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INNOVATIONS IN FINTECH, E-CURRENCY, CRYPTO CURRENCY AND BIG DATA IN THE FINANCIAL SECTOR

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ABSTRACT

This study examines innovations in financial technology (FinTech), with particular focus on the emergence and nature of e-currency, cryptocurrency, and Big Data within the financial sector, using a desktop research approach. The study finds that FinTech has emerged as a key driver of digital transformation, significantly improving efficiency, expanding financial inclusion, and disrupting traditional financial intermediation. Evidence from the literature also indicates that FinTech innovations have enhanced service delivery while creating new opportunities within the financial ecosystem. However, the study identifies notable challenges associated with FinTech adoption, including increased exposure to cyber risks, fraud, and the potential use of cryptocurrencies for illicit financial activities. In addition, technical issues such as system vulnerabilities and integration challenges with existing financial infrastructure persist. The study further reveals that empirical research on FinTech in developing economies, particularly Nigeria, remains limited. . The study concludes that while FinTech holds significant potential for advancing financial systems, its benefits depend on a stable and well-regulated environment. Accordingly, the study recommends strengthening regulatory frameworks to enhance oversight and cybersecurity, promoting the integration and listing of FinTech firms on the capital market, encouraging strategic partnerships between banks and FinTech companies, investing in digital infrastructure and human capital development, and designing inclusive policies that expand financial access to underserved populations.

Key Words: *Financial Technology, E-currency, Bitcoin, Cryptocurrency, Big Data*

1.0 INTRODUCTION

In recent years, financial technology (Fintech) investment has increased significantly across the globe, and this trend is expected to continue due to rapid digital transformation in the financial services industry. Fintech refers to the application of technology to deliver financial services such as payments, lending, fundraising, asset management, and money transfers in a more efficient and accessible manner (AlMomanri & Alomari, 2021). It represents a fusion of "finance" and "technology" aimed at improving service delivery within the financial system.

Fintech firms are innovative, technology-driven startups that often operate alongside traditional financial institutions such as banks, insurance companies, and asset management firms. They are characterized by their ability to disrupt conventional financial service models through digital solutions, improved customer experience, and operational efficiency (Suryono, Budi & Purwandari, 2020). According to Arefjves and Verdenhofs (2021), Fintech firms are essentially non-traditional financial institutions that provide

software-based innovations within the financial services ecosystem.

The rapid growth of Fintech has been driven by technological advancement, demographic changes, non-traditional competition, and the increasing demand for convenient financial services (Chen, 2016). Innovations such as mobile banking, blockchain technology, artificial intelligence, and cryptocurrencies have significantly reshaped global financial markets (KPMG, 2015). As a result, Fintech has become a major driver of digital transformation in the financial sector worldwide.

Although Fintech firms are not yet full substitutes for traditional banks, they have introduced strong competition by offering faster, cheaper, and more user-friendly financial services. The Fintech Disruptor Report (2017) estimates that up to one-third of revenue in traditional financial institutions is at risk due to Fintech innovations. This has encouraged collaboration between Fintech companies and traditional financial institutions as a strategy for survival and competitiveness (Lee & Shin, 2018).

Globally, Fintech adoption has increased steadily, with significant penetration in both developed and emerging economies. The EY Fintech Adoption Index Report (2017) shows an average adoption rate of 33% across major markets, with countries like China recording up to 69%. The high adoption rates are attributed to improved accessibility, transparency, and personalization of financial services compared to traditional banking systems.

However, in developing countries such as Nigeria, Fintech adoption is still at an early stage. Despite the potential of Fintech to improve financial inclusion and economic efficiency, empirical research in the Nigerian context remains limited. Okoli and Tewari (2020) noted that while Fintech has the capacity to enhance financial development in African economies, its impact remains underexplored due to insufficient studies.

In Africa, financial systems are often constrained by limited access to financial services, which has hindered effective savings mobilization and investment growth. This gap has created a strong demand for Fintech solutions to improve financial intermediation and reduce transaction inefficiencies (Andrianaivo & Kpodar, 2011). In Nigeria, however, the adoption of Fintech innovations such as e-currency, cryptocurrency, and big data analytics is still evolving, and their full impact on the financial sector is yet to be adequately examined.

Despite the growing global relevance of FinTech, there remains a significant gap in understanding its implications within developing economies, particularly Nigeria. Existing studies have largely focused on developed markets, leaving limited empirical and conceptual evidence on how FinTech innovations such as e-currency, cryptocurrency, and big data influence financial systems in emerging economies. This study is therefore motivated by the need to bridge this gap by providing a comprehensive review of FinTech innovations and their implications for financial sector development in Nigeria. Specifically, the study aims to examine the concept and activities of FinTech, analyze its development and innovative role in the financial sector, evaluate its superiority over traditional financial institutions, assess the emergence of e-currency, cryptocurrency, and Big Data, explore the relationship between Big Data and FinTech, and investigate the adoption and implementation of FinTech solutions by banks.

This study adopts a desktop research approach**,** which involves a systematic review and synthesis of existing literature on FinTech, e-currency, cryptocurrency, and big data. This method is appropriate as it enables the study to draw on a wide range of existing knowledge to provide a comprehensive understanding of FinTech innovations and their implications within the financial sector, particularly in developing economies such as Nigeria.

2. LITERATURE REVIEW

Financial Technology (FinTech)

Financial Technology (FinTech) has no universally accepted definition due to its evolving and multidisciplinary nature. However, it is generally understood as the integration of finance and technology to improve the delivery of financial services. FinTech represents an innovative and emerging field that continues to attract global attention and investment (Zavolokina, Dolata & Schwabe, 2018).

FinTech refers to the application of information technology in financial services, including digital innovation and technology-driven financial start-ups operating outside traditional banking systems (Zavolokina, Dolata & Schwabe, 2016; Chong et al., 2019). It is primarily aimed at improving efficiency, reducing costs, enhancing speed, and increasing flexibility in financial service delivery (Dapp et al., 2014).

In essence, FinTech involves the use of modern technologies to provide financial services such as payments, lending, savings, investment, and insurance. It also includes disruptive innovations such as blockchain technology and cryptocurrencies (Lerner & Tufano, 2011). These innovations have transformed traditional financial systems by introducing more accessible and customer-oriented financial solutions.

FinTech firms are typically startups or technology-driven institutions that provide alternative financial services and often operate alongside traditional banks (Arefevs & Verdenhofs, 2021). Their core objective is to enhance financial accessibility, efficiency, and convenience through digital platforms such as mobile banking, online payments, and crowdfunding services.

Activities of FinTech Companies

FinTech firms offer a wide range of financial services including payments, lending, savings, investment management, insurance, and financial advisory services (Carmona et al., 2018). These services are often delivered through digital platforms such as mobile applications and online systems, making financial services more accessible to a broader population.

According to Arefevs and Verdenhofs (2021), FinTech activities also include blockchain-based transactions, cryptocurrency services, and peer-to-peer lending platforms. Most FinTech firms begin with payment services and gradually expand into other financial areas such as credit provision, investment products, and insurance, either independently or through partnerships with traditional financial institutions.

Development of FinTech and Innovations

The development of FinTech dates back to the 1950s with the introduction of credit cards and later automated teller machines (ATMs). The evolution continued with electronic trading systems in the 1970s and the adoption of internet-based financial services in the 1990s (Gabor & Brooks, 2017).

From the early 2000s, financial institutions began adopting digital technologies, leading to the rapid expansion of FinTech innovations (Chong et al., 2019). These innovations include mobile banking, blockchain, artificial intelligence, and digital payment systems, which have significantly transformed financial service delivery globally.

FinTech innovations have also increased efficiency and reduced transaction costs, making financial services more accessible. According to Lee and Shin (2018), FinTech disrupts traditional financial systems by unbundling financial services and offering more efficient alternatives.

In developing countries such as Nigeria, FinTech adoption is growing through innovations such as mobile payment platforms, digital savings applications, and social lending systems (Kyari & Akinwale, 2020). These innovations are gradually reshaping financial inclusion and access to credit.

Criticisms of FinTech Companies

Despite its advantages, FinTech faces several challenges. These include regulatory uncertainty, cybersecurity risks, high start-up costs, and limited financial resources. Data security and privacy concerns remain major issues due to the risk of hacking and data breaches.

Other challenges include fraud, money laundering risks, limited skilled manpower, and technical failures in digital systems. FinTech firms also face operational risks due to inadequate infrastructure and evolving regulatory requirements.

Furthermore, FinTech is not a complete substitute for traditional banking systems, as it still depends on collaboration with established financial institutions in many areas (Navaretti et al., 2017).

Superiority of FinTech over Traditional Financial Institutions

FinTech firms have introduced faster, more convenient, and user-friendly financial services compared to traditional banking systems (Dorfleitner et al., 2017). This has increased customer demand for digital banking services and placed pressure on traditional banks to innovate.

Empirical evidence shows that FinTech adoption reduces reliance on traditional banking services, particularly in areas such as payments, savings, and mobile transactions (Parameshwar et al., 2019). The increasing use of mobile banking and internet-based financial services suggests a shift toward digital financial systems.

E-Currency, Crypto-currency and Big Data

E-Currency

E-currency, also known as electronic or digital money, refers to any form of currency or monetary value that is created, stored, managed, and exchanged through digital systems, particularly over the internet. It represents a digital form of value that can be used as a medium of exchange, although it may not possess all the characteristics of traditional legal tender (Okoli & Tewari, 2020).

E-currency is typically issued and controlled by private developers and is often accepted within specific virtual communities (Al-Nawayseh, 2020). Unlike conventional money issued by central banks, it is not always regulated by formal financial authorities, though it can function as an alternative means of payment in certain contexts (Diana & Leon, 2020). Examples include cryptocurrencies such as Bitcoin, which are based on cryptographic algorithms.

E-currency exists in various forms, including cryptocurrencies, virtual currencies, and blockchain-based assets. It is stored electronically, either on centralized systems managed by financial institutions or on decentralized digital networks. Although it shares some features with traditional currencies, such as facilitating exchange, it lacks physical form (e.g., notes and coins), enabling faster and more cost-effective transactions across borders.

However, e-currencies are generally not recognized as legal tender in many jurisdictions unless supported by government regulation. Despite this limitation, they offer significant advantages, including ease of transfer, global accessibility, and reduced transaction costs, making them increasingly relevant in modern financial systems (Razak et al., 2020).

Crypto-currency

Cryptocurrency is a sub-type of digital currency and a digital asset that utilizes cryptographic techniques, peer-to-peer networking, and decentralization to facilitate secure transactions (Razak et al., 2020). It operates without a central authority such as a bank or government, relying instead on distributed ledger technology, commonly known as blockchain.

Bitcoin, introduced in 2008, is one of the earliest and most widely known cryptocurrencies. It exists solely in electronic form and can be used for online transactions, similar to conventional currencies, but without the need for intermediaries. Its decentralized nature ensures transparency, security, and ease of transfer across borders.

Despite these advantages, cryptocurrencies are generally not recognized as legal tender in many jurisdictions unless supported by regulatory frameworks. Their ability to facilitate cross-border transactions also raises concerns regarding regulation and financial security (Al-Bakri, 2018).

From an ethical and religious perspective, particularly within Islamic finance, cryptocurrencies such as Bitcoin have been subject to debate. Many scholars argue that they do not fully satisfy the characteristics of valid currency under Islamic law, and their use is often considered impermissible due to concerns over uncertainty and lack of intrinsic value (Al-Bakri, 2018).

Big Data

Big Data refers to extremely large and complex datasets generated from diverse sources such as social media, transaction records, sensors, and mobile devices, which exceed the processing capacity of traditional data systems (Mago, 2018). It involves advanced analytical techniques

used to capture, store, process, and extract meaningful insights from vast volumes of data.

Due to its dynamic nature, Big Data is commonly characterized by the "3Vs": volume (large amount of data), variety (different data types; structured and unstructured), and velocity (speed of data generation and processing) (Riahi & Riahi, 2018). Additional dimensions such as veracity (data accuracy) and value (usefulness of data) further enhance its relevance.

In the context of FinTech, Big Data plays a critical role in improving decision-making, risk management, fraud detection, and customer service delivery. By analyzing large datasets, financial institutions can identify patterns, predict trends, and offer more personalized financial solutions.

Relationship between Big Data and FinTech

Big Data has gained prominence in business operations as a tool for improving efficiency and enhancing the collection, processing, and distribution of information technology (IT). Its application in managing IT systems, known as IT Operations Analytics (ITOA), enables organizations to monitor performance, predict potential system failures, and provide proactive solutions (Mago, 2018).

In the FinTech space, big data plays a critical role by enabling firms to analyze large volumes of financial and customer data. This supports better decision-making, improves risk assessment, and enhances service delivery. For instance, fintech companies use big data analytics for fraud detection, credit scoring, and personalized financial services. The integration of big data and FinTech therefore enhances efficiency, innovation, and financial inclusion within the financial system.

Banks' Adoption and Implementation of FinTech Solutions

Due to the growing influence of fintech on traditional financial institutions, banks have increasingly adopted fintech solutions to remain competitive in the evolving financial landscape (Webster & Pizzala, 2015; Kerenyi et al., 2018). These adoption strategies generally fall into three main approaches: internal development, acquisition, and collaboration.

Internal development involves banks establishing innovation hubs such as laboratories and research and development (R&D) units to design and integrate fintech solutions. According to Webster and Pizzala (2015), these labs enable banks to develop and test emerging technologies, including blockchain systems. Oshodin et al. (2017) further note that such innovation labs support experimentation and rapid prototyping, while Kyari and Akinwale (2020) emphasizes their role in fostering collaboration within the financial ecosystem. Globally, institutions such as Deutsche Bank and Capital One have established innovation labs to enhance digital transformation and improve customer service delivery.

Another approach is acquisition, where banks purchase or merge with fintech startups to gain access to innovative technologies. This strategy is widely used in developed financial markets, particularly the United States (Kyari & Akinwale, 2020). In Nigeria, similar trends are emerging as fintech startups such as OneFi expand through acquisitions and regional partnerships, strengthening their market presence across Africa.

Collaboration has also become a dominant strategy due to the complementary strengths of banks and fintech firms. While fintech companies excel in innovation and digital solutions, banks possess established customer bases, regulatory experience, and infrastructure (Kyari & Akinwale, 2020). This synergy has led to the rise of "open banking," where banks provide Application Programming Interfaces (APIs) that allow third-party developers to build financial applications and services on bank platforms (Manthorpe, 2017). This collaborative model enhances service delivery, promotes innovation, and improves customer experience in the financial sector.

In Nigeria, banks such as Guaranty Trust Bank (GTPay), First Bank (FirstPayLink), and United Bank for Africa (UCollect) have adopted fintech-driven solutions to enhance digital banking services and improve financial inclusion, especially for unbanked populations. These developments reflect a broader global shift toward digital transformation in banking systems.

Empirical Review

Empirical studies on fintech remain relatively limited, as much of the early literature focuses on conceptual discussions rather than rigorous empirical testing (e.g., Chong et al., 2019; Oseni & Ali, 2019; Razak et al., 2020; Arefevs & Verdenhofs, 2021). However, a growing number of studies have begun to examine its impact on financial systems, adoption behaviour, and institutional performance.

Parameshwar et al. (2019) investigated the disruptive effect of fintech on traditional financial institutions in selected Asian countries using a mixed exploratory and descriptive approach. Their findings, based on data from global fintech reports (2013–2017), revealed that fintech innovations such as mobile money, digital payments, and internet banking significantly reduced the dominance of traditional banking services, particularly in savings mobilisation and account usage.

Okoli and Tewari (2020) examined fintech transmission channels to financial development in African economies (2002–2019) using system GMM and static estimation techniques. Their findings showed that fintech promotes financial development directly in more developed African economies, while indirectly influencing financial inclusion and bank efficiency in frontier and fragile economies. They concluded that financial technology-driven credit expansion plays a key role in addressing financial exclusion in Africa.

Varga (2017) identified fintech as a major enabler of innovation in financial services, improving efficiency and addressing global financial inclusion challenges. Similarly, Arner et al. (2020) found that fintech significantly enhances financial inclusion and sustainability by expanding access to financial services.

In India, Buckley et al. (2019) explored the drivers and barriers of fintech adoption through a conceptual and empirical review. Their findings indicated that fintech has experienced rapid growth, although regulatory challenges and infrastructure constraints may affect its future expansion.

Um et al. (2020) used structural equation modelling to examine fintech adoption among middle-aged and older adults. The study found that perceived usefulness, ease of use, and innovation positively influence intention to use fintech, while uncertainty reduces adoption levels.

Diana and Leon (2020) investigated fintech payment systems in Jakarta using 313 survey responses and structural equation modelling. The study revealed that convenience significantly influences continued use of fintech payment systems, while perceived operational risk had no significant effect.

Al-Nawayseh (2020) found that perceived benefits and social influence significantly affect the intention to use fintech applications, while perceived risk was not a significant determinant. The study also confirmed that customer trust mediates the relationship between risk perception and fintech adoption.

In the banking sector, Lien et al. (2020) examined fintech adoption in Vietnam using multivariate regression analysis on data from 620 customers. The results showed that perceived usefulness, trust, ease of use, and social influence significantly drive fintech adoption in banking services.

Daqar et al. (2021) explored fintech usage during the COVID-19 pandemic and found that increased adoption of contactless payment systems reduced physical contact, thereby contributing to the mitigation of virus transmission risks.

In Nigeria, Adebayo and John (2021) examined fintech adoption in the banking sector using survey data from 150 respondents across five banks. Their findings revealed that perceived risk is a major barrier to fintech adoption, while accessibility and service convenience are key motivating factors. They recommended improved system reliability and human capital development to enhance fintech adoption.

Similarly, Kyari and Akinwale (2020) assessed fintech adoption in Nigerian commercial banks and found that most banks are at a moderate level of fintech implementation, mainly in payment and money transfer services. Their results further showed that fintech adoption is positively influenced by internal R&D, collaboration, and technology acquisition, and has a significant positive effect on bank performance.

Overall, the empirical literature suggests that fintech adoption improves financial efficiency, inclusion, and performance; however, studies focusing on Nigeria remain limited and largely bank-centric. There is a noticeable gap in sector-specific and firm-level empirical evidence, particularly in relation to how fintech and digital financial innovations affect broader financial performance indicators within the Nigerian context. This gap justifies further investigation in this study.

3.0 THEORETICAL FRAMEWORK

This study is anchored on the Technology Acceptance Model (TAM) and the Evolutionary Theory of the Firm.

The Technology Acceptance Model (TAM), developed by Davis (1989), explains technology adoption based on perceived usefulness and perceived ease of use. It posits that individuals or organizations are more likely to adopt a technology when they believe it enhances performance and is easy to use. In this study, fintech and other financial technologies are expected to be adopted by firms when they are perceived to improve efficiency, reduce costs, and simplify financial operations.

The Evolutionary Theory of the Firm focuses on how firms develop technological capabilities through continuous learning, adaptation, and interaction within their environment. It emphasizes that innovation and competitiveness depend on a firm's ability to accumulate knowledge, skills, and internal competencies over time (Zahra & George, 2002; Cerulli, 2014; Iammarino et al., 2012). From this perspective, the adoption of financial technologies depends not only on perceived benefits but also on a firm's ability to build and sustain the required technological and organizational capabilities.

Together, the two theories provide a complementary explanation: while TAM explains the decision to adopt technology, the Evolutionary Theory explains the capacity to sustain and benefit from technological innovation in financial systems.

4.0 CONCLUSION AND RECOMMENDATIONS

This study examined innovations in financial technology (FinTech) with emphasis on e-currency, cryptocurrency, and Big Data, based on a review of existing literature.

The findings reveal that FinTech has become a major driver of digital transformation in the financial sector, significantly improving operational efficiency, enhancing financial inclusion, and reshaping traditional financial intermediation. The study also finds that despite these benefits, FinTech adoption is associated with several challenges, including increased vulnerability to cybercrime, fraud, and the misuse of cryptocurrencies for illicit financial activities. Furthermore, technical risks such as system failures, cybersecurity threats, and integration difficulties with legacy systems remain critical concerns. In addition, the study highlights that empirical evidence on FinTech in developing economies, particularly Nigeria, is still limited, indicating a need for more context-specific research in this area.

The study therefore concludes that fintech remains a key driver of innovation in the financial sector, with strong potential to enhance financial inclusion, efficiency, and service delivery. However, its benefits can only be fully realized within a stable and well-regulated environment. Against this backdrop, the following recommendations are advanced;

1. Regulatory authorities in Nigeria should strengthen and update existing frameworks to effectively regulate fintech operations, enhance cybersecurity, and build investor confidence.
2. Government policies should encourage the integration and listing of fintech companies on the Nigerian capital market to promote financial sector deepening and transparency.
3. Banks should deepen strategic partnerships with fintech firms through open banking frameworks, API integration, and innovation ecosystems to accelerate service delivery, improve customer experience, and enhance operational efficiency.
4. There is a need for sustained investment in digital infrastructure and capacity building to support fintech innovation. This includes upskilling financial sector

professionals in emerging technologies such as artificial intelligence, blockchain, and data analytics.

5. Policymakers should design inclusive fintech policies that target underserved and unbanked populations, particularly in rural areas, by supporting mobile-based financial services and reducing barriers to digital financial access.

5.0 LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDIES

This study is not without limitations. *First,* the study adopted a desktop (library-based) approach, relying entirely on secondary data from existing literature. As such, the findings and conclusions are based on prior studies rather than original empirical evidence. This limits the ability to validate the results with real-time data or firsthand responses from stakeholders in the financial sector. *Second,* the study is dependent on the quality, scope, and reliability of the reviewed literature. Any bias, inconsistency, or limitation inherent in the selected studies may have influenced the overall outcome of this research. *Third,* the study adopts a broad perspective on FinTech innovations without focusing on specific technologies or conducting sector-specific analysis. This general approach may restrict the depth of insight into particular FinTech applications. *Finally,* given the dynamic and rapidly evolving nature of FinTech, some of the findings drawn from earlier studies may not fully reflect the most recent developments in the financial technology landscape.

In view of the above limitations, the following suggestions are made for further research: *First,* researchers should conduct in-depth studies on specific FinTech innovations such as blockchain, mobile banking, artificial intelligence, and digital lending to better understand their individual impacts on financial institutions. *Second,* future research should explore the comparative performance of FinTech firms and traditional financial institutions using quantitative techniques. *Third,* Future studies should also examine emerging risks associated with fintech, particularly cybersecurity threats, digital fraud, and regulatory compliance challenges in evolving digital financial ecosystems *Finally,* further studies should examine emerging issues such as regulatory challenges, cybersecurity risks, and data protection concerns associated with FinTech adoption.

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