

**CHATBOTS AND VIRTUAL ASSISTANCE AS ARTIFICIAL INTELLIGENCE INITIATIVES
AND EMPLOYEE PRODUCTIVITY: EVIDENCE FROM CONSTRUCTION FIRMS IN SOUTH-
SOUTH NIGERIA**

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Abstract

This study investigated the relationship between chatbots and virtual assistance (CVA), as an Artificial Intelligence (AI) initiative, and employee productivity measured by efficiency and team dynamics in construction firms in South-South Nigeria. Premised on the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), Social Exchange Theory, and the Job Demands-Resources (JD-R) model, the study adopted an explanatory cross-sectional survey design. A structured questionnaire was administered to 152 valid respondents drawn from 18 purposively selected building, engineering, and road construction firms across the South-South geopolitical zone of Nigeria. Data were analysed using the Spearman Rank Order Correlation Coefficient. Results revealed a strong and significant positive relationship between chatbots and virtual assistance and efficiency ($r = 0.674$, $p < 0.05$) and between chatbots and virtual assistance and team dynamics ($r = 0.732$, $p < 0.05$). Both null hypotheses were rejected. The findings suggest that conversational AI tools substantially enhance operational efficiency and strengthen collaborative dynamics among construction employees. The study recommends the strategic deployment of chatbot and virtual assistant technologies customised to construction-specific workflows, complemented by structured digital literacy programmes and clear AI governance policies.

Keywords: Chatbots, Virtual Assistance, Employee Productivity, Efficiency, Team Dynamics, Artificial Intelligence, Construction Firms

Introduction

The construction industry occupies a foundational role in economic development, infrastructure growth, and urbanisation across sub-Saharan Africa and particularly in Nigeria, where sustained investment in physical infrastructure is critical to national development agendas (Adetola et al., 2011; Aibinu & Lu, 2008). In the South-South region of Nigeria—a zone characterised by oil-related economic activity, dense urban agglomeration, and growing demand for residential, engineering, and road infrastructure—construction firms operate under persistent pressures of productivity deficits, project delays, workforce communication failures, and inadequate technological integration (Afolabi et al., 2022; Okem et al., 2023). These productivity challenges have prompted growing scholarly interest in the role of Artificial Intelligence (AI) as a transformative lever for enhancing workforce performance in the construction sector (Adiele & Alikornwo, 2025; Odonkor et al., 2024; Osasona et al., 2024). Among the most practically accessible and rapidly diffusing AI tools in organisational settings are chatbots and virtual assistants—conversational AI systems capable of automating communication, managing workflows, providing real-time informational support, and reducing administrative burdens on employees (Adamopoulou & Moussiades, 2020; McTear, 2020). Understanding how these tools influence employee productivity in the South-South Nigerian construction context is therefore both theoretically significant and operationally urgent.

Employee productivity, understood as the effective and efficient conversion of inputs into outputs aligned with organisational goals, encompasses multiple performance dimensions including individual task efficiency, collaborative performance, continuous learning, and adaptive capacity (Tangen, 2005; Locke & Latham, 2002). In the construction industry, two particularly salient dimensions are efficiency—the speed, accuracy, and resource optimisation with which tasks are

executed—and team dynamics, which captures the quality of collaboration, communication, coordination, and collective goal achievement among project teams (Beal et al., 2003; Hackman & Oldham, 1976). Chatbots and virtual assistants are positioned to enhance both these dimensions: by automating repetitive informational and administrative tasks, they free employee cognitive resources for productive task execution (improving efficiency); and by providing seamless, real-time communication channels accessible across dispersed project sites, they foster cohesion and coordination within and across work teams (improving team dynamics). McTear (2020) reported that chatbot adoption in business processes can reduce response times by up to 70%, while Gnewuch et al. (2017) documented that employees using virtual assistants report reduced work stress and improved workflow synchronisation—both directly implicated in efficiency and team productivity.

The existing empirical literature on chatbots, virtual assistants, and productivity in construction is growing but remains geographically skewed toward developed and Asian economies. Smith and Patel (2020) examined AI-enhanced BIM and team productivity in the UK, while Zhang et al. (2021) and Lee and Choi (2021) investigated AI-planning and cost estimation tools in China and South Korea respectively. In the Nigerian and broader African construction context, most AI-productivity studies have focused on safety systems (Ajayi & Okonkwo, 2021), site monitoring drones (Olayemi & Yusuf, 2023), and predictive maintenance (Adegboye & Ogunleye, 2022), with very limited attention to conversational AI tools and their effects on workforce efficiency and team dynamics. Aluko and Ibrahim (2022) and Eze and Maduka (2023) have begun filling this gap, but a targeted examination of chatbots and virtual assistance in relation to efficiency and team dynamics within the South-South Nigerian construction sector remains an unaddressed empirical gap. This study is therefore positioned to make an original and contextually grounded contribution to the AI-productivity literature.

The study examines two specific dimensions of employee productivity: efficiency and team dynamics. Efficiency is operationalised as the capacity to complete tasks quickly, accurately, and with minimal resource waste, directly influenced by the automation of routine tasks and instant informational support provided by conversational AI (Bakker & Demerouti, 2007; Brandtzaeg & Følstad, 2017). Team dynamics is operationalised as the quality of collaboration, communication flow, task coordination, mutual reliance, and shared goal attainment within work teams—dimensions fundamentally shaped by the communication infrastructure available to teams (Beal et al., 2003; Blau, 1964). The alignment of these productivity dimensions with the chatbots and virtual assistance construct provides a coherent framework for empirical investigation. The primary objective of this study is to examine the relationship between chatbots and virtual assistance and employee productivity, measured by efficiency and team dynamics, in construction firms in the South-South region of Nigeria.

Statement of the Problem

Notwithstanding the global proliferation of chatbot and virtual assistant technologies as AI-driven workplace tools, construction firms in South-South Nigeria continue to depend predominantly on manual, face-to-face, and unstructured communication methods that contribute to administrative inefficiencies, miscommunication, coordination failures, and reduced team productivity (Adiele & Alikornwo, 2024; Ibrahim & Musa, 2022; Olanrewaju et al., 2023). The absence of conversational AI adoption limits the ability of workers to receive instant support for technical queries, manage scheduling and workflow coordination, and maintain continuous, accurate communication across geographically dispersed project sites. While global evidence demonstrates that chatbots and virtual assistants substantially enhance efficiency and team dynamics, there is a pronounced scarcity of empirical studies examining these relationships in the Nigerian construction sector—particularly in the South-South region. This empirical deficit is compounded by a lack of context-specific frameworks for AI adoption in Nigerian construction, limiting the ability of managers, policymakers, and technology providers to design and implement effective conversational AI strategies. This study

addresses this gap by providing empirical evidence on the relationship between chatbots and virtual assistance and the efficiency and team dynamics dimensions of employee productivity in construction firms in South-South Nigeria.

Literature Review

Conceptual Review

Chatbots and Virtual Assistance

Chatbots are AI-powered software applications designed to simulate human conversational interactions, typically operating through text or voice interfaces, and capable of performing tasks ranging from answering frequently asked questions to executing complex workflow automation (Adamopoulou & Moussiades, 2020). Virtual assistants, a broader and more sophisticated category, encompass AI systems such as Siri, Google Assistant, Microsoft Cortana, and purpose-built enterprise tools that integrate natural language processing, machine learning, and contextual reasoning to interact with users and perform cognitive and administrative tasks (Jain et al., 2018; McTear, 2020). In organisational settings, chatbots and virtual assistants serve multiple productivity-enhancing functions: they automate repetitive tasks such as report generation, scheduling, and query resolution; they provide real-time access to information, reducing the time employees spend searching for answers; they support onboarding and training through interactive guidance; and they facilitate internal communication by acting as intelligent intermediaries across geographically dispersed teams (Brandtzaeg & Følstad, 2017; Oracle, 2019). The adoption of these tools is theoretically grounded in the Technology Acceptance Model (Davis, 1989), which emphasises perceived usefulness and ease of use as primary adoption determinants, and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), which extends this framework to include social influence and facilitating conditions. In construction, where multi-stakeholder coordination, technical query resolution, and real-time progress reporting are constant demands, chatbots and virtual assistants offer particularly salient productivity benefits.

Employee Efficiency

Efficiency, as a dimension of employee productivity, is conceptualised as the ability to accomplish assigned work with minimal expenditure of time, effort, and resources, while maintaining or improving output quality (Tangen, 2005; Armstrong & Taylor, 2014). In the construction industry, efficiency manifests in faster task completion, reduced redundancy and duplication of effort, streamlined workflows, and improved operational accuracy. Chatbots and virtual assistants enhance efficiency through task automation—managing scheduling, documentation, and routine queries without human intervention—thereby reducing the time employees devote to administrative tasks and enabling them to redirect cognitive and physical resources toward core construction activities (Adamopoulou & Moussiades, 2020; McTear, 2020). According to the JD-R model (Bakker & Demerouti, 2007), conversational AI tools act as job resources that lower job demands (by absorbing routine information tasks) and thus increase the capacity for efficient, motivated performance. This mechanism is particularly relevant in the construction sector, where administrative overhead—associated with reporting, compliance documentation, and inter-team communication—constitutes a significant efficiency drain on skilled technical workers.

Team Dynamics

Team dynamics refer to the interpersonal processes, communication patterns, coordination mechanisms, and collective behavioural norms that characterise how groups work together to achieve shared objectives (Hackman & Oldham, 1976; Beal et al., 2003). In construction settings, effective team dynamics are essential for successful project delivery, as projects require continuous coordination among site engineers, supervisors, subcontractors, procurement staff, and client representatives, often across multiple geographic locations and phases (Arayaci et al., 2018). Chatbots and virtual assistants contribute to team dynamics by providing consistent, accessible, and

timely communication channels that reduce misunderstandings, accelerate information sharing, and support real-time task coordination (Brandtzaeg & Følstad, 2017; Gnewuch et al., 2017). Social Exchange Theory (Blau, 1964) provides a theoretical mechanism: reliable, shared communication tools create conditions of reciprocity and trust within teams, as members who receive consistent informational support through AI channels are more likely to engage collaboratively and contribute effectively to team goals. The deployment of virtual assistants as team-level resources—providing shared access to project data, automated alerts, and progress updates—thus serves as a structural enabler of cohesive, productive team behaviour.

Theoretical Framework

This study is grounded in four complementary theoretical frameworks. The Technology Acceptance Model (TAM) (Davis, 1989) explains that employees' adoption of chatbots and virtual assistants is determined by their perceived usefulness in enhancing task performance and perceived ease of use. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) extends TAM to incorporate social influence—whereby colleagues' positive evaluation of AI tools shapes individual adoption—and facilitating conditions, such as organisational support and training, that mediate the adoption-productivity relationship. Social Exchange Theory (Blau, 1964) explains how the provision of AI-enabled communication resources generates reciprocal engagement and trust among team members, strengthening team dynamics as a productivity outcome. The Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2007) provides the motivational bridge, positing that chatbots and virtual assistants, as job resources, reduce informational and administrative demands on employees, thereby releasing motivational energy for efficient task performance and collaborative engagement.

Empirical Review

Al-Abdullatif (2023) modelled students' perceptions of chatbots in learning by integrating TAM with the Value-Based Adoption Model. A survey of 432 respondents and SEM-PLS analysis showed that perceived usefulness, ease of use, enjoyment, and value were significant predictors of positive attitudes toward chatbot adoption, with perceived risk insignificant. The study demonstrated that user perceptions of AI chatbots are fundamentally shaped by their utility and experiential quality, findings directly applicable to professional AI adoption contexts.

Muthuvenkatachalam, Ambili, Venkatesan, and Rajesh (2024) examined the pedagogical implications of AI and chatbots in nursing education. The study demonstrated that AI chatbots offer personalised learning, simulation, and improved efficiency, while raising concerns about privacy and bias. This cross-sectoral evidence reinforces the productivity-enhancing and team communication roles of conversational AI in professional settings.

Aluko and Ibrahim (2022) investigated AI-powered construction management tools and employee productivity in Nigerian building firms. A sample of 350 construction personnel and SEM analysis showed that AI communication and scheduling tools significantly enhanced workers' time management and reduced project delays. Perceived usefulness and ease of use were strong predictors of adoption, directly supporting the CVA-efficiency relationship tested in this study.

Eze and Maduka (2023) examined the role of AI in supply chain optimisation and on-site employee productivity in engineering firms in Enugu State. With 312 participants and SEM-PLS analysis, results showed that automated AI systems improved material availability, reduced downtime, and generated smoother workflow. Perceived value and enjoyment were significant predictors of AI acceptance and productivity, supporting the task efficiency benefits of AI tools in Nigerian construction settings.

Ajayi and Okonkwo (2021) assessed AI-based safety monitoring systems and productivity in Nigerian road construction sites. A survey of 265 workers using SEM revealed that AI-enabled surveillance systems enhanced employee safety, focus, and engagement. The trust and perceived

safety dimensions of this study complement the team dynamics benefits of conversational AI tools identified in the present study.

Khaled and Omar (2022) investigated AI-driven project dashboards and their influence on construction workers' performance in the Middle East. Surveying 389 professionals using SEM, the study found that dashboards enhanced transparency, task accountability, and time management, positively influencing worker performance and providing motivation benchmarks. The finding that shared AI-based visibility tools enhance individual and team performance aligns closely with the team dynamics argument.

Tan and Lee (2021) evaluated AI workforce scheduling systems and road construction productivity in Malaysia. A survey of 315 construction personnel using TAM-VAM and SEM showed that AI-based scheduling improved work-hour optimisation, prevented job assignment overlap, and reduced employee stress. Perceived ease of use and enjoyment positively influenced productivity, supporting the efficiency dimension of the CVA-productivity relationship.

Kamal and Bashir (2021) assessed AI-based VR training tools and workforce productivity in UAE construction firms. With 360 employees and SEM analysis, findings showed that AI-VR tools reduced onboarding time and improved task execution. Perceived enjoyment and value positively influenced productivity outcomes, reinforcing the role of interactive AI in workforce skill development and team performance.

Smith and Patel (2020) examined AI integration in BIM and team productivity in the UK construction sector. A survey of 400 professionals and SEM analysis showed that AI-enhanced BIM improved real-time collaboration, design accuracy, and early problem detection, directly enhancing team efficiency and cohesion. This study provides strong international evidence for the team dynamics benefits of AI-enabled communication platforms.

Zhang, Liu, and Huang (2021) explored AI-based planning systems and engineer productivity in Chinese road construction firms. Using mixed methods with 280 engineers, the study found that AI tools improved project forecasting, resource allocation, and workflow consistency. The finding that AI enables better team alignment and communication reinforces the team dynamics argument advanced in the present study.

Lee and Choi (2021) investigated AI-driven cost estimation tools and quantity surveyors' productivity in South Korea. SEM-PLS analysis with 322 surveyors showed that AI improved estimation speed, minimised error, and increased precision. The efficiency gains documented align with the productivity-efficiency hypothesis tested in this study.

Idris and Adetunji (2023) assessed AI-enhanced traffic simulation tools and road project planning efficiency in Nigeria. Surveying 310 planners and engineers using SEM, the study showed that AI tools enabled better decision-making and task confidence. Value and usefulness were the strongest predictors, with findings directly relevant to the efficiency dimension examined here.

Musa and Adeyemi (2023) explored AI-enhanced quality control systems and employee efficiency in Nigerian engineering firms. With 298 quality assurance officers and SEM-PLS analysis, AI reduced human error and improved inspection consistency. The reliability of AI systems emerged as the most influential productivity predictor, supporting the link between AI tool quality and workforce efficiency.

Ahmed and Salisu (2023) studied AI-augmented document management and administrative productivity in engineering firms in Northern Nigeria. With 342 employees and SEM, findings showed that AI streamlined file management, reduced search time, and improved information sharing. Perceived enjoyment and trust were significant predictors, reinforcing the team communication and efficiency benefits of AI informational tools.

Olayemi and Yusuf (2023) examined AI-powered drones and worker output in Nigerian building firms. A survey of 287 engineers using SEM showed that drone surveillance improved decision speed, minimised idle time, and enhanced task accountability—outcomes that parallel the efficiency and team visibility benefits of conversational AI documented in this study.

Adegboye and Ogunleye (2022) studied AI integration in predictive maintenance and technician productivity in Nigerian engineering firms. With 305 maintenance staff and SEM-PLS analysis, AI systems reduced equipment downtime and increased efficiency. The finding that AI tools acting as reliable operational resources significantly enhance employee productivity underpins the JD-R framework applied in this study.

Ola-Oluwa (2024) examined AI's impact on knowledge sharing and organisational efficiency in Nigerian enterprises. With 234 respondents and inferential statistics, findings showed that AI-driven knowledge sharing enabled faster information flow, informed decisions, and collaborative environments—directly paralleling the team dynamics benefits of conversational AI examined here.

Brandtzaeg and Følstad (2017) established that people use chatbots primarily for productivity enhancement and information access, and documented that chatbot integration in customer and internal service roles results in improved employee morale, faster service delivery, and reduced administrative burden—findings with direct relevance to the efficiency and team dynamics dimensions of this study.

Adamopoulou and Moussiades (2020) provided a comprehensive review of chatbot history, technology, and applications, demonstrating that well-integrated virtual assistants serve as real-time knowledge bases that enhance employees' access to information and expedite decision-making. Their findings provide a strong empirical and conceptual anchor for the CVA-efficiency relationship.

Gnewuch, Morana, and Maedche (2017) documented that employees working with AI virtual assistants report reduced work stress and fewer missed deadlines—factors closely tied to both operational efficiency and the social cohesion that underlies team dynamics. Their findings reinforce the productivity-enhancing role of conversational AI tools in professional workplaces.

McTear (2020) demonstrated that AI-driven chatbot adoption in business processes can improve operational efficiency and reduce response times by up to 70%, fundamentally altering the pace and quality of task execution. This finding directly supports the efficiency hypothesis tested in the present study.

Bakker and Demerouti (2007) established the JD-R model, demonstrating that job resources—including technological tools—reduce demands, prevent burnout, and fuel work engagement and performance. Conversational AI tools, by absorbing routine informational and administrative tasks, function precisely as job resources in this model, providing the motivational mechanism for both efficiency and team dynamics improvements.

Blau (1964) articulated Social Exchange Theory, establishing that reliable, reciprocal informational exchange within organisations generates trust, cohesion, and cooperative behaviour. Conversational AI tools, by ensuring consistent and accessible communication, operationalise this exchange dynamic at the team level, providing the theoretical foundation for the CVA-team dynamics relationship tested here.

Research Hypotheses

Based on the review of literature, the following null hypotheses are tested in this study:

H₀₁: There is no significant relationship between chatbots and virtual assistance and efficiency of construction firms in South-South, Nigeria.

H₀₂: There is no significant relationship between chatbots and virtual assistance and team dynamics of construction firms in South-South, Nigeria.

Methodology

This study adopted an explanatory cross-sectional survey research design, which facilitated the collection of primary data at a single point in time from management staff across building, engineering, and road construction firms in the South-South geopolitical zone of Nigeria, enabling the examination of relationships between the predictor variable (chatbots and virtual assistance) and measures of the criterion variable (efficiency and team dynamics). The study was guided by a

positivist-pluralist philosophical orientation, which supports quantitative measurement while acknowledging the multi-layered nature of human-technology interaction in the workplace. The target population comprised 291 management staff from 18 purposively selected construction firms in the South-South region of Nigeria. Applying the Krejcie and Morgan (1970) sample size formula, a sample of 165 respondents was obtained; after data screening and exclusion of incomplete responses, 152 valid questionnaires were retained for analysis, representing a 92.1% effective response rate. A structured questionnaire instrument was developed, with items measuring chatbots and virtual assistance adapted from Adamopoulou and Moussiades (2020), McTear (2020), and Brandtzaeg and Følstad (2017), while items for efficiency were adapted from Tangen (2005) and Armstrong and Taylor (2014), and items for team dynamics were adapted from Hackman and Oldham (1976), Beal et al. (2003), and Blau (1964). All items were measured on a five-point Likert scale (Strongly Agree = 5 to Strongly Disagree = 1). Content validity was established through review by academic specialists in management science and information technology. Cronbach's alpha reliability coefficients were 0.83, 0.79, and 0.84 for chatbots and virtual assistance, efficiency, and team dynamics respectively, all exceeding the 0.70 minimum threshold recommended by Nunnally (1978). Data were analysed using descriptive statistics and the Spearman Rank Order Correlation Coefficient (ρ) for hypothesis testing at the 0.05 significance level, using SPSS Version 22. Spearman's ρ was selected to accommodate the ordinal structure of Likert-scale data and ensure analytical robustness under potential distributional deviations from normality (Field, 2018). Ethical considerations were upheld through informed consent, anonymity of respondents, and voluntary participation.

Results

Demographic Characteristics of Respondents

The demographic profile of the 152 valid respondents indicates that the majority were male (77.6%), aged 30–45 years (52.0%), married (55.3%), held B.Sc/B.Tech/HND or OND/NCE qualifications (70.4%), and had 0–9 years of service (78.9%). This profile is consistent with the predominantly young, moderately educated, and male structure of the construction workforce in the South-South region of Nigeria, and suggests a workforce potentially receptive to AI-driven conversational tools given younger cohorts' relatively higher technology familiarity.

Table 1: Summary Demographic Profile of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	118	77.6
	Female	34	22.4
Age Group	18–29 years	58	38.2
	30–45 years	79	52.0
	46 years and above	15	9.9
Educational Qualification	SSCE	28	18.4
	OND/NCE	45	29.6
	B.Sc/B.Tech/HND	62	40.8
Length of Service	Postgraduate	17	11.2
	0–4 years	68	44.7
	5–9 years	52	34.2
	10–14 years	22	14.5
	15 years and above	10	6.6

Source: Field Survey, 2026

Hypothesis Testing

H₀₁: Chatbots and Virtual Assistance and Efficiency

The Spearman Rank Order Correlation analysis testing the relationship between Chatbots and Virtual Assistance (CVA) and Efficiency (E) is presented in Table 2.

Table 2: Spearman Rank Correlation between Chatbots and Virtual Assistance (CVA) and Efficiency (E)

Variable	N	Correlation Coefficient (r)	Sig. (2-tailed)	Decision
Chatbots & Virtual Assistance (CVA) → Efficiency (E)	152	0.674**	0.000	Reject Ho ₁

** Correlation is significant at the 0.01 level (2-tailed). Source: SPSS Output, Version 22.

Table 2 presents a Spearman's rho correlation coefficient of 0.674, significant at $p = 0.000$, which is below the chosen alpha level of 0.05. On the basis of this result, the null hypothesis (H_{01}), which states that there is no significant relationship between chatbots and virtual assistance and efficiency of construction firms in South-South, Nigeria, is hereby rejected, and the alternative hypothesis is accepted. The correlation coefficient of 0.674 indicates a moderately strong and positive association, suggesting that a higher degree of adoption and positive experience with chatbots and virtual assistant tools is significantly associated with greater operational efficiency among construction employees. Employees using these conversational AI tools experience faster task completion, reduced redundancy, more streamlined workflows, and improved task accuracy. Questionnaire data showed that 78.3% of respondents agreed that chatbots provide real-time support that improves work speed, and 79.0% agreed that virtual assistants reduce workload and improve task accuracy, further validating the statistical result. The finding confirms that conversational AI, by absorbing routine administrative and informational demands, frees employee capacity for efficient, productive task execution.

H₀₂: Chatbots and Virtual Assistance and Team Dynamics

The Spearman Rank Order Correlation analysis testing the relationship between Chatbots and Virtual Assistance (CVA) and Team Dynamics (TD) is presented in Table 3.

Table 3: Spearman Rank Correlation between Chatbots and Virtual Assistance (CVA) and Team Dynamics (TD)

Variable	N	Correlation Coefficient (r)	Sig. (2-tailed)	Decision
Chatbots & Virtual Assistance (CVA) → Team Dynamics (TD)	152	0.732**	0.000	Reject Ho ₂

** Correlation is significant at the 0.01 level (2-tailed). Source: SPSS Output, Version 22.

Table 3 presents a Spearman's rho value of 0.732, significant at $p = 0.000$, which is below the chosen alpha level of 0.05. Consequently, the null hypothesis (H_{02}), which states that there is no significant relationship between chatbots and virtual assistance and team dynamics of construction firms in South-South, Nigeria, is hereby rejected, and the alternative hypothesis is accepted. The correlation coefficient of 0.732 is the strongest relationship found in this study, reflecting a strong and significant positive association between the adoption of conversational AI tools and the quality of team collaboration, communication, coordination, and collective performance in construction firms. Respondents strongly endorsed the role of AI tools in enhancing team communication, with 75.7% agreeing that the use of AI assistants has improved communication in the organisation, and 75.0% reporting reliance on virtual tools for timely task completion. The strength of the CVA-team dynamics relationship ($r = 0.732$) compared to CVA-efficiency ($r = 0.674$)

suggests that conversational AI exerts its most powerful productivity impact at the team level, facilitating the communicative and coordinative infrastructure that underpins collective performance.

Discussion of Findings

The finding that chatbots and virtual assistance significantly relates to efficiency ($r = 0.674$, $p < 0.05$) is consistent with a substantial and growing body of empirical evidence. McTear (2020) demonstrated that chatbot adoption in business processes reduces operational response times by up to 70%, directly implicating conversational AI in task efficiency improvements. Adamopoulou and Moussiades (2020) showed that well-integrated virtual assistants serve as real-time knowledge bases, enhancing employees' access to information and expediting decision-making—the precise mechanism observed in the present study's construction context. Gnewuch et al. (2017) documented that employees using virtual assistants report reduced work stress and fewer missed deadlines, factors that directly underpin the efficiency outcomes measured here. Aluko and Ibrahim (2022) found comparable results in Nigerian building firms in Abuja, where AI communication and scheduling tools significantly enhanced time management and reduced project delays, while Ahmed and Salisu (2023) confirmed similar efficiency gains from AI-assisted document management in Northern Nigerian engineering firms. The JD-R model (Bakker & Demerouti, 2007) provides the motivational mechanism: conversational AI tools reduce informational and administrative demands on construction workers, releasing motivational and cognitive resources for efficient, high-quality task performance. The moderate strength of this correlation (0.674) is consistent with the expectation that efficiency improvements are contingent on consistent and high-quality AI system integration, as well as employee digital literacy and acceptance.

The finding that chatbots and virtual assistance significantly relates to team dynamics ($r = 0.732$, $p < 0.05$) is the strongest result in this study and aligns with a coherent body of theory and evidence. Brandtzaeg and Følstad (2017) established that chatbot integration in service environments results in a division of labour that improves employee morale and coordination, directly enhancing team dynamics. Smith and Patel (2020) documented that AI-enhanced BIM in UK construction improved real-time collaboration and early problem detection among diverse project teams, findings that parallel the present study's team dynamics outcome. Social Exchange Theory (Blau, 1964) provides a compelling explanation: conversational AI tools create reliable communication channels that generate reciprocity and trust among team members, as every worker has equal, consistent access to the informational resources needed for collaborative task execution. This trust and reciprocity, in turn, strengthens team cohesion and collective performance. Khaled and Omar (2022) found that AI-driven project dashboards in Middle Eastern construction firms enhanced transparency and accountability, motivating team members and improving coordination—an outcome directly analogous to the team dynamics improvements observed in the present study. The fact that the team dynamics correlation (0.732) exceeds the efficiency correlation (0.674) is theoretically meaningful: it suggests that conversational AI, by transforming the communicative infrastructure of work teams, has a more transformative impact on collective performance than on individual task speed, pointing to the primacy of social and communicative mechanisms in explaining AI's productivity effects in construction settings.

These findings are consistent with the UTAUT framework (Venkatesh et al., 2003), which posits that social influence and facilitating conditions—both operationalised in conversational AI deployment—are critical mediators of the technology adoption-productivity relationship. The predominantly young and moderately tenured demographic profile of respondents (78.9% with 0–9 years of service) supports the strong adoption and positive perception of AI tools observed, as younger workers exhibit lower resistance to digital tools and higher baseline technology familiarity (Davis, 1989). The findings collectively reinforce the argument that chatbots and virtual assistants represent a strategically critical AI initiative for construction firms in South-South Nigeria, with demonstrated capacity to enhance both operational efficiency and the collaborative quality of team performance. These outcomes have important implications for construction firm managers seeking

to leverage digital transformation for sustained competitive advantage in a resource-constrained, high-demand sector.

Conclusion and Recommendations

This study has provided robust empirical evidence that chatbots and virtual assistance significantly and positively influence both efficiency ($r = 0.674$, $p < 0.05$) and team dynamics ($r = 0.732$, $p < 0.05$) among employees in construction firms in the South-South region of Nigeria. Both null hypotheses were rejected at the 0.05 level of significance, confirming that conversational AI tools are significant drivers of employee productivity in this context. The study concludes that the strategic deployment of chatbots and virtual assistant technologies in construction operations enhances task speed, reduces administrative burden, streamlines workflows, and most notably, strengthens the communicative and collaborative fabric of project teams. These findings contribute original empirical evidence to the AI-productivity literature in the South-South Nigerian construction sector, a context that has been systematically underrepresented in global AI research.

Based on these findings, the following recommendations are proposed:

1. Construction firms in the South-South region should accelerate the deployment of chatbot and virtual assistant platforms customised for construction-specific needs, including site reporting, safety alert management, project status updates, and technical query resolution. These tools should be integrated with existing enterprise resource planning (ERP) and project management systems to maximise workflow continuity and data utility.
2. Firms should invest in structured digital literacy programmes designed to build employee competence in interacting with and trusting AI conversational tools. Training should be role-differentiated, targeting the specific workflow challenges of site engineers, supervisors, procurement officers, and administrative staff, and should be embedded in continuous professional development frameworks endorsed by COREN, NIOB, and related regulatory bodies.
3. Government and industry stakeholders should provide enabling policies and incentive structures, including digital infrastructure investment, tax relief, and public-private partnerships, to lower the cost and complexity of conversational AI adoption for small and medium-sized construction firms in the region.

REFERENCES

- Abrahams, J., Mensah, P., & Okoro, C. (2024). Artificial intelligence applications in construction project management. *Journal of Construction Engineering and Management*, *150*(2), 04023145.
- Adamopoulou, E., & Moussiades, L. (2020). Chatbots: History, technology, and applications. *Machine Learning with Applications*, *2*, 100006.
- Adegboye, A. A., & Ogunleye, T. O. (2022). AI integration in predictive maintenance and its effect on technician productivity in engineering firms. *Nigerian Journal of Engineering Research*, *17*(2), 88–104.
- Adetola, A., Olatunji, O., & Aje, I. (2011). Construction industry and economic development in Nigeria. *Journal of Engineering and Applied Sciences*, *6*(2), 45–50.
- Adiele, G. C. & Alikornwo, P. M. (2025). Artificial intelligence tools and organizational success in the financial technology (FINTECH) sector. *International Journal of Financial Research and Management Science* *9*(7), 113-128.

- Adiele, G. C., & Alikornwo, P. M. (2024). Enterprise information system: Upshot for administrative efficiency of local construction firms. *International Journal of Leadership, Quality Education and African Development*, 1(1), 109-120.
- Afolabi, A. O., Ibem, E. O., Aduwo, E. B., Tunji-Olayeni, P. F., & Oluwunmi, A. O. (2022). Critical success factors influencing the adoption of artificial intelligence in construction projects in Nigeria. *Journal of Engineering, Design and Technology*, 20(3), 765–781.
- Afolabi, A. O., Tunji-Olayeni, P. F., & Oyeyipo, O. O. (2023). Adoption of emerging technologies and productivity improvement in the Nigerian construction industry. *International Journal of Construction Management*, 23(4), 589–601.
- Ahmad, T., Zhang, D., Huang, C., Zhang, H., Dai, N., Song, Y., & Chen, H. (2022). Artificial intelligence in sustainable energy industry: Status quo, challenges and opportunities. *Journal of Cleaner Production*, 289, 125834.
- Ahmed, A., & Salisu, M. (2023). Perceptions of AI-augmented document management and administrative productivity in engineering consultancy firms. *Journal of Engineering Management and Innovation*, 8(2), 45–60.
- Aibinu, A. A., & Lu, Y. (2008). The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management*, 26(6), 593–599.
- Ajayi, O. O., & Okonkwo, C. N. (2021). AI-based safety monitoring systems and productivity in road construction sites in Nigeria. *Journal of Construction Safety and Management*, 9(1), 55–70.
- Al-Abdullatif, A. M. (2023). Modeling students' perceptions of chatbots in learning: Integrating technology acceptance with the value-based adoption model. *Education and Information Technologies*, 28(4), 4567–4589.
- Aluko, B. T., & Ibrahim, S. A. (2022). AI-powered construction management tools and employee productivity in Nigerian building firms. *International Journal of Construction Innovation*, 22(3), 210–228.
- Arayaci, Y., Egbu, C., & Coates, P. (2018). Building information modelling (BIM) implementation and remote construction projects: Issues, challenges, and critiques. *Journal of Information Technology in Construction*, 23, 75–92.
- Armstrong, M., & Taylor, S. (2014). *Armstrong's handbook of human resource management practice* (13th ed.). Kogan Page.
- Bakker, A. B., & Demerouti, E. (2007). The job demands–resources model: State of the art. *Journal of Managerial Psychology*, 22(3), 309–328.
- Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273–285.
- Beal, D. J., Cohen, R. R., Burke, M. J., & McLendon, C. L. (2003). Cohesion and performance in groups: A meta-analytic clarification of construct relations. *Journal of Applied Psychology*, 88(6), 989–1004.

- Blau, P. M. (1964). *Exchange and power in social life*. Wiley.
- Brandtzaeg, P. B., & Følstad, A. (2017). Why people use chatbots. *Proceedings of the International Conference on Internet Science*, 377–392.
- Brynjolfsson, E., & McAfee, A. (2017). The business of artificial intelligence. *Harvard Business Review*, 1–20.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Eze, O., & Maduka, U. (2023). Role of AI in supply chain optimization and on-site employee productivity in engineering firms. *Journal of Supply Chain and Operations Management*, 11(1), 88–103.
- Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE Publications.
- Gnewuch, U., Morana, S., & Maedche, A. (2017). Towards designing cooperative and social conversational agents for customer service. *Proceedings of the International Conference on Information Systems (ICIS)*, Seoul.
- Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, 16(2), 250–279.
- Ibrahim, A., & Musa, I. (2022). Chatbots and workflow automation in construction project management. *Journal of Digital Construction*, 4(1), 12–27.
- Idris, B., & Adetunji, R. (2023). Effects of AI-enhanced traffic simulation tools on road project planning efficiency in Nigeria. *International Journal of Transport Planning*, 15(2), 77–94.
- Jain, M., Kumar, P., Kota, R., & Patel, S. N. (2018). Evaluating and informing the design of chatbots. *Proceedings of the Conference on Designing Interactive Systems*, 895–906.
- Kamal, A., & Bashir, N. (2021). AI-based virtual reality (VR) training tools and workforce productivity in construction firms in the UAE. *Journal of Construction Human Resource Development*, 6(1), 34–51.
- Khaled, A., & Omar, F. (2022). Acceptance of AI-driven project dashboards and its influence on construction workers' performance in the Middle East. *Arabian Journal of Science and Engineering*, 47(8), 9345–9361.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
- Lee, C., & Choi, H. (2021). AI-driven project cost estimation and its influence on quantity surveyors' productivity in South Korea. *Asian Journal of Civil Engineering*, 22(5), 821–834.
- Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, 57(9), 705–717.

- McTear, M. F. (2020). Conversational AI: Dialogue systems, conversational agents, and chatbots. *Synthesis Lectures on Human Language Technologies*, 13(3), 1–251.
- Musa, K., & Adeyemi, T. (2023). Influence of AI-enhanced quality control systems on employee efficiency in Nigerian engineering firms. *Journal of Quality Management in Africa*, 4(1), 22–38.
- Muthuvenkatachalam, S., Ambili, P., Venkatesan, L., & Rajesh, K. (2024). Navigating the pedagogical landscape: Exploring the implications of AI and chatbots in nursing education. *Nurse Education in Practice*, 78, 103944.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Odonkor, S., Mensah, E., & Asante, F. (2024). Artificial intelligence and construction project efficiency in West Africa. *Journal of African Construction Studies*, 3(1), 14–30.
- Okem, A., Eze, C., & Nwosu, I. (2023). Challenges and opportunities for AI integration in Nigerian construction management. *Construction Economics and Building*, 23(1), 55–74.
- Olanrewaju, A., Adeyemi, B., & Suleiman, K. (2023). Barriers to AI implementation in the Nigerian construction sector. *African Journal of Science, Technology, Innovation and Development*, 15(3), 445–457.
- Ola-Oluwa, T. (2024). Impact of artificial intelligence in enhancing knowledge sharing and boosting organizational efficiency in Nigerian enterprises. *Journal of Knowledge Management Practice*, 25(1), 1–18.
- Olayemi, F., & Yusuf, A. (2023). Application of AI-powered drones and their effect on site monitoring and worker output in Nigerian building firms. *Journal of Construction Technology and Management*, 6(2), 55–72.
- Oracle. (2019). *AI at work: What people are saying*. Oracle Corporation.
- Osasona, O., Adesanya, A., & Efe, C. (2024). Optimizing construction workflows through AI and machine learning. *Construction Research and Innovation*, 15(1), 5–19.
- Shevat, A. (2017). *Designing bots: Creating conversational experiences*. O'Reilly Media.
- Smith, J., & Patel, R. (2020). Integrating AI in building information modeling (BIM) to improve team productivity in the UK construction sector. *Engineering, Construction and Architectural Management*, 27(8), 1823–1842.
- Tan, H., & Lee, K. (2021). AI workforce scheduling systems and their impact on road construction productivity in Malaysia. *Journal of Civil Engineering and Management*, 27(6), 389–402.
- Tangen, S. (2005). Demystifying productivity and performance. *International Journal of Productivity and Performance Management*, 54(1), 34–46.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.

Zhang, Y., Liu, H., & Huang, Q. (2021). AI-based planning systems and engineer productivity in Chinese road construction firms. *Journal of Construction Engineering and Management*, 147(9), 04021107.