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Financial Inclusion in the Digital Age: A Literature Review on Expanding Access to Financial Services for Underserved Populations

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Abstract: This literature review examines the multifaceted role of digital tools, such as mobile money and online banking, in expanding access to financial services for underserved populations globally. It synthesizes current research on the benefits, challenges, and policy implications of digital financial inclusion. The review highlights how digital financial services (DFS) contribute to poverty reduction, enhanced financial resilience, and economic empowerment, particularly for women, by overcoming traditional barriers like geographic distance and high transaction costs. However, it also critically assesses persistent challenges, including digital and financial literacy gaps, infrastructure limitations, trust deficits, and emerging risks such as fraud and over-indebtedness. The paper concludes by discussing the crucial role of responsive regulatory frameworks and targeted interventions in fostering a truly inclusive and sustainable digital financial ecosystem. It offers directions for future research and policy recommendations.

Keywords: Financial inclusion; Digital age; Digital financial services; Financial literacy

1. Introduction

1.1 Background on Financial Exclusion and the Digital Divide

Historically, a significant portion of the global adult population has been excluded from formal financial services due to various systemic barriers. These include geographic remoteness, which often makes it economically unfeasible for traditional financial institutions to establish physical branches, and the high operational costs of serving low-income populations (Adelaja et al., 2024). Beyond logistical hurdles, socio-cultural factors, such as gender norms that restrict women's financial autonomy or pervasive low literacy levels, have historically exacerbated this exclusion (Adelaja et al., 2024). The persistent lack of access to formal financial mechanisms frequently traps individuals and communities in cycles of poverty and vulnerability, severely limiting their capacity to save, invest, or effectively cope with unforeseen economic shocks.

The advent and rapid proliferation of digital technologies, particularly mobile phones, have presented an unprecedented opportunity to bridge this long-standing financial gap. Digital tools have profoundly transformed financial landscapes, especially in developing economies, by offering novel avenues for service delivery (Welteke, 2022). This transformative impact is evident in the dramatic reduction of the unbanked population: from 2011 to 2021, the fraction of adults globally without a formal financial account plummeted from 48% to 24%, a significant shift attributed mainly to the widespread expansion of digital financial services (DFS) (Demirgüç-Kunt et al., 2022; Poverty Action Lab, 2025).

Despite this remarkable progress, a persistent "digital divide" remains a critical concern. Uneven access to

technology, varying levels of digital literacy, and unreliable internet connectivity across different regions and demographics can limit the reach of DFS (Brown, 2020; Cnaan et al., 2023; van Dijk, 2006). This presents a complex situation. While digital tools demonstrably expand financial access for a substantial portion of the population, there is a concurrent risk of inadvertently deepening existing socio-economic disparities (Cnaan et al., 2023). If the transition to digital finance is not managed with deliberate equity in mind, it could potentially leave specific marginalized populations further behind in the emerging digital financial landscape (Cnaan et al., 2023). This highlights a paradox: digital inclusion, while bringing immense benefits, carries the inherent challenge of potentially creating a new form of exclusion for those unable to participate (Cnaan et al., 2023).

The pervasive adoption of mobile phones has fundamentally reshaped the landscape of financial service delivery. In many developing contexts, mobile connectivity has shifted from a supplementary channel to the primary, or even default, financial infrastructure (Welteke, 2022). This represents a profound paradigm shift, effectively bypassing the need for traditional brick-and-mortar banking models. The widespread mobile phone penetration directly enables the rapid, cost-effective scaling of mobile money and other DFS, which, in turn, serves as the main driver of increased financial inclusion among previously underserved populations (Welteke, 2022). This fundamental change underscores the critical importance of mobile technology in achieving broad-based financial access.

1.2 Purpose and Scope of the Literature Review

To sharpen the analytical focus of this review, the manuscript is directed by the following central research question:

RQ: How do DFS expand access for underserved populations while simultaneously generating new forms of risk, exclusion, and regulatory challenges?

Clearly stating this question allows the review to go beyond merely listing benefits and challenges and instead explore the governance, risk management, and regulatory implications that emerge as digital financial ecosystems develop. In this process, this review contributes to existing literature in two distinct ways. First, it aggregates evidence on digital financial inclusion through the lens of corporate governance and risk oversight, underscoring how issues such as consumer protection failures, data governance risks, cybersecurity threats, and algorithmic decision-making directly influence institutional accountability and regulatory frameworks. Second, the review highlights emerging gaps, especially the scarce exploration of algorithmic credit scoring for marginalized groups, the insufficiently studied long-term impacts of DFS adoption across different regions, and the absence of comparative analyses of regulatory frameworks, which together indicate where current scholarship remains disjointed. By emphasizing the connections between technology, governance, and regulatory capacity, the manuscript provides a more comprehensive and policy-relevant insight into digital financial inclusion than is typically found in current reviews.

To improve transparency and replicability, the subsequent section outlines the systematic review protocol used to identify, select, and synthesize the literature reviewed in this research.

This review contributes to the corporate governance and risk management literature by examining digital financial inclusion as a governance-intensive financial infrastructure rather than solely a development intervention. It highlights how board oversight, enterprise risk management (ERM), data governance, and regulatory coordination shape inclusion outcomes, consumer protection, and systemic stability in digital financial ecosystems.

2. Methodology: Structured Literature Review Protocol

A structured literature review protocol is adopted, informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework and adapted to the interdisciplinary and policy-oriented nature of digital financial inclusion research. While not intended as a full systematic review with meta-analysis, the approach follows PRISMA principles of transparency, replicability, and systematic screening in the identification, selection, and synthesis of relevant academic and institutional literature.

The authors employ a systematic literature review protocol to consolidate findings on digital financial inclusion. Instead of executing a comprehensive systematic review intended for all-encompassing coverage, this method emphasizes thematic consistency, analytical rigor, and policy relevance, which is fitting given the field's interdisciplinary and fast-changing characteristics.

2.1 Literature Search Strategy

The authors categorize the literature into two types: peer-reviewed academic research and institutional or policy-oriented sources. Peer-reviewed articles form the core empirical and theoretical foundation for the analysis. At the same time, reports from organizations such as the World Bank, the United Nations, the Alliance for Financial Inclusion, and J-PAL provide contemporary datasets, implementation evidence, and regulatory insights. The

manuscript clearly distinguishes between these two types of sources, treating them as different forms of evidence.

The literature search was conducted from January to February 2025, using academic databases and institutional repositories to identify peer-reviewed research and high-quality policy evidence. The primary databases included:

- Scopus
- Web of Science
- Google Scholar

Institutional publications were obtained to supplement academic sources.

- World Bank
- United Nations
- Alliance for Financial Inclusion (AFI)
- J-PAL / Poverty Action Lab

This approach of using two sources acknowledges that a significant amount of empirical data regarding digital financial inclusion, especially in developing countries, first comes from international organizations before it gets published in academic journals.

2.2 Keywords and Search Terms

Search phrases were chosen to encompass both the technological and socio-economic aspects of digital finance. Important search phrases included various combinations of:

- "digital financial inclusion"
- "mobile money" AND "financial access"
- "fintech" AND "underserved populations"
- "digital payments" AND "poverty reduction"
- "financial literacy" AND "digital divide"
- "digital credit" AND "risk"
- "regulation" AND "digital finance"

Boolean operators helped refine results and ensured comprehensive coverage across disciplines.

The review examines literature released from 2006 to 2025. This timeframe includes both initial foundational studies on the digital divide and the latest advancements in fintech, mobile money frameworks, and digital regulation.

Studies were included if they satisfied the following criteria:

- Investigated DFS concerning the results of financial inclusion.
- Provided empirical, conceptual, or policy-relevant insights
- Published in peer-reviewed journals or recognised international institutions.
- Focused on underserved or marginalised populations

Studies were excluded if they:

- Centred exclusively on technological design without considering inclusion factors.
- Lacked credible sourcing or methodological transparency
- Were duplicative or superseded by later versions
- Only English-language publications were included.

2.3 Analytical Approach and Synthesis

The selected studies were examined through thematic synthesis, categorizing findings into conceptual themes that correspond with the goals of the review: methods of inclusion, socioeconomic effects, governance and risk factors, regulatory structures, and new challenges. This method facilitated comparisons across different regions and methodologies while preventing excessive fragmentation of evidence.

3. Conceptualising Digital Financial Inclusion

3.1 Definitions and Evolution of Financial Inclusion

Financial inclusion, in its broadest sense, is defined as the access to and use of quality, affordable financial products and services that ultimately lead to enhanced financial well-being (Propson et al., 2023). Crucially, the objective extends beyond merely ensuring that more adults possess financial accounts; it emphasizes that account owners must actively benefit from using these services, such as for digital payments, which offer a range of positive outcomes far beyond simple convenience (Demirgüç-Kunt et al., 2022).

In the digital age, this foundational concept has evolved into "digital financial inclusion." This entails explicitly deploying cost-saving digital solutions to reach populations currently financially excluded or underserved. These services must be tailored to their needs, delivered responsibly, and remain affordable for customers while being

sustainable for providers (World Bank, 2014). This evolution reflects a growing understanding that technology can dramatically reduce costs and expand the reach of financial services. The field's understanding of financial inclusion has matured significantly. While initial efforts focused heavily on expanding mere access, as evidenced by the substantial increase in global account ownership (World Bank, 2021), the current emphasis has shifted. The prevailing view now is that access, while necessary, is insufficient. The accurate measure of inclusion lies in meaningful usage and the generation of tangible welfare outcomes for individuals. This represents a progressive shift towards a more holistic and human-centric understanding of financial inclusion, moving beyond simple quantitative metrics to encompass the qualitative impact on people's lives.

3.2 Key Components of DFS

DFS encompass a broad spectrum of instruments delivered through digital channels. These include e-money accounts, debit cards, and low-cost regular bank accounts (World Bank, 2014). The essential operational components of DFS typically include digital transactional platforms that enable customers to make or receive payments, transfer funds, and store value electronically. These platforms rely on digital devices, primarily mobile phones, for transmitting and receiving transaction data, and often utilize networks of retail agents who facilitate "cash-in" (converting physical cash into electronic value) and "cash-out" (converting electronic value back into cash) services (World Bank, 2014).

Beyond basic payments and value storage, these digital transactional platforms enable the offering of a broader range of formal financial services by both banks and non-bank entities. This expanded suite includes savings, credit, insurance, and even securities, often leveraging transaction data to target customers and manage risk more effectively (World Bank, 2014).

Furthermore, the broader fintech landscape introduces additional innovations, including crowdfunding, insurance tech, budgeting software, blockchain technologies (including cryptocurrencies and decentralized finance), peer-to-peer lending, and robo-advisors and trading applications (United Nations, 2023). These innovations collectively aim to reduce costs and risks while extending and broadening services to previously unbanked populations (United Nations, 2023).

3.3 The Transformative Role of Digital Tools

3.3.1 Mobile money: a primary driver of access

Mobile money services have emerged as the single most significant driver of financial inclusion, profoundly transforming the financial landscape, particularly in developing countries. They have provided an unprecedented avenue for extending financial services to the vast majority of unbanked and low-income earners who were previously excluded from traditional banking systems (Welteke, 2022). The rapid proliferation of mobile money is directly correlated with the widespread adoption of mobile phones, which have evolved from simple communication tools into sophisticated service delivery platforms (Welteke, 2022).

The growth in mobile money adoption has been exponential. In 2020, there were 1.2 billion mobile money accounts globally, facilitating daily transaction values of $2 billion (Welteke, 2022). This strong dissemination is particularly evident in Sub-Saharan Africa (SSA), where a third of adults had a mobile money account in 2021. Notably, all 11 economies worldwide in which more adults own only a mobile money account than a traditional financial institution account are located in SSA, underscoring SSA's dominant role in the region (Demirgüç-Kunt et al., 2022; Welteke, 2022).

Mobile money platforms are uniquely positioned to address "institutional voids" prevalent in credit markets of emerging economies. They achieve this through three critical mechanisms. First, they facilitate the creation of a digital record of financial activities. This enables mobile money operators to provide alternative means for lenders to assess creditworthiness, especially for individuals lacking an established credit history, by analyzing their transaction data (Murray, 2023). Second, they succeed in simplifying access to financial services. By offering a decentralized network that connects various financial services and products from partners such as banks and mobile money platforms, mobile money platforms act as a "one-stop shop," overcoming barriers posed by limited physical access points, such as bank branches (Murray, 2023). Third, they are adept at building a massive user base. These platforms leverage powerful "network effects," where the value of the service increases for both users and providers as more people join, leading to rapid expansion and reach. This not only improves direct financial access but also serves as a crucial bridge to established financial groups such as banks, credit unions, and microfinance institutions, making credit more accessible for individuals and businesses (Murray, 2023).

The increasing reliance on digital transaction data for core financial functions, such as credit assessment, marks a profound shift. This means that an individual's or micro-enterprise's creditworthiness is increasingly evaluated based on their digital transaction history rather than traditional collateral or formal credit histories (United Nations, 2023; World Bank, 2014). This mechanism is particularly impactful for the unbanked, who lack conventional financial footprints, as their engagement with DFS generates valuable data that advanced algorithms can analyse

to create alternative credit scores. While this democratizes access to credit, it also raises significant ethical and regulatory questions about data privacy, the potential for algorithmic bias to perpetuate existing inequalities, and the need for robust consumer protection mechanisms to ensure the fair and responsible use of personal data.

The success and scalability of digital financial inclusion initiatives depend heavily on achieving a critical mass of users and leveraging existing social networks. The concept of "network effects," where the value of a service increases as more people use it, is a key feature of mobile money platforms (Murray, 2023). This creates a positive feedback loop: as more individuals join and use the service, its utility and attractiveness grow for others, leading to exponential growth. This suggests that community-based initiatives, peer influence (Propson et al., 2023), and culturally resonant adoption strategies are vital for scaling DFS, rather than a purely top-down or individual-centric approach.

3.3.2 Online banking and digital payments: broadening reach

Beyond mobile money, the broader adoption of online banking and digital payment systems, including e-money accounts and debit cards, has significantly increased financial access for previously excluded populations (World Bank, 2014). These systems facilitate seamless and secure transactions globally, effectively reducing transaction costs and lowering barriers to entry for even the smallest businesses to participate in the formal economy (Adelaja et al., 2024; United Nations, 2023).

The transition from a cash-based economy to e-money offers substantial advantages. These include greater access to fundamental financial services for all members of society, particularly the poor and marginalised, as well as reducing the scope for cheating, stealing, and burglarising, which disproportionately affects vulnerable populations (Cnaan et al., 2023).

Furthermore, digital money can offer environmental benefits and cost savings for governments by reducing the need to print and mint physical currency (Cnaan et al., 2023). Digital payments have been shown to significantly reduce the financial vulnerability of rural households. They achieve this by lowering the thresholds and costs for individuals and households to participate in the financial market, thereby increasing overall financial accessibility (Xu & Zhang, 2025). This enables rural households to access credit support, overcome financing constraints, and smooth the negative impact of various risk shocks (Xu & Zhang, 2025).

3.3.3 Emerging digital finance innovations (e.g., blockchain, AI, P2Plending)

The broader fintech landscape extends beyond mobile money and traditional online banking to encompass a diverse range of DFS. These innovations include crowd-funding platforms, specialized insurance technologies, personal budgeting software, blockchain-based solutions (such as cryptocurrencies and decentralized finance), electronic payments and transfers, and robo-advisors and trading applications (United Nations, 2023).

These tools collectively aim to reduce costs and risks in financial services while simultaneously extending and broadening their reach to unbanked populations (United Nations, 2023). Due to the lack of extensive, peer-reviewed empirical research on AI, blockchain, and DeFi among low-income populations, this review approaches these technologies conceptually. Their possible contributions should be interpreted with caution, as the current evidence largely stems from industry white papers, regulatory sandboxes, and initial pilot programs instead of thorough causal assessments. Therefore, these technologies ought to be viewed as emerging and exploratory elements within the realm of financial inclusion, rather than as established forces with measurable socioeconomic effects.

Table 1. Overview of digital financial tools and their mechanisms for inclusion

Tool	Core Functionalities	Mechanisms for Inclusion
Mobile money	Payments, transfers, savings, credit, value storage	Overcomes geographic barriers, reduces transaction costs, creates digital credit histories, simplifies access, leverages network effects, acts as a bridge to formal institutions (Murray, 2023; Welteke, 2022)
Online banking/Digital payments	Payments, transfers, e-money accounts, debit cards, value storage	Reduces transaction costs, enhances security/privacy, offers environmental/government cost savings, lowers market participation thresholds, facilitates access to credit/insurance (Cnaan et al., 2023; Xu & Zhang, 2025)
Digital lending platforms	Microloans, credit access, alternative financing	Leverages alternative data for credit assessment, democratizes access to capital, and offers personalised financial products (Adelaja et al., 2024)
Blockchain/DeFi	Decentralised transactions, cryptocurrencies, lending/borrowing without intermediaries	Reduces costs, increases access in weak financial infrastructures, offers stable alternatives to volatile currencies, enhances security (Adelaja et al., 2024)
AI/Machine learning	Personalised financial advice, predictive analytics, risk management, and fraud detection	Enhances predictive analytics, improves risk management, tailors services to individual needs, optimises customer experience (Adelaja et al., 2024)

Decentralized finance (DeFi), built on blockchain technology and smart contracts, represents a particularly disruptive innovation. It offers new pathways for providing financial services, such as lending and borrowing, without the need for traditional financial intermediaries, potentially leading to significant cost reductions and increased access for underserved communities (Adelaja et al., 2024). In this ecosystem, cryptocurrencies can offer a stable alternative to local currencies in volatile economies, enabling transactions and savings free from government intervention (Adelaja et al., 2024; Grima et al., 2021).

Digital lending platforms are another promising solution for enhancing financial inclusion. By leveraging alternative data sources (beyond traditional credit histories) and digital platforms, these services can provide microloans to individuals and small businesses that would otherwise be excluded from formal credit markets (Adelaja et al., 2024). The integration of Artificial Intelligence (AI) and Machine Learning (ML) in fintech is poised to revolutionize personalized financial services. These technologies enhance predictive analytics, enable more sophisticated risk management, improve fraud detection, and allow for more tailored financial advice, catering to individual user needs and enhancing the overall customer experience (Adelaja et al., 2024). Table 1 focuses exclusively on the operational and technological procedures that allow DFS to improve accessibility, without considering socioeconomic outcomes.

3.4 Benefits and Socio-Economic Impacts on Underserved Populations

3.4.1 Poverty reduction and income growth

DFS have made significant strides in reducing poverty and fostering income growth among previously underserved populations. A notable example is the M-PESA mobile money system in Kenya, which is estimated to have lifted approximately 194,000 households, equivalent to 2% of the country's households, out of poverty (Matheson, 2016; Poverty Action Lab, 2025).

In China, the widespread adoption and development of digital inclusive finance have demonstrably contributed to income growth among rural residents. This is achieved by expanding their access to a diverse range of financial services, including payments, deposits, and loans, which were previously inaccessible or limited in remote areas (Gao et al., 2024; Li & Ma, 2021). Beyond direct income effects, DFS can increase profits for micro-entrepreneurs and facilitate crucial labour reallocation. For instance, in Mozambique, mobile money encouraged out-migration and a shift from subsistence agriculture to more productive occupations, leading to increased household expenditures (Poverty Action Lab, 2025). This diversification of income sources and improved economic opportunities directly contributes to poverty alleviation.

The consistent evidence that digital payments reduce transaction costs (Poverty Action Lab, 2025; World Bank, 2014) demonstrates a powerful multiplier effect on economic development. These cost efficiencies cascade into a series of positive economic outcomes, including increased savings, investment, and consumption, at both the individual and household levels (Poverty Action Lab, 2025). For governments, this efficiency translates into significant benefits, including reduced corruption and improved tax collection (United Nations, 2023). These micro and macro-level efficiency gains and cost savings collectively stimulate broader economic activity, driving GDP growth and job creation in emerging economies (United Nations, 2023).

This indicates that digital financial inclusion is not merely a social welfare initiative but a powerful and strategic engine for comprehensive economic development, capable of unlocking significant economic potential in previously marginalized sectors.

3.4.2 Enhanced financial resilience and shock coping mechanisms

DFS, particularly mobile money, have proven instrumental in strengthening financial resilience and improving vulnerable households' ability to cope with economic shocks. By significantly reducing remittance transaction costs, mobile money makes it easier and more affordable for households to receive financial support during crises, thereby helping them maintain stable consumption levels (Poverty Action Lab, 2025). For example, studies in Kenya showed that mobile money users' consumption remained unaffected during income shocks, unlike non-users who experienced a 7% reduction in consumption (Poverty Action Lab, 2025).

Access to formal financial products, such as insurance, facilitated by DFS, helps households manage financial risks associated with unpredictable events, such as health emergencies, natural disasters, and other unforeseen expenses. By mitigating these risks, financial inclusion promotes economic stability and reduces individuals' likelihood of falling into poverty (Adelaja et al., 2024; Block, 2022). Furthermore, digital payment platforms can provide users with early warning information about various risks, enabling them to take timely and appropriate response measures and reduce potential losses (Xu & Zhang, 2025). This proactive risk management capability enhances overall household financial security.

3.4.3 Increased access to diverse financial products (savings, credit, insurance)

DFS have enabled millions of formerly excluded and underserved poor customers to transition from exclusively cash-based transactions to a wide array of formal financial services. This includes not only basic payments and

transfers but also more complex products, such as savings, credit, insurance, and securities, all of which are accessible via mobile phones or other digital technologies (World Bank, 2014). Studies consistently demonstrate that integrating mobile money accounts with traditional banking systems increases savings deposits (Poverty Action Lab, 2025). Mobile money accounts can also help potential borrowers, especially those without traditional credit histories, demonstrate their ability to save, thereby facilitating their access to formal loans (Welteke, 2022).

Digital payments have streamlined access to commercial insurance services by integrating internet technology with the insurance industry. This offers low-threshold and low-cost options, changes traditional sales models, reduces transaction costs, and significantly enhances accessibility. Moreover, by leveraging big data and cloud computing, digital payment platforms can help create multi-tier commercial insurance products tailored to rural families' risk protection needs, addressing information asymmetry and ultimately enhancing households' risk transfer capacity (Xu & Zhang, 2025).

From a risk management perspective, digital insurance products play a critical role in transforming vulnerability into insurable risk; however, weak governance, inadequate disclosure, and limited consumer literacy can undermine their protective function and generate new conduct risks (Pavia et al., 2021).

3.4.4 Empowerment of vulnerable groups, especially women

Digital financial inclusion has significant potential to promote economic empowerment, particularly for women. It can facilitate asset accumulation and directly increase women's economic participation (World Bank, 2014). Research suggests that increasing women's access to financial services can improve household welfare and increase investments in critical areas, such as education and health (Adelaja et al., 2024).

The disproportionately positive impact of DFS on women is a recurring theme. This includes enhanced security and privacy for financial transactions, increased empowerment, higher profits for female entrepreneurs, and a shift towards more productive occupations (Adelaja et al., 2024; Heath & Riley, 2024; Poverty Action Lab, 2025; Welteke, 2022). This suggests that DFS are uniquely positioned to address specific, often deeply entrenched, barriers faced by women in traditional financial systems, such as the need for a male relative's permission to open accounts (Adelaja et al., 2024) or social pressures to share cash within families (Poverty Action Lab, 2025). The privacy and security features inherent in DFS often allow women to circumvent traditional social or familial controls that might otherwise limit their financial autonomy and decision-making power over their earnings and savings. This makes DFS a critical tool for advancing gender equality in financial control.

In Uganda, for instance, switching microfinance loan disbursements from cash to digital channels for female entrepreneurs led to a 15% increase in business profits and a 11% increase in business capital. This digital approach empowered women by enabling them to manage loans securely and overcome social pressures to share money within their families, thereby increasing their control over finances (Poverty Action Lab, 2025).

Similarly, in Kenya, the accessibility of mobile money encouraged women to shift their main occupation from agriculture to more profitable business ventures, and both men and women consumed and saved more (Matheson, 2016; Poverty Action Lab, 2025). Furthermore, regulatory reforms that have welcomed mobile money platforms into the financial services sector have led to a 22% increase in the likelihood of borrowing from formal channels, with a particular impact on women, the poorest individuals, and those with limited education (Murray, 2023). This highlights the transformative power of digital tools in addressing gender-specific barriers to financial access.

3.4.5 Efficiency gains and reduced transaction costs

Digital transactional platforms inherently offer lower costs for both financial service providers and their customers compared to traditional cash-based or branch-based systems. This cost efficiency allows customers to conduct transactions locally, even for small amounts, which is particularly beneficial for managing characteristically uneven incomes and expenses common among underserved populations (World Bank, 2014).

Digital payments have significantly reduced transaction costs for various financial activities, most notably for remittances (Poverty Action Lab, 2025). They have also revolutionized government-to-person (G2P) payments, reducing misappropriation or diversion of funds, lowering administrative costs, and improving the speed and ease of delivery for recipients (Poverty Action Lab, 2025; United Nations, 2023). For example, in Niger, electronic delivery via mobile money reduced per-transfer costs by 20% compared to manual distribution (Poverty Action Lab, 2025).

The efficiency gains extend to businesses and governments. Firms can save substantial labor hours and cut operational costs by transitioning from cash to digital payments. A striking example is the Ebola response workforce in Sierra Leone, which saved approximately 800 working days per month by digitizing payments (United Nations, 2023). Governments can also significantly improve their finances by digitizing payments, reducing opportunities for corruption, enabling more precise targeting of spending, and improving tax collection. Sierra Leone, for instance, saved up to US $10.7 million by digitizing payments, equivalent to funding its Free Health Care Program for 1.4 million children and 250,000 pregnant women annually (United Nations, 2023). Table 2, outlines the empirical findings related to the effects of poverty alleviation, resilience, and empowerment, without repeating the technological details already presented in Table 1.

Table 2. Socioeconomic impacts of digital financial inclusion

Benefit/Impact Area	Specific Outcomes/Examples
Poverty reduction & income growth	M-PESA lifted 194,000 households out of poverty in Kenya; Digital inclusive finance contributed to rural income growth in China; Increased profits for micro-entrepreneurs; Facilitated labour reallocation from subsistence to productive occupations (Gao et al., 2024; Li & Ma, 2021; Matheson, 2016; Poverty Action Lab, 2025)
Enhanced financial resilience	Consumption stability during income shocks (Kenya); Access to insurance products for risk management; Early warning information about risks via digital platforms (Block, 2022; Poverty Action Lab, 2025; Xu & Zhang, 2025)
Increased access to diverse financial products	Transition from cash to formal services (savings, credit, insurance, securities); Increased savings deposits through mobile money integration; Streamlined access to commercial insurance (low-cost, tailored products) (Poverty Action Lab, 2025; Welteke, 2022; World Bank, 2014; Xu & Zhang, 2025)
Empowerment of vulnerable groups (especially women)	Increased economic participation and asset accumulation; Higher business profits and capital for female entrepreneurs (Uganda); Shift to more profitable occupations for women (Kenya); Increased borrowing likelihood from formal channels for women (Adelaja et al., 2024; Heath & Riley, 2024; Matheson, 2016; Murray, 2023; Poverty Action Lab, 2025; Welteke, 2022; World Bank, 2014)
Efficiency gains & reduced transaction costs	Lower costs for providers and customers; Reduced remittance transaction costs; Lower administrative costs for G2P payments (e.g., Niger); Significant labour hour savings for businesses (Sierra Leone); Improved government finances (reduced corruption, better tax collection) (Poverty Action Lab, 2025; United Nations, 2023; World Bank, 2014)
Labour reallocation	Encouraged out-migration and shift from subsistence agriculture to more productive occupations (Mozambique) (Poverty Action Lab, 2025)

3.5 Challenges and Barriers to Digital Financial Inclusion

3.5.1 Digital and financial literacy gaps

Despite the transformative potential of DFS, low levels of digital and financial literacy remain a critical barrier to achieving full financial inclusion (Malady, 2016; Manoj Kumar et al., 2024; Propson et al., 2023; Verma & Shome, 2025; Welteke, 2022). As financial products and services are increasingly delivered digitally, proficiency in both areas is essential for consumers to navigate the ecosystem safely and effectively, ensuring their protection and promoting financial health (Propson et al., 2023).

Research consistently shows that financial literacy and online access are among the strongest predictors of an individual's engagement in digital banking activities (Cnaan et al., 2023). A fundamental lack of understanding of financial concepts and digital tools can prevent individuals from comprehending and effectively utilizing available financial products, leading to underutilization or avoidance of formal services (Cnaan et al., 2023).

The financial literacy gap is not merely about a lack of knowledge; it is deeply rooted in structural barriers such as language barriers, trust deficits, and limited accessibility (Wingate, 2025). Individuals with limited proficiency in the dominant language, for example, score significantly lower on financial literacy tests (12% lower than native speakers) and are more likely to pay higher interest rates, miss out on beneficial financial products due to confusion, or rely on potentially exploitative informal financial services. Language barriers alone account for approximately 23% of the reason why adults remain unbanked in multilingual regions (Wingate, 2025).

3.5.2 Infrastructure limitations and the digital divide

Inadequate digital infrastructure presents a significant impediment to the widespread adoption of fintech services. Unreliable internet connectivity and insufficient electricity supply directly hinder the effective deployment and use of DFS, particularly in remote and rural areas where traditional banking infrastructure is already sparse (Adelaja et al., 2024; Brown, 2020; Welteke, 2022).

The “digital divide” is a tangible barrier: for instance, the Pew Research Centre reports that 41% of adults with household incomes below $30,000 do not have broadband internet at home, creating a substantial obstacle to accessing DFS (Brown, 2020; Wingate, 2025). This highlights the inherent risk that, while DFS can bridge some gaps, they can simultaneously create or deepen another divide, leaving those without access to the necessary digital infrastructure further excluded from the formal financial system (United Nations, 2023).

3.5.3 Trust deficits, language, and cultural barriers

Building and maintaining trust in new digital services and providers is paramount for their adoption and sustained use (World Bank, 2014). Concerns among potential users about data privacy and the security of their personal and financial information often deter them from adopting new technologies (Adelaja et al., 2024; Wingate, 2025).

Cultural factors also play a significant role in financial exclusion. Financial systems often reflect the cultural values and practices of dominant groups, which can create friction for others. This includes financial products that

do not align with religious financial principles, service hours incompatible with the working patterns of certain communities, identity verification systems that do not accommodate diverse documentation, or communication styles that feel alien or uncomfortable (Wingate, 2025). Moreover, deeply ingrained sociocultural factors, such as gender norms that may require a male relative's permission for women to open a bank account or access credit, directly undermine their financial independence and ability to manage household resources (Adelaja et al., 2024). Addressing these trust and cultural barriers requires deliberate effort, including building trust through consistent, transparent interactions; ensuring clear consent processes for data collection; implementing robust security measures; and ensuring compliance with financial regulations across jurisdictions (Wingate, 2025).

3.5.4 Risks: fraud, over-indebtedness, data privacy, and cybersecurity

While digital payments offer numerous benefits, their introduction to low-income and underserved populations also brings inherent risks. These include increased exposure to fraud and phishing scams targeting digital accounts, the potential for over-indebtedness through easily accessible digital credit, and customers receiving incomplete or incorrect information on the fees and costs of financial products (Demirgüç-Kunt et al., 2022; Larsson et al., 2016; Welteke, 2022; World Bank, 2014).

Digital technology itself introduces specific risks, such as service disruptions and data loss (e.g., due to dropped messages), as well as the critical risk of privacy or security breaches arising from the digital transmission and storage of sensitive data (World Bank, 2014). Robust cybersecurity measures are therefore essential to prevent data breaches and maintain public trust in DFS (Adelaja et al., 2024). The ease with which unsecured digital loans can be obtained, particularly by formally unbanked households with limited experience with formal credit, poses a significant risk of pushing vulnerable individuals into debt traps or into over-indebtedness due to inappropriate or predatory lending practices (United Nations, 2023; Welteke, 2022).

3.5.5 Exclusion of specific marginalised communities

Despite the overall increase in financial inclusion metrics, the outreach of DFS to particular disadvantaged and poor groups remains limited. This includes households in remote areas, low-income households, and female-headed households, all of which are often overrepresented in the still-unbanked population (Welteke, 2022).

There is a significant warning against rushing into digital banking and the formation of cashless societies without adequate preparatory measures, as this approach risks further excluding marginalised populations who may lack the necessary information and communication technology (ICT) infrastructure, computer literacy, and financial literacy to participate meaningfully (Cnaan et al., 2023). The economic plight of these already marginalised populations may worsen in the emerging age of digital banking and the digital economy if their specific barriers to access and usage are not proactively addressed (Cnaan et al., 2023). This highlights the need for tailored interventions that recognise the varied experiences and root causes of financial access challenges among different marginalised communities (Propson et al., 2023).

The evidence consistently indicates that financial literacy, digital literacy, online access, and trust are critical barriers (Cnaan et al., 2023; Malady, 2016; Manoj et al., 2024; Propson et al., 2023; Wingate, 2025). A closer examination reveals these are not isolated issues but are profoundly interconnected, forming a reinforcing negative cycle. A lack of adequate digital infrastructure, such as broadband or device ownership, directly limits digital access, hindering the development of digital literacy. Low levels of both financial and digital literacy, coupled with concerns about security and privacy, erode trust in DFS.

This triad of barriers creates a formidable obstacle to meaningful inclusion, suggesting that addressing any single barrier in isolation is likely to be insufficient. A holistic, integrated approach that simultaneously addresses literacy, infrastructure, and trust is necessary for effective, sustainable digital financial inclusion.

Furthermore, the warnings against rushing to cashless societies (Cnaan et al., 2023) and the explicit concern that mandatory digitalization could lead to financial exclusion for those unable or unwilling to use DFS (Welteke, 2022) highlight a critical, emerging risk. While DFS are designed to reduce financial exclusion, they can inadvertently create a new form of exclusion: “digital exclusion.” This means that the benefits of digital transformation are not automatically universal. If not managed carefully, the digital age could deepen the divide for those who cannot adapt or are left behind due to various barriers. Policymakers must adopt a cautious, inclusive approach, ensuring that DFS remain a valuable option rather than becoming a mandate. It is crucial to maintain and support alternative, accessible financial channels for vulnerable populations who may face insurmountable barriers to digital adoption, guaranteeing that no one is left behind in the pursuit of a digital economy. Table 3 has been summarised to highlight only the essential categories of risks, literacy, infrastructure, trust, security, and exclusion, eliminating repetitive explanations.

Though fraud, excessive debt, cybersecurity issues, and breaches of data privacy are well-recognized dangers in digital financial systems, these problems take on greater importance when viewed through the lens of institutional governance and ERM. Digital financial service providers, whether banks or non-banks, now function in increasingly intricate risk landscapes where traditional safeguards fall short. From an ERM standpoint, fraud and the overextension of digital credit pose operational and conduct risks that effectively challenge the sufficiency

of internal controls, risk culture, and consumer protection mechanisms. Likewise, weaknesses in cybersecurity and failures in data governance signify technology and information security risks that necessitate strong governance frameworks, board-level oversight, and ongoing monitoring to ensure compliance with new data protection regulations and resilience.

Table 3. Major challenges and risks to digital financial inclusion

Challenge Category	Specific Manifestations/Examples
Digital & financial literacy gaps	Low proficiency in digital tools; Misunderstanding financial concepts; Language barriers (e.g., 23% of unbanked in multilingual regions due to language); Lower test scores for non-native speakers (Cnaan et al., 2023; Manoj et al., 2024; Propson et al., 2023; Wingate, 2025)
Infrastructure limitations & digital divide	Unreliable internet connectivity; Insufficient electricity supply; Lack of device ownership (e.g., 41% of low-income adults lack home broadband); Geographic barriers (remote areas) (Adelaja et al., 2024; Brown, 2020; United Nations, 2023; Wingate, 2025)
Trust deficits & cultural barriers	Concerns about data privacy and security; Products not aligning with religious principles; Incompatible service hours; Non-accommodating identity verification; Alien communication styles; Gender norms requiring male permission for financial access (Adelaja et al., 2024; Wingate, 2025; World Bank, 2014)
Security risks (fraud, phishing)	Increased exposure to fraud and phishing scams targeting digital accounts; Privacy or security breaches from data transmission/storage; Disrupted service and data loss (Adelaja et al., 2024; Demirgüç-Kunt et al., 2022; Larsson et al., 2016; World Bank, 2014)
Over-indebtedness & predatory lending	Potential for over-indebtedness from easily accessible digital credit; Incomplete/incorrect information on fees/costs; Aggressive debt collection practices; Predatory lending practices targeting vulnerable individuals (Demirgüç-Kunt et al., 2022; United Nations, 2023; Welteke, 2022)
Data privacy & algorithmic bias	Extensive collection, archiving, and selling of personal data; Potential for biased algorithms to perpetuate financial exclusion; Lack of clear rules for algorithms (United Nations, 2023; Welteke, 2022)
Risk of digital exclusion for marginalised groups	Limited outreach to remote, low-income, female-headed households; Worsening economic plight for those lacking IT infrastructure/literacy; Digitalisation as mandatory rather than optional (Cnaan et al., 2023; Welteke, 2022)

These risks collectively create supervisory challenges for regulators, who must modify traditional oversight approaches to encompass digital-only institutions, agent networks, fintech start-ups, and cross-border service providers. Deficiencies in corporate governance, such as poor disclosure, opaque credit-scoring algorithms, fragmented responsibilities for customer data, or weak AML/KYC controls, can lead to systemic risks, especially when mobile money or digital payments dominate national payment systems. As digital ecosystems grow, risks become increasingly interconnected, implying that localized operational failures can have widespread effects through agent networks, third-party technology providers, and interoperable payment systems. Framing these issues within the context of ERM and supervisor oversight structures underscores that promoting digital financial inclusion involves not just offering services but also integrating institutional governance, operational resilience, and systemic stability safeguards throughout the ecosystem.

3.6 Regulatory Landscape and Policy Implications

3.6.1 Current regulatory frameworks and their evolution

The regulatory landscape plays a strategically vital role in unlocking the full developmental potential of mobile money networks and the broader DFS ecosystem (Welteke, 2022). The practical implementation of a national FinTech strategy, when designed to complement existing national financial inclusion strategies, can significantly support the growth of FinTech companies, drive innovation, enhance financial inclusion, and contribute to overall economic development and competitiveness in the digital era (Alliance for Financial Inclusion, 2023).

Key regulatory issues that have emerged with the rise of digital financial inclusion relate to the oversight of agents, the application of anti-money laundering and countering financing of terrorism (AML/CFT) rules, the specific regulation of e-money, comprehensive consumer protection, the regulation of payment systems, and fostering healthy competition within the digital financial sector (World Bank, 2014). A critical challenge for regulators is to ensure that frameworks keep pace with the rapid technological changes inherent in the fintech space. This includes developing regulations that effectively address new and evolving risks related to consumer and data protection, cybersecurity, and ensuring interoperability across different digital financial platforms (Adelaja et al., 2024; United Nations, 2023; World Bank, 2014). Many of these issues require the expertise of multiple regulatory bodies, underscoring the need for effective communication and collaboration among them (World Bank, 2014).

3.6.2 Consumer protection in the digital financial ecosystem

Robust consumer protection is of paramount strategic relevance for ensuring the lasting acceptance and smooth operation of DFS, and crucially, for ensuring that the benefits are genuinely shared with disadvantaged and poor households (Welteke, 2022). A lack of adequate safeguards can quickly erode trust and diminish public acceptance of these new services (Malady, 2016; Welteke, 2022).

Specific consumer protection concerns highlighted in the literature include the need for greater transparency regarding credit conditions, unexpected fees, the actual computation of interest, unexpected withdrawals, and unclear disclosure of the full costs of financial products (Demirgüç-Kunt et al., 2022; Welteke, 2022). Regulators must actively address predatory lending practices and the growing risk of over-indebtedness, particularly as vulnerable individuals gain easier access to digital credit (United Nations, 2023; Welteke, 2022). Regulators must ensure consumers have clear and accessible avenues to contact customer care and file complaints (Welteke, 2022). The documented prevalence of vendor overcharging and misconduct further underscores the urgent need for strong and enforceable consumer protection measures within the digital financial ecosystem (Poverty Action Lab, 2025).

3.6.3 Fostering innovation and collaboration for sustainable inclusion

To truly maximize the potential of digital financial inclusion, policy reforms must actively welcome new entrants into the financial services sector, including mobile network operators and fintech startups. Such reforms have been shown to boost financial access (Murray, 2023) significantly. Governments can play a proactive role by promoting greater collaboration and partnerships between these new players and traditional financial institutions, thereby fostering innovation and co-creation within the broader financial sector (Murray, 2023). This collaborative approach can lead to the development of more diverse and tailored products and services offered through digital channels, contributing to sustainable growth and development (Murray, 2023).

Given the global nature of many fintech players and the potential for activities to shift across borders, international cooperation among regulators is essential. This collaboration is crucial for creating a level playing field, preventing regulatory arbitrage, and effectively managing the influence and activities of global market players, huge technology companies (BigTech) that are increasingly entering the financial services space (Adelaja et al., 2024; United Nations, 2023; Welteke, 2022).

A comparative analysis of global regulatory practices shows that no single framework is adequate for managing the fast-changing digital financial landscape. Effective oversight increasingly depends on a comprehensive regulatory toolkit that integrates proportional regulations for onboarding various market participants (Welteke, 2022; World Bank, 2014), experimental approaches like regulatory sandboxes to securely test fintech innovations (Alliance for Financial Inclusion, 2023), systemic-risk frameworks for overseeing digital platforms and BigTech entities (United Nations, 2023), and coordinated cross-border supervision to tackle transnational data flows, interoperability issues, and regulatory arbitrage (Adelaja et al., 2024). Regions that do not adopt such coordinated, multifaceted regulatory structures are at greater risk of failures in consumer protection, insufficient market transparency, and emerging systemic vulnerabilities. This comparative outlook highlights that achieving digital financial inclusion is closely linked to the larger endeavor of developing adaptable, resilient, and globally harmonized governance frameworks.

3.6.4 Addressing systemic risks and ensuring financial stability

The expansion of mobile money services and other digital financial innovations introduces risks similar to those in traditional banking. Therefore, it is crucial to apply comparable rules and standards to ensure a level playing field across the financial sector and prevent “cherry-picking” or regulatory arbitrage by new entrants (Welteke, 2022). This includes safeguarding customer deposits by ensuring that liquid funds are held in safe and liquid assets, ideally with traditional banks or central banks (Welteke, 2022).

Institutional risks posed by mobile money providers, especially those offering deposit and loan facilities, necessitate their subjecting to the same rules, standards, and regulations as traditional banks, covering aspects such as disclosure requirements, credit reporting, and Know Your Customer (KYC) rules to prevent money laundering (Welteke, 2022). Operational risks, such as fraud, loss of customer details, and insufficient cybersecurity, also need to be addressed with the same rigour as in traditional banking (Welteke, 2022; World Bank, 2014).

Furthermore, technology-specific risks demand attention. The use of alternative data and potentially biased algorithms in digital credit approval can lead to systematic disadvantages and perpetuate financial exclusion for certain disadvantaged groups. Regulation is necessary to establish rules and standards for algorithms, limit data collection and storage periods, require the disclosure of algorithms, and mandate stress tests to identify potential systematic disadvantages (Welteke, 2022).

The extensive collection, archiving, and potential sale of personal data by digital financial service providers also raises serious questions about legitimate interests and potential abuse, necessitating a robust regulatory framework involving both financial and telecommunications regulators to ensure data privacy and the right to informational self-determination (Welteke, 2022; Wingate, 2025).

The increasing reliance on digital data for core financial functions, combined with the explicit risks associated

with data privacy and the potential for biased algorithms, indicates that data itself has become a critical regulatory frontier. It is no longer solely about regulating financial transactions or institutions, but about governing the underlying data infrastructure and ensuring its ethical, secure, and fair use. The sheer volume and sensitivity of data collected by DFS providers necessitate a new focus on data ownership, concentration, control, and privacy. This means that data governance, encompassing issues of data ownership, ethical data use, algorithmic fairness, and robust privacy frameworks, is rapidly becoming as central to effective financial inclusion policy as traditional prudential regulation and consumer protection measures. This requires a multi-stakeholder approach to developing comprehensive data policies.

The regulatory environment faces a fundamental tension: on one hand, it must facilitate innovation and unleash the developmental potential of DFS (Alliance for Financial Inclusion, 2023; Welteke, 2022); on the other, it must address significant risks such as fraud, over-indebtedness, and data privacy breaches (Demirgüç-Kunt et al., 2022; United Nations, 2023; World Bank, 2014). This highlights a constant balancing act. The challenge is not to stifle technological advancement but to guide it responsibly, ensuring that innovation does not compromise consumer protection or financial stability. Effective regulation in the digital age requires a high degree of agility, cross-sectoral collaboration (e.g., between financial and telecommunication regulators), and a forward-looking approach to anticipate and adapt to rapidly evolving technologies and business models, rather than reacting retrospectively.

3.7 Corporate Governance and ERM in Digital Financial Inclusion

Digital financial inclusion initiatives are increasingly exposed to governance failures that can, in turn, lead to exclusion and consumer harm. In particular, the growing reliance on opaque algorithmic decision-making in digital credit and payment systems raises concerns regarding transparency, accountability, and fairness, especially for underserved populations with limited capacity to challenge automated outcomes. Weak oversight of agent networks, which often act as the primary interface between providers and customers, further exacerbates operational vulnerabilities and heightens the risk of fraud and misconduct. These challenges are compounded by poor disclosure practices, in which complex fee structures, credit conditions, and data-use policies are inadequately communicated to users with low financial and digital literacy.

Table 4. Governance and risk management dimensions of digital financial inclusion

Digital Financial Tool	Key Inclusion Benefit	Governance Challenge	ERM Risk Category	Regulatory Implication
Mobile money platforms	Expands access to payments, savings, remittances, and basic financial services for unbanked and remote populations	Weak oversight of agent networks; fragmented accountability across telecom, banking, and fintech providers; limited fee transparency	Operational risk; Conduct risk; Reputational risk; Systemic risk	Agent regulation; consumer protection standards; safeguarding of customer funds; payment system oversight
Online banking and digital payments	Reduces transaction costs and facilitates participation in the formal economy	Inadequate disclosure; cybersecurity vulnerabilities; exclusion of digitally illiterate users	Operational risk; Data risk; Reputational risk	Cybersecurity requirements; disclosure rules; inclusion safeguards
Digital credit and lending platforms	Improves access to credit through alternative data and rapid approval processes	Opaque credit models; aggressive lending; over-indebtedness risk	Conduct risk; Model risk; Reputational risk	Affordability assessments; pricing transparency; algorithmic governance
AI-driven credit scoring and analytics	Enables credit access for individuals without traditional credit histories	Algorithmic bias, lack of explainability, and weak model governance	Model risk; Conduct risk; Data risk	AI transparency requirements; bias testing; data protection compliance
Blockchain and defi applications	Potentially increases access where traditional financial infrastructure is weak.	Regulatory uncertainty; absence of accountability; consumer exposure to complex products	Operational risk; Conduct risk; Systemic risk	Clarification of regulatory perimeter; consumer protection frameworks
Digital microinsurance and insurtech	Enhance financial resilience through risk transfer and shock absorption	Low consumer understanding; claims transparency issues; solvency concerns	Conduct risk, Operational risk, Reputational risk	Prudential supervision; disclosure standards; claims-handling regulation
Agent-based digital financial services	Extends financial access in areas lacking physical banking infrastructure	Inconsistent training; fraud risk; weak monitoring	Operational risk; Conduct risk	Agent licensing, supervision, and enforcement mechanisms

Moreover, accountability within digital financial ecosystems is often fragmented across fintech firms, traditional banks, and telecommunications providers, creating regulatory blind spots and diluting responsibility for consumer protection and risk management failures. From an ERM perspective, these governance weaknesses manifest across multiple risk categories. Operational risks arise through system outages, service disruptions, and agent fraud; conduct risks emerge from mis-selling practices and the rapid expansion of digital credit leading to over-indebtedness; model risks are increasingly evident in AI-driven credit scoring systems that may embed or amplify bias; data risks stem from privacy breaches and insecure handling of sensitive customer information; reputational risks follow from erosion of trust after service failures or perceived exploitation; and systemic risks become salient where mobile money platforms attain dominance within national payment systems. Addressing these interconnected risks places clear responsibility on boards and senior management to define appropriate risk appetite for digital credit expansion, ensure robust oversight of third-party and agent-based service providers, and establish strong data governance frameworks that support accountability, resilience, and sustainable inclusion within digital financial ecosystems.

To synthesize the governance and risk management dimensions identified across the digital financial inclusion literature, Table 4 presents an integrated framework linking key digital financial tools to their primary inclusion benefits, associated governance challenges, corresponding ERM categories, and regulatory implications. This framework consolidates the dispersed evidence reviewed in earlier sections and highlights how inclusion outcomes depend on effective governance structures, risk oversight mechanisms, and regulatory capacity.

4. Conclusion

This part summarizes empirical results from peer-reviewed academic research and includes relevant institutional reports for additional context.

4.1 Summary of Key Findings

Digital tools, particularly mobile money and online banking, have revolutionised financial inclusion, significantly expanding access to formal financial services for previously underserved populations, especially in developing economies. The Global Findex data indicate a dramatic reduction in the unbanked population, mainly attributable to the widespread adoption of DFS. Mobile phones have emerged as the de facto financial infrastructure in many regions, leveraging network effects to accelerate financial access.

The benefits derived from this digital transformation are extensive and multifaceted. They include substantial contributions to poverty reduction and income growth, as evidenced by the impact of M-PESA in Kenya and digital inclusive finance in rural China. Digital tools enhance financial resilience and shock-coping mechanisms by reducing remittance costs and facilitating access to insurance. They have increased access to a diverse range of financial products, including savings, credit, and insurance, for millions previously excluded. Furthermore, DFS have profoundly empowered vulnerable groups, particularly women, by offering enhanced security, privacy, and control over their finances, thereby improving business profits and economic participation. These tools also deliver significant efficiency gains and reduce transaction costs for individuals, businesses, and governments, creating a powerful multiplier effect on economic development.

However, the path to complete digital financial inclusion is fraught with substantial barriers. These notably include persistent digital and financial literacy gaps, inadequate digital infrastructure leading to a digital divide, and deep-seated trust deficits stemming from concerns about security, privacy, and cultural misalignment. These barriers are often interconnected, forming a complex “literacy-infrastructure-trust” triad that requires holistic solutions. The digital age also introduces new and complex risks, such as increased susceptibility to fraud and phishing scams, the potential for over-indebtedness through easily accessible digital credit, and critical data privacy and cybersecurity breaches. A critical concern is the risk of “digital exclusion,” where the rapid shift to digital finance might inadvertently leave behind marginalised populations who cannot adapt or lack the necessary access and skills.

Effective policy and regulatory responses are crucial. They require a delicate and continuous balancing act between fostering innovation in the fintech sector and ensuring robust consumer protection, while simultaneously addressing systemic risks and maintaining overall financial stability. The growing reliance on digital data for financial functions also highlights the imperative of robust data governance frameworks. Holistic, context-specific interventions are crucial for bridging the remaining gaps.

4.1.1 Analytical interpretation and synthesis

The evidence indicates that digital financial inclusion operates through interconnected pathways that affect income and poverty. Key benefits include lower transaction costs, better market access, and improved liquidity. For empowerment, particularly among women, the focus is on enhanced control, privacy, and bargaining power rather than just income increases. Resilience benefits mainly arise from improved coping mechanisms, such as

remittances and access to insurance. It is essential to analyse these outcomes separately to understand the specific policies and institutions that influence each pathway.

Moreover, the quality of governance, regulatory capacity, and risk management significantly affect the scale and sustainability of inclusion outcomes. Lack of oversight and consumer protection can lead to risks such as over-indebtedness and fraud, while regions with robust regulatory frameworks often achieve more stable inclusion outcomes. Thus, digital finance's success is closely tied to institutional development.

Lastly, there is a notable gap between technological advancements and institutional readiness. While mobile money and digital payment systems are well-studied, there is limited evidence on advanced technologies like AI-based credit assessments. This highlights that simply having advanced technology does not guarantee inclusivity; alignment with governance and risk management practices is essential.

Overall, digital financial inclusion is rooted in institutional contexts rather than technology alone, providing a foundation for future policy and governance recommendations.

4.2. Further Recommendations

4.2.1 Future research directions

While evidence is growing, further robust empirical research is needed to understand the long-term connections among mobile money, sustained use of formal financial services, and reductions in gender inequality in account ownership and financial control.

More studies are required to assess the generalizability of findings from specific case studies across diverse financial ecosystems and to keep pace with the rapid technological advancements in fintech, ensuring research remains relevant.

In-depth exploration of effective strategies for building and maintaining trust in DFS, particularly among marginalised communities who may harbour historical distrust of formal institutions or new technologies, is crucial. Continued investigation into the development of optimal regulatory frameworks that can adapt flexibly to evolving fintech innovations while simultaneously ensuring comprehensive consumer protection and financial system stability is also warranted.

Furthermore, future research should examine the specific impacts of emerging technologies such as AI and blockchain on financial inclusion, along with the ethical, social, and regulatory challenges these innovations pose.

4.2.2 Policy recommendations

Based on the analytical assessment of the evidence examined, we outline policy implications and governance recommendations. To foster a truly inclusive and sustainable digital financial ecosystem, several policy recommendations are critical:

• Bridge the Digital Divide: Governments and policymakers must prioritise sustained investment in digital infrastructure, including broadband internet and reliable electricity, especially in rural and underserved areas. Concurrently, they should actively promote digital literacy initiatives. These initiatives should be tailored to diverse consumer groups, including local merchants, and leverage creative and culturally appropriate channels such as social media and interactive voice response campaigns to maximise reach and effectiveness.

• Strengthen Consumer Protection: Develop and rigorously enforce comprehensive consumer protection frameworks that explicitly address transparency of fees, combat predatory lending practices, safeguard data privacy, and provide easily accessible and effective complaint resolution mechanisms for digital financial service users. This includes clear disclosure of all costs and robust measures against fraud and over-indebtedness.

• Foster Responsible Innovation and Collaboration: Implement policy reforms that welcome new entrants like mobile network operators and fintech startups into the financial services sector. Simultaneously, promote strategic collaborations and partnerships between these new players and traditional financial institutions. This should be coupled with ensuring a level regulatory playing field to prevent regulatory arbitrage and mitigate systemic risks, thereby fostering innovation while maintaining stability. International cooperation among regulators is also essential to manage the global nature of fintech.

• Ensure Data Governance and Algorithmic Fairness: Develop robust data governance frameworks that define rules and standards for data collection, storage, and use, ensuring data privacy and the right of informational self-determination. Regulations should also address the potential for algorithmic bias in credit assessments and other financial services, mandating transparency and stress tests to prevent systematic disadvantages for vulnerable groups.

• Promote Financial Inclusion as an Option, not a Mandate: Policies should ensure that DFS remain an accessible option rather than becoming a mandatory requirement. This approach prevents the further exclusion of populations that may face insurmountable barriers to digital adoption due to a lack of literacy, infrastructure, or cultural factors, thereby ensuring that no one is left behind in the pursuit of a digital economy.

4.3 Limitations

This review has various limitations that must be recognised to provide context for its findings. First, although peer-reviewed research constitutes the primary foundation for this review, certain insights, especially those on recent regulatory changes and large-scale implementation outcomes, are sourced from institutional publications rather than academic journals. This is indicative of the practical, swiftly changing landscape of digital financial inclusion research, where international organisations often release data before journal publication. Consequently, readers should view institutional evidence as supplementary rather than a replacement for peer-reviewed confirmation.

Second, the existing empirical literature on digital financial inclusion is geographically limited, with much of the evidence coming from SSA, primarily due to the prevalence of mobile money and from China, where digital finance ecosystems have evolved rapidly. This geographical focus may restrict the applicability of findings to areas with different institutional, socio-economic, and technological circumstances.

Third, the review considers only publications in English, potentially overlooking key local studies, policy discussions, and region-specific evaluations published in other languages. This linguistic limitation is especially pertinent in areas such as Latin America, the Middle East, and certain parts of Asia, where local research may not be included in international databases. In summary, these limitations suggest that, while the review compiles significant global trends, its findings should be interpreted cautiously and could be further strengthened by future research that includes multilingual sources, primary data collection, and broader regional representation.

Author Contribution

Conceptualization, A.M., V.F., and S.G.; methodology, A.M., V.F., and S.G.; software, A.M., V.F., and S.G.; validation, A.M., V.F., and S.G.; formal analysis, A.M., V.F., and S.G.; investigation, A.M., V.F., and S.G.; resources, A.M., V.F., and S.G.; data curation, A.M., V.F., and S.G.; writing—original draft preparation, A.M., V.F., and S.G.; writing—review and editing, A.M., V.F., and S.G.; visualization, A.M., V.F., and S.G.; supervision, A.M., V.F., and S.G.; project administration, A.M., V.F., and S.G.; funding acquisition, A.M., V.F., and S.G. All authors have read and agreed to the published version of the manuscript.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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