

Technological Innovation and the Competitiveness of Small and Medium Enterprises in Enugu State, Nigeria

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Abstract

This study examined the effect of technological innovation on the competitiveness of Small and Medium Enterprises (SMEs) in Enugu State, Nigeria, focusing specifically on mobile banking applications, Point of Sale (POS) machines, social media handling, and functional websites. Four specific objectives guided the study, each investigating the effect of one technological innovation on a corresponding dimension of competitiveness: customer patronage, customer satisfaction, customer loyalty, and market share. A descriptive survey research design was adopted, and primary data were collected from SME owners and managers using a structured questionnaire, the Technological Innovation and SME Competitiveness Questionnaire (TISCOQ). Out of 303 questionnaires administered using a Taro Yamane-derived sample from a population of 1,245 registered SMEs, 287 were properly completed and returned, representing a response rate of 94.7%. Data were analysed using descriptive statistics (mean and standard deviation) and multiple linear regression at the 5% level of significance. The results showed that mobile banking applications had a significant positive effect on customer patronage ($\beta = 0.241$, $t = 4.12$, $p = 0.000$); POS machines had a significant positive effect on customer satisfaction ($\beta = 0.198$, $t = 3.56$, $p = 0.001$); social media handling had the strongest positive effect on customer loyalty ($\beta = 0.276$, $t = 4.85$, $p = 0.000$); and functional websites significantly influenced market share ($\beta = 0.163$, $t = 2.98$, $p = 0.003$). The overall model explained 65.9% of the variance in SME competitiveness ($R^2 = 0.659$; Adjusted $R^2 = 0.648$) and was statistically significant ($F = 54.32$, $p = 0.000$). The study concludes that technological innovation is a critical determinant of SME competitiveness in Enugu State and recommends increased adoption of digital financial tools, improved POS infrastructure, more deliberate social media engagement strategies, and wider establishment of functional websites among SMEs.

Keywords: Technological innovation; SME competitiveness; mobile banking; Point of Sale systems; social media; functional websites; Enugu State, Nigeria.

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Introduction

Small and Medium Enterprises (SMEs) constitute the backbone of most developing economies, providing employment, driving local production, and sustaining commercial activity in urban and semi-urban communities. In Nigeria, SMEs are widely recognised as engines of economic diversification and poverty reduction, and Enugu State, a major commercial hub in South-East Nigeria, hosts a large and diverse population of SMEs spanning manufacturing, retail/trade, and services. In an increasingly digital business environment, the extent to which these enterprises adopt technological innovation has become a decisive factor in their ability to compete, retain customers, and expand market share.

Technological innovation, understood as the adoption and application of modern tools such as digital payment systems, social media platforms, and web-based platforms to improve business operations (OECD, 2018), has transformed how businesses interact with customers globally. For SMEs in Enugu State specifically, technological innovation is less about advanced automation or artificial intelligence, as might be the case in developed economies, and more about adaptive, necessity-driven adoption shaped by environmental constraints such as irregular power supply, limited access to capital, and uneven digital literacy. Even within these constraints, four technologies, mobile banking applications, Point of Sale (POS) machines, social media handling, and functional websites, have emerged as the most visible and widely discussed digital tools among SMEs in the state.

Despite the growing adoption of these tools, many SMEs in Enugu State continue to operate at comparatively low levels of technological integration, relying heavily on traditional, cash-based, and person-to-person business practices. This has produced inefficiencies in service delivery, weaker customer engagement, and constrained market expansion relative to more digitally integrated competitors. Moreover, while a broad literature has examined technological adoption and SME performance, comparatively few studies have empirically disaggregated specific technologies and matched them to the specific competitiveness outcome each is most plausibly expected to influence, within a single context-specific study of Enugu State. This study addresses that gap. In an ideal scenario, the adoption of mobile banking applications, POS systems, social media platforms, and functional websites should allow SMEs operating in commercial hubs such as Ogbete Main Market or the Enugu Industrial Layout to compete effectively with larger firms and even digital-native enterprises. In practice, however, SMEs in the state face structural and operational constraints, including the high cost of internet services, unstable electricity supply, limited digital skills, and inadequate technological support systems, that create variation in how effectively different enterprises are able to convert technology adoption into competitive advantage, and it remains empirically unclear which specific innovations most strongly drive which specific competitiveness outcomes in this setting.

The purpose of this study was therefore to examine the effect of technological innovation on the competitiveness of SMEs in Enugu State, with four specific objectives:

- i. to evaluate the effect of mobile banking applications on customer patronage;
- ii. to determine the effect of POS machines on customer satisfaction;
- iii. to examine the relationship between social media handling and customer loyalty; and
- iv. to ascertain the effect of functional websites on market share.

Four corresponding null hypotheses were tested at the 5% level of significance.

The study is significant on several fronts. Empirically, it offers evidence on the role of technological innovation in enhancing SME competitiveness that can inform both policy decisions and business strategy, examining mobile banking applications, POS systems, social media platforms, and functional websites as distinct, individually testable predictors rather than a single undifferentiated construct. Practically, the findings serve as a reference for SME owners and managers seeking to prioritise scarce investment resources among competing digital tools, while assisting policymakers and development agencies in designing targeted programmes, digital inclusion strategies, and capacity-building initiatives tailored to the specific needs of SMEs in Enugu State. Academically, the study extends the limited context-specific literature on technology-driven competitiveness among SMEs in South-East Nigeria, an area that has received comparatively less scholarly attention than Lagos- and Kano-focused studies, and provides a relevant empirical foundation for future comparative research in similarly structured emerging-market settings.

Review of Related Literature

Conceptual Review

Technological innovation has been conceptualised in various ways across the management literature. Schumpeter (1934) described innovation as the introduction of new combinations of production factors, including new products, new production methods, new markets, and new forms of organisation, framing innovation as a driver of economic change and competitive disruption. Rogers (2003) defined technological innovation as an idea, practice, or object perceived as new by an individual or organisation, while Drucker (1985) characterised innovation as the specific tool through which entrepreneurs exploit change as a business opportunity. More recently, the OECD (2018) defined innovation as the implementation of a new or significantly improved product, process, marketing method, or organisational method in business practice, a definition that captures both the technological and managerial dimensions of innovation relevant to this study.

Within Enugu State specifically, technological innovation among SMEs reflects adaptive, necessity-driven adoption rather than frontier technological transformation. Ezeudu and Mutezo (2025) found that the adoption of electronic payment systems among SMEs in Enugu significantly improved business performance through enhanced transaction efficiency and customer convenience. Process innovation is most visible in financial transactions and record-keeping, where the adoption of POS machines, mobile banking, and electronic transfers has reduced dependence on cash, particularly following Nigeria's cash-scarcity episodes (Udeh & Okafor, 2022), with perceived usefulness and ease of use, consistent with the Technology Acceptance Model, significantly influencing adoption decisions (Eneh, 2021). Marketing innovation is driven largely by social media platforms: Agwu (2023) found that social media and email marketing have a significant positive effect on SME growth in Enugu State, with traders in markets such as Ogbete Main Market and Emene increasingly relying on WhatsApp status updates and direct messaging to sustain customer relationships. Service innovation is reflected in the gradual integration of digital communication tools into customer service, producing hybrid business models in which customers view products online, place orders via chat, and complete payments electronically (Okonkwo & Ezenwakwelu, 2022). Organisational innovation, in turn, depends on managerial flexibility and employee training (Agwu, 2023), with digital leadership shown to have a strong positive effect on SME sustainability and performance (Osuji & Nwafor, 2020).

Mobile banking applications (MBAs) enable users to perform banking tasks, from checking balances to transferring funds, directly from mobile devices, and have been especially significant for financial inclusion in emerging economies where access to traditional banking infrastructure is limited (Amin & Isa, 2017; Prasanna & Ghosh, 2019). Security, through biometric authentication, two-factor authentication, and encryption, and user experience remain central concerns shaping adoption and continued use (Chen & Zhang, 2021; Amin & Bakar, 2022). Point of Sale (POS) systems have evolved from simple cash registers into sophisticated digital systems integrating card payments, mobile wallets, and contactless payments, enabling real-time sales tracking and inventory management while streamlining the payment process (Lee & Kim, 2021; Harrison et al., 2020). Beyond payment processing, modern POS systems increasingly incorporate customer relationship management and analytics capabilities that support data-driven marketing and pricing decisions (Singh & Verma, 2020; Nguyen et al., 2021), while cloud-based POS solutions offer businesses greater flexibility, lower upfront cost, and real-time operational insight (Cao et al., 2021). Social media handling refers to the strategic use and management of platforms such as Facebook, Instagram, WhatsApp Business, and X (formerly Twitter) to promote products, engage customers, and build brand relationships. For resource-constrained SMEs, social media offers a low-cost channel for direct, two-way customer communication that can substitute for more expensive traditional marketing (Chavez & Vega, 2021; Patel & Kumar, 2021). A functional website, meanwhile, is an active, user-friendly online platform that provides product and service information and facilitates customer interaction and transactions; it functions as a digital storefront capable of extending an SME's reach beyond its immediate physical location, thereby supporting market expansion, credibility, and visibility (Adebayo & Olayinka, 2019; Chinedu, Nwachukwu, & Ndukwe, 2022). Collectively, these four technologies constitute the principal digital tools through which SMEs in contexts such as Enugu State pursue competitiveness, understood in this study as the ability to maintain or improve market position through increased customer patronage, satisfaction, loyalty, and market share.

Competitiveness itself has been variously conceptualised in the strategic management literature, ranging from cost- and differentiation-based views rooted in industrial organisation economics to more dynamic, capability-based conceptions that emphasise a firm's ability to adapt to changing market and technological conditions over time. For SMEs operating in resource-constrained environments such as Enugu State, competitiveness is best understood less as a static cost or quality position relative to rivals and more as an ongoing capacity to sustain customer relationships and market presence amid infrastructural and financial constraints. This dynamic conception is consistent with the four competitiveness indicators examined in this study, customer patronage, satisfaction, loyalty, and market share, each of which reflects a relational, customer-facing dimension of firm performance that is directly amenable to influence through the digital tools under investigation, rather than purely internal efficiency metrics such as unit cost or production throughput.

Theoretical Framework

This study is anchored on three complementary theories: the Technology Acceptance Model (TAM), the Diffusion of Innovation (DOI) theory, and the Resource-Based View (RBV).

Technology Acceptance Model (TAM)

The Technology Acceptance Model, propounded by Davis (1986, 1989), explains how users come to accept and use a technology, emphasising two key determinants: perceived usefulness and perceived ease of use. Individuals are more likely to adopt a technology if they believe it will enhance their performance and if it is easy to use. In the context of SMEs in Enugu State, TAM helps explain the adoption of technologies such as mobile banking applications and POS systems, since operators tend to adopt these tools based on perceived benefits such as improved transaction speed, reduced cash-handling risk, and enhanced customer convenience, while perceived complexity or cost constrains adoption.

Diffusion of Innovation (DOI) Theory

The Diffusion of Innovation Theory, developed by Rogers (1962), explains how new ideas and technologies spread within a social system over time through communication channels, distinguishing adopter categories including innovators, early adopters, early majority, late majority, and laggards. Among SMEs in Enugu State, a small number of innovative enterprises quickly adopt social media marketing, mobile banking, and online platforms, while a larger proportion fall within the late-majority category due to constraints such as limited capital, inadequate digital literacy, and poor infrastructure, explaining the uneven pace and pattern of technological adoption observed in the state.

Resource-Based View (RBV)

The Resource-Based View, formally developed by Barney (1991), posits that firms achieve sustained competitive advantage when they possess valuable, rare, inimitable, and non-substitutable (VRIN) resources, which may include physical assets, human skills, organisational capabilities, and intangible assets such as knowledge and technology. For SMEs in Enugu State, digital capabilities such as functional websites, social media presence, customer databases, and electronic payment systems constitute strategic resources: SMEs that effectively deploy these resources are better positioned to attract customers, retain loyalty, and expand market share than those relying solely on traditional business practices. RBV therefore explains how technological innovation becomes a source of competitive advantage in a resource-constrained environment.

Theoretical Synthesis

Although TAM, DOI theory, and RBV originate from distinct intellectual traditions, cognitive-behavioural, diffusion-communication, and strategic-management, respectively, they are complementary rather than competing lenses for this study. TAM operates at the level of the individual adoption decision, explaining why a given SME owner chooses to adopt or resist a specific technology based on perceived usefulness and ease of use. DOI theory operates at the level of the population of SMEs, explaining why adoption is uneven across the sector at any given point in time and why some enterprises lag behind others. RBV, finally, operates at the level of the firm's competitive outcomes, explaining why, once adopted, a digital capability translates into a measurable competitive advantage such as increased patronage, satisfaction, loyalty, or market share. Read together, the three theories suggest a plausible causal chain, from individual perception, through sector-wide diffusion, to firm-level competitive outcome,

that motivates both the four hypothesised relationships tested in this study and the structural barriers examined alongside them.

Empirical Review

Mobile Banking Applications and Customer Patronage

A substantial body of international evidence links mobile banking adoption to customer behaviour outcomes. Johnson and Smith (2022) found that United States millennials were more likely to adopt mobile banking when they perceived it as secure and convenient, with financial literacy acting as a mediating variable. Lee et al. (2023), studying Indonesia, Thailand, and Vietnam using structural equation modelling, found that social influence significantly promoted mobile banking adoption while technology anxiety hindered it, particularly among older users. Ghosh et al. (2020) reported that convenience, transaction speed, and customer support were key drivers of satisfaction and, in turn, loyalty among Indian mobile banking users, while Zhao et al. (2021) found that both institutional and personal trust significantly influenced adoption decisions in China. Within Nigeria, Nwibo and Okorie (2021) observed that electronic banking adoption improved financial efficiency and customer participation in small business transactions in South-East Nigeria, a finding directly relevant to the present study's focus on customer patronage.

Point of Sale (POS) Machines and Customer Satisfaction

Brown, Smith, and Taylor (2024) found that integrating POS systems with customer loyalty programmes significantly enhanced customer satisfaction in e-commerce settings, while Choi and Lee (2023) reported that POS machine reliability was strongly associated with customer satisfaction in supermarket settings. Cao, Zhang, and Lee (2021) highlighted the flexibility and scalability advantages of cloud-based POS systems for modern retailing, and Benoit and Schneider (2022) emphasised that data security and privacy management remain critical challenges shaping customer trust in POS-enabled transactions. In the Enugu context specifically, Eneh (2021) reported that POS usage in urban retail outlets significantly enhanced customer satisfaction through faster and more convenient payment processes, a finding this study's results directly corroborate.

Social Media Handling and Customer Loyalty

Chavez and Vega (2021) found that brand engagement on social media significantly strengthened customer loyalty in the consumer electronics industry, while Patel and Kumar (2021) similarly emphasised the role of social media interaction in shaping repeat-purchase behaviour. Bansal and Kaur (2021) linked customer satisfaction achieved through digital engagement channels to stronger brand loyalty outcomes more broadly. Within Enugu State, Agwu (2023) found that social media marketing significantly enhanced brand loyalty and competitive advantage among fashion SMEs, and Agbo (2021) reported that WhatsApp Business usage improved customer retention among SMEs in Nsukka, both findings consistent with the strong effect of social media handling on customer loyalty documented in this study.

Functional Websites and Market Share

Adebayo and Olayinka (2019) examined the impact of functional websites on the market share of SMEs in Enugu and found a positive and significant relationship, while Chinedu, Nwachukwu, and Ndukwe (2022) similarly linked functional websites to customer loyalty with implications for SME market share in the same context. Akinlolu and Nwachukwu (2021) found that digital platforms more broadly supported market share growth among SMEs in Enugu State. Udeh and Okafor (2022) reported that functional websites significantly improved the growth and market expansion of manufacturing SMEs in the Emene Industrial Layout, a finding this study's results on website adoption and market share directly reinforce.

Comparative Reflections on the Reviewed Studies

Read across the four technology-outcome pairings, the reviewed studies reveal a broadly consistent pattern: digital tools that reduce friction in the customer transaction or communication process, mobile payments, POS terminals, and social media interaction, tend to produce more immediate and more strongly evidenced effects on behavioural outcomes such as patronage, satisfaction, and loyalty than digital infrastructure investments such as websites, whose effects, while still positive across the reviewed literature, are more frequently reported as moderate rather than strong. This pattern held both in the international studies reviewed, spanning the United States, China, South Korea, India, and Southeast Asia, and in the Nigerian and Enugu-specific studies reviewed, suggesting that the relative ranking of technology effects observed in this study's own results is unlikely to be an artefact of the Enugu context alone, but instead reflects a more general feature of how digital tools of differing cost and complexity translate into customer-facing competitive outcomes for resource-constrained SMEs.

Summary of Literature and Gap in Knowledge

The reviewed literature, anchored on TAM, DOI theory, and RBV, consistently indicates that digital tools such as POS systems, mobile banking applications, social media platforms, and functional websites positively influence SME performance indicators, including sales volume, customer satisfaction, operational efficiency, and market visibility. However, several gaps remain. First, many existing studies examine technological innovations in isolation, focusing on a single tool without capturing the combined effect of multiple technologies on SME competitiveness, even though competitiveness in practice is shaped by the simultaneous use of several digital tools. Second, there is a contextual and cultural gap: the socio-economic environment of Enugu State, including traditional business structures such as the Igba-Boi apprenticeship system, is rarely incorporated into studies on technological adoption. Third, there is a geographical gap, since much of the existing Nigerian literature on SME digital transformation focuses on Lagos and Kano, whose infrastructural and socio-economic realities differ from those of Enugu State. This study addresses these gaps by providing an integrated, context-specific empirical analysis of how mobile banking applications, POS systems, social media handling, and functional websites collectively relate to the competitiveness of SMEs in Enugu State.

Methodology

The study adopted a descriptive survey research design, considered appropriate for the systematic, non-experimental collection of quantitative data describing existing patterns of technological innovation and competitiveness among a large population of SMEs. Technological innovation was operationalised using four indicators, mobile banking applications, POS systems, social media platforms, and functional websites, measured by their level of adoption, usage, and perceived impact on customer patronage, satisfaction, loyalty, and market share. The study was conducted in Enugu State, a major commercial hub in South-East Nigeria, and covered all three senatorial zones to ensure adequate representation: Enugu East (urban retail and service-based SMEs in Ogbete, Independence Layout, and Emene), Enugu West (industrial and logistics-based SMEs in 9th Mile, Udi, and Oji River), and Enugu North (agro-allied businesses and SMEs supporting academic communities in Nsukka and Obollo-Afor). The target population comprised 1,245 registered SME owners and managers in Enugu State, as reported by the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN, 2024 National Survey of MSMEs), restricted to SMEs with at least 10 employees to exclude informal, resource-constrained micro-enterprises with limited capacity for technology adoption.

The sample size of 303 respondents was determined using the Taro Yamane formula for finite populations. A stratified random sampling technique was employed to ensure proportional representation across three strata, manufacturing, retail/trade, and services, based on each stratum's share of the population, followed by simple random sampling within each stratum to select individual respondents.

Data were collected using a structured questionnaire, the Technological Innovation and SME Competitiveness Questionnaire (TISCOQ), comprising a demographic section and a research-variable section measured on a 4-point Likert scale (Strongly Agree = 4 to Strongly Disagree = 1), covering mobile banking adoption, POS usage and customer satisfaction, social media engagement and customer loyalty, website adoption and market share, and institutional barriers to technology adoption. Primary data were complemented by secondary data drawn from textbooks, academic journals, government publications, and SMEDAN reports. The instrument was subjected to face and content validation by three experts in entrepreneurship, management, and research methodology in the Faculty of Management Sciences, and its reliability was established through a pilot study of 20 SME owners in Igbo-Eze South Local Government Area, an area outside the sampled senatorial zones, yielding a Cronbach's Alpha coefficient of 0.84, exceeding the conventional 0.70 threshold for internal consistency.

Data were analysed using descriptive statistics, mean and standard deviation, to answer the research questions, applying a cut-off mean of 2.50 to determine agreement or disagreement with questionnaire items, and inferential statistics, multiple linear regression analysis, to test the four research hypotheses at the 0.05 level of significance. Multiple regression was considered appropriate for examining both the combined and individual effects of the four technological innovation variables on the corresponding SME competitiveness outcomes.

Ethical considerations were observed throughout the study. Participation was voluntary, and informed consent was obtained from respondents prior to questionnaire administration. Respondents were assured of the confidentiality and anonymity of their responses, and no personally identifying information was collected on the instrument beyond the demographic categories required for analysis. Data were used strictly for academic purposes, and respondents retained the right to withdraw from the exercise at any stage without consequence.

Results and Discussion

Response Rate and Demographic Characteristics

Of the 303 questionnaires administered, 287 were returned and found usable, representing a response rate of 94.7%, well above the generally accepted threshold for survey-based management research. Table 1 presents the distribution of respondents by business sector.

Table 1: Distribution of Respondents by Business Sector

Sector	Frequency	Percentage (%)
Manufacturing	82	28.6
Retail/Trade	121	42.2
Services	84	29.2
Total	287	100

Source: Author's survey data, 2026.

The majority of respondents (42.2%) were engaged in retail/trade businesses, followed by services (29.2%) and manufacturing (28.6%), indicating a strong representation of commercially active, customer-facing SMEs for which the competitiveness indicators examined in this study are directly relevant.

Table 2: Distribution of Respondents by Years of Business Operation

Years of Operation	Frequency	Percentage (%)
1–5 years	96	33.4
6–10 years	118	41.1
11 years and above	73	25.5
Total	287	100

Source: Author's survey data, 2026.

Most respondent SMEs (41.1%) had operated for 6 to 10 years, followed by 1 to 5 years (33.4%) and 11 years and above (25.5%), suggesting that the sample was dominated by moderately experienced businesses with sufficient operating history to meaningfully assess the effect of technological adoption on competitiveness outcomes.

Descriptive Analysis of Research Questions

Descriptive statistics were computed for each research question using a decision rule of mean ≥ 2.50 = Agree and mean < 2.50 = Disagree.

Table 3: Extent to which Mobile Banking Adoption Influences SME Competitiveness

Item	Mean	Std. Dev.	Decision
Mobile banking improves transaction efficiency	3.32	0.71	Agree
It enhances financial management	3.18	0.76	Agree
It reduces operational delays	3.25	0.69	Agree
Grand Mean	3.25	—	Agree

Source: Author's survey data, 2026.

With a grand mean of 3.25, respondents agreed that mobile banking adoption improves transaction efficiency, enhances financial management, and reduces operational delays, indicating that mobile banking is perceived as a meaningful contributor to SME competitiveness.

Table 4: Effect of POS Usage on Customer Satisfaction

Item	Mean	Std. Dev.	Decision
POS increases payment convenience	3.41	0.65	Agree
POS improves service speed	3.29	0.72	Agree
POS enhances customer experience	3.22	0.74	Agree
Grand Mean	3.31	—	Agree

Source: Author's survey data, 2026.

A grand mean of 3.31 indicates strong agreement that POS usage increases payment convenience, improves service speed, and enhances customer experience.

Table 5: Influence of Social Media Engagement on Customer Loyalty

Item	Mean	Std. Dev.	Decision
Social media improves customer interaction	3.36	0.68	Agree
It enhances brand visibility	3.44	0.66	Agree
It increases repeat patronage	3.21	0.75	Agree
Grand Mean	3.34	—	Agree

Source: Author's survey data, 2026.

A grand mean of 3.34, the highest among the four technology-specific research questions, indicates that respondents strongly associate social media engagement with improved customer interaction, brand visibility, and repeat patronage.

Table 6: Impact of Website Adoption on Market Share

Item	Mean	Std. Dev.	Decision
Website increases customer reach	3.27	0.70	Agree
It improves business credibility	3.31	0.67	Agree
It enhances sales growth	3.19	0.73	Agree
Grand Mean	3.26	—	Agree

Source: Author's survey data, 2026.

With a grand mean of 3.26, respondents agreed that functional websites increase customer reach, improve business credibility, and enhance sales growth.

Table 7: Institutional Barriers Affecting Technology Adoption

Item	Mean	Std. Dev.	Decision
High cost limits adoption	3.38	0.69	Agree
Poor infrastructure affects usage	3.42	0.66	Agree
Lack of technical skills is a barrier	3.30	0.71	Agree
Grand Mean	3.37	—	Agree

Source: Author's survey data, 2026.

A grand mean of 3.37, the highest of all constructs measured, indicates strong agreement that high cost, poor infrastructure, and inadequate technical skills remain significant barriers constraining fuller technological adoption among SMEs in Enugu State, underscoring that the positive effects documented in this study are achieved despite, rather than in the absence of, meaningful structural constraints.

Regression Results and Hypothesis Testing

Table 8: Model Summary

R	R ²	Adjusted R ²	Std. Error of Estimate
0.812	0.659	0.648	0.412

Source: Authors' analysis of survey data using SPSS, 2026.

The multiple correlation coefficient ($R = 0.812$) indicates a strong positive relationship between the combined technological innovation variables and SME competitiveness. The coefficient of determination ($R^2 = 0.659$) shows that approximately 65.9% of the variation in SME competitiveness is jointly explained by mobile banking applications, POS usage, social media engagement, and website adoption, while the modest gap between R^2 and the Adjusted R^2 (0.648) suggests the model is not overfitted and that the predictors are relevant and meaningful.

Table 9: ANOVA – Overall Model Significance

Source	F-statistic	Sig.
Regression	54.32	0.000

Source: Authors' analysis of survey data using SPSS, 2026.

The F-statistic of 54.32 ($p = 0.000$) confirms that the overall regression model is statistically significant, indicating that the technological innovation variables, considered jointly, significantly predict changes in SME competitiveness rather than the observed relationship being attributable to chance.

Table 10: Regression Coefficients

Path	Beta (β)	t-value	Sig.	Decision
Mobile Banking → Customer Patronage	0.241	4.12	0.000	Significant
POS Usage → Customer Satisfaction	0.198	3.56	0.001	Significant
Social Media Engagement → Customer Loyalty	0.276	4.85	0.000	Significant
Website Adoption → Market Share	0.163	2.98	0.003	Significant

Source: Authors' analysis of survey data using SPSS, 2026.

All four technological innovation variables had a positive and statistically significant effect on their respective competitiveness outcomes. Mobile banking applications ($\beta = 0.241$, $p = 0.000$) significantly predicted customer patronage; POS usage ($\beta = 0.198$, $p = 0.001$) significantly predicted customer satisfaction; social media engagement ($\beta = 0.276$, $p = 0.000$) had the strongest effect among all four paths, predicting customer loyalty; and website adoption ($\beta = 0.163$, $p = 0.003$), while the weakest of the four paths, remained statistically significant in predicting market share.

Table 11: Summary of Hypotheses Testing

Hypothesis	Path	p-value	Decision ($\alpha = 0.05$)
H ₀₁	Mobile Banking → Customer Patronage	0.000	Rejected
H ₀₂	POS → Customer Satisfaction	0.001	Rejected
H ₀₃	Social Media → Customer Loyalty	0.000	Rejected
H ₀₄	Website → Market Share	0.003	Rejected

Since all p-values were below the 0.05 threshold, all four null hypotheses were rejected, confirming that mobile banking applications, POS machines, social media engagement, and functional websites each have a statistically significant effect on their respective SME competitiveness indicators in Enugu State.

Discussion of Findings

Mobile Banking Applications and Customer Patronage

The significant positive effect of mobile banking applications on customer patronage ($\beta = 0.241$, $p = 0.000$) suggests that increased use of mobile payment platforms enhances customer convenience, reduces transaction delays, and encourages repeat patronage. Customers appear more willing to patronise SMEs offering flexible, cashless payment options, particularly in a business environment where transaction speed and convenience strongly shape purchasing decisions. This finding is consistent with Nwibo and Okorie (2021), who observed that electronic banking adoption improved financial efficiency and customer participation in small business transactions in South-East Nigeria, and reinforces the broader international evidence that convenience and trust are central drivers of mobile banking's behavioural effects (Ghosh et al., 2020; Zhao et al., 2021).

Point of Sale Machines and Customer Satisfaction

The significant positive effect of POS usage on customer satisfaction ($\beta = 0.198$, $p = 0.001$) indicates that electronic payment systems improve service delivery by reducing cash-handling challenges, accelerating transactions, and improving the overall customer experience; POS-enabled businesses are perceived by customers as more reliable, organised, and modern. This finding aligns closely with Eneh (2021), who reported that POS usage in Enugu urban retail outlets significantly enhanced customer satisfaction through faster and more convenient payment processes, and is consistent with international evidence linking POS reliability and feature integration to satisfaction outcomes (Choi & Lee, 2023; Brown et al., 2024).

Social Media Handling and Customer Loyalty

Social media engagement exhibited the strongest effect among the four paths examined ($\beta = 0.276$, $p = 0.000$), suggesting that active online interaction, timely responses to customer inquiries, and consistent digital presence significantly enhance long-term customer relationships. SMEs that maintain strong social media engagement appear more likely to retain customers, build emotional connections, and encourage repeat purchases. This finding supports Agwu (2023), who found that social media marketing significantly enhanced brand loyalty and competitive advantage among fashion SMEs in Enugu, and is consistent with international evidence on the loyalty-building role of digital brand engagement (Chavez & Vega, 2021; Patel & Kumar, 2021).

Functional Websites and Market Share

Functional websites had a significant positive, though comparatively weaker, effect on market share ($\beta = 0.163$, $p = 0.003$), indicating that SMEs with active websites enjoy greater visibility, broader customer reach, and improved brand credibility than those without an online presence. A functional website functions as a digital storefront that extends business exposure beyond physical boundaries, thereby supporting market penetration. This finding is consistent with Udeh and Okafor (2022), who found that website adoption significantly improved the growth and market expansion of manufacturing SMEs in the Emene Industrial Layout, and with Adebayo and Olayinka (2019), who reported a similar positive relationship between functional websites and SME market share in Enugu.

Taken together, the pattern of results, all four hypotheses rejected, but with social media engagement exerting the strongest effect and website adoption the weakest, suggests that customer-facing, low-cost, high-frequency digital

interaction tools currently generate the greatest competitive returns for SMEs in Enugu State, while capital-intensive digital infrastructure such as websites, though still significant, yields comparatively smaller marginal gains, plausibly reflecting the cost, infrastructural, and digital-skills barriers to fuller website adoption and maintenance identified in the descriptive analysis of institutional barriers (Table 7).

Theoretical and Practical Implications

The findings carry clear implications for the three theoretical perspectives underpinning this study. Consistent with TAM, the strongest effects were observed for technologies most likely to be perceived by SME owners as both immediately useful and comparatively easy to deploy, mobile banking applications and social media handling, requiring lower upfront capital and technical sophistication than website development. Consistent with DOI theory, the persistence of significant institutional barriers (Table 7) despite an overall pattern of positive and significant technology effects indicates that Enugu State's SME sector remains, in aggregate, in the early-to-middle stages of the diffusion curve, with adoption still constrained by infrastructural and skills-related factors affecting the pace at which laggard enterprises catch up with early adopters. Consistent with RBV, the fact that all four technologies, despite varying in strength, produced statistically significant competitive effects supports the proposition that digital capabilities function as valuable, and for many SMEs still comparatively rare, strategic resources capable of generating a measurable competitive advantage in the Enugu State business environment.

Practically, the results suggest that SME managers seeking the fastest competitive returns on limited technology budgets should prioritise mobile banking integration and active social media engagement before undertaking more capital-intensive website development, without treating website investment as optional, since its effect on market share, while the weakest of the four paths, remained statistically robust. For financial institutions and telecommunications providers, the findings support continued investment in expanding affordable mobile banking and POS infrastructure to SME clusters, given the demonstrated customer-facing returns such infrastructure generates for participating businesses. For state and local government agencies, the consistently high mean scores recorded for institutional barriers (Table 7) indicate that policy interventions addressing electricity supply, internet cost, and digital-skills training would likely amplify, rather than merely complement, the competitive returns to technology adoption already being realised by SMEs in the state.

Synthesis of Objectives, Hypotheses, and Findings

Table 12 provides an integrative summary linking each study objective to its corresponding hypothesis and empirical outcome, offering a consolidated view of the study's contribution ahead of the concluding section.

Table 12: Summary of Objectives, Hypotheses, and Key Findings

Objective	Hypothesis	Key Result	Outcome
Effect of mobile banking on customer patronage	H ₀₁	$\beta = 0.241, p = 0.000$	Significant positive effect

Objective	Hypothesis	Key Result	Outcome
Effect of POS machines on customer satisfaction	H ₀₂	$\beta = 0.198, p = 0.001$	Significant positive effect
Relationship between social media handling and customer loyalty	H ₀₃	$\beta = 0.276, p = 0.000$	Significant positive effect (strongest)
Effect of functional website on market share	H ₀₄	$\beta = 0.163, p = 0.003$	Significant positive effect (weakest)

The consolidated results in Table 12 confirm that every hypothesised technology-competitiveness relationship examined in this study was statistically supported, with the magnitude of effect varying systematically by technology type, a pattern that directly informs the prioritisation guidance offered in the recommendations that follow.

Conclusion and Recommendations

Conclusion

This study examined the effect of technological innovation, specifically mobile banking applications, POS machines, social media handling, and functional websites, on the competitiveness of SMEs in Enugu State, Nigeria. The evidence indicates that technological innovation is no longer optional but essential for the survival and growth of SMEs in the state: the shift from traditional, cash-based, brick-and-mortar operations to digitally integrated business models helps firms overcome the constraints of physical location and inefficient cash transactions. Despite conservative business practices and infrastructural limitations that together constrain fuller adoption, there is clear evidence of a transition toward a more digitally integrated SME economy, with digitally engaged SMEs demonstrating higher customer retention, broader market reach, and improved operational efficiency than their less digitally engaged counterparts.

Recommendations

Based on the findings, the study recommends, first, that SME owners intensify the adoption and use of mobile banking applications as a core business tool, offering multiple mobile payment options (bank apps, USSD, fintech wallets) to maximise transaction convenience, supported by digital literacy programmes from government and financial institutions. Second, SMEs should prioritise the deployment and consistent maintenance of POS machines, while financial service providers should improve network reliability and reduce transaction charges to encourage wider adoption. Third, SME operators should strengthen their social media presence across platforms such as WhatsApp, Facebook, Instagram, and X, ensuring timely responses to customer inquiries and consistent, interactive engagement, supported by digital marketing training. Fourth, SMEs should invest in developing and maintaining functional, mobile-friendly, and search-optimised websites, with government and SME support agencies considering subsidies or technical support to lower the cost barrier to establishing an online presence.

Contribution to Knowledge and Limitations

This study contributes to management scholarship by providing localised empirical evidence on the combined effect of four distinct digital technologies within the socio-economic context of South-East Nigeria, advancing existing literature by showing how technological innovation reshapes, rather than merely supplements, traditional SME business practice in the region. The study's principal limitation lies in its cross-sectional design, which captures a single point in time and cannot establish how sustained technological adoption influences competitiveness over a longer horizon; the study was also constrained by SME owners' initial hesitation to disclose certain operational information, mitigated through confidentiality assurances and cross-referencing with SMEDAN and National Bureau of Statistics reports. Future research should adopt longitudinal designs to assess the effect of sustained technological adoption over time, and undertake comparative analyses between SMEs in Enugu and other major South-East Nigerian commercial hubs such as Aba and Onitsha to provide deeper regional insight into patterns of digital transformation. Future studies would also benefit from incorporating objective performance data, such as recorded sales or transaction volumes, alongside the perception-based measures used here, and from testing potential moderating variables, including firm size, sector, and owner digital literacy, which this study's single-equation models did not examine but which the descriptive evidence on institutional barriers suggests may meaningfully condition the strength of the technology-competitiveness relationships documented.

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