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PROJECT MANAGEMENT TECHNIQUES AND DELIVERY OF ROAD CONSTRUCTION PROJECTS IN AKURE, NIGERIA

FAGBEMI, OMOTAYO EZEKIEL & ALADE, KEHINDE TEMITOPE

Department of Project Management Technology, The Federal University of Technology, Akure, Ondo State, Nigeria
Corresponding Author: omotayofagbe@gmail.com
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Abstract

Project success is largely determined by the effective application of various project management techniques, encompassing comprehensive planning, scheduling, effective control, and proper project closure. This study evaluated the effectiveness of project management techniques employed in road construction projects within Akure, Nigeria. The study utilised a descriptive survey research design, which involves the use of structured questionnaire for data collection. This study targeted a finite population of 70 active project professionals, from which a sample size of 60 respondents was derived. Stratified random sampling method was employed to select the respondents. Data were analysed using descriptive statistics and inferential statistics (multiple linear regression and hierarchical moderated linear regression) with the aid of Microsoft Excel and Statistical Package for the Social Sciences (SPSS), version 17.0. Findings revealed a high overall adoption of project management techniques (Grand Mean = 4.12), led by resource planning and allocation (Mean = 4.32) and stakeholder engagement (Mean = 4.20). Collaborative scheduling methods, specifically the Last Planner System (Mean = 3.97), were the least utilised. Direct effects regression (Model 1) showed that project management techniques are strong and statistically significant predictors of road construction project delivery, explaining [redacted] 90.2% of the variance (R Square = 0.902, F = 533.982, p < 0.001). The moderated regression (Model 2) confirmed that government policy plays a significant moderating role in their effect (joint R Square = 0.918, R Square Change = 0.016, joint F = 209.902, p = 0.006). Mean-centering completely resolved severe uncentered multicollinearity, reducing the Condition Number from 1,650 to 5.17, and verified significant direct effects for techniques (B = 0.955, t = 11.970, p < 0.001) and policy (B = 0.157, t = 2.941, p = 0.005). The study concludes that project management techniques have a significant predictive effect on the delivery

Keywords: Project management, Project management techniques, Delivery, Road construction projects, Akure, Nigeria

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

of road construction projects in Akure, and the relationship is significantly moderated by government policy. Hence, the study recommends that professional and regulatory bodies should strengthen contractors' management capacity through continuous training in advanced and lean construction techniques.

Introduction

Globally, road infrastructure is a critical component of economic and social development because it facilitates the movement of people, goods, and services and provides essential connections between communities, markets, industries, and institutions (Ng et al., 2019). However, road construction projects are complex undertakings involving substantial financial resources, multiple stakeholders, technical activities, uncertain environmental conditions, and strict requirements relating to time, cost, quality, and scope. Road construction remains a priority for federal and state governments, yet up to 70 percent of road projects experience delays ranging from moderate to severe (Berta, 2025). Reviews of highway construction risks identify the top recurring factors as financial constraints, regulatory issues, design changes, and weak scheduling (Zhasmukhambetova et al., 2025). In Nigeria, these are compounded by bureaucratic bottlenecks and inadequate stakeholder coordination (Akoh et al., 2025). Empirical data confirm that road projects frequently exceed budgets by more than 30 percent and suffer schedule slippage in over 60 percent of cases (Aligamhe et al., 2024). Distressed projects often result from poor alignment between reward systems and expectations, inadequate management techniques, and breakdowns in stakeholder communication (Iribagiza & Kirabo, 2024). In Akure Metropolis, numerous road projects have been proposed and implemented to support rapid urbanisation, rural-urban migration, and the city's emergence as a commercial hub in Ondo State. Nevertheless, most experience difficulties related to cost, time, and quality.

Project management techniques are the specific tools, methods, and practices applied throughout the project life cycle to achieve the desired objectives of time, cost, quality, and stakeholder satisfaction (Project Management Institute, 2021; Kerzner, 2022). Project management techniques play a strategic role by aligning project activities with clearly defined objectives (Project Management Institute, 2021). Contractors view project management as the disciplined regulation of resources to control costs and schedules while building strong relationships with beneficiaries (Zhao et al., 2021). The process follows a structured life cycle of planning, execution, monitoring, and control, which reduces uncertainty and improves overall project outcomes (Iribagiza & Kirabo, 2024). In Nigeria, construction projects frequently encounter evaluation deficiencies, including poor infrastructure, bureaucratic delays, and material shortages. Studies on highway projects report mean cost overruns of approximately 31.36 percent, with the probability of cost overrun occurrence reaching 94.14 percent (Aligamhe et al., 2024). Schedule delays are equally severe, often exceeding 60 percent of planned duration, and are frequently linked to financial constraints and supply chain disruptions (Precious, 2025).

In road construction, performance is particularly important because delays and cost overruns can increase the financial burden on government and other project sponsors, while poor quality can

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

reduce the service life of roads and increase maintenance costs (Deep et al., 2022). Therefore, achieving satisfactory performance requires not only adequate technical capacity but also effective management of project activities throughout the project life cycle. Satisfactory performance of project can involve delivering a project on schedule, within budget, and meeting or exceeding stakeholder expectations.

While advanced project management techniques have demonstrated success globally, their effectiveness and adaptation in Akure remain underexplored. This study therefore evaluates project management techniques and their direct influence on the delivery of road construction projects in Akure, Nigeria, aiming to provide evidence-based insights that can guide policymakers and contractors toward more efficient, cost-effective, and sustainable infrastructure delivery.

Statement of the Problem

The achievement of project success depends on a spectrum of management techniques, ranging from meticulous project planning to vigilant control and eventual closure (Alphonse & Valens, 2023). Poor project delivery in road construction projects is a recurring phenomenon that exerts a significant negative impact on economic development, undermining the competitiveness and long-term sustainability of construction companies (Ashem Egila, 2020). Poor road contract performance is frequently attributed to insufficient financial management and poor service delivery to road users (Dwomoh, 2021; Ibrahim & Mutuku, 2022), leaving local firms unable to compete strategically with foreign construction firms (Yayok et al., 2022). While the state government's commitment to funding road projects in Akure Metropolis is commendable, actual performance continues to face persistent cost overruns, rework, scope variation, and delays due to numerous pitfalls throughout the project cycle (Aligamhe et al., 2024).

In recent times, the government has implemented a number of policies aimed at improving the efficiency of road construction projects. Despite these efforts, most road construction projects have not been completed within the originally planned deadlines (Cheserek & Sangoro, 2023). Empirical evidence indicates that only 35 percent of projects meet the desired quality requirements, while approximately 55 percent of road construction projects in the country encounter a variety of difficulties that prevent timely completion, leading to cost overruns, or resulting in failure to satisfy required quality standards (Kabiti & Kikwatha, 2022). The successful completion of road construction projects is critical to the continued economic growth and development of Akure Metropolis (Cheserek & Sangoro, 2023). However, the recurring incidence of failed and abandoned projects in Akure has become a matter of serious concern, as huge public investments end up being wasted (Kabiti & Kikwatha, 2022).

Despite the above challenges, the existing body of knowledge reveals a clear gap in the Nigerian context. While existing studies have examined project management practices in other regions, very few have specifically investigated the effectiveness of these techniques in the unique socio-economic and regulatory environment of Akure Metropolis. Furthermore, the interplay between traditional techniques (such as CPM and PERT) and emerging digital tools (such as BIM and AI-assisted risk management) remains largely unexplored in this locality.

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

Thus, this study addressed the identified gap by systematically evaluating the project management techniques currently employed in major road construction projects in Akure and assessing their direct impact on project delivery in terms of time, cost, quality, and overall success.

Objectives of the Study

The general objective of the study is to evaluate the effectiveness of project management techniques employed in road construction projects with a view to improving the delivery of road construction projects in Akure, Nigeria.

The specific objectives are to:

i. assess the project management techniques commonly adopted in the delivery of road construction projects in Akure, Nigeria;
ii. investigate the effect of project management techniques on the delivery of road construction projects in the study area; and
iii. examine the moderation effect of government policy in the relationship between project management techniques and delivery of road construction projects in the study area.

Project Management Techniques

Project management techniques are the specific tools, methods, and practices applied throughout the project life cycle to achieve the desired objectives of time, cost, quality, and stakeholder satisfaction (Project Management Institute, 2021; Kerzner, 2022). In road construction projects, these techniques are not uniform across all stages; rather, they are deliberately selected and adapted to address the unique demands of each phase, from conceptual design through to final handover. The effectiveness of any technique depends on its alignment with the project ecosystem and the project management life cycle. When properly chosen and consistently applied, these techniques reduce uncertainties, minimise waste, and enhance overall project performance, particularly in resource-constrained environments such as Akure, Nigeria (Ibrahim & Elshwadfy, 2021; Zhao et al., 2021).

At the planning stage, the most critical techniques revolve around scope definition, work breakdown structure (WBS), and risk identification. A detailed WBS decomposes the entire road project into manageable work packages, enabling accurate estimation of resources, durations, and costs. In Nigerian road projects, effective use of WBS has been shown to improve cost estimation accuracy by up to 27 percent and reduce scope creep (Aligamhe et al., 2024). Complementary techniques include stakeholder analysis matrices and risk registers, which help identify potential threats such as land acquisition delays, material price fluctuations, and regulatory bottlenecks early enough to develop mitigation strategies. Sustainable planning techniques that incorporate environmental impact assessments and community engagement protocols are increasingly recognised as essential in this phase (Chow et al., 2021).

During the execution stage, techniques shift toward operational control and coordination. The Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT) remain foundational for scheduling. CPM identifies the longest sequence of dependent activities that determines the minimum project duration, allowing project managers to focus resources on critical tasks such as pavement laying and bridge construction. PERT adds probabilistic time estimates to

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

handle uncertainties common in road projects, such as weather interruptions or labour shortages (Kerzner, 2022; Nicolas & Steyn, 2020). Lean construction techniques, particularly the Last Planner System, have gained prominence in recent years. This system promotes collaborative weekly planning, constraint removal, and continuous learning, resulting in more reliable workflow and reduced waste. Studies of road projects in sub-Saharan Africa report that implementation of the Last Planner System can improve schedule reliability by 35–45 percent (Emblemsvåg, 2024; Agrawal et al., 2024). Earned Value Management (EVM) is another powerful execution-stage technique that integrates scope, schedule, and cost performance into a single metric, enabling early detection of variances and corrective action. In Nigerian road construction, EVM has been associated with better cost control and timely decision-making (Isah et al., 2025).

Quality management techniques become prominent during both execution and monitoring phases. These include statistical process control, material testing protocols, in-situ density checks, and regular quality audits. For road projects, techniques such as asphalt mix design verification, concrete strength testing, and pavement smoothness measurements are non-negotiable to ensure durability and safety. Integrated quality management systems that combine ISO 9001 principles with local standards have been shown to reduce rework by 28 percent in similar infrastructure projects (Carmona & Ezzame, 2023).

Risk management techniques span all stages but are most intensive during planning and execution. These include risk identification workshops, probability-impact matrices, Monte Carlo simulation for quantitative analysis, and risk response planning (avoid, mitigate, transfer, or accept). In Akure road projects, common risks such as funding delays, design changes, and supply chain disruptions are best managed through contingency planning and regular risk audits (Irfan et al., 2024). Recent evidence indicates that projects applying formal risk management techniques experience 22 percent lower cost overruns and 18 percent fewer delays than those relying on ad-hoc approaches (Wang et al., 2025).

Monitoring and control techniques rely heavily on performance measurement and reporting. Key performance indicators (KPIs), dashboards, variance analysis, and progress meetings form the core toolkit. Digital techniques such as Building Information Modelling (BIM) for 4D/5D simulation, drone-based progress monitoring, and real-time project management software provide unprecedented visibility and enable data-driven decisions (Yahya et al., 2023). In the Nigerian context, the adoption of these digital techniques remains uneven, but projects that integrate them report significantly better stakeholder satisfaction and reduced claims (Isah et al., 2025).

At the closure stage, techniques focus on lessons-learned documentation, final audits, contract close-out, and knowledge transfer. Post-project reviews using structured questionnaires and focus groups help capture insights that strengthen the project ecosystem for future road projects in Akure and beyond.

Overall, project management techniques in road construction are most effective when they are deliberately matched to the requirements of each life-cycle stage and embedded within a well-orchestrated project ecosystem. No single technique is universally superior; success depends on the project manager's ability to select, sequence, and integrate the right combination of tools at the right time. In Akure, Nigeria, where road projects face persistent challenges of cost overrun, time delay, and quality shortfalls, the strategic and context-sensitive application of these

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

techniques offers a proven pathway to improved project delivery and sustainable infrastructure outcomes.

Implementation of Road Construction Projects

The successful implementation of road construction projects refers to the achievement of project objectives within the predefined constraints of time, cost, and quality, ultimately leading to customer satisfaction and sustainable benefits (PMI, 2021). It encompasses delivering a project on schedule, within budget, and meeting or exceeding stakeholder expectations. According to Kerzner (2022), project success is evaluated based on the alignment of outcomes with the planned project scope and the satisfaction of stakeholders. Completing a project within the stipulated timeframe is a critical indicator of success. A project's timely delivery ensures that it can meet the needs it was intended to address and prevent potential cost escalations due to delays (Osei-Kyei & Chan, 2020).

Time management practices, such as setting realistic schedules and adhering to them through proper monitoring and control, are crucial for project success (Larson & Gray, 2020). Cost control is a fundamental measure of project success. The ability to complete a project within its allocated budget reflects effective financial planning and resource management (Jensen, 2021). Effective budgeting, cost tracking, and financial oversight contribute to a project's successful completion. Delivering a project that meets predefined quality standards is essential for the project's functionality and longevity. According to Turner (2020), quality assurance involves ensuring that all project outputs align with the specifications and expectations set during the planning phase. High-quality outcomes improve stakeholder trust and project sustainability.

The end-users' satisfaction plays a critical role in determining project success. This involves meeting or exceeding the expectations of all stakeholders, including government authorities, community members, and contractors (Eskerod & Jepsen, 2021). Successful projects often involve mechanisms for gathering feedback and implementing adjustments during the project to ensure satisfaction. The successful implementation of road projects has been supported by various recent studies that highlight the importance of integrated management practices. Measuring project success can be complex due to the varying definitions and metrics applied across projects (Williams & Samset, 2021). While some scholars argue that time, cost, and quality are sufficient indicators, others suggest that these metrics do not capture the full spectrum of project benefits, particularly those related to social and environmental impacts (Kumar & Mishra, 2020).

Theoretical Review

The underpinning theories for this study are the Theory of Change (ToC) and the Theory of Constraints (TOC). These theories provide complementary explanations of how project management techniques influence road project delivery and how government policy may strengthen or constrain this relationship.

The Theory of Change (ToC)

The Theory of Change was popularised by Carol H. Weiss in 1995. The Theory of Change is a participatory framework that explains how and why a desired change is expected to occur by

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

linking project activities, outputs, outcomes, and long-term impacts. Theory of Change enables project teams to monitor their validity during implementation and to adjust strategies when assumptions prove invalid or contextual conditions change (Simeone et al., 2023). The Theory of Change explains how effective project management techniques: planning, resource allocation, risk management, performance tracking, and stakeholder engagement lead to improved time, cost, and quality performance of road projects.

The Theory of Constraints (TOC)

The Theory of Constraints, developed by Eliyahu Goldratt in the 1980s, posits that every system has at least one constraint that limits its ability to achieve its goals. The Theory of Constraints is a systems-based management philosophy that asserts every manageable system is limited in achieving more of its goal by at least one constraint, and that the rate of goal achievement is governed by the strength of that constraint (Leybourne, 2024). The Theory of Constraints explains how bottlenecks such as inadequate resources, procurement delays, scope changes, and regulatory challenges can limit project performance. Thus, the framework suggests that government policy can either reduce these constraints and strengthen the effectiveness of project management techniques or intensify them and hinder project performance.

Empirical Review

Empirical research on project management techniques in road construction has consistently demonstrated that the adoption of structured techniques significantly influences project outcomes, particularly in developing countries where infrastructure projects face chronic challenges of cost overruns, schedule delays, and quality shortfalls. Studies conducted across Nigeria and other African contexts reveal that techniques such as the Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), risk management frameworks, and lean approaches like the Last Planner System are increasingly applied, yet their effectiveness varies depending on implementation maturity, organisational capacity, and contextual factors. In Nigeria, empirical investigations have shown that project management techniques contribute substantially to road project success when properly integrated into the project life cycle. For instance, Kehinde and Afolabi (2018) examined the effect of project management techniques on road construction projects using Julius Berger Nigeria Plc as a case study. Their survey of 95 respondents (contractors, site engineers, project managers, and supervisors) found that the majority of practitioners recognised the importance of these techniques, and their application was positively associated with improved project execution. The study concluded that techniques encompassing planning, scheduling, and control practices significantly enhance success rates, with chi-square analysis confirming a statistically significant relationship between technique adoption and project outcomes. This finding aligns with broader African evidence, where structured techniques help mitigate the high failure rates observed in public infrastructure delivery (Unegbu et al., 2022).

Further empirical support comes from studies focusing on specific techniques. Research on the Last Planner System (LPS) in construction projects, including road works, indicates notable improvements in workflow reliability and schedule performance. Emblemsvåg (2024) and related lean construction studies report that LPS implementation can elevate Percent Plan Complete (PPC)

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

rates from typical 35–65% in traditional approaches to 75–90% or higher, leading to reduced rework and better resource utilisation. In African road projects, similar patterns emerge, with LPS helping teams manage constraints more effectively through collaborative weekly planning and lookahead processes. Although direct Nigerian road-specific LPS studies are still emerging, the broader construction literature (including highway and infrastructure projects) supports its positive impact on performance metrics (Dewantoro, 2019; Lagos & Alarcón, 2025). CPM and PERT, as traditional scheduling techniques, have also been empirically tested in road construction settings. Studies applying CPM and PERT to highway projects demonstrate their value in identifying critical paths and handling uncertainties, with probabilistic estimates in PERT proving useful for weather-prone or supply-constrained environments common in Nigeria (Bagshaw, 2010), and with continued application in recent scheduling research. However, empirical findings also highlight limitations: these techniques perform best when combined with lean or collaborative methods rather than used in isolation.

Risk management techniques have received substantial empirical attention in Nigerian and African road projects. Unegbu et al. (2022) investigated the relationship between project performance measures and project management practices in the Nigerian construction industry, focusing on the North Central zone. Using data from 74 project professionals, the study found a statistically significant positive correlation between risk management practices and overall project success. Projects with formal risk identification, assessment, and mitigation processes recorded better performance on cost, time, and quality indicators. Similarly, research on risk management in Nigerian highway projects (e.g., FERMA projects in the FCT) shows that systematic risk strategies reduce cost overruns and improve delivery rates (Odimabo, 2016), which is updated in later frameworks; (Khatatbeh, 2025). In a broader African context, studies on highway construction risks identify financial constraints, political/regulatory issues, land acquisition delays, design changes, and material shortages as recurring factors, with formal risk management techniques mitigating their impact (Zhasmukhambetova et al., 2025). These empirical works collectively indicate that risk management is not only a standalone technique but a cross-cutting practice that amplifies the effectiveness of planning and scheduling tools.

Empirical research has consistently demonstrated that project management techniques exert a significant positive influence on road construction project performance, particularly when applied systematically across the project life cycle. Studies conducted in Nigeria and comparable African contexts revealed strong associations between the adoption of structured techniques and improved outcomes in time, cost, quality, and overall project success. Aligamhe et al. (2024) examined cost performance of road construction projects in Nigeria using data from multiple federal and state highway initiatives. Their analysis revealed mean cost overruns of 31.36 percent, with a 94.14 percent probability of overrun occurrence. However, projects that employed formal project management techniques, including detailed planning, risk management, and scheduling tools, recorded significantly lower overruns. The study concluded that effective technique application can reduce cost variance by up to 25 percent when integrated with robust monitoring systems. This finding is reinforced by Unegbu et al. (2022), who investigated the relationship between project management practices and performance in the North Central zone of Nigeria. Using survey data from 74 construction professionals, they found a statistically significant positive

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

correlation between the use of planning, risk management, and monitoring techniques and overall project success metrics. Their regression analysis showed that these practices collectively explained a substantial portion of variance in performance outcomes.

Further empirical evidence highlights the specific impact of scheduling and risk management techniques. Mongina and Moronge (2021) conducted a census survey of road construction projects in Nairobi City County, Kenya, a context structurally similar to Akure. Their results indicated that project planning, monitoring and evaluation, funding mechanisms, and risk management jointly explained 77.2 percent of the variance in project performance, with planning emerging as the strongest predictor. In Nigerian road projects, similar patterns emerge. Isah et al. (2025) analysed life cycle performance in Nigerian infrastructure projects and found that integrated scheduling techniques (CPM and PERT) combined with formal risk management reduced schedule slippage by an average of 28 percent and improved quality compliance rates. Projects that applied these techniques consistently reported higher Percent Plan Complete (PPC) values and lower rework costs. Many Nigerian contractors, particularly smaller firms, still rely on traditional or ad-hoc approaches due to limited training, resource constraints, and organisational culture, resulting in suboptimal performance (Ongbali et al., 2021; Unegbu et al., 2022). Larger firms like Julius Berger show higher maturity in technique application, correlating with better outcomes.

In the Nigerian road sector, studies confirm that projects with structured stakeholder management practices experience fewer disputes, reduced variation orders, and higher community satisfaction levels (Al-Nimer et al., 2024; Zada et al., 2024). Conversely, empirical work consistently identifies weak stakeholder engagement as a major contributor to performance shortfalls, including scope creep, delays, and cost escalations.

Despite these positive findings, empirical literature also reveals important nuances and contextual limitations. Many studies note that the impact of project management techniques is moderated by implementation maturity, organisational culture, and external environmental factors. Furthermore, some research highlights diminishing returns when techniques are applied in isolation rather than as part of an integrated system. For example, advanced scheduling tools yield greater performance improvements when combined with strong risk management and stakeholder engagement practices.

Methodology

The study adopted a survey research design which involves the use of structured questionnaire for data collection. This study targeted a finite population of 70 active project professionals from which a sample size of 60 respondents was determined using Taro Yamane's formula at a standard 5% margin of error. The study employed stratified random sampling technique. The questionnaire was made up of three parts which contained questions relating to the variables under investigation. Section A assessed the the types of project management techniques commonly adopted in road construction projects using dimensions like Planning/Scheduling, Resource Planning and Allocation (CPM, PERT, Last Planner System), Scope Planning and Change Control, Risk Management, Performance Tracking, Stakeholder Engagement and Communication, section B assessed the perceived effect of these techniques on road project delivery (time, cost, and quality), while section C assessed the moderating role of government policy in the relationship.

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

The indicators for each of the constructs employed a five-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. Data were analysed using descriptive statistics and inferential statistics (multiple linear regression and hierarchical moderated linear regression) to establish the relationship between project management techniques and delivery of road construction projects with the aid of Microsoft Excel and Statistical Package for the Social Sciences (SPSS) software, version 17.0.

Response Rate

The study targeted a sample of 60 project professionals involved in the planning, execution, and monitoring of road infrastructure in Akure. A total of 60 valid copies of questionnaire were successfully retrieved, representing a 100 percent response rate.

Project Management Techniques Commonly Adopted in the Delivery of Road Construction Projects in Akure

Table 1 shows the comprehensive overview of the extent to which various project management techniques are utilised for road construction projects in Akure. Based on the descriptive statistics derived from the field survey, the overall level of adoption is high, as evidenced by a grand mean of 4.12. This suggests that project professionals in the study area are not merely relying on ad hoc practices but are instead employing a structured array of methodologies to align project activities with their predefined objectives. The findings indicate that the application of these techniques is a standard professional expectation in the delivery of major infrastructure within the metropolis.

Among the eight techniques evaluated, resource planning and allocation emerged as the most frequently adopted technique, achieving the highest mean score of 4.32. The prioritisation of this technique is highly significant given the Nigerian construction context, where the successful delivery of projects depends heavily on the strategic forecasting and distribution of scarce human, financial, and material assets. Meticulous resource planning is essential for managing local constraints such as fluctuating material prices, seasonal labour availability, and the unpredictable nature of government funding releases. The high ranking of this technique suggests that managers in Akure view the efficient regulation of resources as their primary lever for controlling project outcomes.

Stakeholder engagement and communication practices ranked second with a mean score of 4.20. This high level of adoption reflects an industry-wide recognition that road construction projects operate within a complex ecosystem of government agencies, contractors, and local communities. By prioritizing communication and collaboration, project managers aim to build the trust and credibility necessary to navigate social risks, reduce community-related stoppages, and ensure smoother project implementation.

Technical control techniques, specifically risk management and scope planning, were also found to be widely implemented, with both recording a mean score of 4.18. The active use of formal risk identification, assessment, and mitigation procedures highlights a proactive approach to the inherent uncertainties of the sector, such as regulatory changes and site-specific geotechnical challenges. Similarly, the adoption of scope planning and change control procedures demonstrates

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

a professional commitment to defining project boundaries and managing the variation orders that frequently disrupt road construction timelines in Nigeria.

Traditional scheduling and monitoring tools continue to provide the analytical backbone for project execution in the study area. The Critical Path Method (CPM) for scheduling and Earned Value Management (EVM) for performance tracking both achieved a mean score of 4.07. These tools are essential for sequencing critical tasks like pavement laying and bridge construction while providing the data-driven visibility needed for early detection of variances. It is noteworthy, however, that more collaborative or probabilistic methods, such as the Last Planner System (LPS) (Mean = 3.97) and the Program Evaluation and Review Technique (PERT) (Mean = 3.95), were the least utilised techniques. This suggests that while project management in Akure is technically grounded, there remains a reliance on deterministic scheduling over the more probabilistic or lean approaches that are gaining traction in global practice.

Table 1: Descriptive Statistics of Project Management Techniques Adoption

Variables	Mean	Std. Dev.	Rank	Decision
Resource planning and allocation techniques	4.32	0.651	1st	High
Stakeholder engagement and communication practices	4.20	0.732	2nd	High
Risk management techniques (identification, assessment, mitigation)	4.18	0.701	3rd	High
Scope planning and change control procedures	4.18	0.701	4th	High
Critical Path Method (CPM) for scheduling	4.07	0.710	5th	High
Earned Value Management (EVM) for performance tracking	4.07	0.686	6th	High
Last Planner System (LPS) for collaborative planning	3.97	0.688	7th	High
Program Evaluation and Review Technique (PERT)	3.95	0.649	8th	High
Grand Mean	**4.12**			**High**

Source: Researcher's Field Survey (2026)

Decision Rule: 4.50 – 5.00 = Very High; 3.50 – 4.49 = High; 2.50 – 3.49 = Moderate; 1.50 – 2.49 = Low; 1.00 – 1.49 = Very Low

Delivery of Road Construction Projects

Table 2 shows the descriptive statistics of perceived influence of project management techniques on the overall delivery of road construction projects in Akure. Results from the field survey indicate a strong level of agreement among project professionals that these techniques are fundamental to achieving successful outcomes. The analysis returned a grand mean of 4.21 for this section, which falls within the high agreement range. This finding suggests that the application of structured management tools is viewed by industry stakeholders as a strategic driver of efficiency and accountability rather than a mere procedural requirement.

The highest ranked item in this category relates to the foundational belief that a strong positive relationship exists between the adoption of project management techniques and successful project delivery, recording a mean score of 4.28. Closely following this is the perception that these

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

techniques enhance overall stakeholder satisfaction, which achieved a mean of 4.27. These results reflect a professional consensus in the local industry that success is increasingly defined by more than technical completion: it must also encompass the extent to which the expectations of government authorities, contractors, and end users are met.

Furthermore, the data provide specific insights into how these techniques mitigate the chronic failures often associated with road infrastructure in Nigeria, particularly schedule slippage and budget inflation. Respondents agreed that project management techniques significantly improve adherence to project schedules, yielding a mean score of 4.20. Similarly, the application of these tools was found to assist in reducing cost overruns and ensuring better quality outcomes in completed roads, with both items achieving mean scores of 4.15. While these technical impacts are ranked slightly lower than relational outcomes such as stakeholder satisfaction, their high mean scores underscore the vital role that disciplined scheduling and tracking methods play in maintaining the integrity of project constraints. Collectively, these findings demonstrate that project management techniques provide the necessary framework for delivering road infrastructure that is timely, cost effective, and durable.

Table 2: Descriptive Statistics of Road Construction Project Delivery

Variables	Mean	Rank	Decision
There is a strong positive relationship between the adoption of project management techniques and successful project delivery	4.28	1st	High
Project management techniques enhance overall stakeholder satisfaction with road project delivery	4.27	2nd	High
Project management techniques significantly improve adherence to project schedules in road construction projects in Akure	4.20	3rd	High
The use of project management techniques helps in reducing cost overruns in road projects	4.15	4th	High
Effective application of project management techniques leads to better quality outcomes in completed roads	4.15	5th	High
Grand Mean	**4.21**		**High**

Source: Researcher's Field Survey (2026)

Decision Rule: 4.50 – 5.00 = Very High; 3.50 – 4.49 = High; 2.50 – 3.49 = Moderate; 1.50 – 2.49 = Low; 1.00 – 1.49 = Very Low

The Effect of Project Management Techniques on Delivery of Road Construction Projects

Multiple linear regression analysis was used to determine the predictive power of project management techniques on road construction project delivery. To ensure a comprehensive analysis, the study employed a hierarchical approach, where Model 1 examined the direct effect of project management techniques on delivery of road construction projects, and Model 2 incorporated the interaction between project management techniques and government policy to assess the moderating influence of the regulatory and political environment. The results for the direct effect model (Model 1 as seen in Table 3, Table 4, and Table 5) indicate a very strong

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

predictive relationship. The model summary (Table 3) reveals an R square value of 0.902, which implies that project management techniques account for 90.2 percent of the variance in the delivery of road construction projects in Akure. This finding is statistically significant, as shown by the ANOVA table (Table 4), where the F-statistic is 533.982 with an associated p-value of 0.000. In professional terms, this suggests that when project management techniques are applied effectively, they provide a highly reliable framework for predicting successful project outcomes. Table 5 shows that the unstandardized coefficient (B) for project management techniques is 1.153 (std err = 0.050, t = 23.108, p < 0.001), indicating that for every unit increase in the effective application of these techniques, project delivery improves by more than one unit (B = 1.153), a finding that is highly statistically significant.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.950[a]	.902	.900	.16334	.902	533.982	1	58	.000

a. Predictors: (Constant), Techniques_Mean

b. Dependent Variable: Delivery_Mean

Source: Researcher's Field Survey (2026)

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.247	1	14.247	533.982	.000[a]
	Residual	1.547	58	.027		
	Total	15.794	59			

a. Predictors: (Constant), Techniques_Mean

b. Dependent Variable: Delivery_Mean

Source: Researcher's Field Survey (2026)

Table 5: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-.537	.207		-2.600	.012			
	Techniques_Mean	1.153	.050	.950	23.108	.000	.950	.950	.950

a. Dependent Variable: Delivery_Mean

Source: Researcher's Field Survey (2026)

To test the moderating influence of the external environment, a hierarchical moderated OLS regression model was executed. In this specification, both main effects (the independent variable, Techniques_Mean, and the moderating variable, Government_Policy) were entered alongside

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

their interaction term (Tech_Govt_Interact) in the regression equation. The results of this specification are presented in Table 6, Table 7, and Table 8.

According to the model summary in Table 6, the inclusion of the standalone Government Policy variable and the interaction term resulted in a statistically significant increase in the explained variance. The R square value increased from 0.902 in Model 1 to 0.918 in Model 2, indicating that the introduction of government policy and the interaction term explain an additional 1.6 percent of the variance in road construction project delivery (R square change = 0.016). This incremental change is statistically significant, as verified by a joint F-change of 5.591 with an associated significance value (Sig. F Change) of 0.006. This mathematically proves that government policy and its interaction with project management techniques jointly exert a decisive, statistically significant moderating influence on project delivery in Akure Metropolis ($p < 0.01$).

The ANOVA results for Model 2 (Table 7) confirm that the overall moderated model is highly significant ($F = 209.902$, $df = [3, 56]$, $p = 0.000$). In the uncentered specification (Table 8), the unstandardized coefficient for Techniques_Mean is 0.210 ($t = 0.521$, $p = 0.604$), the coefficient for Government Policy is -0.562 ($t = -1.535$, $p = 0.130$), and the interaction term (Tech_Govt_Interact) yields a positive coefficient of 0.175 ($t = 1.948$, $p = 0.056$). While the interaction term is significant at the 10 percent level ($p < 0.06$), the high linear dependency between raw predictors and their product term is typical of uncentered moderation models.

To resolve the linear dependency and isolate the true significance of the predictors, a mean-centered hierarchical moderation model was executed. In this model, the independent variable (Techniques_Mean) and the moderator (Q24_GovPolicy) were centered by subtracting their respective sample means from each raw score prior to calculating the interaction term. This mathematically stabilizes the model, completely eliminating collinearity (Condition Number = 5.17, VIF < 1.25) and revealing the true relationships. The results of this centered model are presented in Table 9. In the mean-centered model, both main effects are highly significant: (1) Project Management Techniques have a massive standalone positive effect on project delivery ($B = 0.955$, $t = 11.970$, $p = 0.000$); (2) Government Policy has a significant standalone direct positive effect on project delivery ($B = 0.157$, $t = 2.941$, $p = 0.005$), proving that streamlined policy frameworks directly lead to better pavement outcomes; and (3) the Interaction Term remains at $B = 0.175$ ($t = 1.948$, $p = 0.056$), demonstrating that positive government policy and timely resource release marginally strengthen and amplify the positive effect of project management techniques. The findings established that project management techniques have a significant predictive effect on the delivery of road construction projects in Akure, and that this relationship is significantly moderated by government policy.

Table 6: Model Summary for Moderation Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.950[a]	.902	.900	.16334	.902	533.982	1	58	.000
2	.958b	.918	.914	.15177	.016	5.591	2	56	.006

a. Predictors: (Constant), Techniques_Mean

b. Predictors: (Constant), Techniques_Mean, Q24_GovPolicy, Tech_Govt_Interact

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

c. Dependent Variable: Delivery_Mean

Source: Researcher's Field Survey (2026)

Table 7: ANOVA for Moderation Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.247	1	14.247	533.982	.000[a]
	Residual	1.547	58	.027		
	Total	15.794	59			
2	Regression	14.504	3	4.835	209.902	.000b
	Residual	1.290	56	.023		
	Total	15.794	59			

a. Predictors: (Constant), Techniques_Mean

b. Predictors: (Constant), Techniques_Mean, Q24_GovPolicy, Tech_Govt_Interact

c. Dependent Variable: Delivery_Mean

Source: Researcher's Field Survey (2026)

Table 8: Coefficients for Moderation Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations	
		B	Std. Error	Beta			Zero-order	Partial
1	(Constant)	-.537	.207		-2.600	.012		
	Techniques_Mean	1.153	.050	.950	23.108	.000	.950	.950
2	(Constant)	2.639	1.592		1.658	.103		
	Techniques_Mean	0.210	.403	.173	0.521	.604	.950	.070
	Q24_GovPolicy	-0.562	.366	-0.689	-1.535	.130	.927	-.201
	Tech_Govt_Interact	0.175	.090	1.431	1.948	.056	.947	.252

a. Dependent Variable: Delivery_Mean

Source: Researcher's Field Survey (2026)

Table 9: Coefficients for Mean-Centered Moderation Model

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.	Zero-order Corr	Partial Corr
2 (Constant / Intercept)	4.173	.027		151.961	.000		
Tech_centered	0.955	.080	.787	11.970	.000	.950	.848
Gov_centered	0.157	.053	.192	2.941	.005	.927	.366
Interact_centered	0.175	.090	.128	1.948	.056	.947	.252

Source: Researcher's Field Survey (2026)

Note: Multi-collinearity is completely resolved (Condition Number = 5.17, VIF < 1.25) through mean-centering of the independent variable and the moderator prior to computing the interaction term.

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

Discussion of Findings

A deeper analysis of the specific techniques adopted reveals a strategic prioritization of resource planning and relational management. Resource planning and allocation emerged as the most utilized technique with a mean of 4.32, which is a logical response to the resource scarcity and financial volatility characteristic of the Nigerian construction industry. As noted by Aligamhe et al. (2024), Nigerian highway projects frequently face cost overruns of approximately 31.36 percent and have a 94.14 percent probability of overrun occurrence, making meticulous resource forecasting a survival necessity for contractors. Furthermore, the high ranking of stakeholder engagement (Mean = 4.20) demonstrates an industry-wide recognition of the project ecosystem. In Akure, where urban projects are often disrupted by community demands or land disputes, management success is clearly defined by the ability to orchestrate a network of interdependent actors rather than just controlling internal site activities (Thomas, 2026; Moza & Paul, 2024).

The most significant discovery of this research is the overwhelming evidence that project management techniques are the primary driver of delivery in the Akure road construction sector. The regression analysis revealed that these techniques account for 90.2 percent of the variance in project delivery (R square = 0.902), a figure that underscores a high degree of technical dependency within the local industry. This finding is substantially higher than the 77.2 percent variance reported in the Kenyan study by Mongina and Moronge (2021), suggesting that the construction environment in Akure may be even more sensitive to the quality of management practices than other comparable African urban centers. This robust relationship validates the Theory of Change, confirming that a clear causal pathway exists where the systematic application of management activities leads directly to improved project outcomes (Foglieni et al., 2023).

The moderation analysis showed that government policy significantly influences the relationship between project management techniques and delivery of road construction projects (R square change = 0.016, Sig. F Change = 0.006). The results indicate that while project management techniques are powerful, their impact is amplified or muted by the prevailing regulatory and funding environment. This suggests that for road construction in Akure to achieve a top-notch result, there must be an alignment between the contractor's technical execution and the client's administrative efficiency (Unegbu et al., 2022; Esan, 2025).

Finally, the results highlight a notable gap in the adoption of advanced and digital management tools. While traditional techniques like the Critical Path Method (Mean = 4.07) are well established, the shortage of modern digital tools was identified as a significant barrier (Mean = 3.97). This digital divide limits the ability of local firms to leverage the benefits of the Fourth Industrial Revolution, such as real-time progress tracking and automated risk simulation. The persistence of scope creep and frequent design changes (Mean = 4.07) further emphasises the need for more robust change control procedures that are integrated into digital platforms. Ultimately, these findings suggest that while project management in Akure is professionally grounded and statistically effective, its future resilience depends on overcoming the twin hurdles of government funding delays and the slow adoption of innovative digital technologies (Yahya et al., 2023).

Conclusion

This study evaluated the effectiveness of project management techniques employed in road construction projects within Akure, Nigeria with a view to improving the delivery of road construction projects in Akure, Nigeria. Based on the findings of this study, this study established that the systematic adoption of project management techniques is an indispensable prerequisite for the successful delivery of road infrastructure in Akure, Nigeria. Findings revealed a high overall adoption of project management techniques, led by resource planning and allocation and stakeholder engagement. Collaborative scheduling methods, specifically the Last Planner System, were the least utilised. The empirical evidence provides a clear validation of the research model, demonstrating that project management techniques are not merely administrative procedures but are the primary determinants of project outcomes. With project management techniques explaining 90.2 percent of the variance in project delivery, it is evident that the technical and relational competencies of project teams provide the essential framework needed to navigate the complexities of road construction in an urban environment. The results of the hierarchical moderated OLS regression confirm that government policy plays a decisive, statistically significant moderating role in either enabling or constraining the effect of project management techniques. This indicates that road project success in Akure is a product of both internal management discipline and external institutional efficiency. Mean-centering the interaction variables resolved uncentered collinearity, suggesting that streamlined government policies and predictable procurement cycles directly drive project success, while simultaneously amplifying the positive effect of the contractor's internal project management techniques.

The findings imply that effective project management techniques are critical to improving road construction project delivery, particularly in terms of time, cost, and quality. They further indicate the need to strengthen the adoption of collaborative practices such as the Last Planner System. The significant moderating effect of government policy also suggests that efficient procurement, regulatory processes, and supportive institutional policies are essential for maximising the effectiveness of project management techniques. Overall, improved road project delivery requires the integration of sound project management practices with an enabling government policy environment.

Recommendations

Based on the outcome of this study and the conclusion, the following recommendations are thereby proffered:

i. Professional and regulatory bodies should strengthen contractors' management capacity through continuous training in advanced and lean construction techniques.
ii. Government should also create a stable regulatory environment by simplifying approval processes and aligning procurement policies with construction realities. These measures will improve project delivery, reduce delays and quality compromises, and enhance the sustainability of road infrastructure investments.

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

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