# The Role of Financial Technology (FINTECH) in Changing Financial Industry and Increasing Efficiency in the Economy: An Introductory Note

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### Introduction

Financial technology (abbreviated *fintech*) is used to describe new technology that seeks to improve and automate the delivery and use of financial services. At its core, fintech empowers companies, business owners, and consumers to better manage their financial operations, processes, and lives by utilizing specialized software and algorithms on computers and smartphones. The possibility now looms that entities driven by Fintech may emerge as competitive alternatives to traditional financial intermediaries, markets, and infrastructures. The widespread adoption of new technologies offers advantages and poses risks. While fintech may spur efficiency gains in the financial sector, offer better and more targeted products and services, and deepen financial inclusion in the developing world, its application could undermine competition, trust, monetary policy transmission, and financial stability.

The objective of this paper is to provide an introductory note on how fintech changed the financial industry and made the wider economy more efficient. The paper is divided into seven sections. Section I provides the historical evolution of fintech. Section II discusses the historical evolution of the payment system. Section III considers fintech's influence on the financial industry. Section IV provides the impact of fintech on the global economy. Section V elaborates on why big data is crucial in fintech. Section VI highlights the regulatory implications of fintech. The final section offers some conclusions.

### I. Historical Evolution of Fintech

The following is a historical evolution of fintech as elaborated by Agrawal (2021). Figure 1 provides a simplified timeline.

# Fintech 1.0 (1866-1967)

In 1860, a device called *pentelegraph* was developed to verify signatures by banks. While this was a significant invention, historians date the first valid fintech footprint as 1866, the year the transatlantic cables were set up leading to an era of creating network infrastructure and linkages around the world. A little over fifty years later, in 1918, the digitization of money began with Fedwire's transference of electronic funds via telegraph and Morse code. The publication of the book, *The Economic Consequences of Peace*, in 1919 ignited conversation about future possibilities of fintech. World War I and World War II increased the military need for coders and codebreakers, which catapulted dependence on coding and future digital development. An often overlooked life-altering event of fintech was the Diners' Club Card in 1950, which eliminated the need to pay with cash at restaurants. American Express introduced their first credit card in 1958.

Two years later, Scantlin Electronics's Quotron replaced stock market ticker tape with their development of a screen that delivered stock market quotes.

### Fintech 2.0 (1967-2008)

Fintech 2.0 began with the introduction of Automatic Teller Machines (ATM) by Barclays Bank in 1967 in London, England. Just the year before in 1966, Telex had replaced the telegraph for transferring information across the world; thus, heralding an era of connected financial transactions and communication. The next major fintech growth came in 1971 with National Association of Securities Dealers Automated Quotations (NASDAQ), the first electronic stock exchange which is considered one of the most important fintech developments of all time. NASDAQ changed the way bidding was done and modernized the Initial Public Offering (IPO) process significantly. In 1973, the introduction of the Society for Worldwide Interbank Financial Telecommunication (SWIFT) provided the main messaging network through which international payments are initiated. The 1980s saw the development of electronic trades and online banking systems, including Trade Plus (E-trade) in 1982 and the first mobile phones in 1983. The development of complex computing systems helped in the launching of newer and more dynamic processes and products. One breakthrough was the evolution of E-commerce in the 1990s, which made digital finance more accessible, and the launch of PayPal, the pioneer of cashless payments. Subsequent years saw a rapid development of technology in financial sectors, mainly by the traditional banks as a support function to their primary channels. Then the 2008 financial crisis struck and forced a re-evaluation of fintech and financial innovations.

# Fintech 3.0 (2008-2014)

In response to the 2008 financial crisis, reforms required stricter regulatory compulsions for traditional banks and opened up a new market for smaller banks and investors. This was further helped by public mistrust of large financial institutions. The financial industry's overall focus narrowed on using technology to reduce operational costs. In 2009, Bitcoin was introduced as the first cryptocurrency. Two years later, pay-to-play (P2P) became the newest avenue for consumers to pay for services or the privilege to engage in activities, or "to get into the game." Fintech is a diverse and rapidly growing landscape that spans into regulatory technology (regtech), digital lending, insurance technology (isurtech), digital wallets, crowdfunding, and more.

# Fintech 3.5 (2014-Today)

In 2014, the two most populous countries, China and India, experienced a phenomena, non-linear rise in fintech due to the absence of large industrial and corporate chains of complex physical banking infrastructures. This growth, along with fintech developments in Africa, was led by SaaS<sup>1</sup> developments in financial software by Indian information technology (IT) companies, such as M-Pesa in Africa, Tele birr in Ethiopia, and Alipay in China.

<sup>&</sup>lt;sup>1</sup> a method of software delivery and licensing in which software is accessed online via a subscription, rather than bought and installed on individual computers.

# Figure 1

Historial Rise of Fintech



# **II. Historical Evolution of Payment System**

Buying things and paying for them is part of our everyday lives. The following is a review of the historical evolution of payment systems according to Arroyo (2022):

**A. Barter:** Evidence of the existence of a barter system goes back to the Neolithic, with the emergence of the agricultural/livestock society (probably before 7000 BC). Barter is an exchange of material goods or services for other goods or services.

**B.** Coins: Their first appearance dates approximately 680 to 560 BC in what is now known as Turkey. Bartering sometimes posed difficulties for transactions. Some forms of payment were perishable, so they could not be accumulated. This led to the emergence of coins made of precious metals. A circular shape was adopted as being the most practical.

**C. Paper money and banknotes**: The discomfort of carrying coins in large quantities led to the rise of banknotes. Until the 1970s, each issue of banknotes by a country's authorities had to be backed by gold.

**D. Bills of exchange and checks**: Bills of exchange date back to 12th-century Italy. This document guaranteed that the debtor would pay the creditor or another person authorized to receive the money. The origin of cheques, on the other hand, dates back to around the 18th century and is linked to the English Crown.

**E. Credit cards**: In 1914, Western Union created a loyalty card for its most exclusive customers, giving them access to a line of credit without surcharges. In 1958, Bank of America credit card program issued Visa.

**F. Digital payments**: The internet era allowed for goods and services to be sold online via a computer. Consumers worldwide rely on their mobile devices to access a full range of financial services through Application Programming Interfaces (APIs). This massive decentralization enables person-to-person transactions and direct funding of firms (crowd-funding). These advancements enable unbanked consumers in low-income countries to access financial services for the first time.

**G. Real Time Gross Settlement (RTGS):** RTGS systems enable the transfer (or settlement) of money or securities from one bank to any other in real-time and on a gross basis.

*Settlement in real time* means a payment transaction is not subjected to any waiting period, with transactions settled as they are processed. *Gross settlement* means the transaction is settled on a one-to-one basis, without bundling or netting with any other transaction. Once processed, payments are final and irrevocable. According to Dutta (2023), the advantages of RTGS are:

- It is one of the safest and fastest modes of interbank transfer.
- It is a paperless transfer of funds.
- There are no additional charges levied for RTGS transactions.
- The funds can be transferred using the internet banking service.
- This facility is available on all business days, whose timings vary bank to bank.
- It is an immediate fund transfer mechanism.
- It is now available 24-7 from Monday to Sunday.
- The facility can be availed either online through mobile or internet banking or offline through the bank branch.
- It does not involve any credit and settlement risk for the recipients as every transaction is settled instantly.
- The customers are enabled to predict the cash flow by knowing when their account will be credited and debited

RTGS currently constitutes a core component of any national payment system. RTGS in the context of peer-to-peer lending allows for convenient and instant payment of the loan into the account of the borrower. RTGS represents a critical infrastructure layer supporting fintech innovations as it operates on the background critical infrastructure layer supporting fintech innovations, serving as a payment rail.

**H. Cryptocurrencies**: According to Kaspersky (n.d.), cryptocurrency is a digital payment system that doesn't rely on banks to verify transactions. It's a peer-to-peer system that can enable anyone anywhere to send and receive payments. The first and most known cryptocurrency was Bitcoin, founded in 2009. Investors trade for profit, while speculators at times drive prices skyward. Cryptocurrencies run on a distributed public ledger called *blockchain*, a record of all transactions updated and held by currency holders. Units of cryptocurrency are created through a process called *mining*, which involves using computer power to solve complicated mathematical problems that generate coins. Users can also buy the currencies from brokers, and then store and spend them using cryptographic wallets. If you own cryptocurrency, you don't own anything tangible. What you own is a key that allows you to move a record or a unit of measure from one person to another without a trusted third party. Cryptocurrencies and applications of blockchain technology are still emerging. Transactions including bonds, stocks, and other financial assets could eventually be traded using the technology.

# Types of Cryptocurrencies

Of the thousands of cryptocurrencies, the best-known include:

**Bitcoin:** Founded in 2009, Bitcoin was the first cryptocurrency and is still the most commonly traded. The currency was developed by Satoshi Nakamoto – widely believed to be a pseudonym for an individual or group of people whose precise identity remains unknown.

**Ethereum:** Developed in 2015, Ethereum is a blockchain platform with its own cryptocurrency, called Ether (ETH) or Ethereum. It is the second most popular cryptocurrency.

**Litecoin:** This currency is most similar to Bitcoin but has moved more quickly to develop new innovations, including faster payments and processes to allow more transactions.

**Ripple:** Ripple is a distributed ledger system that was founded in 2012. Ripple can be used to track different kinds of transactions, not just cryptocurrency. The company behind it has worked with various banks and financial institutions.

Altcoins: Non-Bitcoin cryptocurrencies are collectively known as "altcoins" to distinguish them from the original.

**Central Bank Digital Currencies:** Central Bank Digital Currencies (CBDCs) are digital forms of a country's sovereign currency, issued and regulated by the nation's central bank. Developed and developing countries have been exploring and implementing CBDCs to enhance payment systems, increase financial inclusion, and improve monetary policy efficiency. A few examples of countries that have launched their CBDCs include:

### **Developed Countries.**

**Sweden**: The Riksbank has been piloting the e-krona, aiming to provide a digital complement to cash in response to declining cash usage.

# **Emerging Markets.**

**China:** According to Jones (2024), the People's Bank of China has been developing and piloting the digital yuan (e-CNY) across various cities, with transactions reaching significant volumes.

**Brazil:** According to the International Monetary Fund, the Central Bank of Brazil is at the forefront of CBDC development, exploring the potential benefits and implications of a digital real.

### **Developing Countries.**

**The Bahamas:** According to Kumar et al (n.d.), Central Bank of The Bahamas launched the Sand Dollar, becoming one of the first countries to introduce a CBDC, aiming to enhance financial inclusion across its archipelago

**Nigeria:** According to Stanley (2022), the Central Bank of Nigeria introduced the eNaira to improve monetary policy effectiveness and promote financial inclusion.

**Jamaica:** According to Kumar et al (n.d.), the Bank of Jamaica launched the JAM-DEX, focusing on providing a secure and efficient digital payment method for its citizens.

The above examples illustrate the global interest and varying stages of implementation of CBDCs across countries with different economic statuses. Each nation tailors its approach to CBDCs based on specific economic needs, technological infrastructure, and policy objectives

# Is Cryptocurrency Safe?

Cryptocurrencies are usually built using blockchain technology. Blockchain describes the way transactions are recorded into blocks and time-stamped, a fairly complex, technical process that results in a digital ledger of cryptocurrency transactions. Transactions require a two-factor authentication process: (1) enter a username and password to start a transaction, and (2) enter an authentication code sent via text to your mobile phone. Even with securities, cryptocurrencies are not unhackable. In 2018, hackers stole \$534 million from Coincheck and \$195 million from BitGrail.

The value of virtual currencies is driven entirely by supply and demand. This can create wild swings that produce significant gains for investors and significant losses. Cryptocurrency investments are subject to minimal regulatory protection compared to traditional financial products like stocks, bonds, and mutual funds.

**I. Cryptography** is the science of securing information by transforming it into a format that is unintelligible to unauthorized users. It plays a critical role in protecting data and ensuring secure communication across various applications.

The following are some of the key benefits of cryptography:

- Protects sensitive information from being accessed by unauthorized parties. *Example:* Encrypting emails or financial transactions so only intended recipients can read the content.
- Provides secure channels for transmitting information over public or insecure networks. *Example:* Securing internet communication through protocols like HTTPS, which encrypts data exchanged between browsers and servers.
- Verifying the identity of users or systems to ensure they are who they claim to be. *Example:* Digital signatures and certificates authenticate users and websites to prevent impersonation or phishing attacks.
- Ensures that data has not been altered or tampered with during transmission or storage. *Example:* Hashing algorithms create a unique digital fingerprint for files or messages, which can be verified to detect any changes.
- Safeguards data at rest, such as files on a computer or database, from unauthorized access. *Example:* Encrypting sensitive customer data in a database to prevent breaches.

The following are some of the challenges to cryptography:

- Cryptographic algorithms must constantly adapt to new and more sophisticated attacks.
- Loss or theft of private keys can compromise an entire system.
- Errors during the implementation of cryptographic algorithms can introduce vulnerabilities.
- Cryptographic operations can introduce computational and resource overhead, especially in resource-constrained environments. *Example:* Devices like smartphones may struggle to handle intensive cryptographic processes.
- Cryptographic systems must comply with regional laws and international standards, which can be restrictive or inconsistent.
- Algorithms and protocols can become obsolete over time due to advancements in cryptanalysis or computing power.

- A shortage of trained professionals and knowledge about cryptography leads to improper usage and security gaps.
- Cryptographic systems are vulnerable to internal misuse or compromise by authorized users, including but not limited to:
  - Employees leaking private keys or cryptographic secrets.
  - Insider tampering with cryptographic implementations.
  - Ensuring compatibility between different cryptographic systems and protocols can be difficult.
  - Addressing these challenges requires continuous research, robust implementation practices, and proactive adaptation to emerging threats and technologies.

J. Artificial Intelligence (AI) and Big Data Capture is the parsing of vast databases containing the characteristics and transactions of billions of economic agents through advanced algorithms to derive patterns used to predict behavior and prices, which mimics human judgment in automated decisions. Related applications can automate credit approvals, facilitate regulatory compliance and fraud detection, and automate the trading of financial assets. These innovations feed off each other, driving rapid change.

Fintech innovations are characteristically overlapping and mutually reinforcing. For instance, distributed computing relies on big data as well as AI and cryptography for effective distributed ledgers, used by online applications such as digital wallets to transform cell phones and/or wearable devices into points of sale for payments. These strong complementarities reinforce the potential for disruption of the financial sector. The adoption of new applications could also grow non-linearly, given the network effects (the more people are linked through a network, the more valuable is the network to each member) common to finance, but also to communication technologies.

Artificial intelligence (AI) and machine-learning enhance decision-making in areas like credit scoring, fraud detection, and personalized financial services.

The following are its success factors:

- Data Analysis: Processes large datasets for informed decisions.
- *Automation:* Streamlines operations, reducing human error.
- *Personalization:* Offers tailored services to customers.

The following are its challenges:

- *Data Privacy:* Ensuring compliance with data protection laws.
- *Bias and Fairness:* If the data used to train the model contains historical biases, errors, or imbalances, the model may learn and perpetuate these biases. The way the algorithm processes data or prioritizes certain features can inadvertently introduce bias. Developers' assumptions or oversights during model creation can also embed bias. *Example:* Credit Scoring is an algorithm that might unfairly deny loans to individuals from certain demographics because of historical lending practices reflected in the training data.
- *Complexity:* Understanding and interpreting AI-driven decisions can be difficult.

**K. Blockchain** provides a decentralized ledger for secure and transparent transactions, impacting areas like payments, smart contracts, and supply chain finance.

The following are its success factors:

- *Transparency:* Immutable records enhance trust.
- *Efficiency:* Reduces intermediaries, lowering costs and transaction times.
- Security: Cryptographic methods protect data integrity.

The following are its challenges:

- *Scalability:* Handling large transaction volumes remains a concern.
- *Regulatory Uncertainty:* Lack of standardized regulations across jurisdictions.
- *Integration:* Aligning with existing financial systems can be complex.

### III. How has Fintech Changed the Financial Industry and Capital markets

According to Gundaniya (2024), the fintech revolution has the following huge impacts on all banks and financial institutions globally:

**A. Smart Chip Technology ATM Cards** have significantly helped in minimizing the financial loss that occur in the case of mishaps. It comes with Europay, Mastercard, and Visa (EMV) technology embedded in the chip that uses a one-time password for each transaction. This increases the security since the code is valid only for one transaction; so, even if someone steals it, they won't be able to do anything.

**B. Biometric Sensors** along with iris scanners are two technological advancements with Automatic Teller Machines (ATM) that eliminate the need to carry a plastic credit or debit card. No need to remember a pin or a password. A biometric ATM uses integrated mobile applications, fingerprint sensors, and palm and eye recognition to identify the account's owner. Additionally, they use micro-veins to eliminate potential errors made in customer recognition.

**C. Automated Clearing House (ACH)** assists with processing electronic interbank payments nationwide, including but not limited to insurance premiums, social security, salary, dividend payments, bill payments, and direct debits of mortgage.

**D. Omni-channel and branchless banking** have transformed the entire banking system from a branch-specific process to digital channels, such as online, social, and mobile, which reduces a bank's dependence on its brick-and-mortar branches to function. Omni-channel banking enables banks to reduce their branches.

**E. Customer service chatbots** are bits of software that are learning and upgrading from human interaction. Chatbots streamline customer interactions, like query handling and directing customers to the required departments. Bank of America's chatbot Erica can provide investment advice to its customers. The chatbot for UBS Wealth Management can scan customer emails autonomously thus reducing the total time taken in the task from 45 minutes to two minutes. The chatbot for Japan's leading bank can help customers to find relevant pieces of information on their website. Chatbots not only reduce costs and enhance the customer satisfaction but also allow agents in the call centers to focus on value addition.

**F. Robo-advisors** provide automated, algorithm-driven financial planning services with minimal human intervention. Financial institutions use robo-advisors to provide automated investment services to their retail clients. They help democratize access to financial advice, offering cost-effective solutions for clients who might not meet the minimum investment thresholds for traditional advisory services. They also improve client engagement by offering:

- 24/7 accessibility to investment insights.
- User-friendly platforms for tracking and managing investments.
- Educational tools that help clients understand their financial option.

Despite the above benefits, robo-advisors face the following challenges:

- *Trust and Adoption:* Convincing traditional clients to trust automated systems.
- *Regulatory Compliance:* Ensuring robo-advisors meet fiduciary standards and regulatory requirements.
- *Customization Limitations:* Addressing the lack of deeply personalized advice for unique financial situations.

**G. E-Wallets**, commonly known as mobile money services in Africa, have significantly transformed financial transactions by enhancing accessibility and convenience. The following is an overview of prominent E-wallets in selected African countries:

• *M-Pesa (Kenya):* M-Pesa allows users to deposit, withdraw, transfer money, and pay for goods and services via mobile phones.

The following are its successes:

- *High Mobile Penetration:* Leveraged widespread mobile phone usage to reach a broad audience.
- *Agent Network:* Established an extensive network of agents facilitating cashin and cash-out transactions.
- Trust and Security: Built-in user confidence through reliable and secure
- *M-Shwari:* A partnership between M-Pesa (Safaricom) and NCBA Bank, M-Shwari offers micro-loans to M-Pesa users directly on their mobile phones. Loans are accessible instantly and repayable within 30 days, with interest.
- *M-Shwari Savings Account:* Allows users to save money and earn interest. Users can deposit any amount and withdraw at their convenience without penalties.

The following are its challenges:

- Monopoly Concerns: M-Pesa's dominant market position has raised concerns about anti-competitive practices. Regulators have pressured Safaricom (M-Pesa's parent company) to ensure interoperability with other mobile money platforms.
- *Compliance Costs:* Adhering to evolving financial regulations, including antimoney laundering (AML) and counter-terrorism financing (CTF) laws, imposes operational costs.
- *Network Downtime:* System outages and poor connectivity in remote areas can disrupt services, undermining user trust.
- *Agent Accessibility:* Some rural areas still lack sufficient agent coverage for cash-in and cash-out services.
- *Limited Digital Literacy:* Some users, especially in rural areas, lack the knowledge to use M-Pesa effectively, leading to underutilization or misuse.
- *Fees for Services:* While M-Pesa is convenient, its transaction fees are considered high by some users, especially for small transactions, which can discourage usage.
- *Other Mobile Money Platforms:* Competitors like Airtel Money and T-Kash are striving to capture market share, offering lower fees or additional services.
- *Digital Banks and Fintechs:* The rise of fintech startups and digital banking services poses a challenge to M-Pesa's market dominance. Since M-Pesa operates through Safaricom's network, users of other telecom providers face hurdles in accessing the service. Although interoperability has improved, it's

still a barrier for some users. While M-Pesa remains a revolutionary platform, addressing these challenges is critical to sustaining its growth and inclusivity. Strategic partnerships, regulatory compliance, enhanced security, and continued innovation will be key to overcoming these obstacles and maintaining its leadership in the mobile money space.

- **Telebirr (Ethiopia):** Launched by Ethio Telecom, Telebirr is a mobile money platform that enables users to conduct various financial transactions, including money transfers, bill payments, and merchant purchases. The following are its successes:
  - *State Support:* As a state-owned enterprise, Ethio Telecom's extensive infrastructure and customer base facilitated rapid adoption.
  - *User-Friendly Interface:* Designed to be accessible, even to those with limited technological proficiency.
  - *Integration with Government Services:* Enabled payments for utilities and other government services, increasing their utility.

The following are its challenges:

- *Competition:* The entry of other mobile money services, such as Safaricom's M-Pesa, could introduce competitive pressures.
- Inconsistent network coverage and limited access points could hinder service delivery, especially in rural areas.
- Lower user's understanding and trust in digital financial services could be a critical hurdle.
- Commercial Bank of Ethiopia (CBE Birr): CBE has introduced an e-wallet service called CBE Birr. It is a mobile money platform aimed at providing digital financial services to individuals and businesses across Ethiopia. The following are its key features:
  - *Money Transfers:* Enables users to send and receive money through mobile phones.
  - *Bill Payments:* Facilitates payments for utilities and other services.
  - *Mobile Top-Ups:* Allows users to recharge mobile airtime.
  - Merchant Payments: Supports digital payments for goods and services.
  - *Cash In/Out Services:* Accessible through a network of agents for depositing and withdrawing money.

The following are its successes:

- *Strong Institutional Backing:* Being issued by Ethiopia's largest and oldest bank, CBE Birr benefits from trust and a well-established customer base.
- *Extensive Agent Network:* The bank's nationwide presence aids in reaching rural and underserved areas.
- *Government Support:* Integration with public services, such as utility payments, boosts adoption.
- *Focus on Financial Inclusion:* CBE Birr aligns with Ethiopia's financial inclusion goals by targeting unbanked populations.

The following are its challenges:

- Competition: Faces competition from other e-wallets like Telebirr and M-Birr.
- *User Awareness:* Needs continuous efforts to educate users about the platform and its benefits.

- *Infrastructure Limitations:* Challenges related to mobile network coverage and internet access in remote areas.
- *Regulatory Environment:* Must comply with evolving digital finance regulations in Ethiopia.
- CBE Birr is a significant part of Ethiopia's growing digital finance ecosystem, helping to modernize the country's financial services and increase accessibility.
- MTN Mobile Money (Ghana): Operated by MTN Ghana, this service enables users to perform financial transactions, including remittances and bill payments. The following are its successes:
  - Benefited from MTN's extensive telecom infrastructure and customer base.
  - Targeted unbanked populations, promoting financial inclusion. The following are its challenges:
  - *Network Reliability:* Faced occasional service interruptions affecting user experience.
  - *Competition:* Faces competition with other mobile money providers and traditional banking services.
- **Paga Nigeria:** a leading e-wallet platform in Nigeria, offers a range of digital financial services aimed at simplifying transactions for individuals and businesses.

The following are its key features:

- *Money Transfers:* Send and receive money instantly to other Paga users' bank accounts, or mobile numbers. Enables cross-border remittances in partnership with global payment platforms.
- *Bill Payments:* Pay utility bills such as electricity, water, and cable TV subscriptions. Includes options for education fees and government services.
- *Mobile Airtime and Data Top-Ups:* Recharge mobile airtime or purchase data bundles across all major telecom networks in Nigeria.
- *Merchant Payments:* Offers QR code-based and USSD payment solutions for seamless transactions with merchants.
- Facilitates online and offline business payments.
- *Savings and Loans:* Users can save money directly in their Paga wallet and access microloan services through partnerships with financial institutions.
- *Cash In/Out Services:* Users can deposit and withdraw cash via Paga's extensive agent network, which includes over 120,000 agents across Nigeria.
- *E-Commerce Support:* Integration with e-commerce platforms to enable digital payments for goods and services.
- *Multi-Channel Access:* Available via mobile apps (Android and iOS), USSD (\*242#), and web portals, making it accessible to both smartphone and feature phone users.
- *Security:* Employs advanced encryption and two-factor authentication (2FA) to protect user transactions and data.
- *Financial Inclusion:* Designed to reach the unbanked and underbanked population in rural and urban areas.

The following are its successes:

• Extensive Agent Network: A widespread network of agents ensures

accessibility for cash transactions even in remote areas.

- *User-Centric Design:* Offers a simple, intuitive interface to cater to a wide range of users, including those with low digital literacy.
- *Strategic Partnerships:* Collaborations with banks, fintechs, and global payment providers enhance service offerings.
- *Regulatory Compliance:* Licensed by the Central Bank of Nigeria, ensuring trust and legitimacy.
- *Scalability:* Continuous innovation and scalability to accommodate Nigeria's large and growing population.

The following are its challenges:

- *Competition:* Faces stiff competition from other e-wallets like Opay, Palm Pay, and Monie point.
- Infrastructure Issues: Inconsistent electricity and internet access in rural areas can hinder adoption.
- *User Trust:* Educating users about security measures to combat fraud and build trust remains a challenge.
- *Regulatory Risks:* Adapting to changing financial regulations in Nigeria can affect operations.
- **E-Wallets in Africa**: E-wallets have played a pivotal role in transforming the financial landscape in Africa, promoting economic growth and development. However, they must continuously adapt to overcome challenges and meet the evolving needs of their users.

The following are its successes:

- *Financial Inclusion:* E-wallets have brought financial services to unbanked and underbanked populations.
- *Convenience and Accessibility:* Enabled easy and quick financial transactions via mobile phones.
- *Cost-Effectiveness:* Reduced transaction costs compared to traditional banking.

The following are its challenges:

- *Regulatory Compliance:* Navigating diverse and evolving regulatory landscapes across countries.
- *Infrastructure Limitations:* Dealing with inconsistent network coverage and technological infrastructure.
- Security Concerns: Addressing risks related to fraud, cyber threats, and data privacy.
- *User Education:* Ensuring users are informed about how to use e-wallet services effectively and safely.

**H. Artificial Intelligence (AI):** An integral part of the fintech banking services, AI along with machine-learning is vital for fraud detection. The software banks use for fraud detection generates alerts whenever there's a potential fraudulent transaction. While human investigation determines if the attack was real or false, with attacks increasing in sophistication, banks are relying on the speed and efficiency of AI technology to combat fraud. According to the McKinsey Global Institute (Harrist, 2017), the adoption of machine-learning-driven statistical modeling, data aggregation platforms, and process automation can transform anti-money

laundering (AML) operations by simply infusing new efficiencies. For example, the data aggregation platforms can account for data and mine unstructured transactions to offer a 360-degree customer view. This view assists in faster transaction validation. Moreover, with machine-learning algorithms, banks can leverage historical data to predict and determine patterns of a fraud attack. This will reduce the manual effort by approx. 50%.

**I. Capital Markets:** Fintech innovations have revolutionized capital markets by enhancing efficiency, transparency, and accessibility. Technologies like blockchain and distributed ledger technology (DLT) have transformed trading and settlement processes, enabling near-instantaneous transactions, reducing costs, and introducing tokenized assets for fractional ownership. High-frequency and algorithmic trading have increased market liquidity and optimized trading strategies through data-driven decision-making. Similarly, artificial intelligence (AI) and big data analytics have empowered traders with predictive insights, portfolio optimization, and enhanced risk assessment. Platforms like digital exchanges and decentralized finance (DeFi) systems have further democratized market access, allowing global investors to trade traditional and digital assets seamlessly. Innovations in crowdfunding, initial coin offerings (ICOs), and security token offerings (STOs) have created alternative capitalraising mechanisms, while regtech solutions streamline regulatory compliance for market participants. Smart contracts automate trade settlements and compliance, reducing reliance on intermediaries and operational risks. Robo-advisors and AI-driven platforms make sophisticated investment strategies more accessible and cost-effective for institutional and retail investors alike. Together, these advancements have reshaped the capital markets landscape, fostering a more inclusive, transparent, and efficient ecosystem.

# IV. The Impact of Fintech on the Global Economy

Financial innovations are unlike other inventions in that they can directly impact the efficiency of the financial sector, which is how savings and investment are intermediated in an economy. That affects growth. Fintech is part of the digital economy that has produced innovations that have transformed the way we live, even as productivity growth has been slowing across advanced economies for decades.

Fintech development correlates with how open the financial market is. For example, the e-payment systems of Telebirr and M-Pesa, which operate in Ethiopia, Kenya, Tanzania and elsewhere, are the biggest fintech success story since their emergence. The permissive stance of the Central Bank allowed for rapid development. By effectively transforming mobile phones into payment accounts, they increased financial access for previously unbanked people. M-Pesa and Telebirr show how fintech can change a financial sector and increase efficiency across the economy. A Bank for International Settlements study found that fintech is most prominent in countries with less stringent banking regulations, higher incomes, and less competitive banking systems.

If fintech can improve financial inclusion in an economy, then it would more efficiently channel savings into investment in industry, infrastructure, and human capital—the exact capital needed for economic growth. According to Harrist (2017), a report by McKinsey Global Institute concluded that widespread adoption and use of digital finance could increase the gross domestic product (GDP) of all emerging economies by 6%, or a total of \$3.7 trillion, by 2025. This could provide market access to 1.6 billion unbanked people, enable an additional \$2.1 trillion in loans

to individuals and small businesses, increase government tax revenue, and increase the balance sheets of financial services firms by as much as \$4.2 trillion.

#### V. The Role of Big Data in Fintech

*Big data* is a term that describes large, hard-to-manage volumes of data, both structured and unstructured, that inundate businesses on a day-to-day basis. Big data can be analyzed for insights that improve decisions. The role of technology in financial services has been transformative thanks, in part, to the vastness of data pools available for fintech to analyze. According to Serra (2021), the following are the key roles of big data in fintech:

A. Fintech aids with better customer segmentation: In the era of modern technologies, delivering outstanding customer service goes hand-in-hand with having robust data mining and analysis techniques. These techniques are fed by big data and, ideally, provide insights that are translated into detailed user profiles and powerful customer segmentation strategies. This is one of the most effective ways fintech can get to know their customers on a more profound level and understand customer needs better and target a solution.

**B. Helps Deliver More Customer-Centric Services:** Fintechs must enforce in-depth, holistic strategies that target user needs from every angle and get to know them on a personal level. Fintechs can only achieve this in-depth knowledge by leveraging on big data available to them and gaining insight from them by using robust data analysis techniques.

**C. Enhances Fraud Detection and Security Protocols:** Big data is starting to place itself at the forefront of the sector's advancements in security protocols and fraud-detection initiatives. Big Data helps fintech firms and startups create better fraud detection algorithms, more robust security protocols, and impenetrable payment systems to withstand hacking attacks and fraud attempts.

**D. Helps Optimize Operations:** Fintech firms and startups can gain exceptional competitive advantage by applying big data to push their operational effort forwards. Core operations such as risk assessment, loan servicing, human resources, and even legal departments can significantly benefit from big data applications. Big data in fintech equips employees with the necessary data to handle individual customer cases better. Having readily available information improves operations and pushes efficiency forward in customer service, marketing campaigns, and other processes.

**E. Aids in Credit Risk Scoring:** One of the most lengthy, tedious, and expensive processes fintechs have to deal with is credit risk scoring. Operationally speaking, credit risk scoring has always been one of the most inefficient, protracted processes in banking due to the absence of data, the lack of knowledge about data analysis, and the shortcomings in the availability and access to data management tools. Furthermore, because most modern fintech firms offer loans and credit cards to expand their portfolios, they must have the proper data management and analysis tools to regulate and minimize their risk exposure. With modern technologies demanding faster response times, the key to performing efficient credit risk assessments and eclipsing traditional banking's drawn-out assessment processes lies in the quality and speed provided by big data and AI-powered technologies.

# VI. The Need for Fintech Regulation

One of the objectives of new fintech regulations is to combat the criminal activity fintech may provide the opportunity for. As technology evolves, so do those looking to cheat the system. Technological advancements alter financial service attributes and market structure; therefore, financial regulation must adapt to remain effective. Following the 2008 global financial crisis, with the objective of balancing innovation and growth with considerations of financial stability and consumer protection, regulators have developed an increasing number of experimentation-based approaches. Some involve regulators establishing contact points to meet with new entrants to learn about technologies in order to develop appropriate regulatory responses. Others have developed what are called *sandboxes*.

**A. Regulatory Sandboxes:** According to the Fintech Briefing Paper on Regulatory Sandboxes, UNSGA (2020), the following are key elements of the regulatory sandbox:

- A regulatory sandbox is a regulatory approach, typically summarized in writing and published, that allows live, time-bound testing of innovations under a regulator's oversight. Novel financial products, technologies, and business models can be tested under a set of rules, supervision requirements, and appropriate safeguards.
- A sandbox creates a conducive and contained space where incumbents and challengers experiment with innovations at the edge or even outside of the existing regulatory framework.
- A regulatory sandbox brings the cost of innovation down, reduces barriers to entry, and allows regulators to collect important insights before deciding if further regulatory action is necessary.
- A successful test may result in several outcomes, including full-fledged or tailored authorization of the innovation, changes in regulation, or a cease-and-desist order.
- The first regulatory sandbox was launched in 2015 in the U.K. and generated great interest from regulators and innovators around the world. At the beginning of 2018, there were more than 20 jurisdictions actively implementing or exploring the concept.

**B. Objectives of Fintech Regulation:** According to the International Monetary Fund (Dong, 2017), the key objectives of fintech regulation are the following:

- Address vulnerabilities and imperfections in financial markets that weaken financial stability, undermine market efficiency, and expose consumers to risk;
- Provide incentives for institutions to take into account systemic risk;
- Protect consumers where information is hard or costly to obtain; and
- Support competition and prevent oligopolistic behavior.

In order to ensure the effectiveness of these regulations, regulatory technology (regtech) is being introduced in a number of jurisdictions. Regtech is a community of technology companies that solve challenges arising from a technology-driven economy through automation. The rise in digital products has increased data breaches, cyber hacks, money laundering, and other fraudulent activities. With the use of big data and machine-learning technology, regtech reduces the risk to a company's compliance department by offering data on money laundering activities conducted online—activities that a traditional compliance team may not be aware of

due to the increase of online underground marketplaces. Regtech tools monitor transactions that take place online in real-time to identify issues or irregularities in the digital payment sphere. Any outlier is relayed to the financial institution to analyze and determine if fraudulent activity is taking place. Regtech aids in identifying potential threats to financial security and financial stability and is able to minimize those risks and the costs associated with lost funds and data breaches.

#### **VII.** Conclusion

The advent of cutting-edge technologies coupled with customer demand for a safe and more user-friendly banking experience has led banks and financial services to readily adopt fintech. This paper demonstrated that fintech firms have the potential to significantly change the financial sector landscape, by providing innovative products and services that respond to the user's needs for trust, speed, low cost, and security. Regulatory authorities need to balance efficiency and stability tradeoffs. Risks to financial stability and integrity, which result from cyber-attacks, money laundering, and terrorism financing, can be managed without stifling innovation. Rules and standards must evolve to ensure the integrity of data, systems procedures, and platforms. To ensure that effective regulatory frameworks are developed to address the challenges posed by fintech, international cooperation will be essential.

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