

Digital First Banking Transformation and Sustainable Performance in the Evolving Financial Services Industry

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ABSTRACT

The banking industry is undergoing a strategic shift toward digital-first and branchless operating models, driven by consumer demand for fast and flexible services, advances in financial technology, and the need to reduce physical branch-related costs. However, this transformation creates challenges related to cybersecurity, financial inclusion, and customer trust. **This research aims** to identify key factors driving digital transformation in banking and evaluate their implications for operational efficiency, customer experience, and business sustainability. **The study adopts** a literature-based sequential mixed-methods approach. First, quantitative analysis of secondary financial and operational data identifies patterns in operational efficiency, customer growth, and banking performance across traditional and digital-first banks. Second, qualitative evidence from academic literature, industry reports, case studies, and stakeholder perspectives is analyzed to interpret the organizational, technological, and strategic mechanisms underlying digital transformation. **The findings indicate** that digital-first banking improves operational efficiency, accelerates service delivery, enhances customer personalization, and supports customer growth. Nevertheless, cybersecurity risks, financial inclusion gaps, and reduced customer trust arising from limited face-to-face interactions remain significant challenges. **Based on the integrated findings**, an Integrated Digital-First Banking Transformation Framework (IDBTF) is proposed, incorporating Application Programming Interface (API) integration, data analytics, and organizational dynamic capabilities. The framework explains how digital-first banking can enhance operational efficiency, customer experience, and business sustainability while addressing cybersecurity, financial inclusion, and trust challenges, providing theoretical and practical guidance for sustainable digital transformation strategies.

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1. INTRODUCTION

Traditional banking models that rely heavily on physical branch networks are facing increasing pressure from changing consumer preferences, rapid technological development, and intensified competition from fintech companies [1]. The emergence of fintech, mobile banking, cloud computing, and Artificial Intelligence (AI), defined as computer systems capable of performing tasks that normally require human intelligence such

as learning, reasoning, prediction, and decision support has enabled automation and reshaped how customers access financial services [2]. At the same time, the substantial costs of maintaining physical branches have encouraged banks to optimize their cost structures while maintaining service quality and competitiveness [3]. These developments have accelerated the transition toward branchless, digital-first banking models that prioritize technology-based service delivery and reduce dependence on physical branches. However, digital transformation also introduces challenges involving cybersecurity, financial inclusion, data privacy, and declining customer trust due to reduced face-to-face interactions [4]. Previous studies have examined digital transformation from different perspectives. Research on fintech and digital banking primarily emphasizes technological adoption and service innovation, while other studies focus on operational efficiency, customer experience, or financial inclusion. Studies grounded in Dynamic Capabilities Theory further highlight the importance of organizational adaptation in responding to technological change. However, these streams of research are generally examined independently, providing limited understanding of how technological capabilities and organizational capabilities interact to simultaneously influence operational efficiency, customer value creation, business sustainability, financial inclusion, and cybersecurity resilience. This gap indicates the need for a more integrated conceptual perspective. Therefore, this study contributes to the literature by proposing the IDBTF, which synthesizes technological and organizational dimensions into a unified framework for explaining sustainable digital transformation in the banking sector.

This gap indicates the need to conceptualize digital-first banking not merely as a technological transition but as an organizational transformation requiring the alignment of digital technologies and organizational dynamic capabilities [5]. Accordingly, the research aims to identify the key factors driving digital transformation in the banking sector and examine their implications for operational efficiency, customer experience, and business sustainability. A literature-based mixed-methods approach is employed by synthesizing quantitative evidence on operational cost savings and customer growth with qualitative evidence concerning consumer and industry stakeholder perceptions. The resulting Integrated Digital-First Banking Transformation Framework integrates AI, cloud computing, APIs, and data analytics with organizational dynamic capabilities to explain how digital-first banking can generate strategic value while addressing key transformation challenges [6].



Figure 1. Sustainable Development Goals (SDGs)

Figure 1 illustrates the strategic transition toward branchless and digital-first banking through the integration of technological capabilities, organizational dynamic capabilities, customer-oriented outcomes, and sustainability considerations. This transition creates a strategic dilemma for traditional financial institutions because reducing dependence on physical branches can improve operational efficiency and enable scalable digital services, while customers with limited digital access or a preference for face-to-face services must remain included. The transformation therefore requires not only digital technologies but also organizational restructuring, workforce adaptation, cybersecurity, data protection, digital literacy, and regulatory compliance.

Accordingly, this research examines the technological and organizational factors driving digital-first banking and their implications for operational efficiency, customer experience, financial inclusion, customer trust, and business sustainability. The scope covers digital platforms, Artificial Intelligence, cloud computing, API integration, data analytics, fintech collaboration, organizational capabilities, workforce requirements, customer relationships, and regulatory practices [7]. The proposed IDBTF emphasizes that technological innovation must be aligned with organizational dynamic capabilities to generate sustainable banking outcomes while addressing cybersecurity, inclusion, and trust challenges. The framework contributes to SDG 9 through digital innovation and infrastructure, SDG 8 through productivity and resource efficiency, SDG 10 through inclusive financial access, and SDG 16 through cybersecurity, data protection, and responsible digital governance. Overall, sustainable digital-first banking requires a balanced integration of technology, organizational capability, customer value, inclusion, security, and responsible governance.

2. LITERATURE REVIEW

The development of digital technologies has fundamentally reshaped the global banking industry and transformed how financial services are delivered, accessed, and consumed [8]. This literature review examines relevant research on digital transformation in financial services, the transition from traditional branch-based banking toward branchless and digital-first models, and the evolution of customer expectations in the digital era [9]. The review focuses on the key technological, operational, and consumer-related factors underlying this transformation, its implications for banking efficiency and service delivery, and the organizational capabilities required to sustain digital transformation. The literature is subsequently connected to Dynamic Capabilities Theory to explain how banks can reconfigure their resources and capabilities in response to technological and market changes.

2.1. Digital Transformation and Disruption in Financial Services

Digital transformation is reshaping the structure, processes, and delivery of banking services [10]. Digital technologies such as AI, Big Data Analytics, Machine Learning, cloud computing, APIs, and digital platforms improve efficiency, accelerate transactions, automate processes, personalize services, and enhance scalability and interoperability [11]. These technologies support customer identification, transaction processing, fraud detection, and real-time financial recommendations, while fintech intensifies competition through accessible, fast, convenient, and customer-centric services [12]. Consequently, digital transformation has become essential for maintaining banking relevance, operational performance, and competitive advantage, requiring changes in technology, business processes, organizational structures, and strategic capabilities.

2.2. Branch Based Banking Model and Its Costs and Legacy

Traditional branch-based banking models incur substantial costs from physical infrastructure, staffing, maintenance, security, and regulatory requirements. As customer visits decline and digital channels expand, extensive branch networks can reduce cost efficiency and create inefficient resource allocation. Legacy IT systems further increase maintenance and integration costs while limiting compatibility with cloud computing, APIs, and advanced analytics [2, 13]. Manual processes and hierarchical structures can also create organizational inertia, complicating digital transformation [14]. Although digital channels provide greater speed, convenience, accessibility, and 24/7 services, physical branches remain important for customers requiring personalized assistance or facing digital access barriers [15]. Therefore, branchless banking requires not only reducing physical infrastructure but also redesigning technologies, processes, and organizational structures while maintaining financial inclusion and customer support [16].

2.3. The Evolution of Customer Expectations

The evolution of customer expectations is a key driver of banking transformation, as Millennials and Generation Z increasingly demand fast, convenient, accessible, and 24/7 digital banking services [17]. Customers prioritize ease of use, transaction speed, seamless interactions, personalized features, and real-time access, reducing reliance on physical branches [18]. However, greater digital dependence increases concerns about cybersecurity, data protection, service reliability, and reduced human interaction [19]. Banks therefore need customer-centered digital ecosystems that balance technological efficiency with security, trust, accessibility, and appropriate human support [20].

2.4. Theoretical Framework of Dynamic Capabilities Theory

Dynamic Capabilities Theory defines dynamic capabilities as an organization's ability to integrate, build, and reconfigure resources to respond to changing environments [21]. This perspective is relevant to digital banking, where technological, competitive, and regulatory changes require banks to sense opportunities, seize innovations, and transform resources, processes, and structures [22]. Digital transformation therefore requires alignment between technological and organizational capabilities to improve operational efficiency, customer experience, and long-term sustainability [23]. In branchless and digital-first banking, integrating Artificial Intelligence, cloud computing, API-based services, and data analytics with organizational processes and human resources enables flexible operating models, faster service delivery, responsiveness to customer needs, and sustainable competitive advantage [24].

2.5. Proposed Integrated Digital-First Banking Transformation Framework

Building on Dynamic Capabilities Theory, this study proposes the IDBTF to explain how digital technologies contribute to sustainable banking outcomes. Digital Technology Capability, including Artificial Intelligence, cloud computing, API integration, and data analytics, provides the foundation for automation, scalability, interoperability, personalization, and data-driven decision-making [25]. These capabilities strengthen Organizational Dynamic Capabilities through sensing opportunities, seizing digital innovations, and transforming resources, processes, and structures [26]. These capabilities improve Operational Efficiency through automation, cost reduction, faster service delivery, and improved risk management, while enhancing Customer Value Creation through personalization, service quality, convenience, accessibility, and customer trust [27]. These outcomes contribute to Sustainable Banking Outcomes, encompassing business sustainability, financial inclusion, and cybersecurity resilience [28]. Continuous Learning, Innovation, and Improvement provide a feedback loop that enables banks to continuously adapt and reconfigure capabilities in response to technological, market, and regulatory changes [29].

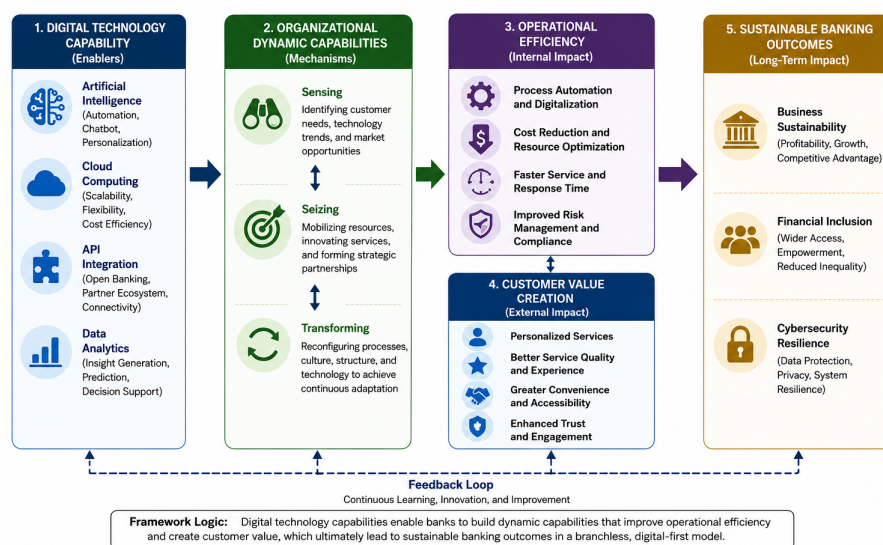


Figure 2. Integrated Digital-First Banking Transformation Framework (IDBTF).

Figure 2 presents IDBTF as a conceptual framework that integrates technological enablers, organizational mechanisms, operational and customer impacts, and long-term sustainability outcomes. The framework emphasizes that digital transformation extends beyond technology adoption and requires alignment between technological capabilities and organizational capabilities. It also recognizes the need to balance operational efficiency with financial inclusion, automation with customer support, and digital accessibility with cybersecurity. The proposed relationships are conceptually derived from the synthesis of literature on digital banking transformation, fintech innovation, digital technologies, organizational capabilities, and sustainable banking and are not statistically tested as causal relationships in this literature-based study.

3. RESEARCH METHODOLOGY

This research adopts a literature-based mixed-methods approach to comprehensively examine the banking industry's transition toward a branchless, digital-first model [30]. The approach is appropriate because the transformation involves interconnected financial, operational, technological, and consumer dimensions that cannot be fully captured through a single method. Quantitative analysis identifies patterns in operational efficiency, cost savings, and customer growth, while qualitative analysis examines consumer perceptions, industry perspectives, and strategic challenges [31]. Integrating both forms of evidence provides a holistic understanding of the drivers, outcomes, and challenges of branchless banking transformation [32].

3.1. Research Approach

The findings are integrated during the interpretation stage to provide a comprehensive understanding of the transition toward branchless and digital-first banking [33]. To ensure transparency, consistency, and reproducibility, predefined inclusion and exclusion criteria were applied to the literature selection process [34]. The inclusion criteria were as follows:

- Peer-reviewed journal articles, relevant industry reports, and publications from recognized international institutions.
- Publications from 2020 to 2024 were prioritized for contemporary relevance, while selected seminal studies before 2020 were included to support the theoretical foundation.
- Studies addressing digital banking, branchless banking, fintech, digital transformation, customer experience, operational efficiency, cybersecurity, or financial inclusion.

Studies were excluded if they focused primarily on non-banking financial services, lacked empirical or theoretical relevance to digital-first banking transformation, or duplicated evidence from more comprehensive publications. These criteria ensured that the selected literature was relevant, credible, and suitable for developing and interpreting the proposed IDBTF.

3.2. Quantitative Analysis

The quantitative component uses secondary data from publicly available annual reports and financial disclosures of eight purposively selected banking institutions, comprising four traditional banks (JPMorgan Chase, Bank of America, HSBC, and DBS Bank) and four digital-first banks (Ally Bank, Starling Bank, Revolut, and Nubank). These institutions were selected as established representatives of their respective banking models with accessible financial and operational data. The unit of analysis is the banking institution, enabling comparative assessment of operational efficiency, customer acquisition, and digital transformation outcomes. Data for 2021–2023 include operating expenses, total customers, number of employees, and annual revenue.

Table 1. Selected Banks, Data Sources, and Observation Period

Bank	Banking Model	Data Source	Observation Period
JPMorgan Chase	Traditional	Annual Report	2021–2023
Bank of America	Traditional	Annual Report	2021–2023
HSBC	Traditional	Annual Report	2021–2023
DBS Bank	Traditional	Annual Report	2021–2023
Ally Bank	Digital-First	Annual Report	2021–2023
Starling Bank	Digital-First	Annual Report	2021–2023
Revolut	Digital-First	Annual Report	2021–2023
Nubank	Digital-First	Annual Report	2021–2023

Based on Table 1 presents the selected banks, their banking model classifications, data sources, and observation period. The sample includes four traditional banks and four digital-first banks, with data obtained from publicly available annual reports covering 2021–2023. This information provides the basis for the comparative quantitative analysis conducted in this study. These indicators were standardized to facilitate cross-bank comparison and assess differences in operational efficiency and customer growth between traditional branch-based and digital-first banking models. The analysis focuses on three key efficiency indicators:

- Operational Cost per Customer calculated by dividing operating expenses by the total number of customers to assess the relative cost of serving each customer.
- Customer Acquisition Cost (CAC) used to assess the resources required to acquire customers based on available customer growth and operating expenditure data.

$$CAC = \frac{\text{Operating Expenditure}}{\text{Customer Growth}} \quad (1)$$

- Revenue per Employee calculated by dividing annual revenue by the number of employees to evaluate workforce productivity.

The quantitative analysis uses descriptive statistics, including averages, ratios, and year-to-year trends, to compare efficiency patterns across banking models and identify differences in cost structures, customer growth, and workforce productivity. The results provide empirical evidence for evaluating whether digital-first banks demonstrate distinct efficiency patterns compared with traditional branch-based institutions and serve as the quantitative basis for subsequent interpretation alongside the qualitative findings.

3.3. Qualitative Analysis

The qualitative component uses a comparative case study approach to examine how banks implement and manage branchless, digital-first transformation. Cases include digital-first banks such as Ally Bank and Starling Bank, and traditional banks undergoing extensive digital transformation, including Capital One and Chase. Evidence is drawn from industry reports, white papers, academic publications, corporate disclosures, and executive interviews, and analyzed thematically to identify patterns in digital strategy, organizational adaptation, operational efficiency, customer experience, technology implementation, and key challenges. Comparing digital-native and incumbent banks provides insights into the organizational and technological mechanisms underlying successful digital-first transformation.

3.4. Data Analysis

Data analysis combines quantitative and qualitative techniques to provide a comprehensive assessment of branchless, digital-first banking transformation. The quantitative analysis applies comparative statistical methods to examine differences in operational efficiency and performance between traditional and digital-first banking models, particularly in terms of cost efficiency and scalability. Meanwhile, qualitative data are analyzed using thematic analysis to identify recurring patterns in digital strategies, operational challenges, customer experience, organizational adaptation, and growth opportunities based on industry reports and case studies. The findings from both approaches are subsequently triangulated during the interpretation stage to integrate numerical evidence with strategic and contextual insights, thereby providing a more comprehensive understanding of the drivers, outcomes, and challenges of branchless digital banking transformation.

4. RESULTS AND DISCUSSION

The digital-first banking model can improve cost efficiency by reducing dependence on physical branches and related expenses such as real estate, staffing, maintenance, and security [35]. Digital-first banks generally incur lower infrastructure, transaction, and customer acquisition costs than traditional banks. Digital platforms and automation reduce manual workloads and enable scalable customer growth without proportional increases in physical infrastructure [36]. However, the magnitude of cost savings varies according to institutional characteristics, technology maturity, regulatory environments, operating models, and market conditions.

Table 2. Operational Comparison of Traditional and Digital First Banks

Indicator	Traditional Banks	Digital First Banks	Efficiency Implication
Branches	High	Low	Lower infrastructure cost
Staffing	Branch based	Digital based	Lower branch cost
Processing	Manual	Automated	Higher efficiency
Acquisition	Traditional	Digital	Lower acquisition cost

Table 2 provides a conceptual comparison derived from the reviewed literature and industry evidence rather than direct quantitative measurements. The indicators illustrate the general operational differences between traditional and digital-first banking models identified across prior studies. These gains should be interpreted as context-dependent rather than universal, as their magnitude depends on digital infrastructure maturity, organizational capabilities, regulatory conditions, customer readiness, and digital governance. Lower structural and transaction costs can strengthen competitive pricing, support investment in digital infrastructure and innovation, improve resource allocation, and enable scalable banking services across customer segments and geographic markets. These efficiency gains can also provide greater capacity to strengthen cybersecurity, improve service quality, develop personalized digital products, and expand financial inclusion initiatives. When supported by effective risk management, workforce capabilities, and continuous technological adaptation, these advantages can contribute to organizational resilience, sustainable competitiveness, and long-term financial and operational sustainability.

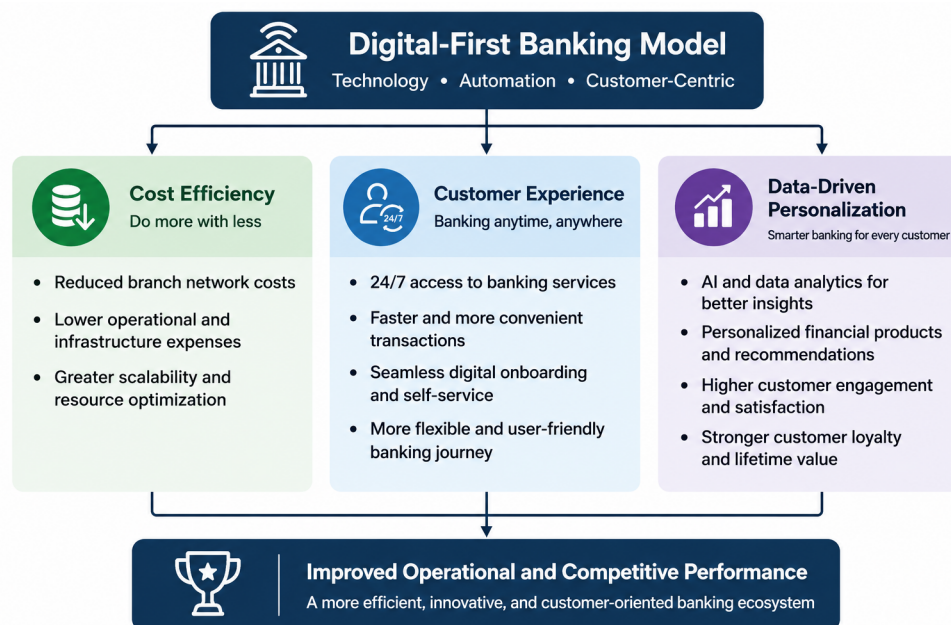


Figure 3. Strategic Advantages of the Digital-First Banking Model

As illustrated in Figure 3, the strategic advantages of the digital-first banking model are driven by three interconnected dimensions, cost efficiency, enhanced customer experience, and data-driven personalization. Digital banking reduces dependence on physical branch networks, enabling banks to lower infrastructure and operational costs while improving scalability and resource allocation. Digital platforms provide 24/7 access, faster transactions, seamless onboarding, and self-service capabilities, creating a more convenient, responsive, and flexible customer experience. These capabilities are particularly relevant to digitally oriented customers who value convenience, speed, and ease of use. Compared with traditional branch-based models, digital-first banking enables continuous service availability and greater customer autonomy, which can strengthen satisfaction and engagement.

Data-driven personalization represents another important advantage of digital-first banking. By leveraging transaction data, application usage, and customer financial preferences, banks can better identify customer needs and deliver more relevant products and services. Artificial Intelligence and data analytics can support personalized savings recommendations, expense management, product offerings, and credit decisions based on individual risk profiles. This data-driven approach enhances service relevance, customer engagement, and loyalty while supporting more timely and informed decision-making. Together, these capabilities strengthen operational efficiency, customer engagement, and competitive performance. The integration of cost efficiency, enhanced customer experience, and data-driven personalization therefore supports a more scalable, innovative, and customer-oriented banking ecosystem.

Table 3. Key Technologies Enabling Digital-First Banking

Technology	Function	Banking Application	Strategic Benefit
AI	Automation	Chatbots, fraud detection	Efficiency
Cloud Computing	Scalability	Digital platforms	Lower infrastructure cost
APIs	Integration	Open banking	Faster innovation
Big Data Analytics	Personalization	Customer profiling	Customer retention
Machine Learning	Prediction	Credit scoring	Better risk management

As illustrated in Table 3, Artificial Intelligence, cloud computing, API integration, and data analytics constitute the core technological foundation of digital-first banking ecosystems, enabling scalable operations, seamless system integration, intelligent decision-making, real-time data utilization, and personalized customer services. Together, these technologies strengthen banks’ ability to transform traditional processes, respond rapidly to changing customer needs, and support sustainable digital growth.

4.1. Challenges and Risks

While the digital-first banking model offers a range of strategic advantages, its implementation also presents significant challenges and risks. These challenges are mainly related to aspects of customer trust, financial inclusion, and cybersecurity. If not managed properly, these risks can hinder the sustainability and long-term acceptance of the branchless banking model.

- **The Challenge of Trust**
The absence of physical branches can hinder trust, particularly for complex services such as residential loans and wealth management, where customers value direct interaction, transparency, and security. Rapid digital transformation may also increase concerns about consumer protection in fully digital environments.
- **Financial Inclusion**
Digital-first banking may exclude individuals with limited digital literacy, inadequate internet access, or low trust in financial technology, particularly low-income, rural, and older populations. Without digital literacy initiatives and adequate infrastructure, digitalization may widen inequalities in access to financial services.
- **Cybersecurity**
Reliance on digital systems increases vulnerability to cyberattacks, fraud, and data breaches, potentially causing financial losses and undermining public trust. Growing technological complexity and data volumes make cybersecurity essential to the sustainability of digital-first banking.

Table 4. Strategic Challenges and Mitigation Strategies

Challenge	Impact	Risk Level	Recommended Strategy
Cybersecurity	Data breach	High	Zero Trust Security
Financial Inclusion	Exclusion of elderly users	Medium	Digital literacy programs
Customer Trust	Reduced loyalty	High	Hybrid service model
Regulatory Compliance	Legal penalties	Medium	Compliance-by-design

The evidence presented in Table 4 suggests that the sustainability of digital-first banking depends not only on technological innovation but also on effective risk management, robust cybersecurity governance, organizational readiness, and financial inclusion. While digital technologies enhance efficiency, scalability, and customer experience, their long-term benefits depend on banks’ ability to protect customer data, manage emerging risks, maintain operational resilience, and ensure accessible services for diverse customer groups. Thus, sustainable digital banking requires a balanced integration of technology, security, governance, and customer-centered strategies.

5. MANAGERIAL IMPLICATIONS

The findings highlight that the successful implementation of a branchless, digital-first banking model requires management to approach digital transformation as a long-term strategic and organizational transformation rather than as a technology adoption initiative. Bank managers should establish an integrated digital transformation roadmap that aligns technological investment with business objectives, customer needs, risk management, and measurable performance outcomes. Strategic investment in cloud computing, AI, APIs, automation, and advanced data analytics should be prioritized to improve operational efficiency, scalability, service personalization, and decision-making capabilities. However, modernization should be implemented through a phased and risk-controlled approach to minimize disruption arising from legacy-system migration and maintain business continuity. Customer trust should remain a central managerial priority by combining the convenience of digital channels with appropriate human support. Accordingly, physical branches can be repositioned from conventional transaction centers into advisory, relationship-management, and financial-literacy hubs for complex services and customers requiring additional assistance, while digital platforms provide seamless, personalized, responsive, and omnichannel services for routine transactions. At the same time, cybersecurity and data governance should be embedded into the core of digital banking strategy through multi-factor authentication, encryption, AI-enabled fraud detection, continuous security monitoring, zero-trust principles, privacy protection, regular security assessments, incident-response mechanisms, and clear accountability for regulatory compliance.

This integrated approach can enable banks to improve efficiency and customer experience without compromising security, resilience, or institutional trust. From an organizational and societal perspective, managers should ensure that digital-first transformation is supported by sufficient internal capabilities and does not unintentionally create new forms of financial exclusion. Continuous employee reskilling and upskilling should therefore be institutionalized, with emphasis on digital competencies, cybersecurity, data analytics, AI literacy, agile working practices, and digital customer service. Management should also strengthen cross-functional collaboration among technology, risk, compliance, operations, marketing, and customer-service units to accelerate innovation while maintaining effective governance and risk controls. Furthermore, financial inclusion should be incorporated into digital banking performance objectives by designing accessible and user-friendly applications, supporting customers with limited digital literacy, maintaining alternative service channels, and improving accessibility for underserved and digitally vulnerable populations. Strategic partnerships with fintech firms, telecommunications providers, regulators, and government institutions can further expand digital financial access and strengthen ecosystem capabilities. By integrating technological innovation with operational resilience, customer trust, cybersecurity, workforce capability, and financial inclusion, managers can move beyond short-term digitalization toward a sustainable branchless banking model that strengthens competitive advantage, improves service accessibility and quality, enhances organizational resilience, and contributes to inclusive long-term economic development.

6. CONCLUSION

This study concludes that the branchless and digital-first banking model represents a fundamental transformation in how financial institutions operate, create value, and engage with customers rather than merely a technological trend. The literature reviewed indicates that digitalization can substantially improve operational efficiency, scalability, service accessibility, and customer convenience by reducing dependence on physical branches, automating processes, and leveraging cloud computing, data analytics, Artificial Intelligence, and API-based technologies. However, the transition also creates a critical managerial trade-off between digital efficiency and relationship-based banking. Although digital channels enable faster, more convenient, and increasingly personalized services, reduced face-to-face interaction may weaken trust and perceived support, particularly for complex financial products and customers with limited digital literacy. The central implication is therefore that successful digital-first banking should not be defined by the elimination of physical interaction, but by the effective integration of digital efficiency with human-centered relationship management.

The study further concludes that the future banking model is likely to evolve toward a digitally led and human-supported ecosystem in which physical branches become smaller, more flexible, and increasingly focused on financial advisory, relationship management, financial education, and complex service needs. Sustaining this transformation requires banks to align technological modernization with cybersecurity, data gov-

ernance, organizational readiness, workforce capability, and customer trust. Cloud-native infrastructure, API integration, modular architectures, AI-enabled services, and data-driven decision-making should therefore be accompanied by robust cybersecurity and digital governance mechanisms, continuous employee reskilling, effective risk management, and strong data-quality and privacy controls. At the institutional level, financial inclusion must remain a strategic outcome of digital transformation by ensuring that digital services are accessible to underserved customers and populations with limited digital capabilities. Regulators likewise need adaptive governance frameworks that support responsible innovation while maintaining consumer protection, cybersecurity, interoperability, data protection, and financial stability. Accordingly, this study contributes to the digital banking literature by highlighting that sustainable transformation depends not on technological adoption alone, but on the alignment of technology, customer relationships, organizational capabilities, security, governance, and inclusion within an integrated banking strategy.

Future research should empirically examine the long-term effects of digital-first and hybrid banking models on financial inclusion, customer trust, customer satisfaction, and organizational performance, particularly among underserved populations and regions with limited digital infrastructure. Comparative studies across demographic groups, levels of digital literacy, financial needs, and developed and emerging markets would provide further insight into which combinations of digital and physical services are most effective under different conditions. Future studies should also investigate how emerging technologies, particularly generative AI, advanced fraud detection, open banking, and increasingly automated customer-service systems, reshape trust, perceived security, and human–technology interaction in banking. Such research would help develop banking models that are not only digitally efficient and innovative, but also secure, inclusive, resilient, customer-centered, and sustainable over the long term.

7. DECLARATIONS

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7.2. Author Contributions

Conceptualization: YS; Methodology: DH; Software: EN; Validation: DH and EN; Formal Analysis: YS and DH; Investigation: AL; Resources: DH; Data Curation: AL; Writing Original Draft Preparation: EN and DH; Writing Review and Editing: AL and EN; Visualization: YS; All authors, YS, DH, AL and EN have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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7.5. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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