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DIGITAL TRANSFORMATION DIMENSIONS AND CUSTOMER SATISFACTION IN DEPOSIT MONEY BANKS: EMPIRICAL EVIDENCE FROM CALABAR METROPOLIS, NIGERIA

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ABSTRACT

This study investigated the effects of digital transformation on customer satisfaction in deposit money banks in Calabar Metropolis, Cross River State, Nigeria. It focused on electronic banking, artificial intelligence and digital infrastructure as dimensions of digital transformation. A cross-sectional survey design was employed, and data were obtained from bank customers through a structured questionnaire. Using the Topman formula, a sample size of 350 was established. Of the questionnaire copies administered, 326 were valid for analysis, yielding a response rate of 93.1%. Data were analysed using descriptive statistics and multiple linear regression with the Statistical Package for the Social Sciences (SPSS). The regression model was statistically significant ($F = 23.491$, $p < .001$) and explained 18.0% of the variation in customer satisfaction ($R^2 = .180$). The results showed that electronic banking (beta = .223, p = .006), artificial intelligence (beta = .168, p = .016) and digital infrastructure (beta = .457, p < .001) each had a positive and statistically significant effect on customer satisfaction. Digital infrastructure emerged as the strongest predictor, followed by

Introduction and Rationale

In the global banking landscape, digital transformation has been driven by advances in financial technology and changes in how customers access financial services. The growth of internet banking and mobile applications has enabled customers to transfer funds, pay bills and monitor their accounts without visiting bank branches (Aliuba et al., 2025). The rise of financial technology (FinTech) companies has also increased competition by providing faster and more accessible financial services (Ndaman & Akomolafe, 2025). Cloud computing, artificial intelligence and data analytics have further expanded the ways banks manage transactions, assess risks and interact with customers (Xie & Wang, 2023). These developments have changed banking

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electronic banking and artificial intelligence. The study concludes that these dimensions of digital transformation are significant predictors of customer satisfaction in deposit money banks in Calabar, with reliable digital infrastructure making the greatest relative contribution. It recommends that banks improve electronic banking channels, strengthen AI-enabled customer support and invest in reliable digital systems to provide more convenient, responsive and uninterrupted banking services.

Keywords: Digital Transformation, Electronic Banking, Artificial Intelligence, Digital Infrastructure, Customer Satisfaction, Deposit Money Banks.

from a service largely delivered through physical branches to one increasingly supported by digital channels. In response, traditional banks around the world have adopted digital platforms to improve transaction processing and respond to changing customer expectations (Porfirio et al., 2024).

Across Africa, the expansion of mobile telecommunications and electronic payment systems has encouraged the adoption of digital banking (Olota et al., 2025). In Nigeria, this shift has been shaped by the growing use of smartphones, increased demand for remote banking and the expansion of electronic payment channels. The Central Bank of Nigeria's cashless policy has also encouraged the use of electronic transactions (Joseph et al., 2026). Competition from fintech companies and the need to serve customers across locations with limited access to physical branches have further pushed banks towards digital solutions (Alonge et al., 2021; Ononye et al., 2024). Digital transformation refers to the integration of digital technologies into an organisation's operations, service delivery and customer interactions to change how it functions and creates value (Alonge et al., 2021). For Nigerian deposit money banks (DMBs), adopting these technologies has therefore become an important response to changes in the financial services market, rather than simply a choice to modernise existing systems (Edesiri, 2026).

The relevance of digital banking is particularly evident in Calabar Metropolis, the commercial and administrative centre of Cross River State, where banking services support the financial activities of diverse population groups. The presence of tertiary institutions and their substantial student populations, alongside civil servants, professionals, traders and other business operators (Uyang et al., 2024), generates considerable demand for accessible and dependable banking services. For students, civil servants and business operators, digital banking provides an important means of conducting financial transactions without the time and transportation costs associated with frequent visits to physical bank branches (Etuk et al., 2025). Consequently, the reliability, accessibility, speed and functionality of digital banking platforms are particularly important in this urban economy (Umoh & Akpan, 2026). Failed electronic transactions, delayed reversals, application downtime and ineffective digital customer support can disrupt personal financial activities, delay business transactions and undermine customers' confidence in deposit money banks. This local context makes Calabar Metropolis an important setting for examining whether the digital transformation initiatives of deposit money banks translate into satisfactory banking experiences for their customers.

However, the adoption of digital technologies has not removed persistent service delivery problems in this setting. Customers still experience failed transactions, delayed reversals, unavailable mobile applications and difficulty obtaining assistance when electronic transactions go wrong (Ebitu et al., 2023; Aliuba et al., 2025). Such problems can arise when digital platforms are poorly integrated with existing banking systems. Unstable electricity and network connectivity can also interrupt transactions. Inadequate cybersecurity measures may expose customers to fraud, while automated customer service systems may fail to resolve enquiries that fall outside their programmed responses (Abdulquadri et al., 2021). These challenges raise questions about whether investments in digital technology consistently translate into better customer experiences. Although existing Nigerian studies have examined digital transformation in relation to operational efficiency and bank performance (Aliuba et al., 2025; Ononye et al., 2024; Edesiri, 2026; Abari-Ogunsona et al., 2025; Sajuyigbe et al., 2026), the respective contributions of specific digital transformation dimensions to customer satisfaction in Nigerian deposit money banks remain insufficiently established. This constitutes a major challenge for deposit money banks because uncertainty about the contributions of specific digital transformation dimensions may lead to poorly directed investments and inefficient use of resources. Weaknesses in artificial intelligence, electronic banking and digital infrastructure may result in poor customer support, failed transactions, service interruptions and delays in resolving complaints. These problems may reduce customer satisfaction, weaken trust and encourage customers to switch to competing banks. A decline in customer retention and patronage may further reduce deposit mobilisation and revenue generation, thereby undermining banks' competitiveness and overall performance. Therefore, this study is necessary to establish the respective effects of digital transformation dimensions (artificial intelligence, electronic banking and digital infrastructure) on customer satisfaction in deposit money banks in Calabar Metropolis. The findings provide evidence to guide digital investment decisions, address service delivery weaknesses and improve customer satisfaction and banking performance. To this end, the study specifically pursued the following specific research objectives:

i. To examine the effect of artificial intelligence on customer satisfaction in deposit money banks in Calabar Metropolis.
ii. To assess the effect of electronic banking on customer satisfaction in deposit money banks in Calabar Metropolis.
iii. To determine the effect of digital infrastructure on customer satisfaction in deposit money banks in Calabar Metropolis.

LITERATURE REVIEW

Digital transformation in the banking sector

Digital transformation refers to the integration of digital technologies into an organization's operations, processes and service delivery to improve performance and create value for customers (Ayeni et al., 2025). It can also be understood as an organisational change process through which digital technologies reshape existing business models, capabilities and approaches to innovation (Abdurrahman, 2025). In summary, digital transformation involves using technology to change how an organisation operates, delivers services and responds to customer

needs. In the banking sector, it entails adopting electronic banking platforms, artificial intelligence, digital payment systems, automated service channels and supporting digital infrastructure to improve banking operations and customer interactions (Alonge et al., 2021; Abdulquadri et al., 2021). Digital transformation is important because it can increase operational efficiency, expand access to financial services, accelerate transactions, support innovation and improve customer experiences, while also strengthening banks' performance and competitiveness (Ononye et al., 2024; Aliuba et al., 2025). Its integration is driven by several factors, including changing customer expectations for convenient and accessible banking, advances in digital technology, competition from financial technology firms, the need to reduce operating costs, demands for faster service delivery and the pursuit of improved organisational performance (Zhang et al., 2025). Other influences include management's capacity to develop digital capabilities, the availability of technological resources and the strategic need to adapt to changes in the financial services environment (Porfirio et al., 2024). In Nigeria, the adoption of digital technologies also reflects efforts by banks to modernize their operations and respond to evolving customer needs and industry demands (Edesiri, 2026). Collectively, these developments position digital transformation as an important approach to improving banking operations, although its outcomes depend on how effectively banks implement and manage their digital capabilities.

Customer Satisfaction in the Banking Sector

Customer satisfaction refers to the extent to which a bank's products and services meet or exceed customers' expectations and fulfil their financial needs (Pakurár et al., 2019). It can also be understood as customers' overall evaluation of their banking experiences based on the value, they receive from the bank's services relative to their expectations (Mainardes & Freitas, 2023). In summary, customer satisfaction reflects customers' assessment of how well a bank meets their needs and expectations through its services, transactions and interactions. It is important in the commercial banking sector because satisfied customers are more likely to remain loyal, continue using banking services and maintain long-term relationships with their banks (Supriyanto et al., 2021; Fida et al., 2020). Satisfaction also has implications for customer retention and banks' competitiveness in an increasingly digital financial services market (Kumar et al., 2022). Customer satisfaction in this study is assessed through customer delight, customer excitement and customer repeat patronage (Ebitu et al., 2023). Customer delight reflects the positive response customers experience when banking services meet or exceed their expectations, while customer excitement describes the positive feelings and enthusiasm associated with their banking experiences. Customer repeat patronage refers to customers' willingness to continue using the services of their existing bank. These indicators capture customers' emotional responses to banking services and their behavioural inclination to maintain an ongoing relationship with the bank. They are relevant in a digital banking context, where convenient and effective technology-enabled interactions may shape customers' experiences and willingness to continue using banking services (Vencataya et al., 2019; Pooya et al., 2020; Kaur et al., 2021; Li et al., 2021). Research on electronic banking also highlights the relevance of customers' experiences with digital banking services to their satisfaction (Ebitu et al., 2023). Furthermore, the

relationship between perceived service quality, customer satisfaction and loyalty supports the consideration of customers' positive responses and continued patronage when examining satisfaction in banking (Supriyanto et al., 2021; Fida et al., 2020; Kumar et al., 2022; Mainardes & Freitas, 2023).

Electronic Banking and Customer Satisfaction

Electronic banking represents the use of electronic channels and digital platforms to provide banking services without requiring customers to visit physical branches for every transaction (Abari-Ogunsona et al., 2025). It includes mobile banking, electronic payment services, digital self-service systems, digital wallets and instant payments. From the resource-based view, these facilities represent technological resources through which banks can expand service access and improve the way customers conduct financial transactions (Barney, 1991). Within digital transformation, electronic banking changes how customers access accounts, transfer funds, make payments and manage their finances (Olumoyegun et al., 2024). Its importance lies in providing convenient access to banking services, reducing dependence on branch-based transactions and enabling customers to complete routine activities more quickly. Electronic banking may therefore improve customer satisfaction by saving time, offering flexible access to services, supporting timely payments and giving customers greater control over their transactions (Edesiri, 2026). These benefits, however, depend on the usability and dependability of the electronic channels provided by banks.

This argument is supported by Ebitu et al. (2023), who found that automated payment systems, electronic delivery channels and electronic information services had significant positive effects on customer satisfaction in commercial banks. Similarly, Ndaman and Akomolafe (2025) reported that internet banking significantly influenced customer satisfaction in selected microfinance banks in Abuja. These findings suggest that electronic banking can improve customer satisfaction by making financial transactions more accessible and convenient. Nevertheless, the benefits depend on customers' ability to access and use the available channels successfully. This makes it relevant to examine electronic banking as a distinct digital transformation dimension and establish its relationship with customer satisfaction in Nigerian deposit money banks. Therefore, it is hypothesized that:

H_1: Electronic banking has a significant effect on customer satisfaction in deposit money banks in Calabar.

Artificial Intelligence and Customer Satisfaction

Artificial intelligence (AI) is an important component of digital transformation because it enables organisations to automate tasks, interpret customer information and provide technology-assisted interactions. In banking, AI refers to the application of intelligent digital systems to perform activities that traditionally require human input, including responding to enquiries, assisting customers and tailoring services to their needs (Abdulquadri et al., 2021). From the resource-based view, AI can be regarded as a technological capability that banks deploy to improve the delivery of services and strengthen customer-related outcomes (Barney, 1991). In this study, AI is examined through AI chatbots, virtual assistants, robotic advisory systems and

AI-enabled service personalization. These applications can provide customers with faster responses, round-the-clock assistance, more relevant financial information and support that reflects their individual needs. They may also reduce delays in routine enquiries and make interactions with banks more convenient. However, the extent to which these benefits improve customer satisfaction depends on how effectively the systems respond to customer needs and resolve their enquiries.

This position is supported by Olota et al. (2025), whose study of Nigerian banks found that AI-related banking applications influenced customer satisfaction, although the effects varied across the technologies examined. Ekwutosi (2025) also reported a significant positive relationship between service automation and customer satisfaction, with chatbots contributing to customer retention. Similarly, Mohammed and Okechukwu (2025) found that AI-driven chatbots significantly improved customer satisfaction in deposit money banks in Abuja, while AI-powered customer analytics helped reduce customer-service response times. These findings support the view that artificial intelligence can contribute to customer satisfaction through responsive, automated and personalized banking interactions. However, they do not establish that every AI application produces the same outcome across all banking contexts, making it necessary to examine AI as a distinct dimension of digital transformation in Nigerian deposit money banks. Therefore, it is hypothesized that:

H_2: Artificial intelligence has a significant effect on customer satisfaction in deposit money banks in Calabar.

Digital Infrastructure and Customer Satisfaction

Digital infrastructure, as a dimension of digital transformation, refers to the technological foundation that enables an organisation to deliver and manage its services through digital systems. It encompasses the hardware, software, networks and supporting systems required to operate digital services reliably (Xie and Wang, 2023). From a resource-based perspective, digital infrastructure can also be understood as a strategic organisational resource that supports the development and effective use of digital capabilities to improve business performance (Barney, 1991). In this study, digital infrastructure refers specifically to the reliability of digital systems, platform availability, system stability and continuity of digital banking services. It enables deposit money banks to process transactions, maintain access to banking platforms and support uninterrupted customer interactions. Its importance lies in the fact that even advanced electronic banking services and artificial intelligence applications depend on stable and accessible technological systems. Reliable infrastructure can enhance customer satisfaction by reducing transaction interruptions, limiting failed payments, ensuring consistent access to banking services and increasing customers' confidence in completing financial transactions. These relationships are consistent with the broader argument that digital transformation can strengthen banking performance and customer-related outcomes (Zhang et al., 2025; Elekwachi and Onwuanaku, 2025).

The foregoing viewpoint suggests that, as a digital transformation dimension, digital infrastructure could substantially enhance customer satisfaction in a financial service organisational context. This viewpoint is supported by Abari-Ogunsona et al. (2025), whose study

examined digitisation for performance improvement in Nigerian banks, highlighting the relevance of digital technology to banking operations. It is also consistent with Edesiri (2026), who investigated the effects of digital transformation on the operations of commercial banks in Delta State, Nigeria. Furthermore, the study by Alonge et al. (2021) examined digital transformation in retail banking in relation to customer experience and profitability, providing a relevant basis for considering the customer-related value of digital banking capabilities. Although these studies provide a useful foundation for understanding digital transformation in banking, their stated research focuses do not, by themselves, establish the independent effect of digital infrastructure on customer satisfaction. This relationship therefore warrants specific empirical examination within Nigerian deposit money banks. Therefore, it is hypothesized that:

H_3: Digital infrastructure has a significant effect on customer satisfaction in deposit money banks in Calabar.

Theoretical Framework

This study is underpinned by the Resource-Based View (RBV) theory, advanced by Barney (1991), which explains how an organization's resources can contribute to superior performance and competitive advantage. The theory argues that differences in organisational performance partly arise from differences in the resources firms possess and how effectively they deploy them. These resources include tangible assets, technological systems, knowledge and organisational capabilities. From this perspective, acquiring resources alone does not guarantee improved performance; organisations must use them effectively to generate value. The RBV therefore provides a basis for explaining how banks can use digital technologies to improve business outcomes, including customer satisfaction. Recent empirical research supports the relevance of this perspective to digital transformation in banking. For example, Abdurrahman (2025) examined digital transformation in relation to digital product innovation performance in the banking industry using the RBV and dynamic capabilities perspectives. The findings showed that organisational resources and capabilities supported digital transformation, which subsequently enhanced digital product innovation performance. Similarly, Zhang et al. (2025), using data from 90 commercial banks, found that digital transformation generally supported bank performance, although the effects varied across its dimensions and depended on how digital resources were deployed. These findings suggest that the contribution of digital technology to business performance depends partly on how banks integrate and utilise their technological resources.

The RBV is appropriate for this study because artificial intelligence, electronic banking and digital infrastructure represent technological resources that deposit money banks can deploy to improve customer satisfaction. Artificial intelligence enables banks to automate customer interactions and respond to enquiries, while electronic banking provides digital channels through which customers can access accounts and conduct transactions. Digital infrastructure provides the technological foundation for operating these services and supporting customers' access to banking facilities. When effectively deployed, these resources may make banking transactions more convenient, improve access to financial services and help customers complete their banking activities more efficiently. Empirical evidence from Nigeria also establishes the relevance of investigating this relationship. Elekwachi and Onwuanaku (2025), in their study of deposit money

banks in Port Harcourt, examined digital transformation strategies in relation to customer satisfaction, demonstrating the relevance of digital transformation to customer outcomes in the local banking context. However, the RBV suggests that the presence of digital technologies should not automatically be equated with improved performance. Their contribution depends on how effectively banks apply these resources to meet customers' banking needs. Accordingly, the theory provides a suitable foundation for examining the respective effects of artificial intelligence, electronic banking and digital infrastructure on customer satisfaction in Nigerian deposit money banks.

Review of Empirical Studies and Conceptual Model

The review of empirical studies (see Table 1) on digital transformation in the Nigerian banking sector shows that previous authors have approached the subject from two broad perspectives: its implications for banks' internal performance and its influence on customers' experiences. From the organisational perspective, Aliuba et al. (2025) investigated operational efficiency, Ononye et al. (2024) examined the relationship between digital transformation and firm performance, and Edesiri (2026) considered changes in commercial banks' business operations. Abari-Ogunsona et al. (2025) and Sajuyigbe et al. (2026) also examined digital technologies in connection with performance improvement in Nigerian banks. This strand of research provides a foundation for understanding digital transformation as a means through which banks can strengthen their operations. However, improved internal operations do not necessarily translate into greater customer satisfaction. Customer-focused investigations have consequently considered the role of particular technologies in shaping banking experiences. Ebitu et al. (2023) examined electronic banking in relation to customer satisfaction, while Olumoyegun et al. (2024) investigated artificial intelligence in selected deposit money banks in Lagos State. Ekwutosi (2025), Olota et al. (2025), and Mohammed and Okechukwu (2025) further examined artificial intelligence in relation to customer experience, satisfaction and customer service. Taken together, these areas of inquiry highlight the need to distinguish the contribution of individual technologies to customer outcomes from their broader implications for bank operations.

A closer examination of technology-specific research reveals different entry points for understanding customer responses to digital banking. Abdulquadri et al. (2021) investigated chatbot adoption in financial services, drawing attention to the use of automated systems in customer interactions. Studies by Ndaman and Akomolafe (2025), Okpala and Chime (2026), and Ebong et al. (2026) considered financial technology in relation to customer satisfaction across different financial service settings. Joseph et al. (2026), in turn, focused on AI-driven customer service and customer loyalty among mobile fintech users in Calabar. Beyond financial services, Oludoyi et al. (2026) examined digital transformation in relation to sales growth, customer satisfaction and retention among SMEs, while Ayeni et al. (2025) investigated its relationship with business performance among SMEs in Ibadan. These studies broaden the understanding of how digital technologies may contribute to customer and organisational outcomes. Nevertheless, their differing research settings and focal variables make it difficult to determine whether findings relating to a particular technology or business sector can be applied directly to customer satisfaction in Nigerian deposit money banks.

Furthermore, although previous studies have examined digital transformation, artificial intelligence, electronic banking and financial technology in relation to customer satisfaction and business performance (Ebitu et al., 2023; Ekwutosi, 2025; Olota et al., 2025; Okpala and Chime, 2026), these studies have largely examined different aspects of digital technology separately. There is still limited evidence on how artificial intelligence, electronic banking and digital infrastructure jointly influence customer satisfaction in deposit money banks in Nigeria. In particular, the relative contribution of each of these technological resources to customer satisfaction remains insufficiently established. This gap provides the basis for examining the relationship between digital transformation and customer satisfaction in Nigerian deposit money banks.

TABLE 1: Empirical studies on digital transformation and customer satisfaction in the banking sector

SN	Author(s)	Study Objectives	Methodology	Key Findings
1	Sajuyigbe et al. (2026)	To investigate the impact of artificial intelligence (AI) technologies on the performance of Nigerian banks, with particular emphasis on operational efficiency, customer satisfaction, deposit mobilisation, and overall financial performance.	The study adopted a survey research design using primary data collected from 228 respondents across six selected banks through a structured questionnaire. Path Analysis–Structural Equation Modelling (PA-SEM) was employed to analyse the data using STATA version 15.	The study found that AI-driven applications, including chatbots, personalised banking services, and automated loan processing, substantially enhanced customer satisfaction and deposit mobilisation. The findings further highlighted the role of AI technologies in improving operational efficiency, strengthening customer engagement, and enhancing the overall performance and competitiveness of Nigerian banks.
2	Abari-Ogunsona et al. (2025)	To examine the impact of digitalisation on the performance of commercial banks in Nigeria, focusing on mobile banking, total assets, and non-performing loans as determinants of return on assets (ROA).	The study adopted an ex post facto research design using secondary panel data from Nigerian commercial banks covering the period 2012–2022. Data were analysed using descriptive statistics, panel least squares, cross-sectional dependence tests, and fixed- and random-effects models.	The study found that digitalisation generally enhanced bank performance, although the effects varied depending on the scale of operations and infrastructure costs. Mobile banking initially demonstrated a positive effect on return on assets, while the fixed-effects results indicated a slight negative effect, possibly due to implementation costs.
3	Olumoyegun et al. (2024)	To examine the effect of artificial intelligence on customer satisfaction in selected deposit money banks in Lagos State, Nigeria, specifically focusing on the effect of electronic payment systems on customer experience and robotic advisory systems on customer loyalty.	The study adopted a survey research design, using a multistage sampling technique to select 385 customers from four systematically important banks: First Bank, United Bank for Africa (UBA), Zenith Bank, and Guaranty Trust Bank (GTB). Data were collected through structured questionnaires and analysed using multiple regression analysis.	The study found that electronic payment systems significantly influenced customer experience, with electronic fund transfers, digital wallets, and mobile payments demonstrating positive effects. Robotic advisory systems also significantly influenced customer loyalty, particularly through technical competency and financial planning capabilities.
4	Olota et al. (2025)	To examine the effect of artificial intelligence on customer satisfaction in the Nigerian banking sector, specifically by investigating the effect of digital payment systems on service reliability and smart banking solutions on digital support responsiveness.	The study adopted a descriptive survey research design, using a simple random sampling technique to select respondents. The sample size was determined using Taro Yamane's formula, while data collected through questionnaires were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS.	The study found that digital payment systems positively and significantly influenced service reliability through secure fund transfers, while instant payment confirmation had a positive but statistically insignificant effect at the 5% significance level. Smart banking solutions positively influenced digital support responsiveness through automated account management, whereas personalised financial insights had a negative but statistically insignificant effect

SN	Author(s)	Study Objectives	Methodology	Key Findings
5	Abdulquadri et al. (2021)	To examine the adoption of chatbots as digital transformation tools in Nigerian financial services, with particular emphasis on improving customer experience, transforming banking business models, and promoting financial inclusion.	The study adopted the Search–Access–Test (S-A-T) model to assess how Nigerian banks implement and deploy chatbots in their financial service delivery. The approach focused on evaluating chatbot accessibility, responsiveness, functionality, and ability to meet customers' needs.	The study found that most Nigerian banks had adopted chatbots to enhance customer engagement and financial inclusion, with WhatsApp being the most frequently used platform. However, the chatbots demonstrated limited responsiveness beyond predefined conversational pathways, and none supported indigenous Nigerian languages.
6	Okpala and Chime (2026)	To examine the effect of financial technology on bank customers' satisfaction in Anambra State, specifically focusing on real-time gross settlement, electronic fund transfer, mobile transfer, and the Instant Payment System (NIP).	The study adopted a descriptive survey research design, using primary data collected through structured questionnaires from customers of deposit money banks across the three senatorial zones of Anambra State. The sample size was reported as 368 respondents, although the description also referenced 384. Data were analysed using percentage tables and regression analysis, while the study was anchored on Technology Acceptance Theory.	The study found that real-time gross settlement, electronic fund transfer, and mobile transfer had significant effects on customer satisfaction in deposit money banks in Anambra State. The study concluded that financial technology significantly influences customer satisfaction and recommended improving the availability, adequacy, and accessibility of electronic payment services to ensure seamless banking transactions.
7	Joseph et al. (2026)	To examine the effects of AI-driven customer service on customer loyalty among mobile FinTech users in Calabar, Cross River State, Nigeria, specifically focusing on AI chatbots, personalised service experience, quick service automation, and AI security infrastructure.	The study adopted a cross-sectional survey research design, using purposive sampling to select mobile FinTech users who had actively used mobile FinTech platforms for at least one year. A sample size of 357 respondents was determined using the Topman formula, and 342 valid responses were obtained through a structured five-point Likert-scale questionnaire. Data were analysed using descriptive statistics and multiple linear regression in SPSS.	The study found that AI chatbots, AI security infrastructure, personalised service experience, and quick service automation had positive and statistically significant effects on customer loyalty.
8	Ebong et al. (2026)	To examine the effect of financial technology transactions on customer satisfaction in selected commercial banks in Calabar metropolis, Cross River State, Nigeria, specifically focusing on mobile banking, peer-to-peer lending, and FinTech chatbot artificial intelligence.	The study adopted a quantitative research approach using primary data collected from a population of 167,820, with a stated sample size of approximately 399 respondents. Multiple regression analysis was employed to examine the relationships between mobile banking, peer-to-peer lending, FinTech chatbot AI, and customer satisfaction.	The study found that mobile banking, peer-to-peer lending, and FinTech chatbot AI had significant effects on customer satisfaction in selected commercial banks in Calabar metropolis. The findings suggest that digital banking applications, online lending platforms, and AI-enabled customer service contribute to improving customers' banking experiences.
9	Ndaman and Akomolafe (2025)	To examine the effect of financial technology on customer satisfaction in selected microfinance banks in the Federal Capital Territory (FCT), Abuja, with particular emphasis on internet banking and mobile banking.	The study adopted a descriptive survey research design, using primary data collected through a structured five-point Likert-scale questionnaire administered to 217 respondents drawn from the employees of five selected microfinance banks. The study reported a population comprising 298 employees and 323 other respondents. Data were analysed using simple percentages and regression analysis with SPSS version 27.	The study found that internet banking had a significant effect on customer satisfaction in the selected microfinance banks. The findings highlighted the importance of investing in advanced internet technologies, user-friendly interfaces, and reliable service delivery to improve customer satisfaction.
10	Mohammed and	To investigate the impact of artificial intelligence on customer	The study adopted a descriptive research design, focusing on employees from five	The study found that AI-driven chatbots significantly improved customer satisfaction in deposit money

SN	Author(s)	Study Objectives	Methodology	Key Findings
	Okechukwu (2025)	service in deposit money banks, specifically examining how AI-driven chatbots and AI-powered customer analytics systems influence customer satisfaction and service response time.	deposit money banks in Abuja. A sample of 347 respondents was selected from a population of 1,442 using stratified random sampling. Data were collected through structured questionnaires and analysed using descriptive and inferential statistics, including regression analysis.	banks. The findings further indicated that AI-driven chatbots and AI-powered customer analytics enhanced customer satisfaction and reduced service response time.
11	Ekwutosi (2025)	To investigate the impact of artificial intelligence adoption on customer experience in the Nigerian banking sector, focusing on the relationship between service automation and customer satisfaction, as well as the influence of AI on customer retention.	The study adopted a quantitative research approach, using questionnaires to collect data from public and private bank customers or respondents in Owerri, Imo State. A total of 300 questionnaires were distributed, of which 260 valid responses were analysed. The specific statistical techniques employed were not stated in the provided summary.	The study found a significant positive relationship between service automation and customer satisfaction. AI-powered chatbots were also found to improve customer retention by providing personalised and efficient banking services.
12	Ononye et al. (2024)	To examine the effect of digital transformation on firm performance in commercial banks in Delta State, Nigeria, while assessing the mediating role of organisational learning in the relationship.	The study adopted a cross-sectional survey research design, using data collected from 284 mid-level employees of commercial banks in Delta State, Nigeria. Data were analysed using the Partial Least Squares approach to Structural Equation Modelling (PLS-SEM).	The study found that digital transformation had a positive and statistically significant direct effect on firm performance and an indirect effect through organisational learning. Organisational learning demonstrated a more pronounced influence on organisational performance than digital transformation itself
13	Aliuba et al. (2025)	To examine the effect of digital transformation on operational efficiency in traditional banking institutions in Anambra State, Nigeria, specifically by determining the effect of blockchain technology on cost reduction and the influence of data security on customer loyalty.	The study adopted a descriptive survey research design, using primary data collected from 353 respondents through a structured questionnaire. Data were analysed using regression techniques, guided by the Fourth Industrial Revolution (4IR) theory and the Technology–Organisation–Environment (TOE) framework.	The study found that blockchain technology had a significant positive effect on cost reduction, while data security significantly influenced customer loyalty. The findings indicated that digital transformation can improve operational efficiency and strengthen customer loyalty through cost-reduction mechanisms and enhanced data security.
14	Edesiri (2026)	The study examined the effects of digital transformation on the operational performance of selected commercial bank branches in Agbor and Asaba, Delta State, focusing on omnichannel banking, automated clearing and settlement systems, and digital infrastructure optimisation.	The study adopted a quantitative survey design, collecting questionnaire data from 400 bank personnel. Data were analysed using descriptive statistics and multiple regression with SPSS version 28.	Digital transformation explained 58.4% of the variation in operational performance. Omnichannel banking improved transaction processing, automated clearing and settlement reduced expenditure, and digital infrastructure optimisation improved operational reliability; all three effects were statistically significant
15	Ayeni et al. (2025)	The study examined the effect of digital transformation on SME business performance in Ibadan, Oyo State, focusing on automation, digital skills and training, and online presence and engagement.	The study adopted a descriptive research design, using structured questionnaires and secondary data from SME records. A purposive sample of 381 SME managers was selected, and data were analysed using descriptive statistics and multiple regression in SPSS version 24.0.	Automation, digital skills and training improved revenue growth and operational efficiency, while online presence and engagement enhanced customer retention. The findings highlighted the importance of digital capabilities in improving SME performance.
16	Oludoyi et al. (2026)	The study examined the effect of digital transformation on SME performance in Ondo State, Nigeria, focusing on sales growth, customer	The study adopted a cross-sectional survey design, collecting data through structured questionnaires administered to 208 SME owners, supervisors and managers. Multiple	The findings revealed that digital transformation positively influenced sales growth, customer satisfaction and customer retention among SMEs. The study also found that POS machines, social

SN	Author(s)	Study Objectives	Methodology	Key Findings
		satisfaction and customer retention.	regression analysis was used to test the relationships between digital transformation and the performance outcomes.	media, websites and accounting software were widely adopted, while CRM, ERP and mobile applications were less common.

Source: Authors' literature review

Based on the gaps identified in the empirical literature, this study examines the relationship between digital transformation and customer satisfaction in deposit money banks in Nigeria. Digital transformation is the independent variable and is measured through electronic banking, artificial intelligence and digital infrastructure. Electronic banking covers mobile banking, electronic payment services, digital self-service systems, digital wallets and instant payments. These technologies enable customers to conduct banking transactions through digital channels. Artificial intelligence refers to the application of AI chatbots, virtual assistants, robotic advisory systems and AI-enabled service personalization in banking activities. Digital infrastructure comprises digital system reliability, platform availability, system stability and continuity of digital banking services. These dimensions represent different technological resources through which banks support and deliver digital banking services (Abari-Ogunsona et al., 2025; Olota et al., 2025; Okpala and Chime, 2026; Ebong et al., 2026; Edesiri, 2026; Sajuyigbe et al., 2026).

Customer satisfaction is the dependent variable and is assessed through customer delight, customer excitement and repeat patronage (Ebitu et al., 2023). Customer delight reflects a customer's positive response when banking experiences exceed expectations, while customer excitement captures the positive feelings generated by the use of banking services. Repeat patronage refers to the customer's willingness to continue using the bank's services. The conceptual model proposes that electronic banking, artificial intelligence and digital infrastructure may influence customer satisfaction through the convenience of digital transactions, AI-enabled customer interactions and the dependable availability of banking platforms. As presented in Figure 1, the model provides a basis for testing the relationship between each digital transformation dimension and customer satisfaction in Nigerian deposit money banks.

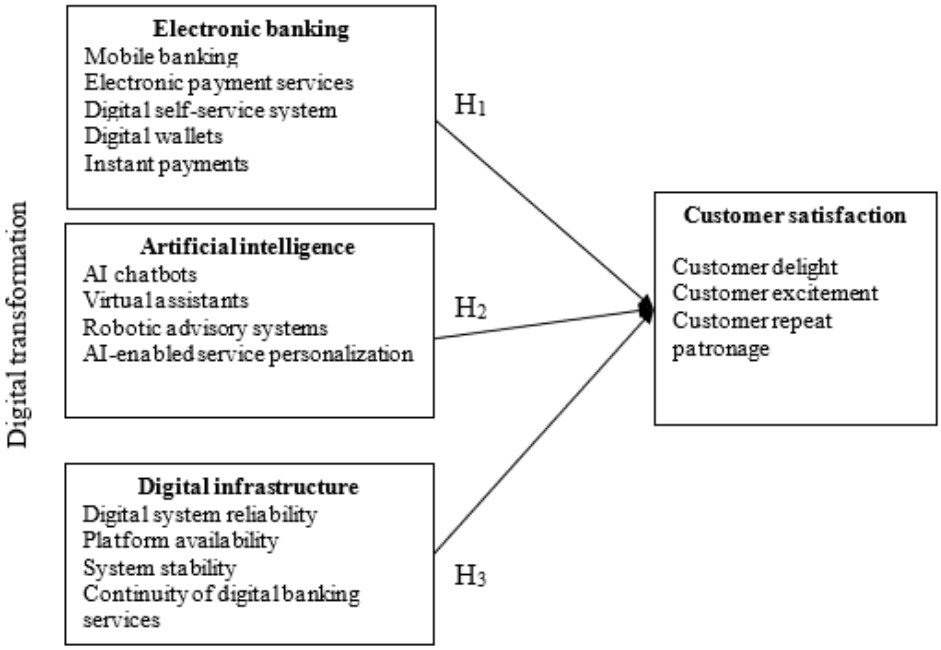

FIG. 1: Conceptual model of the study

Source: Independent variable parameters were adapted from Abari-Ogunsona et al. (2025); Olota et al. (2025); Okpala and Chime (2026); Ebong et al. (2026); Edesiri (2026); Sajuyigbe et al. (2026). Dependent variable parameters were adapted from Ebitu et al. (2023)

MATERIALS AND METHODS

Research Design

A cross-sectional survey design was employed to investigate the relationship between digital transformation and customer satisfaction in deposit money banks in Nigeria. Data were collected from respondents at a single point in time to obtain their views on electronic banking, artificial intelligence, digital infrastructure and customer satisfaction. This design was suitable because the study examined the variables within the existing banking environment without manipulating the banks' digital technologies or customers' experiences. It also provided a basis for applying statistical techniques to determine the relationships between the three dimensions of digital transformation and customer satisfaction in deposit money banks.

Population, Sample and Sampling Technique

The population comprised customers of deposit money banks operating in Calabar Metropolis, Cross River State, Nigeria. The exact population size was unknown because accurate and comprehensive records of all bank customers in the metropolis were unavailable. Therefore, the Topman formula was used to determine the required sample size for an unknown population. The calculation was based on a 95% confidence level, a 5% margin of error, a positive response

probability of 0.65 and a negative response probability of 0.35. The sample size was determined using the formula:

$$n = \frac{Z^2Pq}{e^2}$$

Where n: Sample size required
Z: Tabular statistical unit (1.96)
P: Probability of positive response (0.65)
q: Probability of negative response (0.35)
e: Margin of error (5 percent)

Substituting the values into the formula:

$$n = \frac{1.96^2 (0.65 \times 0.35)}{0.05^2}$$

$$= \frac{3.8416 (0.2275)}{0.0025}$$

$$= \frac{0.8740}{0.0025}$$

$$= 349.6$$

n = 350 customers of deposit money banks approximately

Purposive sampling was used to select 20 deposit money bank branches in Calabar Metropolis for the study. The selection focused on banking institutions with an operational presence in the study area and that provided customers with access to digital banking services relevant to the research, including electronic banking platforms and other technology-enabled services. The selected branches served as locations for recruiting respondents and administering questionnaires. Thereafter, convenience sampling was applied to customers present at the selected bank premises. Questionnaires were administered through direct customer interception within the banking halls and at designated ATM galleries, as well as to customers immediately after completing their banking transactions. Before participation, individuals were screened to confirm that they were customers of deposit money banks and had relevant experience with the banks' digital banking services. This approach provided an opportunity to reach both customers who frequently used digital banking channels and those who visited physical bank branches to conduct their transactions. Consequently, the survey administration procedure facilitated the inclusion of respondents with varying patterns of banking service usage, thereby providing relevant experiences for examining the relationship between digital transformation dimensions and customer satisfaction.

Data Collection and Survey Administration

The study relied on primary data obtained through a structured questionnaire administered to customers of the selected deposit money banks in Calabar Metropolis. The instrument gathered quantitative data on electronic banking, artificial intelligence, digital infrastructure and customer satisfaction, measured through customer delight, customer excitement and repeat patronage. Responses to the study constructs were recorded on a five-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (5). The questionnaire was administered to individuals

approached at the selected bank premises in Calabar Metropolis after confirming that they were customers of deposit money banks. Participation was voluntary, and respondents were informed about the purpose of the research before completing the questionnaire. Of the 350 copies administered, 326 were retrieved and considered suitable for analysis, giving a response rate of 93.1%. The responses provided the data required to examine the relationship between digital transformation and customer satisfaction in deposit money banks in Calabar Metropolis.

Instrument Development, Validity and Reliability

The research instrument was a structured questionnaire designed to measure digital transformation and customer satisfaction in deposit money banks in Calabar Metropolis. Items measuring the independent variable were adapted from Abari-Ogunsona et al. (2025), Olota et al. (2025), Okpala and Chime (2026), Ebong et al. (2026), Edesiri (2026) and Sajuyigbe et al. (2026). The items for customer satisfaction were adapted from Ebitu et al. (2023). The adapted measures were modified where necessary to reflect the study context while maintaining their intended conceptual meanings. Content validity was established through expert assessment of the questionnaire to determine the relevance, clarity and suitability of the items for measuring the study variables. Feedback from the review informed necessary adjustments before the main survey.

A pilot survey was conducted among 30 University of Calabar students who were confirmed to be deposit money bank customers. The pilot exercise assessed the clarity and suitability of the questionnaire and the internal consistency of its measurement scales. Cronbach's alpha was used to evaluate reliability, with a coefficient of 0.70 serving as the minimum acceptable threshold. The results indicated that all measurement scales achieved alpha coefficients of at least 0.70 (see Table 2), demonstrating acceptable internal consistency. To minimize the risk of response contamination and duplication, the 30 students who participated in the pilot survey were excluded from the main survey. The instrument was consequently considered suitable for use in the main data collection.

TABLE 2: Summary of reliability test (Cronbach's alpha)

Construct	Number of Items	Cronbach's Alpha
Electronic banking	5	0.716
Artificial intelligence	4	0.844
Digital infrastructure	4	0.792
Customer satisfaction	3	0.861
	16	

Source: Researchers' analysis via SPSS (2026)

Data Analysis Techniques

The 326 valid questionnaire responses were coded and analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to summarise respondents' assessments of electronic banking, artificial intelligence, digital infrastructure and customer satisfaction. Multiple linear regression

was applied to test the research hypotheses and determine the individual and combined effects of the three digital transformation dimensions on customer satisfaction in deposit money banks in Calabar Metropolis. The regression model was specified as follows:

$$Y = a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + e$$

Where:

Y =	Dependent variable (Customer satisfaction)
a =	The intercept
$\beta_1, \beta_2, \beta_3$ =	Coefficients of the independent variable
X_1, X_2, X_3 =	Parameters of independent variable (Electronic banking, artificial intelligence and digital infrastructure)
e =	Error margin (5 percent)

ANALYSIS AND FINDINGS

Of the 350 questionnaires distributed to customers of deposit money banks in Calabar Metropolis, Cross River State, 326 were returned and found suitable for analysis. This represents a usable response rate of 93.1 per cent, while the remaining 24 questionnaires were excluded from the analysis. Accordingly, the study's findings were derived from the 326 valid responses.

TABLE 3: Descriptive statistics of the study's variables

	No. of items	N	Mean	Std. Deviation
Electronic banking	5	326	3.9110	.93877
Artificial intelligence	4	326	3.7715	1.01485
Digital infrastructure	4	326	3.5184	1.00290
Customer satisfaction	3	326	3.7086	.63565
Valid N (listwise)		326		

Source: Researchers' analysis via SPSS (2026)

The descriptive results presented in Table 3 summarise the responses of 326 deposit money bank customers in Calabar Metropolis, Cross River State, to the study variables using a five-point Likert scale. The mean (M) scores indicate the general direction of respondents' assessments, while the standard deviations (SD) show the degree of variation in their responses. All four variables recorded mean values above the midpoint of 3.0, suggesting generally favourable perceptions of digital transformation and customer satisfaction.

Electronic banking had the highest mean score (M = 3.9110, SD = 0.93877), indicating that respondents rated this dimension more favourably than the other digital transformation variables. Artificial intelligence followed with a mean of 3.7715 (SD = 1.01485), while customer satisfaction recorded a mean of 3.7086 (SD = 0.63565). Digital infrastructure had the lowest mean score (M = 3.5184, SD = 1.00290), although its value remained above the scale midpoint. This suggests that customers viewed electronic banking relatively positively, whereas their assessments of digital infrastructure were comparatively less favourable.

The standard deviations further reveal differences in response consistency. Customer satisfaction had the smallest standard deviation (0.63565), indicating greater agreement among respondents

in their assessments of satisfaction. Artificial intelligence recorded the largest standard deviation (1.01485), followed by digital infrastructure (1.00290), suggesting more variation in customers' experiences and perceptions of these dimensions. Overall, the descriptive statistics indicate favourable assessments across the study variables, with electronic banking receiving the highest mean rating and digital infrastructure the lowest. However, these results describe response patterns only; regression analysis will further determine whether electronic banking, artificial intelligence and digital infrastructure have statistically significant relationships with customer satisfaction.

Hypothesis one:

Ho: Electronic banking has no significant effect on customer satisfaction in deposit money banks in Calabar.

Hypothesis two:

Ho: Artificial intelligence has no significant effect on customer satisfaction in deposit money banks in Calabar.

Hypothesis three:

Ho: Digital infrastructure has no significant effect on customer satisfaction in deposit money banks in Calabar.

Independent variables: Electronic banking, artificial intelligence and digital infrastructure

Dependent variable: Customer satisfaction

Test statistic: Multiple linear regression

Decision criteria: Accept the alternative hypothesis if (P < .05) and reject the null hypothesis, if otherwise.

TABLE 4: Model summary of the effect of digital transformation on customer satisfaction in deposit money banks in Calabar

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.424[a]	.180	.172	.57843

a. Predictors: (Constant), Electronic banking, artificial intelligence and digital infrastructure

Source: Researchers' analysis via SPSS (2026)

TABLE 5: ANOVA[a] of the effect of digital transformation on customer satisfaction in deposit money banks in Calabar

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	23.579	3	7.860	23.491	.000[b]
	Residual	107.737	322	.335		
	Total	131.316	325			

a. Dependent Variable: Customer satisfaction

b. Predictors: (Constant), Electronic banking, artificial intelligence and digital infrastructure

Source: Researchers' analysis via SPSS (2026)

TABLE 6: Coefficients[a] of the effect of digital transformation on customer satisfaction in deposit money banks in Calabar

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.884	.144		19.989	.000
	Electronic banking	.151	.055	.223	2.766	.006
	Artificial intelligence	.105	.043	.168	2.426	.016
	Digital infrastructure	.290	.046	.457	6.254	.000

a. Dependent Variable: Customer satisfaction

Source: Researchers' analysis via SPSS (2026)

Interpretation

The regression analysis examined whether electronic banking, artificial intelligence and digital infrastructure significantly predict customer satisfaction among deposit money bank customers in Calabar Metropolis. The results in Table 4 show that the combined correlation between the three explanatory variables and customer satisfaction is 0.424. The model produced an R^2 value of 0.180, indicating that the three dimensions of digital transformation jointly account for 18% of the observed variation in customer satisfaction. The ANOVA results in Table 5 further establish the statistical significance of the regression model ($F = 23.491$, $p < .001$). This means that the three dimensions, when considered together, significantly predict customer satisfaction. The standardised beta coefficients in Table 6 show that digital infrastructure has the greatest relative contribution to customer satisfaction ($\beta = 0.457$, $p < .001$), followed by electronic banking ($\beta = 0.223$, $p = .006$) and artificial intelligence ($\beta = 0.168$, $p = .016$). All three dimensions have positive and statistically significant coefficients. The results therefore indicate that digital infrastructure is the strongest predictor of customer satisfaction among the variables examined, while artificial intelligence has the smallest relative contribution. Since all reported significance values are below .05, the three null hypotheses are rejected.

Taken together, the results identify digital infrastructure as the most influential of the three dimensions in the fitted model, with electronic banking ranking second and artificial intelligence third in relative predictive strength. The findings suggest that customers' satisfaction is associated not only with the availability of digital banking channels and AI-enabled services but also with the technological systems that sustain their operation. In particular, reliable server architecture, effective database synchronisation and stable telecommunications connectivity are essential for ensuring that digital banking applications and automated customer service tools function effectively. Even sophisticated customer-facing technologies, such as chatbots and mobile banking applications, may fail to deliver satisfactory customer experiences when the underlying technological infrastructure is unreliable. Nevertheless, the model explains only 18% of the variation in customer satisfaction, leaving 82% unexplained by the three digital transformation dimensions examined in the study. This relatively modest explanatory power suggests that customer satisfaction in deposit money banks is influenced by factors beyond digital transformation.

The finding has important managerial implications because it highlights the multidimensional nature of customer satisfaction in the banking industry. Although digital transformation contributes significantly to customers' banking experiences, the unexplained 82% suggests that other factors may also shape their perceptions and evaluations of banking services. Such factors may include branch staff courtesy and responsiveness, bank fees and hidden charges, accessibility of loan facilities, and the physical comfort of banking premises. For instance, customers may experience efficient mobile banking services but remain dissatisfied with discourteous employees, excessive transaction charges, difficulties accessing credit facilities or uncomfortable branch environments. This indicates that customers' overall satisfaction reflects a combination of technology-enabled service experiences and conventional banking service attributes. Consequently, the findings demonstrate that the contribution of digital transformation to customer satisfaction should be understood within the broader context of the quality of human interactions, affordability of banking services, accessibility of financial products and the general branch service environment.

Furthermore, the findings establish the relative importance of digital infrastructure in shaping customer satisfaction, given its highest standardised beta coefficient (β = 0.457). This underscores the central role of reliable technological systems in determining the effectiveness of digital banking services. The positive and significant contributions of electronic banking and artificial intelligence also indicate that customers' experiences with digital service channels and AI-enabled interactions are relevant to their satisfaction. These findings suggest that the perceived value of advanced customer-facing technologies is closely associated with the reliability of the underlying technological infrastructure. These conclusions concern statistical relationships within the sampled customers and should not be interpreted as proof of causation. Accordingly, the first null hypothesis was rejected because electronic banking significantly predicted customer satisfaction (β = 0.223, p = .006). The second null hypothesis was also rejected, as artificial intelligence significantly predicted customer satisfaction (β = 0.168, p = .016). Similarly, the third null hypothesis was rejected because digital infrastructure recorded a statistically significant positive relationship with customer satisfaction (β = 0.457, p < .001). Since all three p-values were below the .05 significance threshold, the study concludes that electronic banking, artificial intelligence and digital infrastructure are significant positive predictors of customer satisfaction in deposit money banks in Calabar Metropolis.

DISCUSSION OF FINDINGS

Electronic Banking and Customer Satisfaction

The regression results demonstrate that electronic banking has a positive and statistically significant effect on customer satisfaction in deposit money banks in Calabar (beta = 0.223, p = .006). This finding indicates that the use of electronic banking channels contributes positively to customers' evaluations of banking services. Through mobile banking, electronic payments, digital self-service facilities and instant transactions, customers can access banking services and conduct financial activities with greater convenience. The result suggests that electronic banking can improve customers' experiences by reducing dependence on physical branches and facilitating access to routine banking services. Its significant positive coefficient also implies that

improvements in electronic banking are associated with higher customer satisfaction when the other digital transformation dimensions are held constant.

Empirical evidence from previous studies provides support for this finding. Ebitu et al. (2023) established that automated payment systems, electronic delivery channels and electronic information services had significant positive effects on customer satisfaction in commercial banks. Similarly, Ndaman and Akomolafe (2025) found that internet banking significantly influenced customer satisfaction in selected microfinance banks in Abuja. These findings reinforce the relevance of electronic service delivery to customers' evaluations of financial institutions. The present study extends this evidence to deposit money banks in Calabar by establishing that electronic banking is a significant predictor of customer satisfaction, with a standardised beta coefficient of 0.223. Although its contribution is lower than that of digital infrastructure, the result confirms that electronic banking remains an important dimension of digital transformation in shaping customer experiences.

Artificial Intelligence and Customer Satisfaction

The analysis further establishes that artificial intelligence has a positive and statistically significant effect on customer satisfaction in deposit money banks in Calabar (beta = 0.168, p = .016). This result suggests that AI-enabled banking services contribute to customers' satisfaction, although the relative contribution is smaller than those of electronic banking and digital infrastructure. AI chatbots, virtual assistants, robotic advisory systems and personalized service applications can facilitate customer interactions by providing automated responses, assisting with routine enquiries and helping customers obtain relevant information. These functions may improve the responsiveness and convenience of banking services. The significant positive coefficient therefore indicates that greater use of AI-enabled services is associated with higher customer satisfaction, provided that the applications respond effectively to customers' needs.

The finding is consistent with Olota et al. (2025), whose study examined artificial intelligence and customer satisfaction in the Nigerian banking sector. It also accords with Ekwutosi (2025), who investigated the relationship between artificial intelligence and customer experience in Nigerian banks, and Mohammed and Okechukwu (2025), who examined the application of artificial intelligence to customer service in deposit money banks in Abuja. These studies provide relevant evidence for considering AI-enabled services as part of banks' efforts to improve customer interactions. The present study adds evidence from Calabar by demonstrating that artificial intelligence has a statistically significant positive effect on customer satisfaction. However, its standardised coefficient (beta = 0.168) is the smallest among the three predictors, suggesting that AI has a comparatively lower relative contribution to customer satisfaction within the estimated model. This does not diminish its importance but indicates that its contribution should be considered alongside the other technological dimensions examined.

Digital Infrastructure and Customer Satisfaction

Digital infrastructure emerged as the strongest predictor of customer satisfaction among the three digital transformation dimensions, recording a positive and statistically significant standardised coefficient (beta = 0.457, p < .001). This finding highlights the importance of the

technological systems that sustain digital banking operations. Platform availability, system reliability, stability and continuity of service are essential for customers to access banking channels and complete transactions successfully. When these systems function consistently, customers are more likely to experience fewer service interruptions and greater confidence in using digital banking facilities. Conversely, system failures and prolonged service disruptions may undermine the benefits of electronic banking and artificial intelligence. The result therefore suggests that the effectiveness of banks' digital services is closely associated with the reliability and availability of the infrastructure supporting them.

This finding is supported by Abari-Ogunsona et al. (2025), whose study examined digitization for performance improvement in Nigerian banks. It also relates to Edesiri (2026), who investigated digital transformation and the operations of commercial banks in Delta State, and Alonge et al. (2021), who examined digital transformation in retail banking in relation to customer experience and profitability. These studies provide a basis for recognising the operational and customer-related importance of digital banking capabilities. The present study extends this body of evidence by showing that digital infrastructure has the strongest relative association with customer satisfaction among the dimensions investigated in Calabar. Its standardised beta coefficient of 0.457 exceeds those of electronic banking (beta = 0.223) and artificial intelligence (beta = 0.168). This comparative result underscores the importance of dependable digital systems in supporting satisfactory banking experiences. Nevertheless, the findings establish the relative predictive strength of digital infrastructure within the estimated regression model and do not imply that infrastructure alone determines customer satisfaction.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the effects of digital transformation (electronic banking, artificial intelligence and digital infrastructure) on customer satisfaction in deposit money banks in Calabar Metropolis, Cross River State, Nigeria. The study was motivated by the rapid adoption of digital technologies in banking and the continuing uncertainty about whether these investments consistently translate into satisfactory customer experiences, particularly amid transaction failures, service interruptions and limitations in automated customer support. The regression results established that all three dimensions have positive and statistically significant effects on customer satisfaction. Digital infrastructure recorded the highest standardised beta coefficient, followed by electronic banking and artificial intelligence. Collectively, the variables explained 18% of the variation in customer satisfaction, and the overall regression model was statistically significant. These findings demonstrate the relevance of digital transformation to customer satisfaction while highlighting the comparatively greater contribution of reliable and accessible digital infrastructure.

The study was limited to customers of selected deposit money banks in Calabar and employed a cross-sectional survey with purposive and convenience sampling. Consequently, the findings should be generalized cautiously beyond the study population, and the observed relationships do not establish causation. Further research could extend the investigation to other Nigerian cities, examine additional determinants of customer satisfaction and use longitudinal designs to assess

how the effects of digital transformation develop over time. Future studies could also investigate specific service challenges, such as failed electronic transactions, platform downtime and the effectiveness of AI-enabled customer support. Nevertheless, the present study provides empirical evidence that electronic banking, artificial intelligence and digital infrastructure are significant predictors of customer satisfaction in the study context. It also highlights the importance of considering the relative contribution of different digital capabilities when evaluating digital transformation in Nigerian deposit money banks.

Recommendations

In view of the study's findings, the following recommendations are proposed for deposit money banks:

i. Deposit money banks should improve the accessibility, usability, security and speed of their mobile banking applications, electronic payment channels and self-service platforms to ensure seamless transactions. These improvements will enhance customer satisfaction by reducing transaction delays, simplifying banking activities and enabling customers to access services conveniently.

ii. Deposit money banks should strengthen AI-enabled customer service by improving chatbot accuracy, expanding virtual assistant capabilities and ensuring that complex enquiries are promptly referred to human customer service representatives. This will enhance customer satisfaction through faster responses, personalized assistance and more effective resolution of customer complaints.

iii. Deposit money banks should invest more in reliable digital infrastructure by upgrading banking systems, strengthening network connectivity, improving platform availability and implementing effective system monitoring and maintenance. These measures will enhance customer satisfaction by minimizing service disruptions, reducing failed transactions and ensuring consistent access to digital banking services.

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