

# Influence of Resource Scheduling On the Performance of Residential Construction Projects in Nairobi City County, Kenya

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**Abstract:** Project performance is a primary consideration in any project, and different strategies are usually employed to ensure better project performance. Despite the dedicated efforts to improve project performance, gated community residential construction projects still register poor performance. A literature review reveals that many public construction projects, residential construction projects, and road construction projects still register poor performance related to project management practices. This study aimed to investigate the influence of resource scheduling on the performance of residential construction projects in Nairobi City County, Kenya. Simple random sampling and purposive sampling was used with a descriptive survey research design. Seventy-nine gated community residential construction projects were selected, with the target population being the project managers, project supervisors, and contractors from each selected project. Data was collected using questionnaires. Descriptive and inferential statistics were adopted to analyse the data presented in tables. The study found a significant relationship between resource scheduling and project performance. The study concluded that the proper allocation of project equipment facilitates smooth operations and successful project completion. The study recommended that project managers, contractors, and supervisors should ensure they clearly set roles for the individuals, teams, tasks, or departments to improve the performance of the project.

**Keywords:** Resource scheduling, Project Performance

## I. INTRODUCTION

Projects are considered as the pursuit of any undertaking that meets the needs of different stakeholders, which includes construction projects (PMI, 2016). The construction projects' performance is often considered in terms of quality, schedule, and cost. Project Management Institute (PMI) acknowledges that successful projects are finished within budget, on time, and meets the desired quality. Across the world, different projects struggle to meet these performance parameters. In the Construction Extension of the Project Management Body of Knowledge (PMBOK), it is noted that most construction projects are unique because they are fraught with uncertainty and are often highly complex, especially because of the complex project environment. They are expected to respond to the different weather, site, economic, community, and physical conditions prevalent at the times of execution. As such, these projects inherently complete beyond the time schedule and outside the budget.

In other parts of the world, the same pattern is replicated. Niazi and Painting (2017) acknowledge the challenge of effective project management that leads to time delays and cost overruns in construction projects in Afghanistan, highlighting corruption, payments, and financing, among others, as the key factors. Shah (2016) noted that in Australia, project management practices are among the key factors, while in Ghana, payments and complexity are the key factors, and in Malaysia, contractor and management factors lead to time delays and cost overruns. Salunkhe and Patil (2014) and Singh (2017) acknowledge the persistence of time delays and cost overruns in construction projects in India. Tommy, Fung, & Tung (2016) acknowledge the same challenge in Hong Kong civil engineering projects. Qatar's construction projects also face the same time and cost overruns (Senouci, Ismail, & Eldin, 2016).

In Africa, the challenge has been extensively studied, but it is yet to be fully addressed. Ineffective project management practices have led to time delays and cost overruns that have continued to affect the performance of public projects, as is evidenced by the Ugandan Civil Aviation Authority (CAA) (Alinaitwe, Apolot, & Tindiwensi, 2013). Projects in Botswana, Egypt, Zambia, and South Africa face the persistent challenge of effective project management (Mukuka, Aigbavboa & Thwala, 2015; Aziz, 2013). Saleh *et al.* (2019) highlighted the causes of delay in construction projects in Libya, noting that it affects the performance of the projects and is often linked to project management practices. The challenge is experienced in Nigeria (Aibinu & Odeyinka, 2016; Amusan, Dolapo, & Joshua, 2017).

In another study, Gituro and Mwawasi (2016) highlight that construction projects contribute to a country's economy in developing countries, and this has been a considerable challenge for project managers. They note that the Kenya National Highways Authority (KeNHA) has reported notable project management challenges in their road construction projects. Boru (2016) looked at the case of Meru County, Kwatsima (2016) looked at the large construction projects in Kenya, and Seboru (2015) looked at the road construction projects in Kenya. Nzingu and Karanja (2018) acknowledged that checking and evaluation are critical to the success of gated community residential construction, especially acknowledging the challenge of proper planning and

budgeting.

The project management practices consequently impact the construction projects' performance, regardless of their location. Fayek (2013) argued that when a construction project extends beyond its due date and budget, they consequently affect the company's performance and the country's economy. The construction project schedule has a huge influence on project success, and time delays affect project success. Al-Hazim *et al.* (2017) examined the project management practices related to time delays and cost overruns in construction projects in Jordan and highlighted that the causes vary greatly from nation to nation and what might cause significant delays in one country might differ from another country (Alaghbari *et al.*, 2017).

Crivelli and Gupta (2013) show that project resource scheduling involves the identification of technical, physical, human, and most importantly, financial resources and organizing the resources in a manner that ensures successful project completion. Miller and Lessard (2011) argue that financial resources are particularly crucial in construction projects as project contractors need them to purchase project machinery and equipment needed and meeting other financial demands of the project, which include fueling machines and vehicles, equipment and machinery maintenance, and meeting wage and salary demands of the project among other miscellaneous costs. Besides the physical and financial resources, human resources are another critical component of the project resources and should be properly managed and scheduled for the success of the projects (Kihoro & Waiganjo, 2015).

The residential construction industry is part of the crucial contributors to the Kenyan economy. The construction projects (CP) are often a conglomeration of different complex processes, stakeholders, contractors, and regulations (PMI, 2016). The residential construction projects include projects that are entirely for residence and not for commercial purposes, and in this study, mixed development projects (those that include commercial buildings) were excluded. This study focused on selected residential construction projects in Nairobi County, specifically the gated-community (GC) residential projects.

#### *Statement of the Problem*

The performance of a project is a primary consideration in any project, and different strategies are usually employed to ensure better project performance. Over time, different studies have attempted to examine the different project management practices affecting residential construction projects' performance. Time and cost are two critical indicators of project success; however, it has been found that 9 out of 10 projects experience cost overruns (Flyvbjerg *et al.*, 2014), and the cost overruns can be as high as 183% (Odeck, 2014; Love *et al.*, 2012), suggesting that the project management practices are not effective.

The project management practices, specifically resource scheduling has a substantial influence on the performance of GC housing projects. In the past few years in Kenya, there has been an increase in the number of property developers bringing in different models of GC housing to the real estate sector. However, there exist several critical elements that have arisen in relation to the project performance executed by the developers (Kihoro & Waiganjo, 2013). According to Musyoka (2017), the success of these GC housing project often depends on the project management practices employed in particular projects.

The lack of effective resource scheduling has continually led to the poor performance of GC construction projects. A literature review reveals that a number of public construction projects and road construction projects still register poor performance related to the project management practices (Boru, 2016. Ochenge (2018) acknowledged that the performance of road infrastructure projects was significantly affected by project management practices. These studies have primarily focused on public sector projects and do not offer insights into the private and residential construction projects.

Some of the factors associated with poor performing projects are sector-specific, especially the difference in how projects are managed within the public and the private sector. Musyoka, Gakuu and Kyalo (2017) advance that GC housing projects in Nairobi County still experienced some challenges despite their nature and higher threshold required in the management of the private-sector projects. Nzingu and Karanja's (2018) study focused on the influence of M&E practices on GC housing projects' success within Nairobi, highlighting that more knowledge about the monitoring tools is needed for the success of the projects. Therefore, the current study attempted to address the gap by examining the influence of resource scheduling on the performance of residential construction projects, and it was limited to the GC residential projects within Nairobi City County.

## II. LITERATURE REVIEW

### *Theoretical Literature Review*

This study was guided by Barney's (1991) Resource-Based View (RBV) theory that posits that a firm is defined as a set of resources. The theory originated from strategic management research on how firms create value and specifically how they can obtain a competitive advantage in the market. Barney (1991) suggested that a firm's competitive advantage is its value-creating strategy, one that is significantly distinct from the current or future strategy of the competitors. Therefore, in this view, the firm's resources are its source of sustained competitive advantage. That is, the resources that a firm has are their primary source of competitive advantage, and the resources can either be strength or a weakness, including both the intangible and tangible resources available to the company.

Barney (1991) notes that the two critical assumptions of the RBV theory are that the resources must be heterogeneous and immobile. The heterogeneity assumption holds that companies possess different skills, capabilities, resources, and structure, which makes the company inherently different. The immobility assumption holds that a certain company's resources have to be immobile, that is, they cannot be moved from one company to the other. Therefore, a firm can get a sustained competitive advantage if the resources are "valuable, rare, imperfectly imitable, and not substitutable" (VRIN) (Barney, 1991).

The project managers should identify whether the available resources meet the VRIN criteria, which will lead to better management and utilization of resources to obtain a competitive advantage. Almarri and Gardiner (2014) argue that the RBV theory is equally important for project managers as it allows them to spread the available resource to align with strategy, identify the value of the resources, and identify the required capabilities for the success of the firm.

The RBV theory is applicable to the current study since one of the critical aspects of project management includes project resource planning/scheduling/management. Identified resources by the project managers of the residential construction projects should meet the VRIN criteria as it ensures that the resources are properly utilized and as much as there might be no competitors, the resources should be used to obtain the advantage. The project manager, who is faced with the challenge of resource availability, will establish the key resources (tangible and intangible) and capabilities that will ensure the construction projects are completed within time and within budget. Additionally, proper resource management in residential construction projects is critical when dealing with project cost overruns and time delays.

#### *Empirical Literature Review*

Nagaraju and Reddy (2012) conducted a case study on resource management in construction projects. They note that resource scheduling is crucial in construction projects, especially due to their high stakes nature that needs efficient resource utilization. The project managers have to make complex scheduling decisions under the varied scheduling needs such as resource constraints and smooth resource utilization along with the inherent uncertainty in construction projects. The study findings highlight that resource scheduling is critical since the nature of construction projects is unique and is marked by complex deployment patterns of resources leading to uncertainty and increased risks. As such, the success of the project needs state-of-the-art resource management, and resource allocation should be done prudently to ensure the projects' timely completion.

Yaghootkar and Gil (2012) did a study on the influence of scheduled-driven project management when working under multi-project scenarios. The findings highlighted that a schedule-driven project management policy could contribute to notable success and improve the company's ability to

deliver on the long-term planned project milestones. Although securing resources ensures timely delivery of the "business-critical" project, lack of enough staff and free resource capacity adversely affects the project schedule as the project is starved of resources. Furthermore, the frequent back and forth shuttling between projects affect the staffs' productivity the more they switch between projects. Ultimately, ineffective resource scheduling hampers the company's overall capacity to deliver on projects.

Obegi and Kimutai's (2017) study on the effects of resource scheduling on the performance of NGO projects in Nairobi City County highlighted that effective resource scheduling is one of the central project success factors. The study findings highlighted that the occasional monitoring of budget to assess expenses vis-à-vis project budgets, project changes during implementation, equipped project staff, and periodic project performance assessment. The project performance was influenced by resource scheduling because it ensured that the project was operating within budget and the changes are made to adapt to the dynamic nature of the projects, and the staff had what was needed for the job.

Ochenge (2018) conducted a study to examine how the performance of road infrastructure projects was affected by the various project management practices in Kenya's Lake Basin Region. The study findings highlighted that the performance of the road infrastructure projects was considerably affected by project risk management, project resource mobilization, group dynamics management, and project monitoring and evaluation. The findings further underscored the meditational role of organizational structure between project success and project management practices. As such, Ochenge's (2018) study highlights the centrality of project management practices, specifically project resource mobilization, group dynamics management, and M&E, on project performance.

Pinha and Ahluwalia (2019), in their study on the effect of flexible resource management on project duration and cost, highlight that poor resource management is often the leading cause of cost overruns and schedule slippage. They propose an approach aimed at empowering the project managers to assess the different scenarios and consequently reduce the project costs and duration. The researchers present a new approach to dynamic resource allocation and project management, which plays a critical role in modern project scheduling approaches. The study concludes that as the project environments become complex, state of the art approaches should be used in project scheduling as they are central to the construction projects' performance.

### III. RESEARCH METHODOLOGY

A descriptive research design was employed to examine the association between project management practices and the performance of residential construction projects in Nairobi City County, Kenya. The population targeted in this study was 79gated community residential construction projects within

Nairobi City County under the real estate realtor Knight Frank. Simple random sampling and purposive sampling was used to select the project manager, project supervisor, and contractor from each project. Questionnaires were the main instrument for collecting data. Descriptive (frequencies, percentages, mean and standard deviation) and inferential statistics (regression model) were adopted to analyse the data. The regression model was utilized to establish a significant

difference between the independent and the dependent variables. Data was presented using mainly tables.

#### IV. FINDINGS

The study sought to establish the influence of resource scheduling on the performance of residential construction projects in Nairobi City County, Kenya. The findings are shown in Table 1.

Table 1: Resource Scheduling

Statements		SD	D	U	A	SA	Total	Mean	Std Dev
Effective allocation and division of work among the available personnel affect project performance	F	4	7	12	33	22	79	3.80	1.047
	%	5	8.6	15.8	42.4	28.1	100		
Clearly setting roles for the individuals, teams, tasks, or departments improve the performance of the project	F	4	9	11	31	24	79	3.79	1.074
	%	5	10.8	14.4	39.6	30.2	100		
Clear budgetary allocation for all project activities helps in the overall management of project costs	F	0	2	11	49	18	79	4.04	0.342
	%	0	2.2	13.7	61.9	22.3	100		
Sufficient budgets for the project activities, teams, or departments improve project cost management	F	4	6	14	22	33	79	3.93	0.346
	%	5	7.9	17.3	28.1	41.7	100		
Proper allocation of project equipment facilitates smooth operations and successful project completion	F	0	2	12	34	31	79	4.18	0.591
	%	0	2.2	15.1	43.2	39.6	100		
Aggregate Mean & Std. D								3.95	0.68

From the above results, the standard deviation results show that the data was within a considerable range, implying that the data proved normal univariate distribution while the aggregate mean for resource scheduling was 3.95. The study findings revealed that 76.0% (mean=3.80) were of the view that effective allocation and division of work among the available personnel affect project performance, 75.8% (mean=3.79) were of the view that clearly setting roles for the individuals, teams, tasks, or departments improve the performance of the project, 80.8% (mean=4.04) were of the view that clear budgetary allocation for all project activities helps in the overall management of project costs, 78.6% (mean=3.93) were of the view that sufficient budgets for the project activities, teams, or departments improve project cost management whereas 82.6% (mean=4.18) were of the view that proper allocation of project equipment facilitates smooth operations and successful project completion.

The study findings on the influence of resource scheduling on project performance indicated that the majority of the respondents were of the opinion that the proper allocation of project equipment facilitates smooth operations and successful project completion. Proper allocation of resources ensures no project activity stalls due to lack of equipment and facilities; hence the project undertaken can be completed within the shortest time and as scheduled. These findings are in

consonance with findings by Nagaraju and Reddy (2012), who noted that resource scheduling is crucial in construction projects, especially due to their high stakes nature that needs efficient resource utilization. Resource scheduling is critical since the nature of construction projects is unique and is marked by complex deployment patterns of resources leading to uncertainty and increased risks. The success of the project needs state-of-the-art resource management and resource allocation should be done prudently to ensure the projects' timely completion.

#### Model Summary of Regression Analysis

Table 2: Model Summary of Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.838 <sup>a</sup>	.780	.768	.197	.880	71.697	1	78	.000

Table 2 shows a model summary that provides information about the regression line's ability to account for the total variation in the dependent variable. R is a measure of the

strength of the relationship between dependent and independent variables and it is represented by a factor of 0.838 which is closer to one meaning that both dependent and independent variables are strongly related.  $R^2$  also called the coefficient of determination is the statistical measure of how close the data are to the fitted regression line. The higher the higher the R-squared, the better the model fits study data. Therefore, at 0.880(60.9%) shows that best fit of study. The adjusted  $R^2$ , also called the coefficient of multiple determinations, is the percent of the variance in the dependent explained uniquely or jointly by the independent variables. The result on adjusted  $R^2$  indicates that resource scheduling variables explain a factor of 0.768(76.8%) of the changes in the performance of residential construction projects in Nairobi City County, Kenya. This means that other variables not studied contribute 23.2% of the project performance.

#### Coefficient of Determination of the Variable

Table 3: Coefficient of Determination of the Variable

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	0.690	.280		5.330	.000
	Resource scheduling	0.714	.054	1.246	3.969	.001

From the above regression model, holding the resource scheduling at constant, the performance of residential construction projects in Nairobi City County, Kenya would be at a factor of 0.690. The study also revealed that resource scheduling influenced project performance to a very great extent at a factor of 0.714. The resulting regression equation was  $Y = 0.690 + 0.714X_1$

Where  $Y =$  Project Performance

$X_1 =$  Resource Scheduling

The study established that resource scheduling was positively related to the performance of residential construction projects in Nairobi City County, Kenya as shown by t-value ( $t = 3.969$ ,  $p < 0.05$ ). This is supported by Nagaraju and Reddy (2012), who noted that resource scheduling is crucial in construction projects, especially due to their high stakes nature that needs efficient resource utilization.

#### V. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

The study concluded that the proper allocation of project equipment facilitates smooth operations and successful project completion. Proper allocation of resources ensures no project activity stalls due to lack of equipment and facilities; hence the project undertaken can be completed within the shortest time and as scheduled.

The study recommended that project managers, contractors, and supervisors should ensure they clearly set roles for the

individuals, teams, tasks, or departments to improve the performance of the project. Understanding and operating within the methods is critical to the overall team system. When a team member accepts the position on the team, that individual accepts specific responsibilities. When the project manager addresses team responsibilities immediately and consistently, we have seen individuals, and then teams move toward cohesiveness and effectiveness. Ultimately, improving team effectiveness will improve project success

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