International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Resource Management Practices and Completion of Road Construction Projects in Rwanda: Base-Butaro-Kidaho Road Project

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ABSTRACT

The study assessed the effect of resource management practices on completion of road construction projects in Rwanda, with a specific focus on the Base-Butaro-Kidaho road construction project. The research aimed to evaluate the effect of material resource management, financial resource management, and human resource management on the project's successful and timely completion. A mixed-methods approach was employed, combining quantitative and qualitative data collection techniques. The study population consisted of 393 stakeholders involved in the planning, execution, and oversight of the Base-Butaro-Kidaho road project. A sample of 198 respondents was selected using stratified and simple random sampling techniques, complemented by purposive sampling to identify key respondents Descriptive statistics, correlation coefficients, and multiple linear regression were employed to analyze the data. Key findings indicate that material resource management had an overall average mean score of 4.53, showing that it was highly effective in ensuring the project's completion. Financial resource management showed a strong positive correlation with project completion ($r = .504$, $p < .01$), while human resource management had the strongest positive impact ($r = .570$, $p < .01$). The overall resource management practices demonstrated a significant correlation with project success ($r = .643$, $p < .01$). The regression analysis further revealed that human resource management had the most substantial positive impact on project completion, followed by financial and material resource management. The ANOVA results confirmed the statistical significance of all three management practices in predicting project success. The study concludes that comprehensive and strategic resource management practices are essential for the successful completion of road construction projects, with human resource management being the most influential factor. Based on these findings, the study recommends enhancing human resource management, strengthening financial resource management, and improving material resource management to ensure the continued success of future projects. Suggestions for further research include expanding the scope to other infrastructure projects, investigating additional factors influencing project success, and conducting cross-regional comparisons to understand contextual influences on resource management practices.

Keywords: Resource Management practices, Material Resource Management, Financial Resource Management, Human Resource Management and Road Construction Project Completion,

I. INTRODUCTION

Efficient resource allocation requires careful planning to determine the optimal distribution of resources

across different project tasks and activities. This involves forecasting resource requirements, identifying potential constraints, and prioritizing resource allocation based on project priorities and objectives (Umble, Half and Umble, 2020). One of the key challenges in resource management for road construction projects is the scarcity of resources and the need to optimize their utilization. Limited availability of materials, skilled labor, and equipment impact project timelines and costs if not managed effectively. The project managers must employ strategies to maximize resource efficiency while minimizing waste and inefficiencies (Chan & Kannan, 2023). Monitoring and control mechanisms are essential for tracking resource usage and performance throughout the project lifecycle (Lyons et al., 2021). Regular monitoring allows project managers to identify potential resource shortages or bottlenecks early on and take corrective action to prevent disruptions to project progress. Additionally, monitoring helps to ensure compliance with project budgets and timelines (Lyons et al., 2021).

The countries in SSA and the East African Community (EAC) are facing the challenges regarding inadequate infrastructure funding, regulatory constraints, and environmental concerns has garnered significant attention in recent years. Effective resource management practices are crucial for addressing these challenges and ensuring the sustainable development of road infrastructure in the region. This involves strategic planning, risk assessment, and capacity building to overcome obstacles and drive progress. Infrastructure projects, particularly road construction, play a pivotal role in fostering economic development and enhancing the quality of life for citizens worldwide (Odeck, 2020).

The efficient resource management practices are essential to allocate available funds effectively and prioritize projects based on their socio-economic impact and strategic importance. Moreover, capacity building and skills development within government agencies and construction firms are vital for enhancing resource management practices in road construction projects (Rwanda Ministry of Infrastructure, 2022). The government has adopted policies and regulations to minimize the environmental impact of infrastructure development and promote eco-friendly construction practices. The Government of Rwanda, through the Rwanda Transport Development Agency (RTDA), has initiated a project aimed at upgrading cross-border roads. The project consisted of two lots, the South-Western lot covering Rusizi and Nyaruguru districts, and the North-Western Border lot covering Musanze, Nyabihu, and Rubavu districts. The lot encompasses the Bugarama-Bweyeye, Remera-Gatunda-Nyagisozi, and Bweyeye-Bitare Border roads. The primary objective of this project was to upgrade the road infrastructure, thereby enhancing road connectivity and stimulating socio-economic development in the project area (Rwanda Transport Development Agency, 2020).

Despite substantial investments and efforts, these projects often encounter significant challenges related to resource management, leading to delays, cost overruns, and suboptimal outcomes (Muvunyi & Biey, 2021). Statistics from the Annual Road Condition Survey conducted between August and October 2020 revealed that only 75.15% of national roads, both paved and unpaved, are in good condition, but there are also a highlighted persistent issue including the funding constraints, inadequate capacity within government agencies and construction firms, and environmental considerations hinder project success. For instance, while several road maintenance projects achieved 100% physical progress, others faced delays, as evidenced by projects like the maintenance of Rubagabaga Bridge and Satinsyi Bridge, where progress ranged between 83.2% to 84%. Therefore, this article was conducted a comprehensive analysis of resource management practices and their impact on road construction project completion in Rwanda.

1.2 Objectives

The main purpose of the study was to assess the resource management practices and completion of road

construction projects in Rwanda. Specifically, the study achieved the following:

1. To evaluate the effect of material resource management on completion of the Base-Butaro-Kidaho road construction project in Rwanda;
2. To assess the effect of financial resource management on timely completion of the Base-Butaro-Kidaho road construction project in Rwanda;
3. To analyze the role of human resource management in ensuring the successful completion of the Base-Butaro-Kidaho road construction project in Rwanda;

1.3 Research Hypotheses

The study sought to test the following null hypotheses:

H_{01}: Material resource management has no significant effect on completion of the base-butaro-kidaho road construction project in Rwanda

H_{02}: Financial resource management has no significant effect on budget requirements and timely completion of base- butaro-kidaho road construction project in Rwanda

H_{03}: Human resource management has no significant effect on improved coordination, productivity, and timely completion of the road construction project in Rwanda

2. REVIEW OF RELATED LITERATURE

2.1. Institutional Theory

Institutional theory explores how organizations are influenced by their external environments, including social norms, values, and regulatory frameworks. Prominent contributors like DiMaggio and Powell (1983) and Scott (1987) emphasized that organizations operate within institutional structures that shape their behaviors to align with societal expectations, focusing on maintaining legitimacy by conforming to these pressures. This theory has been foundational in understanding how organizations adapt to external demands but is sometimes critiqued for overstating the passive acceptance of institutional pressures and downplaying organizational agency in reshaping their environments (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). In the context of road construction, institutional theory helps explain how external institutional forces such as government regulations and industry standards impact resource management practices. For the Base-Butaro-Kidaho Road Project in Rwanda, understanding these pressures can help stakeholders align resource management with institutional norms, improving compliance and project outcomes.

2. Resource Dependency Theory

Developed in the 1970s by Pfeffer and Salancik (1978), resource dependency theory examines how organizations rely on external resources、financial, human, and informational to survive and succeed. The theory underscores the importance of managing these dependencies, such as securing critical resources and forming strategic partnerships, to mitigate risks associated with resource scarcity. For the Base-Butaro-Kidaho Road Project, resource dependency theory is crucial in addressing external resource dependencies. Recognizing the need for resources like funding and materials, this theory can guide stakeholders in developing strategies such as resource diversification and strategic alliances to enhance the project's resilience and performance.

3. Theory of Constraints (TOC)

Introduced by Goldratt in 1984, the Theory of Constraints (TOC) focuses on identifying and alleviating constraints within systems to optimize performance. It is built on the idea that systems are limited by a few key constraints, which hinder goal achievement. TOC offers tools like the Five Focusing Steps to

systematically address these constraints (Goldratt, 1984). In road construction, particularly for the Base-Butaro-Kidaho Road Project, TOC helps identify bottlenecks in resource management practices such as scheduling, allocation, and monitoring. By addressing these critical constraints, project managers can optimize resource use and improve project completion within the allocated timeframe and budget.

4. Conceptual Framework

In this context, the framework delineates key variables related to resource management practices and project completion.

Independent Variables

Resource Management Practices

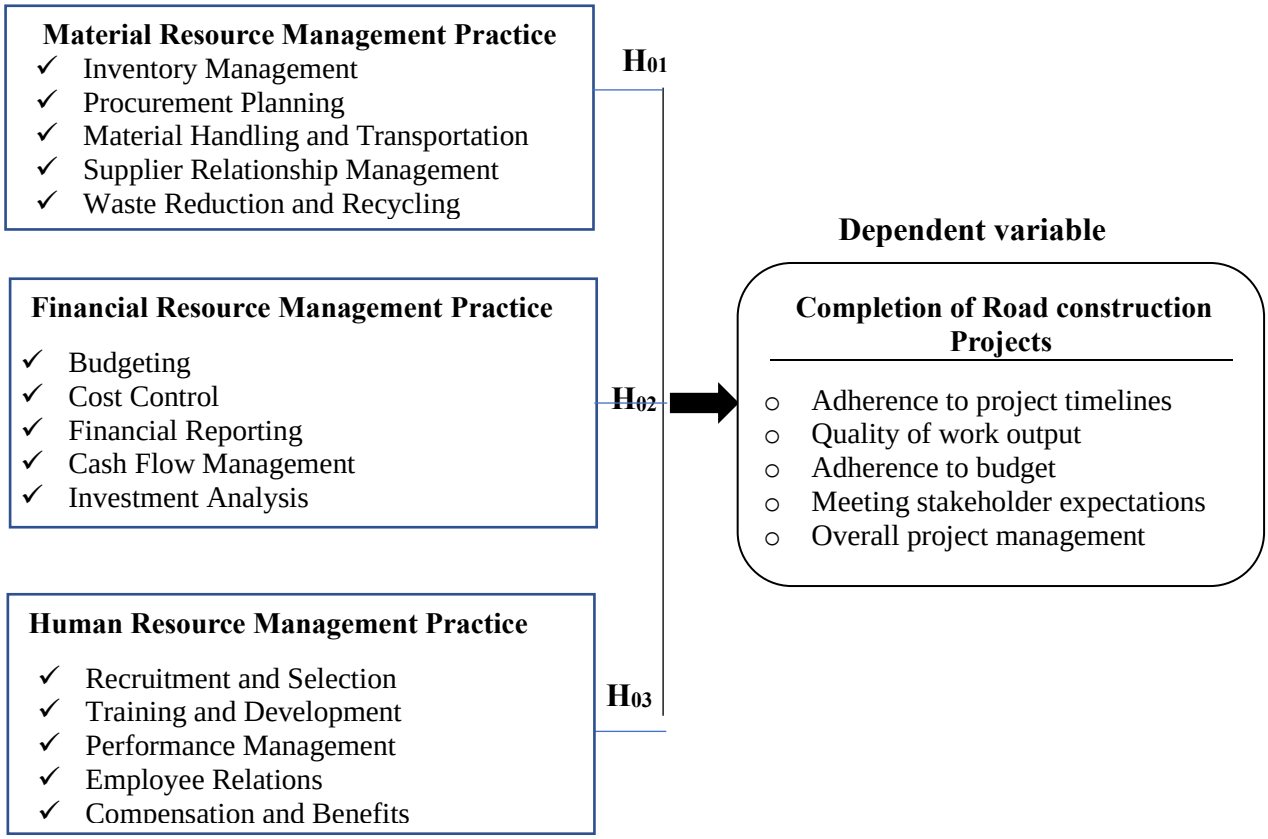

Figure 1: Conceptual framework

Source: researcher compilation (2024)

Material Resource Management Practices and Project completion

The road construction industry plays a crucial role in the economic development of countries worldwide, contributing significantly to global GDP and infrastructure development. Effective management of resources is essential for ensuring the successful completion of road construction projects while adhering to budgetary constraints and timelines. Various studies have examined resource management practices in road construction projects across different regions, highlighting the challenges and opportunities associated with optimizing resource allocation. Chen, Hu, and Li, (2021), discussed the growing demand for road infrastructure due to population growth and increased economic activities, highlighting the need for effective resource management to meet transportation needs. They emphasized the role of government agencies and private contractors in managing road construction projects and outlined the challenges

associated with resource allocation and project delivery. Liu et al. (2021) focused on resource management practices in road construction projects in the USA, emphasizing the optimization of resource allocation to ensure timely project completion within budgetary constraints. They highlighted the importance of monitoring and control mechanisms for tracking resource usage and performance throughout the project lifecycle to prevent disruptions and ensure compliance with project budgets and timelines.

The road construction industry plays a crucial role in the economic development of countries worldwide, contributing significantly to global GDP and infrastructure development. Effective management of material resources is essential for the successful completion of road construction projects while meeting budgetary constraints and timelines. This literature review aims to examine existing research on material resource management practices in road construction projects and their impact on project completion. Resource Management Practices in Road Construction, the importance of optimizing the allocation of resources such as funding, materials, labor, and equipment in road construction projects. Similarly, Umble and Haft, (2020) highlight the need for careful planning, forecasting, and prioritization of resources to ensure efficient project execution.

Financial Resource Management Practices and Project Completion

Financial resource management practices play a crucial role in the timely completion of road construction projects. Effective management of financial resources ensures that projects have the necessary funding to proceed smoothly and reach completion within the allocated timeframe. Several financial resource management practices are employed in the construction industry to enhance project performance and minimize delays. These practices include accurate budgeting and cost estimation, efficient allocation of funds, transparent financial reporting, proactive risk management, and adherence to financial regulations and standards. By implementing these practices, project stakeholders can mitigate financial risks, optimize resource utilization, and maintain project progress according to schedule. Financial resource management practices are integral to the successful completion of road construction projects, ensuring that sufficient funding is available and utilized efficiently to meet project objectives within specified timelines. The literature underscores the significance of various practices employed in managing financial resources and their impact on project completion timeliness. Accurate budgeting and cost estimation are fundamental to effective financial resource management in road construction projects (Alves et al., 2020).

Human resource management practices and Project Completion

The successful completion of road construction projects relies significantly on effective human resource management (HRM) practices. This literature review explores the role of HRM practices in ensuring project success, focusing on their impact on workforce productivity, safety, and overall project performance. HRM practices encompass various activities, including recruitment, training, performance management, and employee engagement, all of which are crucial for optimizing human capital in the construction sector. Studies by Helen Babalola et al. (2022), highlight the significance of HRM practices in recruiting, retaining, and developing competent personnel for construction projects. These practices ensure that the workforce possesses the necessary skills and competencies to execute project tasks efficiently. Training and development programs are essential components of HRM practices in the construction industry. Rateb Jalil Sweis et al. (2020) emphasizes the impact of training on organizational performance, particularly in enhancing employee skills and capabilities. Similarly, the importance of continuous learning and skill development in construction organizations, as it contributes to improved

project outcomes and workforce satisfaction. Furthermore, performance management systems play a crucial role in ensuring accountability and driving productivity in road construction projects.

Resource Management Practices and Project completion

Resource management practices play a pivotal role in determining the completion timeline and quality outcomes of road construction projects. Effective management of resources such as funding, materials, equipment, and labor is essential for ensuring project success. Several studies have investigated the impact of resource management practices on the completion timeline and quality outcomes of road construction projects, shedding light on the strategies and challenges involved in optimizing resource utilization. Umble, Haft and Umble (2020) emphasized the importance of efficient resource allocation in construction projects, including road construction. Their research highlighted the role of strategic planning, forecasting, and prioritization in optimizing resource utilization and minimizing project delays. By identifying potential constraints and proactively managing resources, project managers can enhance the completion timeline and ensure quality outcomes.

Gordon and Tulip (2022) addressed the challenges posed by resource scarcity in road construction projects. Their study underscored the importance of innovative resource management practices in overcoming limitations associated with limited availability of materials, skilled labor, and equipment. Strategies such as collaboration, technology adoption, and waste minimization were identified as effective means of maximizing resource efficiency and improving project performance. Chan and Kannan (2023) examined the impact of resource management practices on project timelines and costs in the context of road construction. Their research highlighted the significance of monitoring and control mechanisms for tracking resource usage and performance throughout the project lifecycle. By implementing robust monitoring systems, project managers identify potential resource shortages or bottlenecks early on and take corrective action to prevent delays and ensure quality outcomes.

3. RESEARCH METHODS

Mixed-methods approach, combining both quantitative and qualitative techniques by adopting descriptive and correlative research designs to show a comprehensive understanding of the complexities surrounding resource management practices and their impact on the completion of road construction projects.

Target population: comprises 393 people in various stakeholders involved in the planning, execution, and oversight of the road construction project.

Sample Size: in this study, the 5% of margin errors was adopted, and also the privacy level was 95%. The formula of Taro Yamane elaborated in 1982 was used to determine the sample size.

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

n = Sample Size; **N** = Population; **e** = Margin of error

$$n = \frac{393}{1+393*(0.05)^2} = 198$$

Sampling procedures and techniques: stratified sampling was used to enhance the precision of the study by acknowledging and accounting for potential variations among different sectors, leading to more accurate and insightful findings. Within each stratum, the researcher applied a simple random sampling technique to select respondents accompanied by purposive sampling technique.

Data collection method: the questionnaire design incorporates both nominal and a 5-Likert scale formats, allowing for a nuanced understanding of respondents' perspectives where Scale Point 5.

Data Analysis techniques: SPSS IBM 23.0 version was used as software for analysis. Descriptive statistics method was used to describe the perceptions of respondents through frequencies, percentages, mean, and standard deviation for data collected. A correlation coefficient is a numerical measure of some type of correlation, meaning a statistical relationship between two variables. They all assumed values in the range from −1 to +1, where ±1 indicated the strongest possible agreement and 0 the strongest possible disagreement. The correlation coefficient (R) of a model (say with variables x and y) took values between −1 and 1. It described how x and y are correlated. If x and y are in perfect harmony, then this value is positive 1. If x increased while y decreases in exactly the opposite manner, then this value is −1. 0 is a situation where there is no correlation between x and y. Multiple linear regression analysis is a powerful statistical method that allowed to examine the relationship between two or more variables of interest. The regression models were formulated to measure the relationship between sub-variable representing resource management practices and completion of road construction projects in Rwanda. Based on the variables, the following functions had been set as X= Resource management practices (RMP) which has the following indicators:

- 1=Material Resource Management (MRM)
- 2= Financial Resource Management (FRM)
- 3= Human Resource Management (HRM)

While Y is dependent variable which is Completion of Road Projects (CRP);

Y or CRP=$\beta 0+\beta_1 MRM+\beta_2 FRM+\beta_3 HRM+\varepsilon$

Where: $\beta 0$=Constant, $\beta 1$-$\beta 3$ are regression coefficients of determination; ε is standard error

4. RESEARCH FINDINGS

The results of the study assessed the resource management practices and completion of road construction projects in Rwanda are presented in this chapter. The gathered information was accurately analyzed and interpreted in accordance with the research objectives of the study, which include evaluating the effect of material resource management on completion of the Base-Butaro-Kidaho road construction project in Rwanda; assessing the effect of financial resource management employed and their impact on the timely completion of the Base-Butaro-Kidaho road construction project in Rwanda; and analyzing the role of human resource management in ensuring the successful completion of the Base-Butaro-Kidaho road construction project in Rwanda.

Table 1: Findings on Socio- demographic characteristics of respondents

Statements		Frequency	Percent
Gender of respondents	Males	117	59.1
	Females	81	40.9
	Total	198	100
Age of respondents	21-25 years	44	22.2
	26-35 years	78	39.4
	36-45 years	50	25.3
	46-55 years	20	10.1
	56-65years	6	3

	Total	198	100
Marital status of respondents	Single (never married)	64	32.3
	Married / living together	107	54
	Engaged to be married	17	8.6
	Widowed	7	3.5
	Divorced / separated	3	1.5
	Total	198	100
Education level of Respondents	Masters level and above	14	7.1
	Bachelors level	141	71.2
	Secondary	33	16.7
	Professional courses	6	3
	Other education level (i.e., TVET, VTC…)	4	2
	Total	**198**	**100**

Source: Primary Data (2024)

The findings showed the gender distribution of the respondents, with males comprising 59.1% of the sample and females making up 40.9%. The age distribution indicating that the majority of respondents fall within the 26-35 years age group (39.4%), followed by those aged 36-45 years (25.3%). The marital status of the respondents indicated that over half (54.0%) are married or living together, and 32.3% are single. Finally, the results outline the formal education levels of the respondents, with the majority holding a Bachelor's degree (71.2%), followed by those with secondary education (16.7%) and those with a Master's degree or higher (7.1%).

The effect of material resource management on completion of the Base-Butaro-Kidaho road construction project in Rwanda;

Findings presented the perceptions on the effect of material resource management on the completion of the Base-Butaro-Kidaho road construction project in Rwanda. The table highlights the responses to various statements related to material resource management practices, including inventory management, procurement planning, material handling, supplier relationship management, and waste reduction.

Table 2: Findings on the effect of material resource management on completion of the Base-Butaro-Kidaho road construction project;

Statement	N	Mean	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
The inventory management practices were effective in the Base-Butaro-Kidaho road construction project;	198	4.5354	0.72396	-1.543	0.173	2.34	0.344
Procurement planning was efficiently implemented in the Base-Butaro-Kidaho road construction project;	198	4.4444	0.92041	-1.946	0.173	3.768	0.344

Material handling and transportation methods were well-executed during the Base-Butaro-Kidaho road construction project;	198	4.5101	0.87689	-2.016	0.173	3.875	0.344
Supplier relationship management was effectively maintained throughout the Base-Butaro-Kidaho road construction project;	198	4.4343	0.96288	-1.828	0.173	2.914	0.344
Waste reduction and recycling initiatives were successfully integrated into the Base-Butaro-Kidaho road construction project;	198	4.4646	0.98014	-2.089	0.173	4	0.344
Inventory management contributed positively to the progress of the Base-Butaro-Kidaho road construction project;	198	4.5758	0.85009	-2.418	0.173	6.035	0.344
The procurement planning strategy played a significant role in the success of the Base-Butaro-Kidaho road construction project;	198	4.6061	0.81631	-2.439	0.173	6.138	0.344
Material handling and transportation techniques enhanced the efficiency of the Base-Butaro-Kidaho road construction project;	198	4.596	0.71842	-2.209	0.173	6.129	0.344
Supplier relationship management practices positively impacted the Base-Butaro-Kidaho road construction project;	198	4.5404	0.77124	-2.015	0.173	4.68	0.344
Waste reduction and recycling efforts were instrumental in maintaining sustainability in the Base-Butaro-Kidaho road construction project.	198	4.5758	0.75523	-2.117	0.173	5.164	0.344
Overall Average	**198**	**4.52829**	**0.837557**	**-2.062**	**0.173**	**4.5043**	**0.344**

Source: Primary Data (2024)

The findings revealed that effective material resource management, particularly inventory management practices, played a significant role in the successful completion of the Base-Butaro-Kidaho road construction project. Inventory management practices scored a high mean of 4.5354, indicating strong agreement among respondents that these practices were effective. The closely clustered responses, as reflected by a low standard deviation (0.72396), suggest consistency in this view. Additionally, the negative skewness (-1.543) and leptokurtic distribution (kurtosis of 2.34) further underscore the importance placed on inventory management.

Procurement planning efficiency was another critical factor, with a mean score of 4.4444. Although the higher standard deviation (0.92041) indicated some variability in perceptions, the overall consensus was that procurement planning was efficiently implemented. The skewness (-1.946) and kurtosis (3.768) suggest that respondents valued procurement planning as vital for project success. The effectiveness of material handling and transportation methods was also highlighted, with a mean score of 4.5101. The moderate variation in responses (standard deviation of 0.87689) suggests some differences in opinion, but the overall agreement was strong, as indicated by the skewness (-2.016) and kurtosis (3.875). Supplier relationship management was positively perceived, with a mean score of 4.4343. The moderate variability in responses (standard deviation of 0.96288) suggests that while most respondents agreed on the importance of strong supplier relationships, there was some level of disagreement. The study also found that waste reduction and recycling initiatives were deemed crucial for the project's success, with a mean score of 4.4646. The high skewness (-2.089) and kurtosis (4) values indicate a strong consensus on the importance of these sustainability practices. This echoes findings by Tam (2011), who noted that effective waste management not only contributes to environmental sustainability but also improves project efficiency by reducing material costs and disposal issues. Overall average mean score of 4.52829 across all variables reflects a strong agreement among respondents that material resource management was highly effective in the completion of the Base-Butaro-Kidaho road construction project.

The effect of financial resource management employed and their impact on the timely completion of the Base-Butaro-Kidaho road construction project in Rwanda;

The analysis in this section provides a deeper understanding of how strategic financial resource management was crucial in driving the successful and timely completion of the Base-Butaro-Kidaho road construction project, ultimately contributing to the overall project performance.

Table 3: Findings on the effect of financial resource management employed and their impact on the timely completion of the Base-Butaro-Kidaho road construction project

Statement	N	Mean	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
Budgeting practices were crucial for the Base-Butaro-Kidaho road construction project;	198	4.5152	0.81687	-2.053	0.173	4.739	0.344
Effective cost control measures were implemented during the Base-Butaro-	198	4.4848	0.87101	-1.955	0.173	3.781	0.344

Kidaho road construction project;							
Financial reporting procedures were diligently followed throughout the Base-Butaro-Kidaho road construction project;	198	4.5101	0.81695	-1.923	0.173	3.833	0.344
Cash flow management strategies played a significant role in the completion timeline of the Base-Butaro-Kidaho road construction project;	198	4.4545	0.97453	-2.148	0.173	4.453	0.344
Investment analysis techniques were utilized to inform decision-making during the Base-Butaro-Kidaho road construction project;	198	4.5202	0.7979	-1.944	0.173	4.102	0.344
Budgeting had a direct impact on the timeline of the Base-Butaro-Kidaho road construction project;	198	4.4646	0.9269	-1.905	0.173	3.287	0.344
Cost control measures influenced the efficiency of the Base-Butaro-Kidaho road construction project's completion timeline;	198	4.5303	0.84095	-2.036	0.173	4.249	0.344
Financial reporting practices provided transparency and accountability in the Base-Butaro-Kidaho road construction project;	198	4.5303	0.82264	-1.977	0.173	3.897	0.344
Effective cash flow management facilitated timely progress in the Base-Butaro-Kidaho road construction project;	198	4.4596	0.9212	-2.064	0.173	4.387	0.344
Investment analysis guided resource allocation decisions, impacting the completion timeline of the	198	4.303	1.0941	-1.519	0.173	1.397	0.344

Base-Butaro-Kidaho road construction project.							
Overall Average	**198**	**4.47726**	**0.888305**	**-1.9524**	**0.173**	**3.8125**	**0.344**

Source: Primary Data (2024)

The results stated that budgeting practices have a mean score of 4.5152 and a standard deviation of 0.81687, the data indicates that respondents found budgeting practices to be highly effective in the Base-Butaro-Kidaho road construction project. The negative skewness value of -2.053 suggests that the majority of responses were on the higher end of the scale, indicating strong agreement with the statement. The kurtosis value of 4.739 further emphasizes that responses were clustered around the high agreement scores, reflecting the critical role budgeting played in the project's financial management. Effective cost control measures indicated the mean score for this variable is 4.4848, with a standard deviation of 0.87101. The skewness of -1.955 indicates that respondents generally agreed on the effectiveness of cost control measures. The kurtosis of 3.781 suggests a relatively peaked distribution, showing that most respondents strongly supported the idea that cost control was effectively implemented. Financial reporting procedures has a mean score of 4.5101 and a standard deviation of 0.81695. The skewness of -1.923 and a kurtosis of 3.833 indicate that financial reporting procedures were highly regarded by respondents, with most agreeing that these procedures were followed diligently.

Cash flow management strategies have a mean score of 4.4545 and a standard deviation of 0.97453, cash flow management strategies were seen as important. The skewness of -2.148 and kurtosis of 4.453 indicate that respondents strongly believed in the importance of effective cash flow management for the project's timely completion. Investment analysis techniques has a mean score of 4.5202 and a standard deviation of 0.7979. The skewness of -1.944 and a kurtosis of 4.102 indicate that investment analysis techniques were seen as important by most respondents. However, the lower skewness and kurtosis compared to other variables suggest that there was a slight variation in opinions. Impact of budgeting on timeline have a mean score of 4.4646 with a standard deviation of 0.9269 reflects that respondents felt strongly that budgeting had a direct impact on the project's timeline. The skewness of -1.905 and kurtosis of 3.287 support the idea that respondents mostly agreed on this point.

Budgeting was not only crucial for financial planning but also had a direct impact on ensuring that the project stayed on schedule, likely by preventing resource shortages. Impact of cost control on timeline has a mean score of 4.5303 and a standard deviation of 0.84095, respondents indicated strong agreement that cost control measures positively influenced the project's timeline. The skewness of -2.036 and kurtosis of 4.249 further support this agreement. Cost control measures ensured that financial resources were used efficiently, minimizing delays and keeping the project on track. Financial reporting for transparency has a mean score of 4.5303 and a standard deviation of 0.82264. The skewness of -1.977 and kurtosis of 3.897 suggest that financial reporting practices were seen as highly effective in providing transparency and accountability. Effective cash flow management has a mean score of 4.4596 and a standard deviation of 0.9212, respondents indicated that effective cash flow management facilitated timely project progress. The skewness of -2.064 and kurtosis of 4.387 reflect strong agreement with this statement. Investment analysis and resource allocation had a slightly lower mean score of 4.303 and a higher standard deviation of 1.0941, indicating some variability in responses. The skewness of -1.519 and kurtosis of 1.397 suggest that while most respondents agreed, there was some disagreement on the extent to which investment analysis influenced resource allocation decisions. Overall, the financial resource management practices employed

in the Base-Butaro-Kidaho road construction project were found to be highly effective, as indicated by an overall average mean score of 4.47726.

Human resource management in ensuring the successful completion of the Base-Butaro-Kidaho road construction project in Rwanda;

This section explores the pivotal role that HRM played in ensuring the project's timely and successful completion. By focusing on key HRM practices such as recruitment and selection, training and development, performance management, employee relations, and compensation, this analysis provides insights into how these elements contributed to building a capable and motivated workforce, ultimately driving the project to meet its objectives.

Table 4: Findings on the role of human resource management in ensuring the successful completion of the Base-Butaro-Kidaho road construction project in Rwanda;

Statement	N	Mean	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
Effective recruitment and selection processes are essential for assembling the right team for the Base-Butaro-Kidaho road construction project;	198	4.5354	0.87042	-1.882	0.173	2.492	0.344
Training and development programs ensure that workers possess the necessary skills and knowledge for their roles in the Base-Butaro-Kidaho road construction project;	198	4.6465	0.6731	-2.364	0.173	6.773	0.344
Performance management systems help monitor and evaluate the progress of workers, contributing to the successful completion of the Base-Butaro-Kidaho road construction project;	198	4.6263	0.75516	-2.83	0.173	9.676	0.344
Positive employee relations foster a collaborative work environment conducive to the successful completion of the Base-Butaro-Kidaho road construction project;	198	4.6162	0.72947	-2.511	0.173	7.547	0.344
Compensation and benefits packages attract and retain skilled workers, contributing to the success of the Base-Butaro-	198	4.5859	0.81247	-2.547	0.173	7.223	0.344

Kidaho road construction project;							
Recruitment and selection practices directly impact the quality of the workforce involved in the Base-Butaro-Kidaho road construction project;	198	4.6414	0.65895	-1.933	0.173	3.477	0.344
Training and development initiatives ensure that workers are equipped to handle the challenges of the Base-Butaro-Kidaho road construction project;	198	4.702	0.60211	-2.159	0.173	4.592	0.344
Effective performance management systems help identify areas for improvement and ensure that project goals are met;	198	4.6111	0.73718	-2.771	0.173	9.901	0.344
Positive employee relations promote teamwork and cooperation, enhancing efficiency in the Base-Butaro-Kidaho road construction project;	198	4.596	0.79234	-2.361	0.173	6.134	0.344
Competitive compensation and benefits packages motivate workers to perform their best, contributing to the overall success of the Base-Butaro-Kidaho road construction project.	198	4.7071	0.67218	-2.816	0.173	9.444	0.344
Overall Average	**198**	**4.62679**	**0.730338**	**-2.4174**	**0.173**	**6.7259**	**0.344**

Source: Primary Data (2024)

Findings indicated effective recruitment and selection processes with a mean score of 4.5354 and a standard deviation of 0.87042, respondents agreed that effective recruitment and selection were essential in assembling the right team for the project. The negative skewness of -1.882 suggests that the majority of respondents strongly supported this view, while the kurtosis of 2.492 indicates a relatively normal distribution, with most responses clustering around the mean. Training and development Programs had a mean score of 4.6465, with a lower standard deviation of 0.6731, indicating strong agreement among respondents that training and development were crucial. The skewness of -2.364 and a high kurtosis of 6.773 highlight that responses were heavily skewed towards agreement. Performance management

systems; respondents gave this variable a mean score of 4.6263, with a standard deviation of 0.75516. The skewness of -2.83 and kurtosis of 9.676 indicate that most respondents strongly agreed that performance management systems were vital for monitoring and evaluating workers' progress.

Positive Employee Relations show the mean score for positive employee relations was 4.6162, with a standard deviation of 0.72947. The skewness of -2.511 and kurtosis of 7.547 show that respondents felt strongly about the importance of fostering a collaborative work environment. Compensation and benefits packages had a mean score of 4.5859, with a standard deviation of 0.81247. The skewness of -2.547 and kurtosis of 7.223 indicate that respondents strongly believed in the importance of competitive compensation and benefits for attracting and retaining skilled workers. Impact of recruitment and selection on workforce quality; the respondents assigned a mean score of 4.6414, with a standard deviation of 0.65895, to the impact of recruitment and selection on workforce quality. The skewness of -1.933 and kurtosis of 3.477 suggest a strong agreement among respondents.

Training and development initiatives had one of the highest mean scores at 4.702, with a standard deviation of 0.60211. The skewness of -2.159 and kurtosis of 4.592 show strong agreement that training initiatives were key to equipping workers to handle challenges. Effective performance management for Improvement indicated a mean score of 4.6111 and a standard deviation of 0.73718, this variable was also highly rated by respondents. The skewness of -2.771 and kurtosis of 9.901 indicate that performance management systems were seen as essential for identifying areas of improvement and ensuring project goals were met. Positive employee relations for teamwork has the mean score for this variable was 4.596, with a standard deviation of 0.79234. The skewness of -2.361 and kurtosis of 6.134 suggest that respondents strongly agreed that positive employee relations promoted teamwork and cooperation. Competitive compensation and motivation had the highest mean score of 4.7071, with a standard deviation of 0.67218. The skewness of -2.816 and kurtosis of 9.444 indicate that competitive compensation and benefits were seen as highly motivating for workers.

Inferential Analysis

The findings are categorized into correlation coefficient analysis, and linear regression analysis. These analyses provide critical insights into the data distribution, the strength and direction of relationships between variables, and the predictive power of key factors influencing the project's success.

Correlations

This section examines the strength and direction of the relationships between the various resource management practices and the successful completion of road construction projects.

Table 5: Correlations Coefficient matrix analysis results

		Material Resource Management	Financial Resource Management	Human resource management	Resource Management Practices	Completion of Road Construction Projects
Material Resource Management	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	198				

Financial Resource Management	Pearson Correlation	.388**	1			
	Sig. (2-tailed)	.000				
	N	198	198			
Human resource management	Pearson Correlation	.085	.309**	1		
	Sig. (2-tailed)	.235	.000			
	N	198	198	198		
Resource Management Practices	Pearson Correlation	.720**	.827**	.580**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	198	198	198	198	
Completion of Road Construction Projects	Pearson Correlation	**.339****	**.504****	**.570****	**.643****	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	198	198	198	198	198
**. Correlation is significant at the 0.01 level (2-tailed).						

Findings show correlation coefficient matrix analysis results: positively correlates with the completion of road construction projects (r = .339, p < .01), indicating that effective material resource management is moderately associated with successful project completion. Findings indicated that financial resource management shows a stronger positive correlation with project completion (r = .504, p < .01). This suggests that better financial resource management is significantly associated with the successful completion of road construction projects. Human Resource Management also positively correlates with project completion (r = .570, p < .01), showing that efficient human resource management practices have a strong association with successful project outcomes. Resource Management Practices demonstrates a strong positive correlation with the completion of road construction projects (r = .643, p < .01). This indicates that overall resource management practices are strongly linked to successful project completion.

Table 6: Simple Correlations Coefficient Analysis Results

		Resource Management Practices	Completion of Road Construction Projects
Resource Management Practices	Pearson Correlation	1	.643**
	Sig. (2-tailed)		.000
	N	198	198
Completion of Road Construction Projects	Pearson Correlation	.643**	1
	Sig. (2-tailed)	.000	
	N	198	198
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 6 present the findings on the simple correlations coefficient analysis results between resource management practices and completion of road construction projects that shows Pearson correlation

coefficient is .643 ($p < .01$), reinforcing the strong, positive relationship between effective resource management practices and the successful completion of the project. This high correlation indicates that resource management practices significantly influence project success. The correlation analysis reveals that all resource management practices (material, financial, and human resources) are positively and significantly correlated with the successful completion of road construction projects. Among these, financial and human resource management show the strongest relationships, indicating their critical role in project success.

Linear Regression Analysis Findings

Linear regression analysis was conducted to determine the predictive power of material, financial, and human resource management practices on the completion of road construction projects.

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.688[a]	.474	.466	6.99757	.474	58.207	3	194	.000	1.284

a. Predictors: (Constant), Human resource management, Material Resource Management, Financial Resource Management

b. Dependent Variable: Completion of Road Construction Projects

The model shows an R value of .688, indicating a strong correlation between the predictors (material, financial, and human resource management) and the completion of road construction projects. The R-squared value is .474, meaning that approximately 47.4% of the variance in project completion can be explained by the model. This is a substantial proportion, indicating that these factors are significant predictors of project success. The adjusted R-squared value is .466, which accounts for the number of predictors in the model and confirms the model's goodness-of-fit.

Table 8: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8550.411	3	2850.137	58.207	.000[b]
	Residual	9499.395	194	48.966		
	Total	18049.806	197			

a. Dependent Variable: Completion of Road Construction Projects

b. Predictors: (Constant), Human resource management, Material Resource Management, Financial Resource Management

The ANOVA table shows that the regression model is statistically significant ($F(3, 194) = 58.207$, $p < .01$). This means that the model as a whole significantly predicts the completion of road construction projects. The analysis of variance (ANOVA) was also conducted to test the significance of three key management practices including material resource management, financial resource management, and human resource management on the successful completion of the Base-Butaro-Kidaho road construction project in Rwanda. The first hypothesis (H01) tested whether material resource management had no

significant effect on project completion. The ANOVA results revealed a significant effect, with a p-value of .001, leading to the rejection of H01. This indicates that effective material resource management is crucial for the successful completion of the project. The second hypothesis (H02) stated that there is no any impact of financial resource management on budget requirements and timely project completion. The analysis showed a significant effect, with a p-value of .000, resulting in the rejection of H02. This underscores the importance of financial resource management in adhering to budgetary constraints and meeting project deadlines. Lastly, the third hypothesis (H03) said that there is no significant influence of human resource management on improved coordination, productivity, and timely completion of the project. The findings demonstrated a significant effect, with a p-value of .000, leading to the rejection of H03. This highlights the critical role of human resource management in ensuring effective coordination and productivity throughout the project lifecycle.

Table 9: Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	**Std. Error**	**Beta**			**Lower Bound**	**Upper Bound**	**Tolerance**	**VIF**
1	(Constant)	56.886	5.370		10.593	.000	46.294	67.477		
	Material Resource Management	.291	.088	.187	3.313	.001	.118	.465	.848	1.179
	Financial Resource Management	.416	.086	.288	4.859	.000	.247	.585	.773	1.294
	Human resource management	.931	.110	.465	8.483	.000	.715	1.148	.903	1.108
a. Dependent Variable: Completion of Road Construction Projects										

The results on the regression analysis reveals that material resource management has a positive and significant effect on the completion of the Base-Butaro-Kidaho road construction project. The unstandardized coefficient (B) for material resource management is .291, with a p-value of .001, and a standardized beta of .187. This indicates that for every unit increase in material resource management practices, the project completion score increases by .291 units. While this effect is significant, it is not as strong as the effects of financial and human resource management. Whereas the financial resource management also plays a crucial role in the successful completion of the project. The unstandardized coefficient is .416, with a p-value of less than .01, and a standardized beta of .288. These results suggest that improvements in financial resource management have a significant and relatively strong positive impact on project completion. Effective financial resource management ensures that the project remains within budget and meets its deadlines, contributing to its overall success. Among the predictors, human

resource management has the strongest impact on the completion of the road construction project. The unstandardized coefficient is .931, with a p-value of less than .01, and a standardized beta of .465. This indicates that effective human resource management significantly enhances the likelihood of successful project completion.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

The study explored the impact of resource management practices like material, financial, and human resources on the successful completion of the Base-Butaro-Kidaho road construction project in Rwanda. The analysis revealed that all three management practices significantly influence project success, with human resource management showing the strongest positive impact, followed by financial and material resource management. The findings showed a strong correlation between effective resource management practices and successful project completion. Specifically, human resource management demonstrated the highest correlation, highlighting its critical role in coordination, productivity, and overall project success. Financial resource management also showed a substantial positive impact, emphasizing the importance of managing finances effectively to meet budgetary and scheduling requirements. Material resource management, while significant, had a comparatively lesser impact but remained crucial for efficient resource utilization and sustainability. The study concludes that comprehensive and strategic resource management practices are essential for achieving project objectives, with human resource management being the most influential factor in ensuring the successful completion of the Base-Butaro-Kidaho road construction project.

Recommendations

To ensure continued success in future projects, the following recommendations are proposed to enhance the effectiveness of resource management strategies.

- **Enhance human resource management:** Given its strong positive impact, it is recommended that project managers prioritize human resource management by implementing effective coordination mechanisms, providing adequate training, and ensuring optimal workforce productivity.
- **Strengthen financial resource management:** Project managers should focus on improving financial resource management practices to ensure that projects stay within budget and meet deadlines.
- **Improve material resource management:** While material resource management had a relatively lower impact, it is still essential for project success. Managers should ensure efficient procurement, inventory management, and material handling practices to minimize waste and promote sustainability.
- **Adopt integrated resource management practices:** A holistic approach to resource management that integrates human, financial, and material resources is recommended.

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