ARTIFICIAL INTELLIGENCE ADOPTION AND PERFORMANCE OF SMALL AND MEDIUM ENTERPRISES IN NAIROBI COUNTY, KENYA: THE MODERATING ROLE OF DIGITAL SKILLS

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Abstract

Artificial Intelligence (AI) has become a transformative capability for enterprises seeking efficiency, market expansion, and improved customer engagement. However, empirical evidence on AI adoption and SME performance in developing economies remains limited, particularly in the Kenyan context where SMEs operate under resource constraints and uneven digital readiness. This study examines the effect of AI adoption on the performance of SMEs in Nairobi County, Kenya, focusing on four dimensions of AI adoption: AI-driven marketing, AI-enabled operations automation, AI-supported customer engagement, and AI-based decision support. Additionally, the study assesses the moderating role of digital skills in the relationship between AI adoption and SME performance. A descriptive cross-sectional design is proposed, targeting SME owners and managers in Nairobi County. Data was collected using structured questionnaires and analyzed using descriptive statistics and multiple regression analysis, including moderation testing via interaction effects. The study anticipates that AI adoption will have a statistically significant positive influence on SME performance, and that higher levels of digital skills will strengthen the effect of AI adoption on performance. The findings are expected to offer practical guidance to SME managers on high-impact areas of AI utilization and inform policymakers on SME digital capacity-building initiatives.

Keywords: Artificial Intelligence adoption, SME performance, digital skills, digital transformation, Kenya, entrepreneurship.

1.0 Introduction

Artificial Intelligence (AI) is increasingly influencing how firms operate, compete, and deliver value to customers across sectors. Advances in machine learning, natural language processing, recommendation systems, and automation tools have made AI more accessible, allowing even small firms to integrate AI capabilities into marketing, customer engagement, and operational processes (Dwivedi et al., 2021). For Small and Medium Enterprises (SMEs), AI represents both an opportunity and a strategic necessity due to heightened competitive pressures, shifting consumer expectations, and the need for data-driven decision-making.

In Kenya, SMEs account for a substantial proportion of business activity and employment, making them central to national economic growth and entrepreneurship development. However, many SMEs experience performance constraints resulting from limited resources, low process automation, weak market intelligence, and poor access to strategic technologies. Nairobi County, as Kenya's commercial hub, provides a suitable context for studying AI adoption because of its dense SME population, active innovation ecosystem, and rising availability of affordable AI-enabled tools such as chatbots, digital advertising automation, and analytics platforms.

Despite the increasing discourse around AI-driven competitiveness, empirical research linking AI adoption and SME performance remains limited in emerging markets. In many cases, adoption studies focus on large firms and developed economies, overlooking SMEs in resource-constrained settings. Furthermore, where AI adoption is examined, insufficient attention is given to firm capabilities such as digital skills, which may determine whether AI adoption translates into meaningful performance outcomes. Digital skills influence how SMEs select appropriate AI tools, integrate them into workflows, interpret outputs, and sustain adoption over time. Therefore, digital skills may strengthen or weaken the performance gains attributable to AI adoption.

This study seeks to examine the influence of AI adoption on SME performance in Nairobi County, Kenya, and to determine whether digital skills moderate the relationship. By focusing on four practical dimensions of AI adoption, AI-driven marketing, AI-enabled operations automation, AI-supported customer engagement, and AI-based decision support, the study provides an applied framework relevant to entrepreneurship and management practice.

1.1 Statement of the Problem

Although AI tools are increasingly accessible to SMEs through mobile applications, cloud platforms, and social media integrations, many SMEs in Nairobi County continue to record stagnating performance due to competition, inefficient processes, limited market reach, and low customer retention. While some SMEs report benefits from AI-enabled marketing, automation, and customer service tools, others struggle to realize performance improvements due to inadequate digital readiness and skills. Empirical evidence on whether and how AI adoption influences SME performance in Kenya remains insufficient, and the extent to which digital skills condition AI-performance outcomes is under-researched. This knowledge gap undermines evidence-based interventions aimed at supporting SME competitiveness in the digital economy. Therefore, this study examines the effect of AI adoption on SME performance in Nairobi County and assesses the moderating role of digital skills.

1.2 Objectives of the Study

General Objective

To examine the effect of artificial intelligence adoption on the performance of SMEs in Nairobi County, Kenya.

Specific Objectives

1. To determine the effect of AI-driven marketing on SME performance in Nairobi County.
2. To assess the effect of AI-enabled operations automation on SME performance in Nairobi County.
3. To examine the effect of AI-supported customer engagement on SME performance in Nairobi County.
4. To determine the effect of AI-based decision support on SME performance in Nairobi County.
5. To examine the moderating role of digital skills in the relationship between AI adoption and SME performance.

1.3 Research Hypotheses

H01: AI-driven marketing has no significant effect on SME performance in Nairobi County.
H02: AI-enabled operations automation has no significant effect on SME performance in Nairobi County.
H03: AI-supported customer engagement has no significant effect on SME performance in Nairobi County.
H04: AI-based decision support has no significant effect on SME performance in Nairobi County.
H05: Digital skills do not significantly moderate the relationship between AI adoption and SME performance.

2.0 Literature Review

2.1 Theoretical Review

Technology–Organization–Environment (TOE) Framework

The Technology–Organization–Environment (TOE) framework explains organizational adoption of innovations as a function of three contexts: technological factors, organizational characteristics, and environmental pressures. Within the technological context, SMEs evaluate AI adoption based on perceived relative advantages such as improved productivity, market targeting, and data analytics capabilities. Organizational context includes firm size, managerial innovativeness, digital infrastructure, and staff skills, which shape a firm's readiness to integrate AI. Environmental context captures competition, customer expectations, regulatory environment, and availability of external technological support, which jointly pressure firms toward digital transformation. TOE is applicable to this study because it provides a structured lens for examining AI adoption among SMEs and explains why adoption outcomes may vary across firms. In particular, digital skills align with the organizational readiness dimension in TOE and can influence whether AI adoption yields measurable performance outcomes (Tornatzky & Fleischer, 1990; Zhu & Kraemer, 2005).

2.2 Empirical Review

2.2.1 AI-driven Marketing and SME Performance

AI-driven marketing refers to the use of AI-enabled tools in customer targeting, content generation, predictive advertising, personalization, and automated campaign analytics. AI enhances marketing by enabling SMEs to segment customers more accurately, optimize advertising spend, and deliver timely tailored messages that improve conversion rates. Studies show that AI-supported marketing analytics improves market responsiveness, customer acquisition, and revenue generation. For SMEs, AI-driven marketing can significantly improve performance by increasing brand visibility and improving return on marketing investment (Chatterjee et al., 2021; Dwivedi et al., 2021). However, the effectiveness of AI-driven marketing depends on the firm's ability to interpret data outputs and implement insights, meaning digital skills are likely to influence performance outcomes.

2.2.2 AI-enabled Operations Automation and SME Performance

AI-enabled operations automation involves deploying AI tools to reduce manual tasks, automate inventory control, streamline procurement, automate accounting, and optimize workflows. Automation improves operational efficiency by reducing errors, lowering processing time, and enabling SMEs to scale operations. Empirical studies suggest that automation and intelligent systems can improve productivity and reduce operating costs, leading to improved profitability (Raisch & Krakowski, 2021). Nevertheless, SMEs may face barriers related to integration costs and workforce capability.

2.2.3 AI-supported Customer Engagement and SME Performance

AI-supported customer engagement includes the application of AI in chatbots, automated customer messaging, recommendation systems, sentiment analysis, and customer relationship management automation. These tools enhance responsiveness, customer satisfaction, and retention. Evidence indicates that AI-based customer engagement can improve customer experience and loyalty, which directly contributes to improved firm performance (Huang & Rust, 2021). In SMEs, customer engagement innovations can provide differentiation in highly competitive markets like Nairobi.

### 2.2.4 AI-based Decision Support and SME Performance

AI-based decision support refers to the utilization of AI for forecasting demand, identifying market trends, risk analysis, pricing decisions, and strategic planning. AI decision support improves decision quality by enabling evidence-based management and predictive insight. Studies indicate that analytics and AI-driven decision tools contribute to performance through improved planning accuracy, risk mitigation, and faster strategic responses (Wamba-Taguimdje et al., 2020). However, SMEs may underutilize AI decision tools when digital skills and data culture are weak.

2.2.5 Moderating Role of Digital Skills

Digital skills refer to the capacity of employees and owners to utilize digital tools, manage data, interpret analytics, and integrate technology into business processes. Digital skills are increasingly recognized as a critical capability for realizing benefits from digital transformation investments. Firms with higher digital skills are more likely to achieve performance

improvements from AI adoption because they can select appropriate tools, customize workflows, address ethical risks, and interpret outputs correctly. Studies suggest that digital skills strengthen the relationship between technology adoption and performance outcomes, implying a moderation effect (Kraus et al., 2022).

2.3 Conceptual Framework
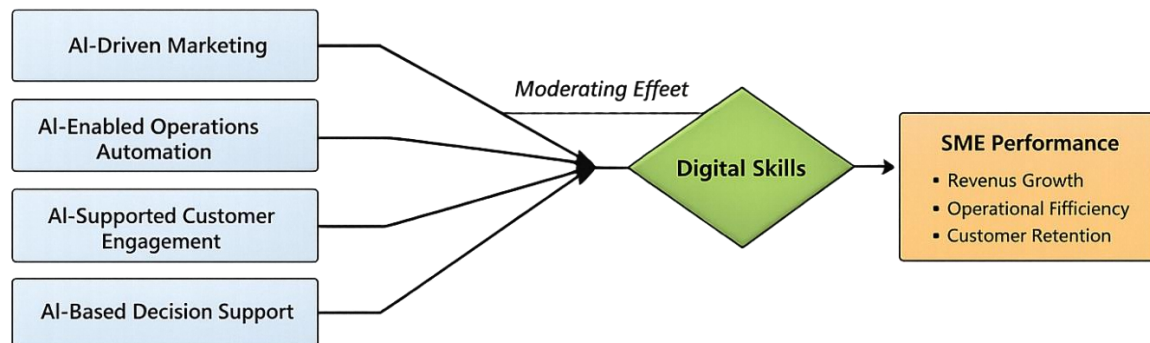
3.0 Research Methodology

3.1 Research Design

This study adopts a descriptive cross-sectional survey research design. A cross-sectional approach is appropriate because the study seeks to examine the influence of artificial intelligence (AI) adoption on SME performance in Nairobi County at a single point in time, rather than tracking change longitudinally. Cross-sectional survey designs are widely used in entrepreneurship and technology studies because they allow the researcher to collect quantifiable data on managerial practices, organizational capabilities, and performance perceptions from a relatively large population within a limited timeframe (Creswell & Creswell, 2018; Saunders et al., 2019). In this study, the design is particularly suitable because AI adoption among SMEs in Kenya is occurring rapidly and heterogeneously, meaning SMEs are at different levels of adoption, capability, and maturity. The cross-sectional survey makes it possible to capture these variations and to establish statistically significant associations between AI adoption dimensions and performance outcomes.

3.2 Study Area

The study was conducted in Nairobi County, Kenya. Nairobi County is selected because it serves as Kenya's primary economic and entrepreneurial hub, hosting a dense concentration of SMEs engaged in retail, trade, hospitality, logistics, services, light manufacturing, and digitally enabled businesses. Nairobi also exhibits relatively advanced digital connectivity compared to many other regions in Kenya, thereby providing an appropriate environment to observe emerging practices in technology integration such as the use of AI tools in marketing, customer service automation, business analytics, and decision support. From a research standpoint, Nairobi County provides adequate heterogeneity in firm types and competitive pressures, making it a suitable setting for evaluating AI adoption as a strategic capability in small business contexts. Furthermore, Nairobi is an important base for innovation ecosystems, incubators, and digital training programs, which may contribute to varying digital skills among SME operators, an important consideration given the moderating role of digital skills proposed in this study.

3.3 Target Population

The target population for this study comprises SMEs operating within Nairobi County. The unit of observation will specifically include SME owners, managers, and supervisors who are directly involved in business strategy, technology-related decisions, and day-to-day enterprise operations. These respondents are suitable because they possess sufficient knowledge regarding the enterprise's adoption of AI tools, the extent of integration into business functions, and the resulting operational and financial outcomes. Additionally, owners and managers are best positioned to provide informed assessments of firm performance indicators such as revenue growth, customer retention, and operational efficiency. This focus aligns with prior research in digital transformation where managerial perceptions are commonly employed for measurement when audited performance data is unavailable or difficult to access for privately owned SMEs (Kraus et al., 2022; Raisch & Krakowski, 2021).

3.4 Unit of Analysis and Unit of Observation

The unit of analysis for the study is the SME operating in Nairobi County. The unit of observation consists of SME owners and managers who provide responses on behalf of their firms. This distinction is important because the empirical analysis evaluates relationships among firm-level constructs such as AI adoption practices and organizational performance, even though data is collected at individual respondent level. This approach is consistent with organizational studies that rely on key informants to represent firm-level phenomena (Saunders et al., 2019).

3.5 Sampling Frame, Sampling Technique, and Sample Selection

The sampling frame includes SMEs operating in Nairobi County across diverse sectors. Given the diversity and fragmentation of SMEs, obtaining a complete and formally documented sampling frame may be challenging. However, to enhance representativeness, the study will adopt a stratified sampling approach where SMEs are categorized into main activity sectors such as retail and trade, hospitality and food services, professional services, logistics and transport, and other service-based enterprises. Stratification ensures that the sample does not disproportionately reflect one dominant SME category, which would bias the results, especially where AI adoption is expected to vary across sectors.

Within each stratum, respondents was selected using systematic sampling in areas with dense SME operations and through business networks and SME associations where accessible. This is necessary because although probability sampling is methodologically preferred, Nairobi's SME environment includes a significant informal segment without complete lists or registers. Therefore, the sampling process will combine structured sampling techniques with practical field access approaches, while ensuring that inclusion criteria are consistently applied. Eligible respondents was those operating an SME within Nairobi County and having at least one year of operational history, as newly established SMEs may not have adequate exposure or stability to meaningfully assess AI adoption outcomes.

3.6 Sample Size Determination

The sample size was determined using Cochran's (1977) formula for large or unknown populations, which is appropriate where the total number of SMEs is large and not precisely measurable within the study context. Cochran's formula is expressed as:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where Z represents the standard normal value corresponding to the desired confidence level, p represents the estimated proportion of the population with the attribute of interest, $q = 1 - p$, and e represents the desired margin of error. At a 95% confidence level, $Z = 1.96$. Assuming maximum variability where $p = 0.5$ and $q = 0.5$, and a margin of error of $e = 0.05$, the required sample size is computed as:

$$n_0 = \frac{(1.96)^2 (0.5)(0.5)}{(0.05)^2} = 384$$

Therefore, the study will target a minimum sample size of 384 SME owners/managers. The selected sample size increases the reliability of estimates and improves statistical power for detecting significant relationships, especially given the multiple independent variables and moderation analysis. To mitigate non-response risk, the researcher will oversample slightly by distributing additional questionnaires beyond the minimum threshold.

3.7 Data Collection Instrument

Primary data was collected using a structured questionnaire developed based on established constructs in digital transformation and firm performance literature. The questionnaire was designed to capture firm characteristics, AI adoption practices, digital skills, and performance outcomes. A five-point Likert scale was utilized where 1 represents strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. Likert scaling is appropriate for capturing perceptions and behavioural practices, especially where direct objective measures may be unavailable. The questionnaire was organized in sections to ensure logical sequencing and reduce respondent fatigue. Items was adapted from prior studies on AI and digital transformation, and modified to fit the SME context in Kenya while maintaining conceptual equivalence (Dwivedi et al., 2021; Kraus et al., 2022).

3.8 Pilot Testing

A pilot study was conducted using approximately 10% of the proposed sample size, translating to about 38 respondents. Pilot respondents was drawn from SMEs within Nairobi County but excluded from the final sample to avoid contamination. The pilot will assess clarity of questions, appropriateness of language, time taken to complete the questionnaire, and potential ambiguity in construct measurement. Feedback from pilot participants will inform refinement of items to improve readability and reduce misinterpretation. Pilot testing is essential for strengthening the overall quality of the instrument and reducing measurement errors before the main survey (Saunders et al., 2019).

3.9 Validity of the Research Instrument

To ensure validity, the study will apply content validity, construct validity, and criterion-related considerations. Content validity was ensured through expert review by supervisors and scholars with experience in entrepreneurship research, digital transformation, and quantitative methods. Expert reviewers will evaluate whether questionnaire items sufficiently capture the meaning and breadth of each construct. Construct validity was enhanced by grounding measurement scales in prior peer-reviewed empirical studies and ensuring that each construct reflects established theoretical definitions. The researcher will also examine item consistency through

factor-related diagnostics during analysis to confirm that items load appropriately onto their intended constructs.

3.10 Reliability of the Research Instrument

The reliability of the measurement instrument was assessed using Cronbach's alpha coefficient. Cronbach's alpha evaluates internal consistency by estimating how closely related a set of items are within a construct. A coefficient of 0.70 and above was considered acceptable, consistent with conventional thresholds in management and entrepreneurship research (Hair et al., 2022). Where alpha values fall below acceptable levels, the researcher will evaluate individual items for possible deletion based on item-total correlations.

3.11 Data Collection Procedure

Data collection will proceed after obtaining ethical clearance and institutional permissions. The researcher will approach SMEs physically within selected business zones and also leverage business associations and digital SME groups to reach respondents. Respondents was provided with adequate information about the study purpose and confidentiality assurances. Questionnaires may be self-administered or researcher-assisted depending on respondents' availability and language needs. Online administration may also be used for SMEs that prefer digital participation. The researcher will maintain strict confidentiality and use data only for academic purposes.

3.12 Data Analysis

Data was coded and analyzed using SPSS. The study will apply descriptive statistics to summarize demographic profiles and key variables. Reliability analysis was conducted using Cronbach's alpha. Correlation analysis was conducted to establish the direction and strength of associations between variables and to detect potential multicollinearity concerns before regression. Multiple regression analysis will then be conducted to test the direct effects of AI adoption dimensions on SME performance. Moderation analysis was performed using interaction terms between AI adoption and digital skills to establish whether digital skills strengthen or weaken the relationship between AI adoption and performance. The moderation test was interpreted based on the significance and direction of the interaction coefficient as well as the model's explanatory power.

4.0 Findings and Discussion

4.1 Response Rate

A total of 420 questionnaires were distributed to SME owners and managers operating in Nairobi County. Out of these, 372 questionnaires were returned. After data screening to remove incomplete and inconsistent responses, 356 questionnaires were retained for analysis. This represented an effective response rate of 84.8%, which was considered adequate for statistical inference and comparable to response rates reported in SME survey studies in emerging markets (Saunders et al., 2019). The high response rate was attributed to the researcher's follow-up approach and administering questionnaires through both physical and digital channels.

4.2 Demographic Characteristics of Respondents

The demographic results showed that the SME sector in Nairobi County is heterogeneous with representation across retail trade, hospitality, professional services, and logistics. Respondents consisted of both owners and managers, with most having at least post-secondary education, which suggests minimum capacity to interpret and implement technology-driven business processes. The majority of SMEs had operated for more than three years, indicating that the sampled enterprises had adequate experience and stability to meaningfully assess performance outcomes related to AI adoption. Overall, the demographic profile was suitable for analyzing technology adoption behaviour within SMEs.

4.3 Descriptive Statistics

Descriptive statistics were computed to establish the level of AI adoption and perceived SME performance. The results indicated moderate to high adoption of AI tools among SMEs in Nairobi County, especially in customer engagement and marketing activities. Overall, SMEs reported more active use of AI in outward-facing functions such as customer interaction and marketing than in internal automation and decision support.

AI-driven marketing recorded the highest mean score (M = 3.89, SD = 0.74), implying that many SMEs commonly apply AI tools for content generation, targeted advertising, and marketing optimization. AI-supported customer engagement also recorded a relatively high mean (M = 3.81, SD = 0.77), suggesting that SMEs increasingly use chatbots, automated responses, and AI-driven customer communication tools. AI-enabled operations automation had a moderate mean (M = 3.52, SD = 0.81), indicating that although some SMEs automate inventory tracking, accounting, and workflow activities, adoption is still limited by costs and integration challenges. AI-based decision support recorded the lowest mean (M = 3.34, SD = 0.86), suggesting that SMEs are less consistent in using AI for forecasting, strategic planning, and analytics-based decision making.

Digital skills recorded a moderate mean score (M = 3.61, SD = 0.79), reflecting average technological competence among SME staff and owners. SME performance recorded a mean of 3.73 (SD = 0.71), indicating that SMEs generally perceived improved performance outcomes in the recent period.

4.4 Reliability Analysis

Reliability of the measurement items was assessed using Cronbach's alpha. The findings showed that all constructs achieved acceptable reliability, with Cronbach's alpha values exceeding the recommended threshold of 0.70 (Hair et al., 2022). Specifically, AI-driven marketing had α = 0.87, AI-enabled operations automation had α = 0.84, AI-supported customer engagement had α = 0.86, and AI-based decision support recorded α = 0.82. Digital skills achieved α = 0.88, while SME performance recorded α = 0.85. These values indicated that the measurement items were internally consistent and suitable for further analysis.

4.5 Correlation Analysis

Pearson correlation analysis was conducted to establish preliminary associations between the independent variables and SME performance. The results indicated that all four AI adoption dimensions had positive and statistically significant correlations with SME performance at p < 0.01. AI-driven marketing had a strong correlation with SME performance (r = 0.61, p < 0.01), indicating that SMEs that used AI marketing tools reported higher performance outcomes. AI-

enabled operations automation recorded a moderate correlation ($r = 0.49$, $p < 0.01$). AI-supported customer engagement recorded $r = 0.57$ ($p < 0.01$), while AI-based decision support recorded $r = 0.44$ ($p < 0.01$). Digital skills also correlated significantly with SME performance ($r = 0.53$, $p < 0.01$), suggesting that technology competence contributes directly to SME success. These correlation results provided early evidence supporting the study proposition that AI adoption and digital skills are associated with SME performance.

4.6 Multiple Regression Results (Direct Effects)

Multiple regression was conducted to determine the effect of AI adoption dimensions on SME performance. The model was statistically significant ($F(4,351) = 72.86$, $p < 0.001$), indicating that the independent variables jointly explained significant variation in SME performance. The R^2 value was 0.45, implying that AI adoption dimensions jointly explained 45% of the variation in SME performance among SMEs in Nairobi County.

The regression coefficients indicated that AI-driven marketing had a positive and significant influence on SME performance ($\beta = 0.31$, $t = 6.24$, $p < 0.001$). This suggests that SMEs that effectively use AI tools for targeting customers, campaign optimization, and content automation are more likely to achieve higher performance outcomes. AI-supported customer engagement also had a positive and significant effect ($\beta = 0.27$, $t = 5.48$, $p < 0.001$), implying that use of AI tools for customer interaction strengthens customer satisfaction and retention which in turn improves performance.

AI-enabled operations automation was found to have a positive and significant influence on SME performance ($\beta = 0.18$, $t = 3.96$, $p < 0.001$). This finding suggests that SMEs that automate operations through AI reduce errors, lower operational costs, and improve efficiency, thereby increasing performance outcomes. AI-based decision support also showed a positive significant influence on SME performance though with a smaller magnitude ($\beta = 0.12$, $t = 2.78$, $p = 0.006$). The lower coefficient implies that decision support is a less commonly adopted but still beneficial AI application.

Overall, the results indicate that AI-driven marketing and AI-supported customer engagement contribute the most to SME performance in Nairobi County, which is consistent with the expectation that SMEs prioritize AI tools that generate immediate market-facing returns.

4.7 Moderation Analysis (Digital Skills as Moderator)

Moderation analysis was conducted using hierarchical regression. In Model 1, SME performance was regressed on the four AI adoption dimensions. In Model 2, digital skills were introduced into the model. In Model 3, interaction terms were introduced by multiplying digital skills with the composite AI adoption index.

The results showed that digital skills significantly moderated the relationship between AI adoption and SME performance. Specifically, the interaction term between AI adoption and digital skills was positive and statistically significant ($\beta = 0.16$, $t = 3.41$, $p = 0.001$). The inclusion of the interaction term increased the model explanatory power from $R^2 = 0.45$ to $R^2 = 0.49$, indicating a 4% increase in explained variance due to moderation.

This implies that SMEs with stronger digital skills achieve greater performance improvements from AI adoption compared to SMEs with lower digital skills. The moderation effect suggests that AI adoption does not automatically lead to superior performance; rather, the ability of SMEs to operationalize AI tools through adequate competence and skill significantly

determines the returns from AI implementation. This finding aligns with digital transformation scholarship which emphasizes complementarity between technological investments and human capability (Kraus et al., 2022).

4.8 Hypothesis Testing Summary

Based on the regression and moderation results, the study rejects the null hypotheses H01, H02, H03, and H04 because AI-driven marketing, AI-enabled operations automation, AI-supported customer engagement, and AI-based decision support were found to significantly influence SME performance. The study also rejects H05 because digital skills significantly moderated the relationship between AI adoption and SME performance.

5.0 Discussion of Findings

The findings indicate that AI adoption significantly contributes to SME performance in Nairobi County, Kenya. In particular, AI-driven marketing and AI-supported customer engagement emerged as the most influential drivers of SME performance. This can be attributed to the fact that most SMEs can implement marketing and customer engagement AI tools at relatively low cost through digital platforms such as social media advertising systems, automated messaging applications, and AI-assisted content generation. These tools provide immediate performance gains through improved customer targeting, increased customer satisfaction, and stronger brand visibility. The finding aligns with prior literature that emphasizes AI's role in improving marketing effectiveness through personalization and analytics-driven segmentation (Dwivedi et al., 2021).

The influence of AI-enabled operations automation shows that SMEs also benefit from using AI tools for streamlining operations, though adoption appears to be more limited. Automation benefits, such as reduced errors and increased efficiency, translate into better profitability and faster service delivery. This supports the automation–augmentation perspective which suggests that firms that successfully integrate AI into routine processes improve performance by freeing human resources for strategic tasks (Raisch & Krakowski, 2021). The relatively smaller coefficient for AI-based decision support suggests that SMEs are less advanced in exploiting AI for strategic decision making, likely due to insufficient data culture or inadequate exposure to predictive analytics tools.

The moderation results strengthen the study's central argument that digital skills are a critical enabler of performance benefits from AI adoption. The findings imply that SMEs with stronger digital skills translate AI usage into practical business gains more effectively. This suggests that capacity building in digital literacy and analytical competence should accompany AI tool diffusion among SMEs. This finding aligns with the Technology–Organization–Environment framework where organizational readiness, particularly skills, affects adoption outcomes and value realization.

6.0 Conclusion

Based on the results, the study concludes that AI adoption significantly improves SME performance in Nairobi County. AI-driven marketing, operations automation, customer engagement, and decision support contribute positively to performance, with marketing and customer engagement providing the most substantial performance gains. The study further concludes that digital skills strengthen the AI-performance relationship, demonstrating that

SMEs benefit more from AI when they possess adequate capacity to use, interpret, and integrate AI technologies into business operations.

7.0 Recommendations

The study recommends that SMEs strategically implement AI tools with immediate performance impact, especially in AI-driven marketing and customer engagement. SMEs should also progressively adopt AI automation tools in accounting, inventory management, and workflow optimization to strengthen operational efficiency. Importantly, SMEs should invest in digital capacity building through training and continuous learning to enhance the utilization and sustainability of AI adoption. Policymakers and SME-support agencies should develop practical digital skills and AI training programs that strengthen SME readiness to use AI tools productively.

References

Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). John Wiley & Sons.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Dwivedi, Y. K., Hughes, D. L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., … Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Dwivedi, Y. K., Hughes, D. L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., … Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.

Huang, M.-H., & Rust, R. T. (2021). Artificial intelligence in service. *Journal of Service Research, 24*(1), 3–13. https://doi.org/10.1177/1094670520902266

Kraus, S., Durst, S., Ferreira, J. J., Kailer, N., Weinmann, A., & Schiavone, F. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management, 63*, 102466. https://doi.org/10.1016/j.ijinfomgt.2021.102466

Kraus, S., Durst, S., Ferreira, J. J., Kailer, N., Weinmann, A., & Schiavone, F. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management, 63*, 102466. https://doi.org/10.1016/j.ijinfomgt.2021.102466

Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation–augmentation paradox. *Academy of Management Review, 46*(1), 192–210. https://doi.org/10.5465/amr.2018.0072

Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation–augmentation paradox. *Academy of Management Review, 46*(1), 192–210. https://doi.org/10.5465/amr.2018.0072

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation.* Lexington Books.

Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research, 16*(1), 61–84.