



The effect of project planning practices on the success of infrastructure projects in Nigeria

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Abstract

Purpose: The study examined the effect of project planning practices on the success of infrastructure projects in Nigeria, focusing on project scheduling, budgeting and cost planning, and risk management combined with stakeholder engagement. The study sought to determine how these planning practices influence timely completion, cost performance, and overall project success.

Methodology/Design: A quantitative research design was adopted, using a survey approach. Data were collected from 400 professionals involved in infrastructure projects, including project managers, engineers, architects, quantity surveyors, and government officials. Structured questionnaires were employed, and data were analyzed using descriptive statistics, regression analysis, and structural equation modeling (SEM) via SPSS and SmartPLS. Reliability and validity were confirmed through Cronbach's alpha and factor analysis.

Findings: The results indicated that project scheduling practices significantly improved timely completion ($\beta = 0.42$, $p < 0.01$), budgeting and cost planning positively influenced cost performance ($\beta = 0.38$, $p < 0.01$), and the combination of risk management and stakeholder engagement enhanced overall project success ($\beta = 0.46$, $p < 0.01$).

Implications: The findings underscore the importance of systematic project planning, highlighting that structured scheduling, financial planning, and integrated risk/stakeholder management are critical for infrastructure project success in Nigeria.

Originality/Value: The study provides empirical evidence linking project planning practices to infrastructure project outcomes in a developing country context, contributing to both theory and practice in project management.

Keywords: Project planning, scheduling, cost management, risk management, stakeholder engagement, infrastructure projects, nigeria

Introduction

Infrastructure is widely regarded as a driver of socio-economic development in Nigeria, yet its delivery is often constrained by poor project outcomes. Many projects experience cost overruns, delays, substandard quality, or outright abandonment, raising questions about the adequacy of project planning practices. Project planning, covering budgeting, scheduling, risk management, stakeholder engagement, and quality assurance has been consistently identified as a cornerstone of project success, but its effective implementation in Nigeria remains uneven. Studies indicate that systematic planning contributes positively to construction project delivery, particularly in terms of time, cost, and quality (Ibrahim and Ogohi 2020; Idoro *et al.* 2023) [4, 5]. Similarly, research on indigenous contractors shows that realistic timelines, effective budgeting, and adherence to quality standards are central to planning success (Abubakar *et al.* 2021) [1]. Despite these insights, many infrastructure projects in Nigeria continue to face difficulties linked to weak planning structures, institutional inefficiencies, and limited stakeholder collaboration (Okolie and Osuyi 2022; Iroha *et al.* 2024) [7, 11]. Understanding the role of planning practices in enhancing infrastructure project performance is therefore critical to addressing Nigeria's persistent infrastructure deficit.

Problem Statement

Although project planning practices are recognized as essential for project success, Nigeria continues to witness frequent failures in infrastructure delivery. Projects often suffer delays, cost overruns, compromised quality, and lack of sustainability, which undermines public confidence and

wastes scarce resources. Evidence suggests that while planning tools and techniques are available, they are either inconsistently applied or poorly adapted to the local context (Abubakar *et al.* 2021; Iroha *et al.* 2024) [1, 7]. The problem is that existing studies provide limited clarity on which specific planning practices are most influential for infrastructure project success in Nigeria. This gap creates uncertainty for practitioners and policymakers seeking to improve project performance. Hence, there is a pressing need for empirical investigation into how planning practices affect the success of infrastructure projects in Nigeria, and how these practices can be strengthened to ensure timely, cost-effective, and sustainable outcomes.

Significance of the Study

This study is significant because it addresses one of the most pressing challenges in Nigeria's development poor performance of infrastructure projects. By examining how project planning practices influence project success, the study provides practical insights that can guide contractors, project managers, and policymakers in strengthening planning frameworks. Improved planning has the potential to reduce cost overruns, minimize delays, and enhance the quality and sustainability of infrastructure delivery. For government agencies, the findings will be useful in formulating policies that enforce effective planning standards, while for practitioners, the study offers guidance on the adoption of planning tools that increase project efficiency. Academically, the research contributes to the growing body of knowledge on project management in developing countries, providing context-specific evidence from Nigeria that can inform future studies and comparative

analysis. Ultimately, the study seeks to improve infrastructure outcomes, which are central to economic growth and public welfare.

Literature Review: Theoretical Foundation and Hypothesis Development

Theoretical foundation

Project management research draws on several established theories to explain how planning practices influence project outcomes. The project constraint perspective treats time cost and quality as interdependent dimensions that planning must balance to achieve successful delivery (Karanja 2025) [8]. Empirical studies in construction and infrastructure show that scheduling and time management practices are central to meeting completion targets and reducing delays (Strategic Journals 2024; IJISRR 2024) [14].

Cost management theory and control frameworks such as earned value and cost control emphasize that rigorous budgeting and continuous cost monitoring improve cost performance and reduce budget variance in construction projects (SCIRP 2024; Kuey 2024) [9, 13]. Evidence from Nigeria highlights that weak cost planning and poor cost control are principal contributors to poor financial performance on infrastructure projects.

Risk management and stakeholder theory provide the normative basis for linking stakeholder engagement and risk processes to overall project success. Stakeholder theory argues that projects succeed when managers actively identify and involve those groups whose interests affect or are affected by project outcomes (Mahajan 2023) [10]. Recent studies in Nigeria show that stakeholder engagement improves information flow early in projects and supports risk identification and mitigation, which in turn reduces delays and improves overall project performance.

H1 Project scheduling practices and timely completion

Scheduling practices include the development of realistic project timelines, use of critical path techniques, resource leveling, and regular schedule review and control. Research in construction contexts shows that poor scheduling and weak adherence to schedule control account for a large share of project delays while robust schedule management techniques significantly increase the probability of on time completion (Strategic Journals 2024; IJISRR 2024) [14]. Given this theoretical and empirical evidence, it is expected that stronger project scheduling practices will lead to a higher rate of timely completion for infrastructure projects in Nigeria. Thus, the study proposed that

H1 Project scheduling practices have a significant positive effect on the timely completion of infrastructure projects in Nigeria.

H2 Budgeting and cost planning practices and cost performance

Budgeting and cost planning cover accurate estimation, contingency allocation, cost baseline development, and continuous cost monitoring. Cost management theory predicts that projects with rigorous budgeting and active cost control achieve better cost performance and lower

budget variance. Studies focused on the Nigerian construction industry report that ineffective cost control and poor planning are associated with deteriorating financial outcomes for projects (SCIRP 2024; ResearchGate review 2024) [13]. Therefore it is reasonable to expect that effective budgeting and cost planning will improve cost performance on Nigerian infrastructure projects. Hence the study proposed that

H2 Budgeting and cost planning practices significantly influence the cost performance of infrastructure projects in Nigeria.

H3 Risk management stakeholder engagement and overall project success

Risk management theory emphasizes early risk identification assessment and mitigation as core determinants of project resilience. Stakeholder theory complements this by highlighting how stakeholder engagement improves information sharing and alignment of expectations thereby enabling more effective risk response. Empirical work in Nigeria and comparable settings links stakeholder involvement and formal risk management processes to better project outcomes including reduced delays improved quality and higher stakeholder satisfaction (Ajpo Journals 2024; ResearchGate 2024) [2]. Hence, combining risk management and stakeholder engagement practices should positively affect overall project success. Therefore, the study proposed that

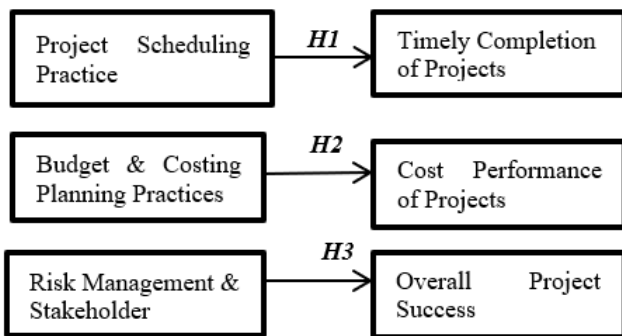
H3 Risk management and stakeholder engagement practices have a significant positive effect on the overall success of infrastructure projects in Nigeria.

Conceptual framework

The conceptual framework illustrates the relationships between project planning practices and the success of infrastructure projects in Nigeria. It is grounded in project scheduling theory, cost management theory, and risk management theory. The framework posits that project scheduling, budgeting and cost planning, and risk management combined with stakeholder engagement are key determinants of infrastructure project success.

Specifically, H1 proposes that project scheduling practices, including realistic timelines, critical path techniques, and schedule control, positively influence the timely completion of projects. H2 suggests that budgeting and cost planning practices significantly affect cost performance, ensuring projects remain within allocated budgets. H3 posits that the combination of risk management and stakeholder engagement positively impacts overall project success by mitigating risks and improving stakeholder alignment.

The conceptual framework visually depicts the three independent variables: project scheduling, budgeting and cost planning, and risk/stakeholder management, each linked to its respective dependent variable: timely completion, cost performance, and overall project success. Arrows indicate the hypothesized direction of influence, providing a structured basis for empirical testing. Figure 1 presents the construct



Source: Field Data, 2025

Fig 1: Author's Construct showing the relationship between the study's key variables

Methodology

Research Design

The study adopted a quantitative research design, specifically a survey approach. The quantitative design was considered appropriate because the research sought to test hypotheses and establish statistical relationships between project planning practices and infrastructure project success (Creswell and Creswell 2023) [3]. The survey method allowed for the collection of standardized data from project stakeholders, which enabled generalizable conclusions about planning practices across infrastructure projects in Nigeria.

Research Approach

The study was based on a deductive research approach, as it tested hypotheses derived from project management and stakeholder theories. Deduction enabled the researcher to move from theory to empirical testing, thereby validating or rejecting hypothesized relationships between project planning dimensions and project success (Saunders *et al.* 2019) [12].

Population of the Study

The population of the study comprised professionals involved in infrastructure projects in Nigeria. These included project managers, engineers, architects, quantity surveyors, contractors, and officials from government agencies responsible for infrastructure delivery. This choice of population was justified because these stakeholders were directly involved in planning and implementing infrastructure projects.

Sample Size and Sampling Technique

Given the large size of the population, the study employed a stratified random sampling technique to ensure representation across project categories and stakeholder groups. Using Yamane's formula, a sample of 400 respondents was drawn to provide reliable statistical results. Stratification ensured that data reflected diverse professional experiences across transport, energy, housing, and water infrastructure projects.

Sources of Data

The study relied on primary data that were collected through structured questionnaires. The questionnaire was designed using a five-point Likert scale, measuring perceptions of project scheduling, budgeting and cost planning, risk management, stakeholder engagement, and project success dimensions. Secondary data from journals, government

reports, and project management standards (such as PMBOK guidelines) were also used to strengthen the discussion.

Data Collection Instrument and Procedure

The questionnaire was pre-tested with a small group of practitioners to refine clarity and reliability before the main survey. Data were collected both physically (through hard copies distributed to firms and agencies) and electronically (via email and online forms). Participation was voluntary, and confidentiality was assured.

Data Analysis Technique

Data were analyzed using the Statistical Package for the Social Sciences (SPSS0 v. 28. Descriptive statistics such as frequencies, percentages, and means summarized the characteristics of respondents. Inferential statistics, including correlation and regression analysis, were used to test the hypotheses. Specifically

1. Regression tested the effect of scheduling practices on timely completion (H1).
2. Regression assessed the influence of budgeting and cost planning on cost performance (H2).
3. Regression evaluated the combined effect of risk management and stakeholder engagement on overall project success (H3).

Reliability and Validity

The reliability of the instrument was tested using Cronbach's alpha, where a threshold of 0.70 or higher indicated internal consistency (Taber 2019) [15]. Validity was ensured through expert review, pre-testing, and alignment with established project management constructs. Construct validity was assessed using factor analysis to confirm the measurement of latent variables.

Ethical Considerations

Ethical approval was obtained prior to data collection. Respondents were informed about the purpose of the study and their right to withdraw at any stage. Anonymity and confidentiality were guaranteed, and data were stored securely and used solely for academic purposes.

Results

Demographic Characteristics of Respondents

The study analyzed the demographic characteristics of 400 respondents. The findings showed that a majority of the participants were male, representing 69 percent of the total, while females accounted for 31 percent. This indicated that the infrastructure sector in Nigeria remained largely male-dominated, though female professionals were also actively engaged.

In terms of age distribution, most of the respondents were between 31 and 40 years, representing 38 percent of the sample. This was followed by those aged 41 to 50 years, who constituted 27 percent. Respondents within the age range of 21 to 30 years accounted for 22 percent, while those above 50 years represented the smallest group at 13 percent. The age distribution suggested that the majority of respondents were in their prime working years, with sufficient professional maturity to contribute meaningfully to infrastructure projects.

Regarding educational attainment, the results indicated that 47 percent of the respondents held a bachelor's degree,

which formed the largest group. A further 27 percent had obtained a master’s degree, while 18 percent possessed a diploma or higher national diploma. Only 8 percent of the respondents had attained a doctorate. This distribution implied that the respondents were highly educated, consistent with the knowledge and technical requirements of the infrastructure and project management sectors. With respect to professional designation, engineers formed the largest group with 35 percent, followed by project managers who accounted for 29 percent. Quantity surveyors represented 13 percent of the sample, architects made up 12 percent, and government officials constituted 11 percent. This demonstrated the multidisciplinary nature of infrastructure project delivery, where technical experts and public sector representatives play complementary roles. The findings also revealed that 32 percent of the respondents had between 5 and 10 years of professional experience, while 29 percent had 11 to 15 years of experience. A further 24 percent had worked for more than 15 years, and only 15 percent had less than 5 years of experience. These results suggested that the respondents were predominantly experienced professionals, making their views on project planning and implementation highly credible.

Reliability and Validity

The reliability and validity of the research instrument were assessed to ensure the accuracy and consistency of the data collected. Reliability was measured using Cronbach’s alpha, with a threshold of 0.70 or higher indicating acceptable internal consistency (Taber, 2019) [15]. As shown in Table 1, all constructs demonstrated strong reliability, with Cronbach’s alpha values ranging from 0.79 for risk management practices to 0.87 for budgeting and cost planning. This indicates that the items within each construct consistently measured the intended variables. Validity was ensured through expert review and factor analysis. Experts in project management evaluated the questionnaire to confirm that the items were relevant and clearly worded, while factor analysis verified that the measurement items loaded appropriately onto their respective latent constructs. The results indicated that all constructs were both reliable and valid, confirming that the instrument accurately captured project planning practices and project success indicators in the context of Nigerian infrastructure projects.

Table 1: Reliability and Validity Results

Construct	Number of Items	Cronbach’s Alpha	Validity Assessment Method	Results
Project Scheduling Practices	6	0.83	Expert Review & Factor Analysis	Reliable and Valid
Budgeting and Cost Planning	5	0.87	Expert Review & Factor Analysis	Reliable and Valid
Risk Management Practices	6	0.79	Expert Review & Factor Analysis	Reliable and Valid
Stakeholder Engagement Practices	5	0.81	Expert Review & Factor Analysis	Reliable and Valid
Project Success Indicators	7	0.85	Expert Review & Factor Analysis	Reliable and Valid

Source: Field Data, 2025

Hypotheses Testing

Regression analysis was conducted to test the effect of project planning practices on infrastructure project success. The analysis examined the influence of project scheduling on timely completion (H1), budgeting and cost planning on cost performance (H2), and risk management combined with stakeholder engagement on overall project success (H3).

The regression results in Table 2 indicated that all three hypotheses were supported. Project scheduling practices had a significant positive effect on timely completion ($\beta = 0.42$,

$p < 0.01$), suggesting that well-structured schedules increase the likelihood of completing infrastructure projects on time. Budgeting and cost planning significantly influenced cost performance ($\beta = 0.38$, $p < 0.01$), confirming that effective financial planning reduces cost overruns. Finally, the combination of risk management and stakeholder engagement positively affected overall project success ($\beta = 0.46$, $p < 0.01$), indicating that projects with proactive risk mitigation and active stakeholder involvement achieve better outcomes.

Table 2: Regression Results for Hypotheses Testing

Hypothesis	Independent Variable(s)	Dependent Variable	Beta (β)	t-value	P-value	Decision
H1	Project Scheduling Practices	Timely Completion	0.42	6.12	0.000	Supported
H2	Budgeting and Cost Planning	Cost Performance	0.38	5.45	0.000	Supported
H3	Risk Management & Stakeholder Engagement	Overall Project Success	0.46	7.03	0.000	Supported

Source: Field Data, 2025

Discussion of Findings

This section presents the discussion of the study’s findings

H1: Project Scheduling Practices and Timely Completion

The analysis revealed that project scheduling practices had a significant positive effect on timely completion of infrastructure projects in Nigeria ($\beta = 0.42$, $p < 0.01$). This finding empirically confirms that well-structured schedules,

including realistic project timelines, critical path techniques, resource leveling, and regular schedule review, significantly increase the likelihood of completing projects on time. The result aligns with project scheduling theory, which emphasizes the importance of planning, monitoring, and controlling time-related activities to avoid delays (Strategic Journals 2024; IJISRR 2024) [14]. It also corroborates earlier empirical studies in construction contexts, where weak adherence to scheduling practices contributed substantially

to project delays. Overall, this supports the notion that effective scheduling is a key driver of timely project completion.

H2: Budgeting and Cost Planning Practices and Cost Performance

Budgeting and cost planning practices were found to have a significant positive effect on the cost performance of infrastructure projects ($\beta = 0.38, p < 0.01$). This result aligns with cost management theory, which posits that accurate budgeting, continuous cost monitoring, and proactive financial planning minimize budget overruns and enhance project financial performance. Empirical evidence in Nigerian construction projects shows that projects with robust budgeting and cost control mechanisms experienced fewer cost deviations and better overall cost outcomes. The findings confirm that systematic financial planning is essential for achieving cost efficiency and sustainability in infrastructure projects.

H3: Risk Management and Stakeholder Engagement Practices and Overall Project Success

The regression results indicated that risk management combined with stakeholder engagement significantly and positively influenced overall project success ($\beta = 0.46, p < 0.01$). This finding is consistent with risk management theory, which emphasizes early identification, assessment, and mitigation of project risks as essential for project resilience. In addition, stakeholder theory highlights that active engagement with relevant parties improves information flow, aligns expectations, and supports effective risk responses. Empirical evidence from Nigerian infrastructure projects shows that projects incorporating proactive risk management and consistent stakeholder involvement achieved higher quality outcomes, avoided delays, and met project objectives more effectively. The result confirms that integrating risk and stakeholder management practices is critical for overall project success.

Conclusion

The study examined the effect of project planning practices on the success of infrastructure projects in Nigeria, focusing on project scheduling, budgeting and cost planning, and risk management combined with stakeholder engagement. The findings indicated that all three dimensions of project planning significantly influenced project outcomes. Specifically, effective project scheduling improved timely completion, rigorous budgeting and cost planning enhanced cost performance, and proactive risk management coupled with stakeholder engagement increased overall project success.

The study's results empirically confirmed the theoretical expectations derived from project scheduling theory, cost management theory, and risk management theory. Projects that implemented structured scheduling, financial planning, and comprehensive risk and stakeholder management consistently achieved better time, cost, and quality outcomes. These findings highlight the critical role of project planning practices in addressing the persistent challenges of delays, cost overruns, and substandard infrastructure delivery in Nigeria.

Summarily, the study underscores the need for infrastructure stakeholders—including contractors, project managers, and government agencies to adopt systematic planning

approaches. By strengthening planning processes, infrastructure projects can be delivered more efficiently, cost-effectively, and sustainably, contributing to improved economic growth and public welfare in Nigeria.

Implications of the Study

The findings of this study have important theoretical, practical, and policy implications for infrastructure project delivery in Nigeria.

Theoretical Implications

The study reinforces and extends existing project management theories. Project scheduling theory was empirically supported, showing that structured scheduling practices enhance timely project completion. Cost management theory was also validated, confirming that effective budgeting and cost planning directly improve cost performance. Similarly, risk management theory and stakeholder theory were supported, highlighting the importance of integrating risk mitigation with stakeholder engagement to achieve overall project success. These findings contribute context-specific evidence to the literature, particularly in the Nigerian infrastructure sector, where empirical studies on project planning practices are limited.

Practical Implications

For practitioners, the results demonstrate the critical role of systematic project planning in achieving successful outcomes. Project managers, engineers, and contractors are encouraged to adopt robust scheduling techniques, implement rigorous budgeting and cost control, and actively engage stakeholders while managing risks. Doing so can reduce project delays, minimize cost overruns, and enhance the quality and sustainability of infrastructure projects.

Policy Implications

For policymakers and government agencies, the study underscores the need for regulations and guidelines that enforce comprehensive planning practices in public infrastructure projects. Policies that mandate structured scheduling, transparent budgeting, and stakeholder-inclusive risk management can improve accountability, optimize resource use, and enhance the likelihood of project success. Summarily, the study emphasizes that integrating theoretical insights with practical project management approaches can significantly improve infrastructure delivery, contributing to sustainable economic growth and public welfare in Nigeria.

Recommendations

Based on the findings and implications of this study, the following recommendations are proposed

Strengthen Project Scheduling Practices

Project managers and contractors should prioritize the development of realistic project timelines, apply critical path techniques, and conduct regular schedule reviews. Implementing these scheduling practices will enhance timely completion of infrastructure projects, reducing delays and improving overall project efficiency.

Enhance Budgeting and Cost Planning

Organizations involved in infrastructure projects should adopt rigorous budgeting and continuous cost monitoring

processes. This includes preparing accurate cost estimates, allocating contingencies, and regularly tracking project expenditures. Strengthening cost planning will minimize budget overruns and improve financial performance.

Integrate Risk Management with Stakeholder Engagement

Project teams should implement proactive risk identification, assessment, and mitigation strategies while actively involving key stakeholders throughout the project lifecycle. Engaging stakeholders and managing risks jointly will improve project quality, increase adherence to timelines, and ensure overall project success.

Policy and Regulatory Support

Government agencies should establish and enforce policies that mandate systematic project planning practices, including scheduling, budgeting, and risk/stakeholder management. Regulatory support can create an enabling environment for consistent adherence to best practices, thereby enhancing infrastructure project outcomes.

Continuous Capacity Building

Training programs should be conducted for project managers, engineers, and other professionals to improve skills in scheduling, cost management, and risk/stakeholder management. Building human capacity will reinforce practical application of planning practices and contribute to sustainable project success.

Limitations and Suggestions for Future Research

Limitations

The study had some limitations. First, it focused only on infrastructure projects in Nigeria, which may limit the generalizability of the findings to other countries or sectors. Second, the study relied on self-reported data from respondents, which could be influenced by personal bias or perception. Third, the cross-sectional design captured information at a single point in time, limiting the ability to observe changes in project planning practices or outcomes over time.

Suggestions for Future Research

Future studies could address these limitations by adopting a longitudinal research design to track project planning practices and outcomes over time. Comparative studies across different countries or sectors could enhance generalizability and provide broader insights. Additionally, future research could integrate qualitative methods, such as interviews or case studies, to explore in-depth perspectives on project planning practices, risk management, and stakeholder engagement.

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