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Review Article

Bridging the Gap: Exploring the Role of FinTech in Advancing Financial Inclusion in Nigeria

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Abstract— Financial technology (FinTech) has emerged as a transformative force in bridging financial inclusion gaps, particularly in developing economies like Nigeria. Despite significant progress, millions of Nigerians remain excluded from formal financial systems due to infrastructural, socio-economic, and institutional barriers. This review explores the evolution of FinTech in Nigeria, its role in enhancing financial inclusion, and the theoretical and empirical underpinnings guiding this transformation. The aim is to identify how FinTech solutions can address systemic challenges and assess gaps in existing literature for future research directions. Results reveal that FinTech innovations, including mobile banking, digital payments, and micro-lending platforms, have significantly improved financial access for underserved populations. However, barriers such as digital literacy, regulatory constraints, and infrastructure deficits limit broader adoption. The discussion highlights the importance of demand-side factors, such as user trust and gender dynamics, and the interplay between FinTech and complementary infrastructure like digital identity systems and internet penetration. The conclusion underscores that while FinTech holds immense potential for advancing financial inclusion, its success in Nigeria requires targeted policy frameworks, stakeholder collaboration, and adaptive innovations tailored to local contexts. The novelty of this review lies in its integration of empirical findings with theoretical insights, identifying unexplored areas such as gender-sensitive FinTech solutions, environmental sustainability, and long-term socioeconomic impacts.

Keywords— Digital banking, Financial Inclusion, Financial Technology, FinTech innovation, Nigeria

1. Introduction

Financial inclusion stands as a critical process that provides appropriate financial products with affordable prices to establish economic growth alongside inequality reduction. Nigerian society faces an ongoing challenge of financial exclusion for groups that include financially disadvantaged individuals and rural populations alongside women [1]. Financial Technology (FinTech) brings new prospects to bridge the access gap by using innovative solutions for expanding financial service accessibility. Global organisations view financial inclusion as a key building block to achieving sustainable development goals. The United Nations lists financial inclusion as a priority in its Sustainable Development Goals through SDG 1 (No Poverty) together with SDG 8 (Decent Work and Economic Growth). Countries acquiring better financial inclusion demonstrate enhanced economic strength because their citizens and enterprises execute saving, borrowing, and investment operations with superior efficiency. The latest World Bank's Global Findex database (2021) indicates that 1.4 billion adults worldwide lack access to banking services while most of these individuals come from developing regions, particularly Sub-Saharan Africa.

FinTech functions as a game-changing technology which tackles existing financial industry problems. FinTech addresses underbanked populations through mobile money platforms, blockchain technology, digital credit, and peer-to-peer lending systems [2]. FinTech innovations are effective alternatives to traditional banking systems because they offer accessibility combined with convenience and cost-effective features in geographical areas with limited access to formal financial institutions. FinTech innovations have significant impacts on Nigeria's African populace because this major nation faces both an extensive population without formal banking access and accelerating digital transformation initiatives. The government, along with financial institutions, continues to make efforts towards reducing financial exclusion, yet the problem persists as a significant concern.

The Enhancing Financial Innovation and Access (EFInA) 2020 report shows that formal financial services exclude 38 million Nigerian adults, which amounts to 36 per cent of the adult populace. The combination of limited infrastructure together with limited educational opportunities in rural settings brings about the most significant exclusion rates [3].

The obstacles to financial inclusion in Nigeria are mainly caused by low income, insufficient trust in banking institutions, cultural perspectives and religious demands and inadequate infrastructure. Traditional financial institutions did not meet the specialised needs of women and those residing in rural areas; thus, these demographic groups face higher financial exclusion rates [4]. Building innovative financial solutions with technological components becomes essential for delivering accessible, affordable, and dependable financial services across Nigeria. Recent mobile technology developments combined with growing internet penetration and young technological people in Nigeria have ignited a FinTech revolution during the last ten years. Several FinTech firms operate as disruptive financial elements that deliver an array of products, from mobile transactions and digital credit to wealth organisation and investment compilation services. Major players within the Nigerian FinTech industry include Paystack along with Flutterwave Paga and Carbon, and these organisations have achieved regional and global recognition because of their creative solutions [5].

Mobile money systems have done the most to advance financial inclusion among users. The mobile platforms offer their users the ability to manage money transfers together with bill payments as well as savings options through their mobile devices. Paga stands as a dominant Nigerian mobile money operator that is driving higher levels of financial service delivery both in rural and urban regions [6]. FinTech startups utilise big data with Artificial Intelligence (AI) to produce credit-scoring systems that allow individuals and small businesses whose financial history is undocumented to obtain loans. The development of FinTech and financial inclusion in Nigeria has received essential support from both the government and official regulatory agencies. The Central Bank of Nigeria (CBN) introduced multiple sector-specific policies that include the National Financial Inclusion Strategy (NFIS) to reach a 20% exclusion rate by 2025 [7]. The ongoing initiatives in Nigeria involve payment service banks delivering financial services to underreached populations, as well as cashless policy implementation and agent banking promotion programs. FinTech companies, together with traditional banks and telecommunication providers, have formed partnerships that produce operational and distribution synergies that boost the coverage and effectiveness of financial services. The MoMo Agent service created by MTN through a partnership with the Central Bank showcases the power of joint efforts to boost financial inclusion [8]. Financial access expansion through FinTech companies has shown substantial improvements, but several obstacles remain unchanged. New startups face impediments to their expansion through existing regulatory requirements along with the associated costs needed to comply. Rural areas face a significant hurdle to FinTech expansion because of their deficient power grids and their missing internet infrastructure [9]. Additionally, issues of cybersecurity and data protection pose risks to the adoption of digital financial services. The adoption of FinTech solutions becomes limited because many people lack digital literacy skills, thus requiring ambitious education programs to spread awareness across the general population.

Financial inclusion enhancement through FinTech is explained through innovation diffusion theory and financial intermediation theory. According to innovation diffusion theory, new technologies expand across social structures because early adopters lead the broader acceptance process [10]. Small business owners and entrepreneurial youth in Nigeria play key roles as innovation drivers in achieving nationwide financial integration. Financial institutions gain importance through the financial intermediation theory because they function as connectors between savers and those who need to borrow money. The traditional financial system faces disruption through FinTech, which enables transactions savings and lending activities directly and efficiently. The platform transition produces tangible value by cutting operational expenses while improving operational speed and expanding financial resource availability [11]. The research findings benefit numerous parties, including governmental stakeholders, together with FinTech enterprises and financial service organisations and the unprivileged user base. The understanding of FinTech innovation's effects on financial inclusion becomes vital for policymakers because it helps them create supportive regulations and policy frameworks. This research allows FinTech companies to develop solutions that address inclusion by using the insights they have learned. The study outcomes become helpful for financial institutions to identify potential partnerships with FinTech companies that will improve their service capabilities while extending their market presence. The research enables underserved populations to gain empowerment through the discovery of specific methods that help them defeat financial exclusion barriers. The problem of financial exclusion continues to be a severe barrier to economic development in Nigeria while also maintaining high-income discrepancies throughout the nation. According to Enhancing Financial Innovation and Access (EFInA, 2020), African largest economy, Nigeria, struggles to include more than a third of its adult population in its formal financial services sector. The three groups that face the most significant financial exclusion are rural residents, women, and people with low income status. They lack access to traditional banking services due to geographical barriers and cultural and infrastructure limitations. Acceptance of underserved populations remains beyond traditional banking institutions despite their difficulties handling operational costs along with minimal rural establishment presence and rigid products. Millions of Nigerians must use unsafe and restricted rotating savings and credit associations instead of formal banking services because they lack complete protection.

FinTech solutions present an opportunity to address the recognised problems. FinTech innovations, including mobile money, digital lending, and peer-to-peer platforms, have already shown their capability to deliver financial services to previously excluded populations [12]. However, the total financial potential of FinTech solutions to promote inclusion in Nigeria remains untapped because of regulatory obstacles, low digital proficiency, and subpar infrastructure. This paper investigates FinTech innovations that promote financial inclusion in Nigeria by evaluating their effectiveness for marginalised communities and identifying expansion obstacles and solutions.

2. Concept of Financial Technology (FinTech)

The technology sector, known as FinTech, concentrates on using innovative solutions for financial operations to alter how specific services handle their financial actions. Due to its dynamic nature, FinTech applications cover mobile payments and digital lending systems, as well as blockchain solutions and AI tools [13]. Through modern technological advances, FinTech introduces enhanced financial products that become accessible and more convenient for users while also remaining inclusive. The core goal of FinTech consists of addressing traditional financial system weaknesses because these systems present inefficiencies alongside expense and physical barriers that create barriers to service for underserved groups. Traditional banks have faced difficulties in serving underbanked and unbanked people for a long time, according to [12]. The traditional financial structures experience disruption through FinTech because this innovative approach minimises financial processes at low costs and provides broad service adoption.

The analysis of historical FinTech development becomes possible through FinTech study. During a previous phase, FinTech concentrated on back-end systems to improve banking and financial institution process automation and operational effectiveness [14]. Major financial technologies such as credit cards, ATMs, electronic payments and others were developed during the FinTech 1.0 period of the mid-20th century. They established foundational elements that turned financial services into digitally transformed systems that have emerged in the present digital world [15]. During the period of the internet and mobile technology development 'FinTech 2.0' entered its next evolutionary stage. The innovation became customer-oriented to enhance both user experience and accessibility during this period. Online banking and mobile payment platforms and e-commerce integrations became everyday use as institutions lost their central position in financial services [16]. The global financial crisis of 2008 marked a significant turning point by making consumers doubt traditional banking institutions, thus pushing more FinTech startup creation. By launching their operations, startups focused firmly on transparent business models, efficient operations and user empowerment together with banking alternatives [17].

The technological progression of "FinTech 3.0" allows startups to unite forces with traditional financial institutions to develop shared financial platforms. The expansion of FinTech occurs because of regulatory support together with open banking initiatives, technological advancements in blockchain and AI, and significant data analytics power [18]. FinTech serves two fundamental roles in modern business: it disrupts established industries while simultaneously enabling financial inclusion, which drives digital economic advancement across the whole financial industry. Advanced payment systems represent the primary section where FinTech development occurs. The combination of mobile wallet solutions, along with contactless payment methods with digital currency technology, has revolutionized how consumers and businesses conduct payments. Nigerian payment processes have been optimised by the introduction of Paystack and Flutterwave, which allow users to execute basic fund transfers and digital transactions [19]. A cash-based transaction system exists in Nigeria, with banking facilities missing in various geographical areas, so the population needs these solutions.

FinTech applications show significant advancement toward the creation of lending systems and credit infrastructure for users. The credit rating process of untraditional and small businesses relies on FinTech companies that deploy alternative credit systems and big data analytics. The new system lets poor people, together with start-ups, obtain credit access autonomously without needing extensive documentation or asset guarantees [20]. Instant loan services are accessible through mobile applications to Nigerian customers who use Carbon or Branch services.

FinTech provides investors with a range of tools and robo-advisor automation to manage wealth autonomously with digital investment solutions and funds-saving mobile applications. Technologies present accessible ways for people throughout the population to boost their money as they work towards financial objectives at moderate costs. Robo-advisors that use AI algorithms produce automated investment suggestions that create refined financial planning tools which reduce human contact [21]. The fundamental component of FinTech systems is insurance technology, which serves as its foundation. The insurance-supporting software system which operates within the FinTech domain operates under the name InsurTech. Through InsurTech implementation, the insurance industry achieved two key benefits, including digital processing implementation combined with fresh insurance services such as usage insurance plus microinsurance to reach more customers. The present insurance penetration levels in Nigeria stand low due to technological advancements that have become important in this sector [22]. People acquire insurance policies using FinTech platforms which match their financial condition and personal requirements.

Blockchain technology, together with cryptocurrency, represents two significant first-wave forces in the FinTech industry. Digital financial transactions using blockchain techniques provide secure transparency to ensure fewer cases of fraud and build trust within the system. The cryptocurrency network enables worldwide payment transactions with alternative funds, which enhances banking access to communities with minimal banking facilities. The adoption of Bitnob and Binance and multiple cryptocurrency platforms in Nigeria serves to extend the borders of the financial ecosystem through their use. FinTech delivers numerous advantageous elements to its users. The accessibility of digital technologies improves by reaching population segments that exist in rural areas where physical banking infrastructure is scarce. The mobile phone, combined with an internet connection, works as a financial service portal through which people without prior opportunities can join the formal economy. The implementation of FinTech solutions provides affordable services because reduced operational expenses from FinTech solutions are passed on to consumers at lower fees and reduced rates. Intuitive interfaces with customised services are what the FinTech provides based on consumer preferences.

Through FinTech systems, traditional banking system gaps are eliminated to establish financial capabilities among disadvantaged groups, including female populations, young people and small business owners. The customized financial offerings through FinTech boost economic capabilities and promote social inclusiveness among all users. Technological developments contribute to building new financial products, thus keeping the industry ready to transform consumer needs. Organizations in the FinTech sector face various obstacles even as they exist. Governments, along with financial authorities, face essential barriers in their effort to connect financial innovation with consumer protection practices. CBN functions as a key regulatory body in Nigeria by creating policies and guidelines that define the FinTech field. Digital protection threats emerge as a serious concern since the rising digitalisation of financial operations exposes user information to possible fraud attempts and data invasions [23]. The limited digital proficiency of the population, together with inconsistent infrastructure standards, worsens these problems, especially for areas with low levels of technological adoption. The FinTech industry in Nigeria achieved substantial growth thanks to young demographic statistics combined with sizeable mobile phone adoption rates and the growing startup environment. The FinTech sector in Nigeria operates optimally through multiple entities, including financial institutions plus initial startups, along with regulatory programs that support technology innovation together with financial inclusivity. The FinTech industry has seen Paystack along with Flutterwave PiggyVest and Cowrywise establish themselves as leaders who resolve payment systems and money saving problems and credit accessibility requirements. CBN delivers crucial support to FinTech advancement through its implementation of eNaira, which enhances financial access and economic performance. The CBN works to develop an opportune environment for FinTech development to help both close the financial inclusion gap and provide power to disadvantaged population segments [24]. Through the National Financial Inclusion Strategy (NFIS), the country sets challenging targets to enhance the availability of financial services throughout all regions of Nigeria.

The global financial industry transforms FinTech because it develops modern solutions which solve traditional banking system issues. Financial services delivery and consumption patterns have undergone significant transformation through technology deployments such as mobile applications, blockchain systems, AI solutions, and big data analytics. Technology-driven financial services in Nigeria continue their thriving growth because of regulatory backing, entrepreneurial innovations, and evolutionary technology developments. FinTech continues to grow in importance because it enables broad financial access, which results in economic development and social advancement for all digital economy participants.

3. Overview of Financial Inclusion

A fundamentally important idea regarding financial inclusion demonstrates how to provide people and businesses with affordable financial services at the right time with suitable offerings. Economic growth alongside inequality reduction depends upon these financial services, savings, credit facilities, insurance payments, and investments. Throughout history, financial systems have restricted a significant portion of the population from accessing their services, especially in developing countries. The cause of exclusion includes separate factors comprising weak banking infrastructure, demanding account regulations and expensive transaction fees. Statistics from the World Bank show that approximately 1.4 billion adults worldwide have had no access to bank services during the recent period [25]. People who do not have access to financial services miss out on economic growth opportunities because both capital movement and consumer spending decrease in consequence.

The initiative to enhance financial inclusion requires special attention for all communities which lack sufficient financial services. Rural populations encounter multiple barriers because they lack bank branches and have poor access to technology. Women, together with youth and small-scale business owners, face barriers to financial inclusion from social structures, insufficient financial comprehension and lack of appropriate security assets. These inequalities show that it is vital to develop specific strategies that will remove financial exclusion barriers [26]. Financial inclusion goes beyond economic empowerment by affecting people on a broader societal level. Financial systems that promote inclusivity help achieve multiple societal and economic targets, which include decreasing poverty levels while generating jobs and reaching gender parity. Financial service access allows people to accumulate savings for unexpected situations alongside investments in educational pursuits and healthcare and accumulation of wealth for improved security in the future. Businesses benefit from financial inclusion because it enables them to pursue credit, which helps them achieve growth, innovation, and marketplace competitiveness.

One of the key dimensions of financial inclusion is the accessibility of banking and financial services. The traditional banking infrastructure primarily depends on physical locations that demand high operating expenses to operate and sustain. Banks have traditionally restricted their operations to urban areas for historical reasons, thus neglecting rural and remote regions. Modern digital technologies transformed the traditional banking structure through their capability to distribute financial services through mobile phones and online platforms combined with agent banking networks. Innovations have greatly enlarged access to financial services, especially in developing countries [27]. Becoming financially included depends heavily on the ability of services to remain affordable to consumers. Bank services become unaffordable for low-income group members because they need to pay steep charges to maintain the necessary minimum balance. FinTech companies, alongside digital banks, provide cheap or no-cost account solutions which help make financial services reachable to economically underprivileged individuals. FinTech innovations succeed in decreasing transaction charges to let underprivileged people access formal economic systems without paying excessive costs.

Financial service usability functions as an essential factor that determines the effectiveness of financial inclusion. The combination of affordable accessibility to financial services does not guarantee regular usage if the platforms do not meet user requirements among different demographic groups. Projects intended for city workers do not fit the requirements of agricultural workers in rural areas and small business operators who need financial products. Financial services benefit from custom-built options that create suitable financial solutions that match the needs of different demographic markets through services like micro-loan savings plans and insurance products. Financial literacy education establishes advanced usability by training people to execute knowledgeable financial choices. Financial inclusion stands as a top policy matter in Nigeria because a significant portion of its population lacks access to formal banking services. The CBN organised various efforts to boost financial inclusion through its implementation of the National Financial Inclusion Strategy (NFIS) [28]. As part of this plan for 2020, the strategy targets a goal of lowering the exclusion rate to 20% while improving service access for rural residents and digital financial platform usage and educating people about financial matters.

Mobile money services played a vital role as one of the significant forces that promoted financial inclusion across Nigeria. Through platforms including Paga OPay and MTN Mobile Money, Nigerian individuals can conduct transactions, make bill payments, and save funds using their mobile phones. Mobile money services have become vital for people in rural areas since traditional banking infrastructure remains inadequate in those locations. Through agent banking networks, financial services now reach more people since individuals can obtain essential banking facilities through neighbourhood representatives.

Microfinance institutions, through their operations, provided critical support for the progress of financial inclusion in Nigeria. MFIs provide customized financial products and loans with small amounts to meet the credit requirements of qualifying low-income groups and small businesses that lack access to conventional banking. The achievements of microfinance projects prove that financial inclusion serves as an effective model for economic growth that combats poverty [29]. The progress toward total financial inclusion in Nigeria meets strong opposition from various remaining obstacles. The main restrictions stem from weak digital infrastructure, which affects rural zones specifically. Unstable power supply, together with restricted internet access, prevents digital financial systems from being adopted, thus forcing communities to deal with cash transactions. Financial service utilization becomes limited due to inadequate financial literacy skills among users. People need better digital literacy to operate digital interfaces, as well as a sufficient understanding of how formal financial instruments provide advantages.

The implementation of financial inclusion initiatives in Nigeria encounters limitations through federal policy and regulatory structures. Although the CBN has been successful at creating an environment favourable to financial innovation, its regulatory barriers and inconsistent policies sometimes prevent FinTech companies, together with other financial services providers, from growing appropriately. Industry stakeholders, together with policymakers, need to work alongside regulatory bodies to strike a proper equilibrium between innovation and consumer protection [30]. The economic situation in Nigeria has worsened due to the existing gender distribution gaps in the financial sector. Women form the majority of individuals who remain out of the banking system because traditional norms combine with lacking access to funds and weak financial education skills. Universal access to financial services requires specific interventions, which consist of gender-inclusive financial products and the implementation of gender equality policies together with programs for financial capability growth among women.

Economic resilience received heightened visibility during the COVID-19 pandemic thanks to financial inclusion. Digital financial services provided essential support to numerous businesses and individuals because traditional financial systems became disrupted by lockdowns and travel restrictions. The pandemic in Nigeria revealed digital payment solutions, as well as mobile money and online banking, grew quickly because financial inclusion proved essential during economic crises. The analysis showcased several deficiencies in the current financial system because it excluded those who lacked digital capabilities and formal identification [31]. Sustainable economic progress depends on financial inclusion since it enables people and businesses to take part entirely within the financial system. Financial inclusion programs that focus on removing obstacles to accessibility, lowering costs, and improving system usability give power to people in underserved populations while creating equality in social networks and economics. The country of Nigeria achieved considerable advancements through its mobile money services, while other advancements were realised through microfinance institutions and digital banking platforms. To achieve complete financial inclusion, the Nigerian system needs to overcome infrastructure obstacles and regulatory barriers, as well as understand and resolve gender-based differences. The digital transformation of finance enables Nigeria to use its innovative potential to build a financial system that is inclusive of all citizens.

4. The Evolution of FinTech in Nigeria

FinTech development in Nigeria portrays an extraordinary journey that brings together disruptive technology with innovations alongside financial solutions in one of Africa's biggest economic blocs. During the last twenty years, Nigeria moved from its status as a cash-dependent economy to building a thriving online finance market through regulatory changes, tech company growth, and rising smartphone use and internet access.

Traditional banks initiated FinTech in Nigeria through the adoption of electronic banking systems in the early 2000s to advance their operational efficiency and service reach. The first stage of FinTech development in Nigeria emerged through Automated Teller Machines (ATMs) and electronic funds transfers as well as online banking platforms. The focus of these innovations remained on customer convenience as well as decreasing bank branch usage [7]. The new financial technologies mainly benefited urban populations since the rural areas remained excluded from banking services. Mobile money services became the second significant development in FinTech evolution throughout Nigeria. The CBN launched the Mobile Money Regulatory Framework in 2010 with its primary goal to support digital payment development and increase financial inclusion. Mobile money platforms Paga, FirstMonie, and PocketMoni found market success by allowing phone users to handle essential financial dealings through their mobile devices. Most people who lacked traditional banking access found this evolution revolutionary for the Nigerian market.

At the start of mobile money adoption, only a tiny proportion of users joined, while Kenya set a benchmark for widespread M-Pesa mobile money usage. Multiple hindering factors caused this difference, including limited financial knowledge among users, limited digital network capabilities, and regulatory hurdles. The CBN introduced the National Financial Inclusion Strategy (NFIS) in 2012, which aimed to decrease the exclusion rate to 20% by 2020 as part of its remedy plan. The strategy contained vital directions to increase digital access to financial services and innovative financial sector developments [32]. The proliferation of smartphones and increased internet penetration in the mid-2010s marked a turning point in the evolution of FinTech in Nigeria. The innovative technologies established the perfect situation to enable rapid expansion of digital financial services while establishing new FinTech startup businesses. The Nigerian FinTech ecosystem gained its leadership through pioneers Paystack Flutterwave and Interswitch, which delivered groundbreaking solutions for payments, wealth management, lending, and remittances [33]. Startups have applied modern technology to tackle several financial system challenges, including costly deals, restricted credit access, and slow payment operations.

The acquisition of Paystack by Stripe in 2020 signified a significant achievement in Nigerian FinTech development because Stripe operates as a global payment processing company. The historical acquisition of Paystack by Stripe confirmed Nigerian FinTech startup potential while drawing massive international investment to the sector. The growing popularity of investment in the African FinTech sector elevated Nigeria to become a primary African recipient of capital funding [34]. The growth of FinTech in Nigeria was fueled by multiple key elements that combine a young, digitally adept community with large groups who avoid traditional banking and favourable regulatory policies. The vast space for financial innovation exists because data from the World Bank shows that 36% of Nigerian adults have remained unbanked in recent years [30]. FinTech organizations take advantage of this space through their specific financial solutions that serve underserved populations at manageable prices and with easy accessibility.

FinTech development in Nigeria strongly depends on the regulatory structures established by the nation. The Nigerian regulatory bodies, including CBN, developed innovation-promoting policies together with structures which protect consumers and maintain financial stability. PSBs Licensing Framework and Regulatory Sandbox Framework serve as enabling tools for FinTech businesses to test novel business methods and expand their activities. Through its launch of the eNaira digital central bank currency, Nigeria has demonstrated its dedication to using technology to advance financial inclusion and digital transformation. The FinTech revolution in Nigeria extended its reach to multiple financial service areas, moving past traditional payment solutions. The FinTech sector addresses multiple financial requirements through solutions that include microloans, insurance, investment management, and savings products. The startup companies Carbon and FairMoney have developed digital lending services for immediate credit access, while PiggyVest and Cowrywise enable customers to implement different savings options. The innovations fostered an expanded financial infrastructure that grants more people and businesses improved financial stability and successful prospects.

Despite its commendable achievements, the FinTech sector in Nigeria needs to overcome significant obstacles to both sustainable and continued long-term expansion. Digital connectivity problems coupled with unreliable electricity supply primarily hinder rural areas from benefiting from FinTech benefits. Minimising these infrastructure shortages represents a priority because it will allow FinTech services to reach every Nigerian resident no matter where they reside [35]. Security and trust issues represent a significant problem for Nigerian users with digital financial services. Digital vulnerabilities, together with fraud incidents along with data security issues, hinder the expansion and adoption of FinTech solutions in Nigeria. Creating trust among users depends on secure measures, clear communication, and intense regulatory surveillance. Users need financial literacy training together with digital proficiency instruction to become equipped with the skills required to handle digital financial decisions with confidence.

The competitive landscape of the FinTech sector in Nigeria also presents challenges for startups seeking to scale their operations and achieve profitability. Intense competition, coupled with the high cost of customer acquisition, necessitates continuous innovation and differentiation. Collaborations and partnerships with traditional financial institutions, technology providers, and government agencies can provide FinTech companies with the resources and support needed to overcome these challenges and unlock new opportunities. Table 1 provides an overview of key milestones and developments of the evolution of FinTech in Nigeria.

Table 1. Evolution of FinTech in Nigeria

Year	Key Development
The early 2000s	Introduction of electronic banking systems by traditional banks
2010	Launch of the Mobile Money Regulatory Framework by the CBN
2012	Introduction of the National Financial Inclusion Strategy (NFIS)
Mid-2010s	Proliferation of smartphones and increased internet penetration
2020	Acquisition of Paystack by Stripe, signalling global recognition of Nigerian FinTech potential
2021	Introduction of the naira, Nigeria's central bank digital currency

The evolution of FinTech in Nigeria reflects a dynamic and transformative journey that has redefined the financial landscape and expanded access to financial services for millions of Nigerians. While significant progress has been made, achieving comprehensive financial inclusion requires continued investment in infrastructure, regulatory innovation, and capacity building. By addressing these challenges and leveraging the potential of technology, Nigeria can harness the power of FinTech to drive economic growth, reduce inequality, and create a more inclusive financial system.

5. Theoretical Framework for FinTech and Financial Inclusion

Every research project receives its intellectual foundation from theoretical frameworks because these frameworks guide researchers to analyse phenomena through specific viewpoints. The understanding of technological systems with financial networks and social economics requires a robust theoretical foundation for FinTech and financial inclusion research. The author presents key theoretical frameworks of FinTech and financial inclusion in a Nigerian setting while showing their relevant applications. The Diffusion of Innovations (DOI) theory created by Everett Rogers serves as a fundamental theoretical basis for understanding FinTech alongside financial inclusion. The DOI theory describes all essential aspects regarding the speed of technological adoption and popularisation in communities. DOI theory provides substantial analytical value for examining FinTech solution use in Nigeria since technology adoption differs by population background and regional position [36]. The adoption process relies on five key attributes related to innovations, which include relative advantage, compatibility, complexity, trialability, and observability. Mobile payment systems in Nigeria have become popular because they provide more advantages than conventional banking methods through their convenience and accessibility. The theory demonstrates how early adopters, together with opinion leaders, speed up adoption processes while the young tech-savvy population demonstrates this phenomenon by advancing FinTech adoption within urban communities [37].

The Technology Acceptance Model serves as a meaningful framework when studying what drives people to accept and utilise technology. According to TAM, the key elements that drive technology acceptance are perceived usefulness and perceived ease of use [38]. The factors described shape user behaviour within FinTech systems in Nigeria. Users adopt mobile money services because they think these services enable money transfers even when they do not have bank account access. Users have adopted digital wallets and payment apps in large numbers because they find them easy to use alongside their better utility value. In Nigeria, the external components, including cultural norms and economic situations, along with regulatory policies, determine user acceptance as described in TAM [39].

The Unified Theory of Acceptance and Use of Technology (UTAUT) extends the features of TAM through social influence and facilitating conditions and user experience factors. UTAUT serves as a complete system for investigating FinTech adoption patterns in complex Nigerian sectors [40]. Human behaviour heavily depends on social influences when adopting new technologies because people base their choices on what their peers use as well as family members' opinions and community leader trends. The adoption of FinTech services becomes possible through facilitating conditions that include smartphone access together with internet connectivity and digital literacy. UTAUT emphasises the imperative of developing user-focused solutions that resolve the unique requirements of specific user clusters for Nigerian financial inclusion success [41].

FinTech bridges financial service provider gaps to underserved populations through mechanisms supported by the Financial Intermediation Theory from an economic standpoint. Through the Financial Intermediation Theory, financial institutions such as banks and non-bank financial institutions serve as resource alignment agents that minimise information asymmetry and transaction expenses. The modern financial intermediaries of FinTech companies utilise technology to improve both financial service efficiency and market accessibility and make services more affordable. Nigerian digital lending platforms employ data analytics with algorithms to evaluate borrower creditworthiness, which eliminates conventional credit scoring requirements and enables more people from underserved populations to obtain loans [42]. The theory demonstrates how FinTech disrupts banking models through its capability to provide affordable, innovative solutions that meet specific requirements of non-banked and underbanked populations.

The Capability Approach from Amartya Sen offers a person-oriented method to study FinTech effects on financial inclusion access. The method prioritises personal capability upgrading and resource access because it understands the value of both opportunities and available assets. FinTech plays a crucial role in financial inclusion according to the Capability Approach because it enables people to enhance their economic and social well-being [43]. Mobile money tools let users conserve funds, invest their money, and oversee their financial resources, which expands their financial capability. Electronic platforms that offer insurance services alongside healthcare and education access improve the overall well-being of underprivileged populations. According to the Capability Approach, one must remove structural impediments such as poverty, gender discrimination and inadequate infrastructure to guarantee the fair distribution of FinTech benefits.

The value of products and services gets enhanced as more users join through the Network Effects Theory framework. The success of FinTech platforms heavily relies on reaching critical mass because network effects are powerful in this market. Network adoption of mobile payment systems in Nigeria produces an effect where the product service value grows when more people become platform users [44]. The increased popularity of the service brings new merchants and providers who spin an upward cycle of growth that fosters innovation. To develop an interoperable and inclusive financial ecosystem, the FinTech industry requires meaningful collaboration between players, regulators, and traditional financial institutions.

The adoption framework of Institutional Theory demonstrates how regulatory systems, together with institutional arrangements, affect FinTech technology development and product implementation. The theory explains how people, together with organisations, function under formal and informal systems of rules which guide their conduct. The Nigerian FinTech sector gains its innovations and protects consumers through regulatory frameworks like the Payment Service Banks Licensing Framework and Regulatory Sandbox Framework. Institutions like cultural norms, along with social networks, play essential roles through informal mechanisms that shape the behaviours of users and their adoption patterns [45]. Financial services provider trust serves as an essential determiner for FinTech solution adoption rates in Nigerian rural zones because these regions face minimal traditional banking service capabilities.

The Systems Theory delivers a comprehensive approach to understanding how multiple parts of the FinTech system function together as a whole. The theory constructs an ecosystem as a complex network among FinTech companies together with regulators, financial institutions and users, and multiple additional actors. Such actors need to cooperate and create synergies through Systems Theory to accomplish financial inclusion goals together. FinTech startups, when teamed up with traditional banks, combine the operational abilities of each group to develop novel, accessible solutions on a large scale. FinTech businesses and regulatory entities that partner for collaborative efforts establish an environment that promotes innovation and protects security [46]. According to Systems Theory, feedback processes such as user interactions and marketplace changes play a vital role in helping the ecosystem improve continuously.

These theoretical frameworks together give an all-inclusive understanding of the elements that influence FinTech adoption for financial inclusion across Nigeria. These theoretical frameworks enable policymakers, together with practitioners and researchers, to create solutions which tackle specific Nigerian challenges and advantages. Nigeria must implement a comprehensive program that includes technological progress and employee training with regulatory backing to remove barriers to digital service adoption, inferior infrastructure, and limited computer skills. Solid security protocols alongside transparent information-sharing practices with user-friendly design features serve as essential requirements for building confidence in digital financial products.

6. Empirical Studies on FinTech and Financial Inclusion

Research investigations demonstrate how FinTech technologies specifically promote financial access for developing economies across Nigeria. The research examines different elements that link FinTech with financial inclusion through evaluations of service accessibility, technological acceptance, and digital financial solution impacts on social classes. A thorough overview of research findings emerges from Nigerian and worldwide settings, which creates a full grasp of FinTech's effects on financial inclusion.

The global financial inclusion trends receive substantial attention from Akolgo [47], who demonstrates how FinTech tools help people connect to financial resources. The introduction of mobile money and online banking platforms through digital finance enhanced access to financial services, especially among customers who were initially excluded from the financial sector. The analysis demonstrated mobile money accounts served as a principal factor advancing financial inclusion throughout Sub-Saharan Africa, and Ghana, together with Kenya, exhibited outstanding inclusion rates. Research confirms that FinTech solutions can achieve comparable outcomes in Nigeria since smartphone money adoption rates have been low.

Numerous research findings demonstrate that Nigerian businesses that implement FinTech solutions expand their financial inclusivity. The research paper by David-West et al. [48] evaluated mobile payment systems regarding financial inclusion across Nigeria. The research established that Paga, together with OPay, was instrumental in boosting financial service utilisation among populations that lacked banking facilities. A summary of essential research data about Nigerian mobile payment platform adoption and usage appears in Table 2.

Table 2. Adoption Rates and Usage Patterns of Mobile Payment Platforms in Nigeria

Platform	Adoption Rate (%)	Primary Use Cases	Key Demographics
Paga	45.3	Bill payments, money transfers	Urban youth, small traders
OPay	38.7	Transport payments, transfers	Urban youth, low-income groups
FirstMonie	25.6	Savings, bill payments	Rural women, small traders

The statistics in Table 2 demonstrate mobile payment technology has rapidly expanded its reach toward the urban youth population and small trading businesses. Mobile payments have received moderate acceptance from rural residents, yet these populations still need specific solution-based approaches because of their distinct difficulties.

The authors of another empirical study led by Ahmad and others [49] studied how African households benefited from mobile money services while gaining better financial access. The research analysed the impact of mobile money on financial inclusion through panel collection from Kenyan, Ugandan, and Nigerian populations. Mobile money usage by people led to multiple benefits, including more significant financial savings and better availability of credit, together with stronger resistance to financial crisis. The research in Nigeria established a direct link between homes that used mobile money services, which led them to save money for investments that generated productive wealth and built economic growth together with poverty mitigating effects.
Analysis from Nwidobie [50] shows the financial inclusion statistics between mobile money users and non-users in Nigeria, which are presented in Table 3.

Table 3. Financial Inclusion Indicators among Mobile Money Users and Non-Users in Nigeria

Indicator	Mobile Money Users	Non-Users
Percentage with savings	68.4	43.2
Access to credit (%)	54.7	28.9
Resilience to financial shocks	72.1	39.5

Table 3 shows that mobile money adoption rates substantially change key financial inclusion metrics. Users of mobile money services save more money and obtain access to credit while showing better abilities to withstand financial shocks. FinTech demonstrates its capacity to direct Nigeria toward balanced financial inclusion, which secures acceptable household well-being.

Field observations show that FinTech solutions possess the potential to help eliminate differences in financial inclusion between male and female populations. The research conducted by Van Hove and Dubus [51] examined how the M-Pesa mobile money service in Kenya affects female financial inclusion. M-Pesa provided women with enhanced financial service access, which enabled them to establish savings and investment accounts to manage their assets better. The research results find universal value in Nigeria since men and women maintain separate financial access spheres even though the nation progressively shifts toward electronic money handling.

EFInA initiatives showcase current data demonstrating Nigeria's position regarding financial inclusion together with the role FinTech has taken for its advancement (2022). The research concluded that FinTech solutions, including agent banking and digital wallets, have effectively expanded financial services availability across rural territories. Legislative bodies, alongside traditional banking institutions and FinTech companies, need to cooperate in developing financial inclusion policies according to the results of the study cited. The research recognized multiple adoption obstacles which include low digital competence levels and substandard infrastructure alongside legal restrictions.
A summary of primary barriers to FinTech adoption in Nigeria is contained in Table 4 from the EFInA study.

Table 4. Barriers to FinTech Adoption in Nigeria

Barrier	Description
Low digital literacy	Limited understanding of digital financial tools
Inadequate infrastructure	Poor internet and mobile network coverage
Regulatory constraints	Complex licensing and compliance requirements
Trust issues	Concerns about security and data privacy

The findings in Table 4 highlight the critical challenges that need to be addressed to ensure the widespread adoption of FinTech solutions in Nigeria. Addressing these barriers requires a multi-stakeholder approach involving policymakers, FinTech companies, and civil society organisations.

7. Gaps in the Literature

Various pertinent gaps remain within the literature about FinTech and financial inclusion, which opens new avenues for study and advancement. Research about FinTech-enhanced financial inclusion exists, but few studies have investigated how contextual elements affect FinTech adoption and production in Nigeria's developing financial sector [32]. Most academic research uses global or regional scope to analyse FinTech while avoiding discussion of the socio-economic and cultural elements that shape the Nigerian financial environment.

Available studies put significant weight on supply-side analysis of FinTech innovation by investigating the roles of banks and FinTech firms and their regulatory partnerships in fostering financial inclusion. The vital nature of this perspective fails to recognize the crucial demand-side elements which dictate how effectively FinTech solutions can serve their targets. Little research exists to understand how end-users perceive FinTech services because research primarily focuses on marginalised groups who reside in rural areas, as well as women and those in the informal sector [52]. A fundamental knowledge gap exists in assessing permanent changes resulting from FinTech applications. The prevailing research focuses on rapid outcomes through enhanced accounts and transaction volumes, whereas essential evaluation of long-term economic growth and poverty elimination remains scarce in current literature. The evaluation of FinTech's long-term effects on communities requires more extensive longitudinal studies since these investigations will reveal its complete transformative ability.

Research into the financial inclusion-FinTech connection lacks a comprehensive exploration of supporting infrastructure components, which include digital identity technologies together with internet availability and mobile communication networks. The investigation of FinTech adoption relationships with infrastructure conditions is essential to understanding technology solutions in Nigeria due to ongoing infrastructural gaps throughout the country. Studies which unite these components create a complete understanding of what both enables and hinders financial inclusion [53]. The metrics used to evaluate financial inclusion do not have universal agreement. Diverse research methods use different assessment metrics, including account access data and frequency statistics, which produce conflicting findings that cause difficulties while comparing results across studies. The creation of standardized measurement methods which evaluate the comprehensive financial inclusion dimensions would improve research reliability and practical usefulness in future investigations.

More research needs to be conducted to understand how regulatory frameworks and policies impact the FinTech industry's financial inclusion capacity. Research regarding enabling regulatory frameworks exists but lacks detailed policy examination alongside comparisons between different regulatory approaches. A lack of thorough research exists about Nigeria's National Financial Inclusion Strategy, together with the Central Bank’s sandbox initiatives, which could effectively promote FinTech-driven inclusion. Academic research has surprisingly neglected the major gap regarding gender inequalities that exist within financial inclusion processes. The widespread acceptance of unique financial barriers that women face when accessing money fails to generate substantial evidence showcasing FinTech solutions for breaking these obstacles and creating gender equality [54]. Studies should investigate gender-specific solutions within FinTech, which will help scientists better comprehend their influence on financial inclusion and gender equality goals.

Other newer technologies, including AI and blockchain, along with big data analytics, find an essential intersection in FinTech, but researchers have only just begun to explore this promising field. While FinTech technologies show promise of improving scalability efficiency and inclusivity through their various applications, there remains doubt about the extent to which they will promote financial inclusion in Nigeria's markets. The discourse between FinTech systems and financial inclusion operates independently from environmental and sustainability interests. The analysis of intelligent FinTech solutions for sustainable finance and green financing warrants special attention because they are now prominently discussed in international sustainable development initiatives [55]. The study contains several additional significant weaknesses, which primarily comprise unexplored future ramifications of FinTech adoption. Despite its advantages, FinTech comes with several risks, including cybersecurity threats, data privacy threats, and the exclusion of financially illiterate populations. Studies about these risks remain sparse in the literature, and strategies to minimise their adverse effects are not available.

Collaboration efforts between entities serve as the driving force behind the implementation of financial inclusion through FinTech technology. The significance of multi-stakeholder involvement gets support from studies, yet research about these collaborative dynamics and results is mainly lacking in Nigerian settings. Research opportunities exist to understand the development of strategic FinTech-company-government-NGO alliances for financial inclusion expansion. The literature review supports the necessity of filling these knowledge gaps so the field of FinTech-based financial inclusion can progress further. Research in areas identified as under-researched by this study will enable future work that will lead to the development of effective, equitable, and sustainable FinTech solutions that minimise population marginalisation.

8. Conclusion

The research on FinTech shows three significant points about its impact on financial inclusion in Nigeria. The country's financial sector has shown a significant transformation through the development of FinTech technologies. Essential financial services are now accessible to millions who never had bank access because mobile banking and digital wallets, along with payment platforms, appeared. FinTech innovations lead to higher operational efficiency, reduced costs, and expanded accessibility patterns, particularly for underprivileged and remote community members. Various scientific studies demonstrate the central importance of FinTech services for reducing financial exclusion restrictions. The main obstacles to financial inclusion stem from the high costs of transactions together with remote locations that are difficult to reach, as well as insufficient traditional banking infrastructure. FinTech companies prove their ability to overcome barriers in financial services by delivering designed solutions which include microloans alongside insurance products and digital savings programs. Namely, the digital divide, together with poor infrastructure and regulatory difficulty, represent significant obstacles preventing FinTech from reaching its maximum potential across Nigeria. The Technology Acceptance Model and Diffusion of Innovation theory together create a framework which explains both FinTech solution uptake and effect. The selected frameworks highlight the core elements of user behaviour shaping, which consist of perceived ease of use and trust alongside socio-cultural conditions. Incorporating these user-related insights into FinTech design methodology leads to better widespread adoption and enduring impact. The current research has found essential gaps which upcoming academic studies, along with policy programs, need to focus on. Research should focus on conducting studies which consider Nigeria's special socio-economic framework and specific regulatory protocols. Research should dedicate equal attention to demand-side aspects, including user trust development alongside improved financial expertise because supply-side approaches currently dominate the literature. Studies tracking the extended effects of FinTech on economic empowerment along with poverty reduction need immediate attention because of their current absence. According to the analysis, enabling infrastructure, including digital identity systems and internet penetration, gives crucial support to FinTech adoption. The effectiveness of FinTech interventions can improve through infrastructure improvement alongside standardized financial inclusion measurement methods. The development of financial systems requires exploration into solutions that address gender equity and sustainability alongside investigations into the unexpected effects of adopting FinTech systems. The complete achievement of financial inclusion in Nigeria through FinTech demands an integrated system with various elements. All major stakeholders, such as policymakers and FinTech developers alongside development organisations, need to work together to resolve identified challenges and missing components. Theoretical and empirical research findings enable stakeholders to develop creative solutions that effectively serve the diverse Nigerian population's requirements.

Data Availability
None.

Conflict of Interest
The authors declare that they do not have any conflict of interest.

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Authors' Contributions
Udo Uduak Udo conducted the literature review, formulated the research objectives, and conceptualised the study. Augustine Okon Jacob was involved in data collection, analysis, and interpretation of findings. Both authors contributed to the development of the research methodology and discussion of results. Udo Uduak Udo drafted the initial manuscript, while Augustine Okon Jacob provided critical revisions and refinements. Both authors reviewed and approved the final version of the manuscript.

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