

The Role Of Blockchain Technology In Enhancing Financial Inclusion

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Abstract

Blockchain technology has emerged as a transformative force with the potential to greatly improve financial inclusion, especially among underbanked and unbanked communities. Financial inclusion refers to the accessibility and availability of financial services for all individuals, yet billions remain excluded from formal financial systems. Traditional banking often overlooks these populations due to geographic barriers, high transaction fees, and strict regulatory frameworks.

Blockchain provides a decentralized, secure, and transparent platform for financial transactions, allowing individuals to access services without relying on traditional banking infrastructure. By removing intermediaries, blockchain lowers transaction costs, accelerates service delivery, and enhances transparency. It enables peer-to-peer transactions, facilitates cross-border remittances, and supports micro-lending through smart contracts, thereby broadening access to vital financial services.

Furthermore, the immutable and auditable characteristics of blockchain foster trust in financial systems, particularly in regions plagued by weak institutions or corruption. However, despite its promise, blockchain faces substantial hurdles such as regulatory uncertainties, limitations in technological infrastructure, and cryptocurrency volatility that impede widespread adoption.

Integrating blockchain with complementary technologies like mobile banking and the internet could further enhance its role in advancing financial inclusion. This paper investigates the diverse effects of blockchain technology on financial inclusion while critically analyzing both its potential advantages and the challenges that must be addressed to fully leverage its capabilities in promoting global financial access and equity.

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I. Introduction

The rise of blockchain technology has become a transformative element in the financial sector, particularly in enhancing financial inclusion for unbanked and underbanked populations globally. Traditional banking systems often exclude marginalized communities due to high costs, bureaucratic barriers, and insufficient access to necessary identification. In contrast, blockchain offers an innovative solution that has the potential to democratize financial services. This introduction examines the diverse roles of blockchain technology in fostering financial inclusion, drawing insights from various research studies and expert opinions.

Since its inception, blockchain technology has demonstrated significant potential for institutionalizing remittances and expanding access to financial services (Rella 2019). Authorities and practitioners alike have explored how blockchain can streamline and potentially replace the existing infrastructure that underpins international payments and remittances, such as correspondent banking. This is achieved by utilizing blockchain's decentralized ledger to verify and record transactions. Correspondent banking relationships, commonly referred to as "Nostro-Vostro accounts," enable banks to operate in countries where they lack a physical presence. These arrangements are frequently described as "correspondent banking" (Rella 2019; Bai et al., 2020). Rella (2019) argues that blockchain technology facilitates the formalization of remittances rather than hindering it. Current efforts are focused on updating the existing infrastructure, services, business models, and regulatory frameworks to incorporate these applications (Schuetz and Venkatesh 2020). Furthermore, blockchain technologies represent the latest evolution of systems that promote frictionless capitalism rather than the introduction of entirely new monetary systems.

At its core, blockchain technology is a decentralized ledger system that enables secure and transparent transactions without relying on intermediaries. Ntaskou (2023) emphasizes that "the potential of blockchain technology to facilitate access to financial services for the unbanked and underbanked is profound," empowering marginalized communities by fostering a more equitable financial system. This view is supported by Gallo et al. (2024), who contend that "blockchain can lower costs, reduce risk, and enhance financial innovation," thereby making essential services more accessible to those traditionally excluded from the financial ecosystem.

In recent years, blockchain has emerged as a pivotal term globally. Experts concur that this online

platform holds significant promise for businesses worldwide and is poised to dominate the Internet in the coming century. Abdulhakeem and Hu (2021) assert that blockchain technology possesses immense potential to improve lives in the decades ahead. Its applications span various sectors, including “cryptocurrencies, online payments, and remittances.” Additionally, it finds utility in the Internet of Things, smart contracts, voting systems, healthcare, and the verification of educational credentials (Abdulhakeem and Hu 2021). The underlying technology of blockchain can also be employed to track physical items as well as intellectual property rights across a wide array of domains.

Research shows that around 2 billion people globally remain unbanked, with a significant concentration in developing areas such as Africa, Asia, and Latin America (Gallo et al., 2024). These individuals typically depend on cash-based systems or informal lending methods that can often be predatory. The potential of blockchain to offer low-cost solutions is essential; as noted by Aggarwal (2024), “the use of blockchain can significantly reduce transaction fees and eliminate barriers to entry for low-income individuals.”

The applications of blockchain go beyond basic transactions. It facilitates the creation of digital identities for those without formal identification, which is crucial for accessing traditional banking services. As highlighted by Mohd et al. (2022), “blockchain can facilitate the creation and verification of digital identities, thus expanding access to financial services for those excluded from the traditional banking system.” This feature is especially important in rural regions where standard identification methods may be lacking.

Furthermore, blockchain technology promotes the establishment of decentralized finance (DeFi) platforms that provide peer-to-peer lending and microfinance opportunities. These platforms empower users by enabling direct engagement with lenders, eliminating intermediaries, thus lowering costs and enhancing accessibility. Kuada (2019) emphasizes that “DeFi solutions can provide access to capital for small businesses and individuals who would otherwise be unable to secure loans through traditional means.”

Despite its potential, the adoption of blockchain technology in mainstream finance encounters several obstacles. Regulatory ambiguity poses a significant challenge, as different regions have varying regulations regarding blockchain governance. As noted by Varghese & Viswanathan (2018), “while some regulators embrace blockchain’s potential, others adopt a more cautious stance due to concerns over security and fraud.” This regulatory environment calls for collaboration between policymakers and industry players to develop frameworks that foster innovation while safeguarding consumers.

Additionally, challenges related to cybersecurity and technological literacy must be addressed to ensure effective adoption among underserved communities. Schuetz et al. (2024) argue that “understanding technology adoption patterns is crucial for implementing effective blockchain solutions in rural India,” emphasizing the importance of targeted educational programs alongside technological implementation.

Globally, numerous case studies demonstrate successful blockchain applications aimed at enhancing financial inclusion. For instance, Coins.ph in the Philippines offers a platform enabling users to conduct transactions using cryptocurrencies without needing a bank account (Aggarwal, 2024). Similarly, BitPesa has revolutionized remittance services throughout Africa by utilizing blockchain to lower costs and accelerate transaction speeds.

In India, research suggests that blockchain adoption could link rural populations with global markets, opening up unprecedented economic participation opportunities (Schuetz et al., 2024). The potential for blockchain to connect underserved communities with vital financial services is supported by experts like Perianne Boring, who states that “blockchain technology has such a wide range of transformational use cases...creating financial sovereignty in the farthest regions of the world.”

In summary, while challenges persist on the road to widespread adoption of blockchain technology for financial inclusion, its potential advantages are clear. By reducing costs, enabling digital identities, and fostering innovative financial solutions, blockchain could significantly transform global finance. Moving forward, it is crucial for stakeholders across various sectors—governments, private companies, and civil society—to work together in leveraging this technology’s capabilities for inclusive economic development.

This analysis highlights the urgent need to tackle financial exclusion through innovative technologies like blockchain while addressing the complexities of regulation and implementation across different contexts.

II. What Is Blockchain Technology?

Swan (2015) defines blockchain as “a public ledger with potential as a decentralized digital repository of all assets—not only tangible assets but also intangible assets such as votes, software, health data, and ideas.” She highlights its transformative potential across various sectors. At its essence, blockchain functions as a public ledger that documents transactions in a decentralized manner. In contrast to traditional databases, which are governed by a central authority, blockchain operates across a network of computers, enhancing security and resistance to tampering.

One of blockchain’s most notable benefits is its capacity to act as a decentralized digital repository for all asset types. Historically, assets have been maintained in centralized databases, which are susceptible to

hacking and data breaches. Blockchain presents a more secure and transparent alternative by distributing information across the network. This structure eliminates a single point of failure and makes data manipulation significantly more challenging.

Blockchain is capable of storing both tangible and intangible assets. Tangible assets encompass physical items such as real estate, vehicles, and precious metals. Conversely, intangible assets include non-physical items like intellectual property, digital content, and financial instruments. By utilizing blockchain to record these assets, individuals and organizations can create a secure and verifiable ownership record.

The transformative capabilities of blockchain reach multiple sectors. In finance, blockchain can enhance transaction efficiency and lower costs by removing the necessity for intermediaries. Smart contracts—self-executing agreements with terms encoded directly into the software—can automate processes and mitigate fraud risks. In healthcare, blockchain can securely store and share patient information, fostering improved interoperability and privacy. Within the supply chain sector, blockchain can monitor the flow of goods from production to consumption, ensuring transparency and reducing counterfeit products.

Tapscott & Tapscott (2016) assert that blockchain technology will fundamentally reshape the world by facilitating new forms of collaboration and trust without intermediaries. They emphasize its potential impact on governance and corporate structures.

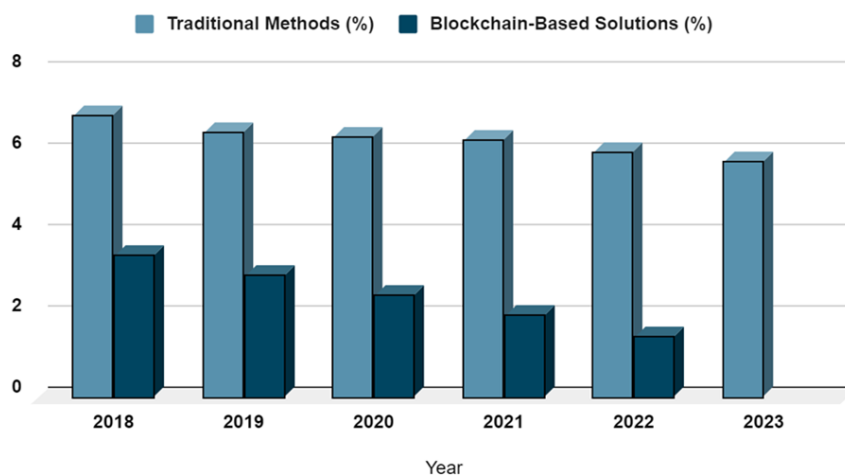
Bitcoin was the first cryptocurrency introduced, with numerous others now available. Blockchain technology allows Bitcoin users to digitally sign documents and transfer their rights to those documents to other users. This transfer is publicly documented in the blockchain data, enabling all network participants to independently verify transaction validity. The resilience of the blockchain against attempts to alter the ledger is bolstered by cryptographic techniques and the fact that each participant in the Bitcoin blockchain maintains their copy of the ledger. The evolution of blockchain technology has made it possible to develop various cryptocurrency systems, including Bitcoin and Ethereum. Consequently, blockchain technologies are often perceived as being confined to Bitcoin or cryptocurrency applications in general.

However, this perception is outdated; the technology is now employed in a broader range of applications and is under exploration in diverse industries (Pilkington, 2016; Saberi et al., 2019; Yaga et al., 2019).

As businesses rely on information for their success—directly correlating with how quickly they can receive and act upon that information—“blockchain technology is ideally suited for the delivery of information since it provides information that is immediately shared and completely transparent and that is stored on an immutable ledger that can only be accessed by network members who have been granted permission to do so”. This fosters increased confidence while creating new opportunities and efficiencies.

Based on the available information, a graph is presented that shows the average costs of remittance transactions using traditional methods compared to blockchain-based solutions over time. This graph reveals a distinct trend: as blockchain technology evolves and gains broader acceptance for remittances, the expenses related to these transactions are anticipated to keep declining, which could fundamentally change the way individuals transfer money internationally.

Average Cost of Remittance Transactions



Key Insights from the Graph:

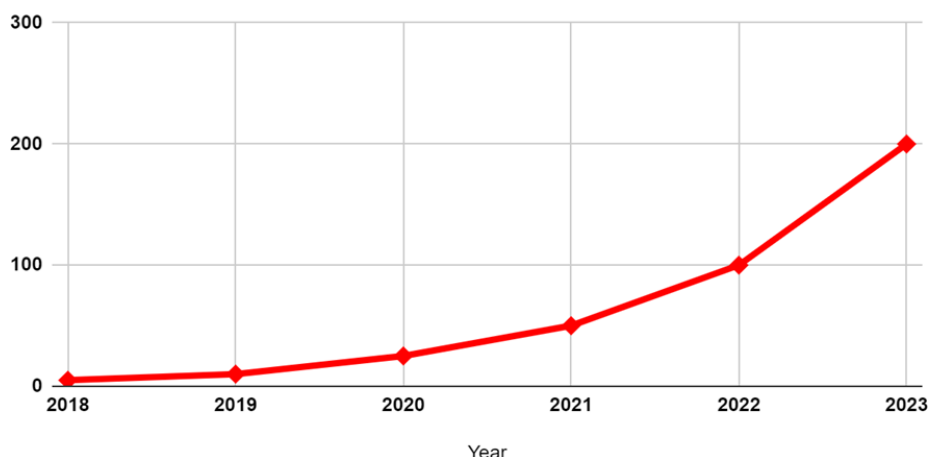
- **Rapid Growth:** The number of users engaging with blockchain-based financial services has jumped from around 5 million in 2018 to an estimated 200 million by 2023. This increase signifies a growing trust and enthusiasm for decentralized finance (DeFi) solutions, as evidenced by findings from various studies.

- **Market Expansion:** A report by DashDevs (2024) indicates that the fintech blockchain market is expected to expand considerably, fueled by user demand for more efficient, transparent, and cost-effective financial options.
- **Adoption Drivers:** Several factors are propelling this growth, including blockchain's capacity to reduce transaction costs, improve security, and extend financial services to previously underserved communities (Ntaskou, 2024; Mohd et al., 2022).
- **Future Projections:** The ongoing trend implies that as more individuals and businesses become aware of the advantages of blockchain technology, user numbers will likely continue to climb, potentially reaching even greater heights in the coming years.

Chen and Bellavitis (2019) contend that blockchain can enable decentralized finance (DeFi) solutions that are more innovative and accessible than conventional financial services. The potential uses of blockchain in promoting financial inclusion are extensive:

- **Remittances:** Blockchain has the potential to significantly lower the costs tied to cross-border remittances. Research conducted by PwC suggests that fees for blockchain-based solutions can be reduced to as little as 1%, in contrast to traditional fees that may exceed 3% (PwC, 2023).
- **Microfinance:** Smart contracts on blockchain platforms can streamline lending processes, facilitating access to loans for individuals without credit histories (Udeh et al., 2024).
- **Digital Identity:** Blockchain can offer secure digital identities for those lacking formal identification, thereby enabling access to financial services (Gallo et al., 2023).
- **Insurance:** Blockchain supports the development of microinsurance products designed for low-income populations, enhancing risk management capabilities (Zhuang, 2023).

Increase in Users of Blockchain-Based Financial Service Platforms (2018 -2023)



This line graph above depicts the growth in users of various blockchain-based financial service platforms in recent years. The data highlights the increasing acceptance and integration of blockchain technology within the financial sector. This trend not only points to enhanced financial inclusion but also emphasizes the transformative influence of blockchain on traditional financial systems.

III. What Is Financial Inclusion?

Financial inclusion, which aims to provide essential financial services to all individuals and businesses, remains a significant global challenge, especially for underserved communities in developing nations. As defined by the World Bank (2022), it involves "the process of ensuring access to essential financial services, at affordable costs, for all individuals and businesses." This concept encompasses a variety of services, including savings accounts, credit, insurance, and payment systems. According to Kuada (2019), advancing financial inclusion necessitates not only access to financial tools but also education regarding their advantages and functionalities. The World Bank estimates that around 1.4 billion adults globally lack access to fundamental financial services, hindering their ability to enhance their economic situations and engage in the global economy. The United Nations has identified financial inclusion as a crucial facilitator for achieving eight of the seventeen Sustainable Development Goals. The World Bank Group emphasizes the role of financial inclusion as a vital component in combating extreme poverty and fostering shared prosperity (Mhlanga, 2020; World Bank, 2022). Traditional banking often neglects marginalized groups—such as those in rural regions, women, and

low-income individuals—due to barriers like geographical distance, inadequate documentation, and high transaction costs. This situation calls for innovative solutions to bridge these gaps. The challenges posed by COVID-19 have further underscored the necessity of expanding access to digital financial services. One promising solution is blockchain technology, which has emerged as a transformative force capable of enhancing financial inclusion by offering secure, low-cost, and accessible financial services. Between 2011 and 2017, notable progress was made toward achieving financial inclusion, with the number of adults globally who have access to a bank account rising by 1.2 billion. By 2017, 69% of adults worldwide had an online presence. Over 80 countries have begun providing customers with access to digital financial services, some of which can be accessed via mobile phones. Many of these services have reached substantial scale (Mhlanga, 2020; World Bank, 2022).

The World Bank defines digital financial inclusion as the availability of a range of formal financial services that cater to people's needs and are offered responsibly at prices that are both accessible for clients and sustainable for providers. Delivering services to currently unreached or underserved populations necessitates the use of efficient and cost-effective digital tools. Any digital financial service comprises three essential components: a digital transactional platform, retail agents, and devices—most commonly mobile phones—used by both customers and retail agents to perform transactions through the platform. A digital transactional platform serves as the foundation for any digital financial service. When utilizing this platform, customers can hold electronic value with an authorized bank or non-bank entity while also being able to send and receive payments and transfers using their devices. Customers may also store electronic value with authorized non-bank entities. When interacting with retail agents equipped with digital devices connected to communication networks for transaction data transmission and reception, customers can convert cash into electronically stored value and vice versa. Retail agents facilitate this process by transmitting transaction-related information. Depending on existing regulations and their agreements with primary financial institutions, agents may also be tasked with additional responsibilities. The customer's device could be a tool like a credit card linked to a digital device such as a POS terminal, or it could be a mobile phone serving as a means for data delivery. Moreover, the customer's system may integrate both analog and digital functions.

IV. Empirical Evidence Supporting Blockchain's Role In Financial Inclusion

Blockchain technology, as noted by Mavilia and Pisani (2020), was initially developed to support Bitcoin, the most recognized and controversial cryptocurrency globally. However, it has quickly established itself as a transformative technology capable of revolutionizing and creating new industries. Mavilia and Pisani (2020) provided an overview of the essential characteristics and functionalities of blockchain technology. The authors then focused on potential applications that could be utilized in developing countries. Their empirical analysis highlights the shortcomings of the continent's current financial systems and serves as a basis for discussing how blockchain could mitigate financial exclusion and promote sustainable development in African nations. These points were presented to reinforce the authors' earlier claim that the empirical research identified significant deficiencies in the continent's financial infrastructure. Danho and Habte (2019) point out that financial services have traditionally been offered by centralized institutions, resulting in various central entities exerting control over financial systems. Some argue that this centralization of power has exacerbated wealth inequality.

The primary benefit of blockchain technology lies in its ability to resolve trust issues without relying on a central authority or intermediary. Since their inception, blockchain technologies have demonstrated considerable potential for formalizing remittances and enhancing financial inclusion. Moreover, an increasing body of research underscores the significance of blockchain technology for financial inclusion across different contexts. Chen and Bellavitis (2019) examine the advantages of decentralized finance, analyzing existing business models while assessing potential challenges and limitations. They assert that blockchain technology can reduce transaction costs, simplify the use of decentralized platforms, and cultivate distributed trust, thereby paving the way for innovative business models. Blockchain technology facilitates the emergence of decentralized financial services that are more innovative, interoperable, borderless, and transparent. Pal et al. (2021) further explain that the decentralized nature of blockchain reduces operational costs for financial service providers, enabling them to offer services at lower prices.

Udeh et al. (2024) contend that blockchain fosters trust among stakeholders by providing immutable transaction records, which is vital for establishing confidence in financial systems. Norta et al. (2019) highlight the Everex wallet as a means to transition from traditional currency to cryptocurrency, simplifying access to cryptocurrencies. This innovation allows users to quickly buy and trade tokens without needing to visit an exchange. Despite this advancement, the conventional financial system has not met the standards set by other technological innovations. Abdulhakeem and Hu (2021) argue that while the internet has opened up a new realm of possibilities in various aspects of life, including banking, the existing financial system has not fulfilled these expectations. Research by Abdulhakeem and Hu (2021) indicates that although nearly everyone today has

internet access, not everyone possesses a bank account. The internet enables instantaneous global information transfer; however, time and money are still required when dealing with financial assets. According to the World Bank, approximately 1.7 billion people worldwide remain unbanked. Furthermore, Abdulkhaleem and Hu (2021) suggest that recent technological advancements and blockchain technology have fueled a growing trend toward decentralization within the financial sector. The Bitcoin Blockchain, created by Satoshi Nakamoto, represented a groundbreaking innovation as it enabled peer-to-peer transactions without intermediaries or centralized systems.

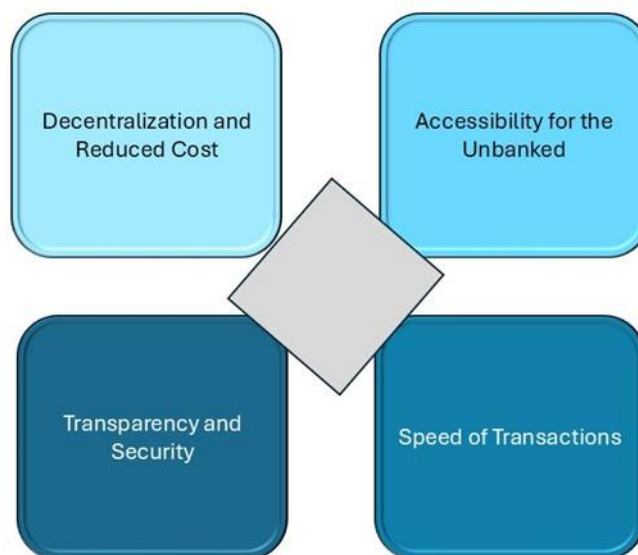
Rella (2019) also asserts that blockchain technologies hold significant promise for formalizing remittances and expanding financial inclusion since their inception. Regulators and practitioners have recently explored how blockchain technology might replace correspondent banking infrastructures that facilitate cross-border payments and remittances. Rella (2019) emphasizes that blockchain technologies do not represent entirely new monetary systems; rather, they are the latest evolution in a series of technological innovations signaling the rise of frictionless capitalism.

Successful implementations of blockchain in enhancing financial inclusion have been documented in various case studies:

- **Coins.ph:** A digital wallet service based in the Philippines that employs blockchain technology to offer a range of financial services including remittances and bill payments. Zhuang (2023) reports that Coins.ph has significantly improved access to financial services for unbanked populations by enabling transactions via mobile phones without requiring a traditional bank account.
- **BitPesa:** A platform facilitating cross-border payments using Bitcoin and other cryptocurrencies across Africa. Research by Udeh et al. (2024) highlights how BitPesa has lowered transaction costs associated with remittances from abroad while enhancing payment processing efficiency.
- **Unocoin:** Operating primarily in India, this platform provides Bitcoin-based solutions for payments and savings targeted at individuals lacking access to traditional banking facilities. Gallo et al. (2023) emphasize how Unocoin allows users to save in Bitcoin while offering an accessible platform for transactions.

V. Blockchain Technology And Financial Inclusion

Blockchain technology holds the promise of significantly improving financial inclusion by offering decentralized, cost-effective, and secure solutions that empower marginalized communities. The accompanying image illustrates these concepts.



The impact of blockchain on digital financial inclusion can manifest in various ways. The image above visually depicts potential scenarios, including decentralization and cost reduction, improved accessibility for the unbanked, enhanced transparency and security, and increased transaction speed.

Key Challenges to Financial Inclusion

Financial inclusion is increasingly acknowledged as essential for stimulating economic growth, alleviating poverty, and fostering equality. It involves ensuring that individuals and businesses, especially those

from disadvantaged backgrounds, have access to valuable and affordable financial products and services. Despite its importance, numerous obstacles impede the global pursuit of financial inclusion. This introduction examines these challenges through diverse scholarly perspectives, emphasizing the complex nature of financial exclusion.

Lack of Access to Financial Services: A primary obstacle to financial inclusion is the limited access to financial services. The World Bank reports that around 1.7 billion adults remain unbanked, largely due to geographical limitations, inadequate infrastructure, and a scarcity of financial institutions in rural areas (Demirgüç-Kunt et al., 2018). For instance, in Nigeria, high banking service costs and a lack of trust in financial institutions worsen this situation. Ozili (2020) states that "the high cost of financial services can make it difficult for individuals to open bank accounts and access loans," restricting their ability to save and invest.

In Ethiopia, studies indicate that both involuntary exclusions—such as distance from banks—and voluntary exclusions—like insufficient funds—significantly affect formal account ownership (Alemayehu et al., 2023). The research highlights that "the determinants, barriers, saving, and credit motivations are different across individual characteristics," underscoring the need for targeted interventions to tackle these varied challenges.

Low Financial Literacy: Another major challenge is low financial literacy. Many individuals lack the essential knowledge and skills needed to navigate financial systems effectively. Research by Tiwari et al. (2019) revealed that "illiteracy and a lack of familiarity with technology were barriers to the full adoption of digital financial products among ultra-poor women in northern Kenya." This underscores how educational gaps can hinder marginalized groups from accessing available financial services.

In Niger, only 35% of adults are literate, with female literacy rates even lower at 27% (IMF, 2023). This educational deficit restricts individuals' capacity to comprehend and engage with financial products, perpetuating a cycle of exclusion. Kaligis et al. (2018) assert that "the higher the education level, the better the financial literacy," indicating that improvements in educational outcomes could significantly boost financial inclusion.

Cultural and Social Barriers: Cultural factors also significantly contribute to financial exclusion. In many areas, traditional beliefs and practices may discourage individuals from participating in formal financial systems. For example, Amari and Anis (2021) identified "cultural reasons" as barriers preventing individuals in Tunisia from accessing financial services. Similarly, in Nigeria, historical grievances related to economic exploitation have fostered distrust towards banks (Monapp, 2023).

Moreover, gender disparities present a considerable challenge. Women frequently encounter additional obstacles such as limited mobility and societal norms that restrict their access to financial resources. The IMF (2023) emphasizes that "closing the gender gap in terms of access and use of financial services is imperative for women's economic empowerment," noting that women's savings rates tend to surpass those of men.

Technological Barriers: The swift advancement of technology offers both opportunities and challenges for financial inclusion. While digital finance can effectively reach underserved populations, it necessitates a certain level of technological literacy. Research by Sarma and Pais (2008) indicates that "the absence of appropriate technology infrastructure can hinder access to digital finance." In regions with low smartphone penetration or inconsistent internet connectivity, traditional banking methods may remain the only viable option for many individuals.

Additionally, as highlighted by Credolab (2023), "the reluctance of financial institutions to serve small value customers" due to perceived risks exacerbates exclusion among low-income populations who may not meet conventional lending criteria.

Policy Implications: To overcome these challenges, comprehensive policy interventions are necessary that address both supply-side and demand-side factors. Governments and financial institutions must work together to improve infrastructure while simultaneously promoting tailored financial literacy programs for specific demographics. As noted by Adegbite & Machete (2020), "the increase in financial literacy has not only increased the number of bank accounts but also significantly reduced account dormancy."

In conclusion, while significant progress has been made toward achieving global financial inclusion, persistent challenges remain. Analyzing these barriers through various scholarly lenses reveals the complexity of the issue and highlights the need for targeted solutions that address individual circumstances alongside broader systemic issues.

VI. Blockchain Technology Solutions To Financial Inclusion Challenges

Blockchain technology has emerged as a transformative force in tackling the challenges associated with financial inclusion. By providing decentralized, secure, and transparent financial systems, blockchain can effectively alleviate many barriers faced by unbanked and underbanked populations. This section examines various blockchain-based solutions that can enhance financial inclusion, supported by insights from researchers and industry experts.

Reducing Transaction Costs: One of the most notable benefits of blockchain technology is its potential to reduce transaction costs. Traditional banking systems often involve multiple intermediaries, resulting in high fees that disproportionately impact low-income individuals. For example, money transfers can be costly; Western Union may impose fees of up to 35% for transactions below \$10. While wealthier individuals might absorb these costs, they represent a significant burden for those in rural areas. According to a study by Chen and Bellavitis (2019), "Blockchain technology can lower transaction costs, make decentralized platforms easier to use, and foster distributed trust." By removing intermediaries, blockchain facilitates direct peer-to-peer transactions, making financial services more affordable for marginalized communities.

Furthermore, the Milken Institute emphasizes that "blockchain can facilitate remittances at a fraction of the cost of traditional methods," which is particularly advantageous for migrant workers sending money home (Milken Institute, 2023). This cost-effectiveness can greatly enhance access to financial services for those who rely on remittances as a primary source of income.

Digital Identity Verification: Many individuals lack the official identification required to access financial services. Blockchain technology can help address this issue by enabling the creation of secure digital identities. As noted in a research article by Ntaskou (2024), "blockchain can facilitate the creation and verification of digital identities for individuals who lack official identification documents." This capability is essential for expanding access to banking services for populations often excluded from traditional systems due to inadequate documentation.

Moreover, Christine Moy and Jill Carlson (2023) highlight that "blockchain offers surprising promise in expanding financial inclusion" by providing a secure means for identity verification without relying on traditional institutions. This innovation can empower individuals in developing countries where formal identification systems are either lacking or unreliable.

Decentralized Finance (DeFi) Solutions: The emergence of decentralized finance (DeFi) platforms represents another significant advancement in promoting financial inclusion. DeFi utilizes blockchain technology to offer financial services such as lending, borrowing, and trading without traditional intermediaries. The Aspen Institute notes that "DeFi could help more households access, use, and benefit from better financial tools" (Aspen Institute, 2021).

These platforms enable individuals to engage in financial markets with lower barriers to entry. For instance, asset tokenization allows fractional ownership, enabling people to invest in real estate or other assets with minimal capital (Milken Institute, 2023). This democratization of investment opportunities can contribute to wealth-building among historically marginalized groups.

Smart Contracts for Financial Services: Smart contracts—self-executing agreements with terms directly encoded—can streamline various financial processes. They enhance transparency and reduce the need for intermediaries in transactions. According to Chapiro (2023), "smart contracts create efficiencies in traditional systems," facilitating quicker and more reliable transactions for users who might otherwise experience delays due to bureaucratic processes.

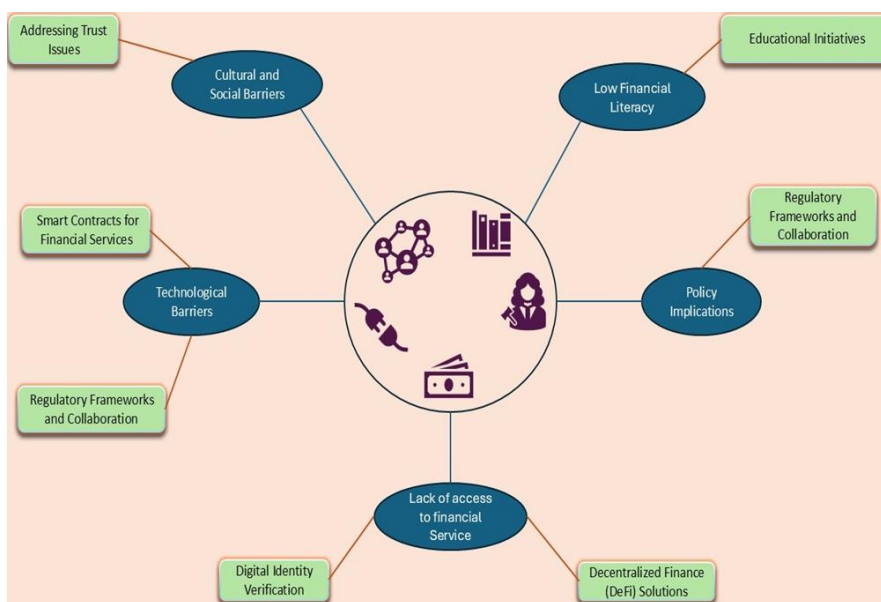
For example, smart contracts can automate insurance payouts or loan approvals based on predefined conditions, making these processes faster and more accessible. This efficiency is particularly valuable in regions where traditional banking infrastructure is limited or slow.

Addressing Trust Issues: The decentralized nature of blockchain fosters trust among users who may be skeptical of traditional financial institutions. The immutable and transparent characteristics of blockchain records ensure that all transactions are verifiable without needing a central authority. Chen and Bellavitis (2019) assert that "the absence of a central authority addresses trust issues," which is vital for building confidence among users historically excluded from formal financial systems.

Additionally, initiatives funded by organizations like UNICEF have demonstrated how blockchain can enhance trust in humanitarian contexts by ensuring that aid reaches its intended recipients without diversion or fraud (Chapiro, 2023). Such applications underscore blockchain's potential not only for financial inclusion but also for improving accountability in resource distribution.

Regulatory Frameworks and Collaboration: While blockchain offers numerous opportunities for advancing financial inclusion, effective implementation necessitates appropriate regulatory frameworks. Ntaskou (2024) notes that "policymakers must collaborate with businesses and civil society to harness blockchain's potential." Establishing clear regulations that protect consumers while fostering innovation is crucial for ensuring these technologies fulfill their intended purpose.

Moreover, Ruchi Rathor emphasizes that "a collective approach involving governments, organizations, and the private sector is vital" for maximizing the benefits of blockchain technology (Finextra, 2024). Through collaboration, stakeholders can create an environment conducive to the growth of blockchain solutions aimed at enhancing financial inclusion.



In conclusion, blockchain technology presents a variety of innovative solutions to address the challenges related to financial inclusion. From reducing transaction costs and facilitating digital identity verification to enable decentralized finance and improve trust in transactions, these technological advancements hold the potential to create a more inclusive financial landscape. However, achieving these objectives will require collaboration among various stakeholders and the establishment of supportive regulatory frameworks.

VII. Conclusion And Recommendations

Since their inception, distributed ledger technologies have demonstrated significant potential for formalizing remittances and enhancing access to various financial services. Authorities and practitioners are exploring the capabilities of blockchain technology to verify and record transactions within a decentralized ledger. This exploration is driven by the belief that blockchain could simplify and potentially replace existing infrastructures that facilitate international payments and remittances, such as correspondent banking.

The objectives of this analysis were to evaluate the impact of blockchain technology on integrating previously excluded parties into the financial system and to provide insights into the key benefits and lessons associated with financial inclusion. After a thorough review of relevant prior research, the author concludes that blockchain technology can significantly foster digital financial inclusion across diverse contexts. These contexts include its application in financial transactions, enhancing savings, extending credit, and providing insurance.

The study's findings indicate that blockchain has the potential to enable financial access for all individuals, regardless of their status or geographical location. It concludes that if the technology supporting blockchains is effectively implemented, financial inclusion can be achieved across multiple dimensions. Therefore, it is imperative for governments, particularly in developing economies, to seriously consider investments in blockchain to enhance financial inclusion.

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