurement performance in Kenya. Employed a cross section survey approach relating the influence of resource allocation planning on procurement performance in the Kenya public finance sector. Descriptive research design was employed as it best works where research seeks information concerning the current status or 'what exists'. The target population consists of the 124 state agencies. The study first sought to establish whether procurement was recognized as significant in the operations of public entities. Results indicated that 23% and 34% of the respondents strongly agreed and agreed respectively that procurement departments were very important to public entities.

Lemarleni *et al* (2020) conducted a study on the effects of resource allocation on strategy implementation at Kenya Police Service in Nairobi County. The study targeted a population of fifty-six police officers of the rank of OCPDs and OCSs all working in thirteen police divisions and forty-three police stations within Nairobi County, they were used because they occupy strategic position at the operational level, they are the key implementers of strategic plan of the service at divisions and stations respectively and therefore best placed to give detailed account of effects of resource allocation in relation to strategy implementation. The study findings make useful contribution to theory and research on strategy implementation and especially when applying resource-based view (RBV) and MCkinsey 7S Model which gives further understanding of those theories. The study however concludes that there is no significant moderating effect of organizational culture on the influence of resource allocation on strategy implementation at the Kenya police service even though.

Sadiq (2020) conducted a study on the effect of resource allocation strategy on the performance of water services boards in Kenya. The target population of this study was employees of water services board in Kenya. The researcher used stratified random sampling technique to select a sample size of 150 employees from the population of the employees of water services boards. The study findings indicated that strategic staff development, strategic financial resources, strategic infrastructural development and strategic technological deployment positively influenced performance of water Services Boards. From the study findings, it can be concluded that resource allocation strategy have a significant effects on the performance of water services boards in Kenya.

Capacity Planning and Project Implementation

Alkhater (2021) conducted a study on the effect of analyzing the adoption of capacity planning methodologies and tools in the Turkish nongovernmental organizations (NGOS) working in Syria humanitarian response. Several studies have found that the development and humanitarian projects implemented by non-governmental organizations have unique characteristics such as intangible results, a high number of stakeholders, and complicated and risky contexts. It was found as well that PCM and PMD Pro methodologies are the most adopted methodology among NGOs, and the logical framework matrix, cost accounting, and the project schedule are the most adopted capacity planning tools followed by the progress report, communication plan, and work breakdown structure(WBS). The study concluded that the compliance with budget, meeting the project deadline, compliance with the quality, satisfaction of the local community, and monitoring and reporting to stakeholders factors are the highest achieved in NGOs' performance as demonstrated

Gureh and Ondara (2024) conducted a study on the effect of capacity planning practices and implementation of Somali humanitarian fund projects by local non-governmental organizations in Mogadishu, Somalia. The effective management and control of a project are fundamental to its

success. In the context of intricate projects, such as those associated with the Somali Humanitarian Fund (SHF), strict adherence to a defined scope, schedule, and budget is crucial to attaining the desired outcomes. The findings highlight the critical role of effective communication, comprehensive planning, adequate financing, and robust monitoring and evaluation (M&E) mechanisms in project success. In conclusion, this study provides valuable insights into the intricate dynamics of capacity planning practices and their profound impact on the implementation of Somali Humanitarian Fund (SHF) projects by local Non-Governmental Organizations (NGOs) in Mogadishu, Somalia

Mkutano (2020) conducted a study on the effect of capacity planning practices and performance of non-governmental organizations projects in Nairobi city county, Kenya. The study also sought to find out the effect of communication, capacity planning, stakeholder involvement, monitoring and evaluation on the performance of non-governmental organizations projects. The target population of the study was 201 NGOs operating in Nairobi County. Stratified and simple random sampling was used to select 50% of the target population thus 100 NGOs in Nairobi County. The study findings indicated that there was improved project performance due to effective use of capacity planning practices such as communication, planning, stakeholder participation and monitoring and evaluation of project activities. The study concluded that project communication significantly affects the project outcomes; therefore, clearly establishing and managing the structures of communication on project must always be on the agenda of team leaders and management before the commencement of every project.

Owino and Omwenga (2022) conducted a study on the effect of capacity planning practices and performance of non-governmental organizations in Migori County, Kenya. This study ascertained the impact of capacity planning approaches on the performance of non-governmental organization projects in Nairobi City County, Kenya. he study's findings suggested that effective capacity planning methods such as communication, planning, stakeholder engagement, and monitoring and evaluating project activities resulted in enhanced project performance. According to the research descriptive analysis, the research concludes that communication is the first vital factor that influences performance of non-governmental organizations in Migori County, Kenya.

Murithi and Muchelule (2023) conducted a study on the influence of capacity planning on NGO'S projects performance in Kenya. The purpose of this study was to establish the role of monitoring and evaluation on performance of non-governmental organizations projects in Meru County. A descriptive survey research design was adopted; target population of the study was 147 registered NGO's in Meru County. Random sampling was used to select 2 representatives from the 60 NGOs thus a sample size of 112 respondents drawn from the target population. Questionnaires were used for data collection. The study found that from the multiple regression coefficients findings, it is clear that capacity planning has a statistically significant positive effect on performance. From the findings the study concludes that monitoring and evaluation has a

positive and significant influence on the performance of non-governmental organizations projects in Meru County, Kenya. This was evident from the both descriptive and inferential statistical data

RESEARCH METHODOLOGY

Research Design

The research design is the set of conditions for data collection and analysis that are designed to balance the economy of the research procedure with the relevance of the research purpose. According to Creswell and Poth (2018), researchers must inquire about the knowledge claims and theoretical perspectives they are introducing to any research, reflect on the strategies they plan to employ in their study, which subsequently influence their methods, and question the methods they use to collect and analyze information. This investigation employed a descriptive survey design. A descriptive study is characterized by an examination of a situation or a particular issue that elucidates the patterns of relationships between variables.

Study Population

The unit of analysis was the road construction projects implemented by National Government road agencies (KURA, KeRRA, and KeNHA) while the unit of observation was management employees involved in the implementation of these road construction projects. The management employees include; top managers, senior officers and officers. Therefore, the target population for the research was 695 respondents comprising of director general, directors, procurement managers, project engineers, resident engineers, site engineers and surveyors. The table shows the agencies and the staff size.

Table 1: Target Population

Category	KURA	KeRRA	KeNHA	Total
Top Management	5	5	6	16
Senior Officers	52	117	10	179
Officers	104	360	36	500
Total	**161**	**482**	**52**	**695**

Sample Size and Sampling Technique

Kothari (2019) explains that a sample size refers to the number of items to be selected from the universe to constitute a sample while sampling procedures refers to the technique used in selecting the items of the sample. The study used Yamane (1967) formula to determine the size of the sample. The selection formula is as follows:

$$n=\frac{N}{1+(N-1)e^2}$$

Where n= the required sample size

N = is the Target Population (695 respondents)

e = accuracy level required. Standard error = 5%

Sample calculation

$$n=\frac{N}{1+(N-1)e^2}$$

$$n=\frac{695}{1+(695\ )0.05^2}$$

$$n=\frac{695}{2.7375}=254$$

From the formula, the sample size was 254 respondents

Data Collection

The data was collected from a systematically selected sample of respondents from the population of study using a structured questionnaire. The concepts derived from the literature review were employed to develop structured questionnaires. Additionally, they have the advantage of simultaneously providing an even stimulus to a large number of individuals, which allows the investigator to accumulate data relatively easily (Saleemi, 2019).

Pilot Study

A pilot study is a small-scale study that is conducted prior to the main study to determine the appropriateness of the research questions, the most appropriate methods, and an estimate of the time required (Ismail, Kinchin & Edwards, 2017). A pilot study is essential for the development and testing of research instruments by utilising a small percentage of the total sample size. Hertzog (2018) has determined that 10% of the necessary sample is sufficient for a pilot study. Consequently, a pilot study was conducted in Kiambu County, which involved 10% of the total number of respondents. Questionnaires and consent forms were printed and the consent forms were issued to selected participants to get their consent before issuing the questionnaires. Participants were randomly selected.

Data Analysis and Presentation

Data from questionnaires was coded and analyzed using the latest Statistical Package for Social Sciences (SPSS) computer software. SPSS software was used because of its ability to appropriately create graphical presentations of questions, data for reporting and presentation. The analyzed data was presented in the form of frequency distribution tables, pie charts and bar

graphs where appropriate. The study employed mixed methods data analysis by applying the use of descriptive and inferential statistics.

The objectives of the study guided data analysis. SPSS was used to analyze the data collected from the field. To allow data to be entered into the software, the questionnaires were referenced, and the data coded. Quantitative data collected was analyzed using descriptive statistics techniques. Through descriptive analyses, correlational as well as experimental studies emerge; and they provide clues on the issues that require more attention which leads to further research (Mugenda & Mugenda, 2018).

Multiple regression models were fitted to the data to determine how the predictor/independent variables affect the response/dependent variable. Multiple regression analysis was used in this study because it uses the predictor variables in predicting the response variable. It is a statistical tool attempting to establish whether some variables can be used together in predicting a particular variable (Mugenda & Mugenda, 2018).

To determine any causal relationship, multiple linear regression analysis was conducted. As stated by Gujarati (2019), causation models are best explained by linear regression analysis and thus, the study used linear regression results for each variable to measure hypothesis 1 and 2. The model was;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Where;

Y = dependent variable (successful implementation of road construction projects in Nairobi City County, Kenya)

X_1 = Resource Allocation

X_2 = Capacity Planning

β_0 = the constant term

β_{1-2} = the Beta coefficient

ε = the error term

RESEARCH FINDINGS AND DISCUSSIONS

Response Rate

The sample size of this study was 254. The researcher distributed 254 questionnaires to the respondents during data collection process and 226 were fully filled and returned to the researcher thus making a response rate of 89%. That a response rate which is more than 50% is considered adequate while excellent response rate is usually above 70%. This implies that the response rate in this research is good for making conclusions as well as recommendations.

Table 2: Response Rate

Response Rate	Frequency	Percent
Response	226	89
None Response	28	11
Total	**254**	**100**

Descriptive Statistics Analysis

Resource Allocation and Project Implementation

The first specific objective of the study was to determine the influence of resource allocation on successful implementation of road construction projects in Nairobi City County, Kenya. The respondents were requested to indicate their level of agreement on statements relating to resource allocation and successful implementation of road construction projects in Nairobi City County, Kenya. The results were as presented in Table 3.

From the results, the respondents agreed that resources are appropriately assigned to tasks based on their skills and expertise (M=3.891, SD=0.805). In addition, the respondents agreed that clear responsibilities are designated to team members for effective resource utilization (M=3.875, SD=0.798). Further, the respondents agreed that there are minimal delays caused by unavailability of resources (M=3.854, SD=0.891).

From the results, the respondents agreed that backup resources are planned in case of primary resource unavailability (M=3.815, SD=0.598). In addition, the respondents agreed that the quantity of resources allocated is sufficient to meet project demands (M=3.787, SD=0.772). Further, the respondents agreed that resource levels are adequate to avoid bottlenecks during project execution (M=3.741, SD= 0.681).

Table 3: Resource Allocation and Project Implementation

	Mean	Std. Dev
Resources are appropriately assigned to tasks based on their skills and expertise.	3.891	0.805
Clear responsibilities are designated to team members for effective resource utilization.	3.875	0.798
There are minimal delays caused by unavailability of resources.	3.854	0.891
Backup resources are planned in case of primary resource unavailability.	3.815	0.598
The quantity of resources allocated is sufficient to meet project demands.	3.787	0.772
Resource levels are adequate to avoid bottlenecks during project execution.	3.741	0.681
Aggregate	**3.827**	**0.758**

Capacity Planning and Project Implementation

The second specific objective of the study was to assess the influence of capacity planning on successful implementation of road construction projects in Nairobi City County, Kenya.The respondents were requested to indicate their level of agreement on various statements related to capacity planning and successful implementation of road construction projects in Nairobi City County, Kenya. The results were as shown Table 4.

From the results, the respondents agreed that accurate forecasts of resource requirements are made before project initiation (M=3.887, SD= 0.820). In addition, the respondents agreed that future resource needs are regularly predicted based on project progress and changes (M=3.841, SD= 0.687). Further, the respondents agreed that resource demand fluctuations are anticipated and planned for appropriately (M=3.826, SD=0.509).

From the results, the respondents agreed that the team effectively matches resource demand with available capacity throughout the project (M=3.755, SD= 0.687). In addition, the respondents agreed that the capability of resources is thoroughly assessed before assignment to tasks (M=3.739, SD= 0.681). Further, the respondents agreed that resource skills and competencies meet the project's technical requirements (M=3.712, SD=0.876).

Table 4: Capacity Planning and Project Implementation

	Mean	Std. Dev
Accurate forecasts of resource requirements are made before project initiation.	3.887	0.820
Future resource needs are regularly predicted based on project progress and changes.	3.841	0.687
Resource demand fluctuations are anticipated and planned for appropriately.	3.826	0.509
The team effectively matches resource demand with available capacity throughout the project.	3.755	0.687
The capability of resources is thoroughly assessed before assignment to tasks.	3.739	0.681
Resource skills and competencies meet the project's technical requirements.	3.712	0.876
Aggregate	**3.793**	**0.710**

Project Implementation

The respondents were requested to indicate their level of agreement on various statements relating to successful implementation of road construction projects in Nairobi City County, Kenya. The results were as presented in Table 5.

From the results, the respondents agreed that the project is completed within the originally planned timeframe (M=3.726, SD=0.674). In addition, the respondents agreed that delays during the project are effectively managed and minimized (M=3.711, SD=0.904). Further, the respondents agreed that costs are accurately estimated and controlled throughout the project (M=3.703, SD=0.765).

From the results, the respondents agreed that financial resources are efficiently utilized to avoid unnecessary expenses (M=3.674, SD=0.888). In addition, the respondents agreed that the project objectives are clearly defined and communicated from the start (M=3.651, SD=0.543). Further, the respondents agreed that stakeholder expectations are adequately considered in setting the project objectives (M=3.633, SD=0.698).

Table 5: Project Implementation

	Mean	Std. Dev
The project is completed within the originally planned timeframe.	3.726	0.674
Delays during the project are effectively managed and minimized.	3.711	0.904
Costs are accurately estimated and controlled throughout the project.	3.703	0.765
Financial resources are efficiently utilized to avoid unnecessary expenses.	3.674	0.888
The project objectives are clearly defined and communicated from the start.	3.651	0.543
Stakeholder expectations are adequately considered in setting the project objectives.	3.633	0.698
Aggregate	**3.683**	**0.745**

Inferential Statistics

Inferential statistics such as correlation analysis and regression analysis were used to assess the relationships between the independent variables (resource allocation and capacity planning) and the dependent variable (successful implementation of road construction projects in Nairobi City County, Kenya).

Correlation Analysis

This research adopted Pearson correlation analysis determine how the dependent variable (successful implementation of road construction projects in Nairobi City County, Kenya) relates with the independent variables (resource allocation and capacity planning).

Table 6: Correlation Coefficients

		Project Implementation	Resource Allocation	Capacity Planning
Project Implementation	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	226		
Resource Allocation	Pearson Correlation	.882**	1	
	Sig. (2-tailed)	.000		
	N	226	226	
Capacity Planning	Pearson Correlation	.864**	.112	1
	Sig. (2-tailed)	.001	.083	
	N	226	226	226

**. Correlation is significant at the 0.01 level (2-tailed).

From the results, there was a very strong relationship between resource allocation and successful implementation of road construction projects in Nairobi City County, Kenya (r = 0.882, p value =0.000). The relationship was significant since the p value 0.000 was less than 0.05 (significant level). The findings are in line with the findings of Hall, Smith and Mitton (2020) who indicated that there is a very strong relationship between resource allocation and project implementation.

Further, there was a very strong relationship between capacity planning and successful implementation of road construction projects in Nairobi City County, Kenya (r = 0.864, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings are in line with the findings of Alkhater (2021) who indicated that there is a very strong relationship between capacity planning and project implementation.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (resource allocation and capacity planning) and the dependent variable (successful implementation of road construction projects in Nairobi City County, Kenya).

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.805	.649	.648	.10428

a. Predictors: (Constant), resource allocation and capacity planning

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the

independent variables and the dependent variable was 0.649. This implied that 64.9% of the variation in the dependent variable (successful implementation of road construction projects in Nairobi City County, Kenya) could be explained by independent variables (resource allocation and capacity planning).

Table 8: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	103.023	2	51.512	213.743	.002[b]
	Residual	55.771	223	.241		
	Total	158.794	225			

a. Dependent Variable: successful implementation of road construction projects in Nairobi City County, Kenya

b. Predictors: (Constant), resource allocation and capacity planning

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 213.743 while the F critical was 3.036. The p value was 0.002. Since the F-calculated was greater than the F-critical and the p value 0.002 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of resource allocation and capacity planning on successful implementation of road construction projects in Nairobi City County, Kenya.

Table 9: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.292	0.075		3.893	0.000
	resource allocation	0.374	0.098	0.375	3.816	0.000
	capacity planning	0.356	0.094	0.357	3.787	0.001

a Dependent Variable: successful implementation of road construction projects in Nairobi City County, Kenya

The regression model was as follows:

$$\mathbf{Y = 0.292+0.374X_1 + 0.356X_2 +\varepsilon}$$

According to the results, resource allocation has a significant effect on successful implementation of road construction projects in Nairobi City County, Kenya β_1=0.374, p value= 0.000). The relationship was considered significant since the p value 0.000 was less than the

significant level of 0.05. The findings are in line with the findings of Hall, Smith and Mitton (2020) who indicated that there is a very strong relationship between resource allocation and project implementation.

Furthermore, the results revealed that capacity planning has a significant effect on successful implementation of road construction projects in Nairobi City County, Kenya β1=0.356, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings are in line with the findings of Alkhater (2021) who indicated that there is a very strong relationship between capacity planning and project implementation.

CONCLUSION AND RECOMMENDATIONS

Conclusions

The study concludes that resource allocation has a positive and significant effect on successful implementation of road construction projects in Nairobi City County, Kenya. Findings revealed that assignment, availability and sufficiency influence successful implementation of road construction projects in Nairobi City County, Kenya.

Further, the study concludes that capacity planning has a positive and significant effect on successful implementation of road construction projects in Nairobi City County, Kenya. Findings revealed that forecast, demand and capability influence successful implementation of road construction projects in Nairobi City County, Kenya

Recommendations

The study recommends that the management of road construction projects in Kenya should prioritize the timely and equitable allocation of financial, human, material, and equipment resources based on project needs and implementation schedules. Adequate resource planning and continuous monitoring should be undertaken to ensure that critical resources are available when required, thereby minimizing delays, cost overruns, and disruptions during project execution.

Further, the study recommends that the management of road construction projects in Kenya should undertake comprehensive capacity planning before and throughout project execution to ensure that adequate human resources, equipment, technical expertise, and financial resources are available to meet project demands. Regular capacity assessments should be conducted to identify potential resource gaps and facilitate timely adjustments through recruitment, training, equipment acquisition, or resource reallocation.

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