IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

Digital Financial Systems and Global Financial Inclusion: Opportunities, Risks, and the Role of Digital Public Infrastructure

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DOI: https://doi.org/10.56975/ijrar.v13i1.329442

Abstract

The rapid growth of digital financial systems has reshaped the global financial landscape, making technology a key driver of financial inclusion. This study assesses how digital finance expands access to services and examines the socio-economic factors influencing adoption and usage. Moving beyond account ownership, it emphasizes usage, quality, and resilience, using mixed-methods analysis of global and national data from 2021–2025, with special focus on digital public infrastructure in India.

Findings show that interoperable, low-cost digital payment systems improve financial participation and economic resilience. However, barriers such as the digital divide, gender disparities, infrastructure gaps, and cybersecurity risks continue to constrain inclusive outcomes. The study highlights digital financial literacy as essential for consumer protection and draws policy insights from the World Bank and the International Monetary Fund. It concludes that sustainable financial inclusion requires not only technological expansion but also strong infrastructure, consumer safeguards, and human capability development.

Keywords: Digital financial inclusion, Digital public infrastructure, Financial technology adoption, Cybersecurity in finance, Digital divide and gender disparities.

INTRODUCTION

The global financial landscape is currently undergoing a structural transformation characterized by the convergence of digital technology and a systemic mandate for universal financial access. Financial inclusion, as conceptualized by the World Bank, involves the provision of financial services—encompassing payments, savings, credit, and insurance—that are delivered in a responsible, sustainable, and affordable manner to all segments of society, particularly those historically marginalized. In the contemporary era, digital financial

systems (DFS) have emerged as the primary vehicle for achieving this goal, utilizing mobile technology, cloud computing, and interoperable payment infrastructures to bypass the geographic and economic hurdles associated with traditional brick-and-mortar banking (Demirgüç-Kunt et al., 2022).

The evolution of financial inclusion has transitioned from a narrow focus on account ownership to a more comprehensive understanding of financial health and well-being. Early initiatives prioritized "Access," essentially the ability of an individual or business to open a formal account in a regulated institution. However, contemporary frameworks, such as those developed by the i2i measurement team, emphasize that "Usage" and "Quality" are the true indicators of socio-economic impact. While an account serves as the gateway to the formal economy, it is the sustained and diversified use of that account—for value transfer, liquidity management, and resilience against external shocks—that creates meaningful economic outcomes for households and small-medium enterprises (SMEs).

The mechanism of financial inclusion functions as a dynamic feedback loop between the supply side, comprising banks and fintech providers, and the demand side, consisting of individuals and businesses. On the supply side, institutions invest in digital infrastructure, automated teller machines (ATMs), and point-of-sale (POS) terminals to lower transaction costs and expand their reach into remote territories. On the demand side, individual characteristics—including education levels, income, and digital literacy—determine the extent to which these services are adopted and integrated into daily life. For SMEs, financial inclusion acts as a catalyst for innovation, employment, and technological upgrades, which collectively drive sustainable development goals (SDGs) such as poverty alleviation and inclusive economic growth.

As the world approaches the mid-point of the decade, the integration of digital banking and fintech is increasingly seen as an enabler of sustainable financial ecosystems. The proliferation of mobile money, digital wallets, and electronic payments has fundamentally transformed traditional banking practices, particularly in developing countries where legacy infrastructure was often insufficient. This report provides an exhaustive analysis of the current state of financial inclusion, the efficacy of digital financial systems, and the systemic barriers that must be addressed to achieve full financial equity (Ozili, 2020).

NEED FOR STUDY

The imperative for a detailed study on digital financial inclusion arises from the unprecedented acceleration of digital adoption following the COVID-19 pandemic. The technological revolution, and the rapid deployment of digital solutions as a response to social distancing measures, transformed access to finance globally. Between 2021 and 2024, the percentage of individuals in developing economies who made or received a digital payment increased from 55% to 62%, while reaching 96% across OECD countries. However, this rapid digitization has also created a "double-edged sword" effect, where increased access is accompanied by new and shifting risks.

There is a critical need to examine the disparity between "uptake" and "actual usage." The Global Findex 2021 data revealed that while account ownership has grown, approximately 35% of accounts in some major economies, such as India, remain inactive—a rate significantly higher than the average for developing economies. Understanding why accounts remain dormant is essential for policymakers to move beyond decorative metrics toward functional inclusion. Furthermore, the digital divide persists as a significant barrier; disparities in affordability, digital tools, and gender-responsive design continue to exclude the most vulnerable.

The surge in cybercrime also necessitates urgent academic and policy attention. The rapid adoption of online banking and fintech platforms has exposed users to sophisticated threats, including banking Trojans, phishing attacks, and AI-driven deepfakes. For low-income users, the loss of funds due to a cyber incident is not merely a financial setback but a psychological trauma that can permanently erode trust in formal financial systems. Consequently, analyzing the intersection of digital safety and financial literacy is paramount for building a resilient digital economy.

Finally, the study is needed to evaluate the role of digital public infrastructure (DPI) in achieving the United Nations Sustainable Development Goals. Financial inclusion is identified as a key enabler for goals such as poverty reduction (SDG 1), gender equality (SDG 5), and decent work and economic growth (SDG 8). By documenting the impact of systems like India's Unified Payments Interface (UPI) and various mobile money models in Africa, this research provides a roadmap for other developing nations seeking to bridge the financial divide (World Bank, 2022).

OBJECTIVES

The study aims to assess how digital financial systems advance global financial inclusion and the socio-economic factors influencing their effectiveness. Specifically, it seeks to:

- Examine the shift in financial inclusion from basic access to a multidimensional framework covering usage, quality, and resilience.
- Analyze global trends in account ownership and digital payment adoption (2021–2025), with special focus on digital public infrastructure in India.
- Identify key socio-economic barriers, including the digital divide, gender gaps, and infrastructure limitations.
- Evaluate cybersecurity risks and the role of digital financial literacy in consumer protection.
- Derive policy insights from global institutions such as the International Monetary Fund and the World Bank to guide future inclusion strategies.

METHODOLOGY

This study employs a comprehensive mixed-methods research design, synthesizing macro-level transactional data with micro-level demand-side surveys and qualitative thematic analysis. The methodology is designed to provide a holistic view of the financial ecosystem, accounting for both supply-side infrastructure and demand-side behavior.

Data Sources and Frameworks

The research utilizes several foundational datasets and conceptual frameworks to ensure analytical rigor:

1. **Global Findex Database (2021 & 2025)**: As the world's most comprehensive demand-side survey on financial inclusion, the Findex provides data on how adults in over 140 economies access and use financial services. It serves as the primary source for global and regional trends in account ownership, digital payments, and financial resilience.
2. **RBI Financial Inclusion Index (FI-Index)**: Developed by the Reserve Bank of India, this composite index measures the extent of financial inclusion across three pillars: Access (35%), Usage (45%), and Quality (20%). The index incorporates 97 indicators from the banking, investment, insurance, postal, and pension sectors (Reserve Bank of India, 2025).
3. **i2i Measurement Framework**: This framework focuses on the functional needs met by financial services—value transfer, liquidity, resilience, and meeting goals—moving the focus from mere uptake to meaningful usage patterns.
4. **Technology Acceptance Model (TAM)**: Applied specifically to the study of UPI and mobile banking, TAM helps evaluate "Perceived Usefulness" (PU) and "Perceived Ease of Use" (PEOU) as drivers of digital adoption among diverse populations.

Analytical Parameters

The analysis is structured around the three sub-indices of the FI-Index, which are quantified using the following scale and weighting system:

Sub-Index	Weight	Primary Indicators and Data Points
Access	35%	Number of bank branches, ATMs, BC outlets per 100k adults; availability of digital banking units (DBUs); mobile and internet penetration rates.
Usage	45%	Volume and value of digital transactions (UPI, IMPS, NEFT); percentage of adults receiving government transfers (DBT); frequency of savings and credit uptake.
Quality	20%	Financial literacy scores; grievance redressal efficiency; consumer protection frameworks; assessment of inequality in service distribution.

The study also incorporates qualitative insights from peer-reviewed literature and reports from global organizations like CGAP and the OECD to contextualize the quantitative findings within the broader socio-economic landscape (Reserve Bank of India, 2025).

DATA ANALYSIS AND DISCUSSION

The analysis of the data reveals a profound shift in the global financial architecture, driven by the rapid expansion of digital financial systems. This section details the findings across global and regional contexts, highlighting the mechanisms of growth and the persistent challenges of exclusion.

Global Trends in Financial Inclusion (2021–2025)

The Global Findex 2021 report established that 76% of adults globally had an account with a financial institution or mobile money provider, representing a significant increase from 51% in 2011. This growth was not uniform; developing economies saw a more rapid increase in mobile money accounts, which contributed to an 8-percentage point rise in ownership between 2014 and 2021. By 2024 and heading into 2025, the trend has shifted toward deeper engagement, particularly in savings (Donovan, 2012).

Metric	2021 Global Avg	2021 Developing Economies	2025 Projections/Latest
Account Ownership	76%	71%	79%
Digital Payment Usage	High (96% OECD)	57%	62% (Developing)
Formal Savings	Moderate	24% (in accounts)	40% (Fastest rise in decade)
Financial Resilience	-	-	56% can access emergency funds

The data suggests that the "digital revolution" is a powerful tool for governance. Social programs in various countries now channel transfers directly to beneficiaries' mobile phones, which has been proven to reduce leakage and delays. Furthermore, receiving a digital payment is often the first step toward broader engagement with the financial ecosystem, leading individuals to save, store, and eventually borrow money through formal channels (Demirgüç-Kunt et al., 2022).

The Indian Experience: A Model for Digital Public Infrastructure

India’s journey toward financial inclusion is unique due to its large-scale deployment of digital public infrastructure (DPI). The Reserve Bank of India’s Financial Inclusion Index (FI-Index) rose to 67.0 in March 2025, up from 64.2 in 2024 and 53.9 in 2021. This 24.3% increase in just four years reflects the cumulative impact of various government schemes and the explosion of digital payments.

The Impact of PMJDY and JAM Trinity

The Pradhan Mantri Jan Dhan Yojana (PMJDY) has been the bedrock of India's inclusion strategy. As of August 2025, the scheme reached a milestone of 55.98 crore beneficiaries. Crucially, the equity in access has improved significantly; the income gap in account ownership, which was 14 percentage points in 2011, became insignificant by 2021, and the gender gap has effectively closed.

However, the "Usage" dimension remains the next big challenge. While account ownership is near-universal at 89% as of 2025, a substantial portion of these accounts has historically been inactive. The government's push toward "Saturation of Financial Inclusion Schemes" in 2025, which included opening 6.65 lakh new accounts in a single month through intensive campaigns, aims to address these pockets of exclusion and encourage active use.

The UPI Revolution

The Unified Payments Interface (UPI) has architected a paradigm shift in the nation’s payment landscape. Processing over 15 billion transactions per month as of late 2024, it has become a global benchmark for real-time payments.

UPI Performance Metric	Value / Status
Monthly Volume	> 15 Billion Transactions
Share of Digital Payments	81.8% by Volume
Transaction Value Contribution	8.7% (indicating high prevalence of small-ticket use)
Zero-Cost Policy	Mandatory for end-users to drive adoption

The analysis shows that for urban India, UPI has been a catalyst for economic efficiency, supporting a platform-based gig economy and reducing operational costs for SMEs. In rural India, its impact is centered on breaking geographic barriers. By eliminating the need for physical bank branches and ATMs, mobile phones have become "mini-banks". This is particularly critical in remote areas where traditional banking was non-feasible. Furthermore, the adoption of UPI by street vendors and "kirana" stores has created a digital record of their business activities, potentially improving their eligibility for formal credit in the future (International Monetary Fund, 2023).

Socio-Economic Barriers and the Digital Divide

Despite the positive trends, "digital inequality" persists as a significant hurdle. This is defined as a situation where diverse characteristics deprive people of the knowledge, competency, and funds required to use digital assets. In Sub-Saharan Africa and other emerging markets, informal businesses—which contribute significantly to GDP—often face low technology adoption due to high costs and infrastructure deficits (Ozili, 2020).

The digital divide is shaped by several intersecting factors:

- **Affordability**: A lack of access to affordable home internet and data plans remains a significant barrier for the poorest households.
- **Infrastructure**: In rural communities, unreliable internet and power supply prevent consistent use of digital financial services.
- **Literacy and Trust**: Financial, digital, and "digital financial" literacy gaps leave users vulnerable to fraud. Trust deficits, often caused by past experiences with banking fraud or system outages, deter users from moving away from cash.

Gender Disparities in Digital Access

The gender gap in digital financial inclusion is particularly pronounced in certain regions. In Palestine, for example, women's adoption of financial technology lags due to lower digital literacy, limited financial independence, and restrictive social norms. Cultural constraints often limit women's economic agency, and while digital tools like mobile money have the potential to empower them, their effectiveness is moderated by the level of control women have over digital devices. However, there is evidence that digital payments can facilitate "learning by doing," where women who receive their own benefit payments into accounts develop financial capability independently over time.

Cybersecurity and Financial Safety

The shift toward digital finance has outpaced the enhancement of security and user awareness in many markets. Cybercrime targeting digital financial systems now poses a grave risk to the stability and trust of the ecosystem.

Type of Threat	Mechanism	Impact on Inclusion
Phishing / Social Engineering	Fraudsters use SMS, email, or calls to trick users into sharing PINs or login credentials.	Direct loss of funds; erosion of trust in digital platforms.
System Downtime	Unplanned outages due to network failures or cyber-attacks.	Deterred users revert to cash; inability to meet urgent financial needs.
AI-Driven Fraud	Use of deepfakes and generative AI to bypass verification or impersonate family.	Vulnerability among low-literacy users who cannot distinguish real from fake.

The OECD reports that 40% of adults who bought goods and services online in 2023 did not reach the minimum target digital financial literacy score. This knowledge gap is a primary vulnerability. Users often disregard basic security procedures, such as regularly changing passwords or verifying secure website certificates. Addressing this requires a "Responsible Digital Finance Ecosystem" where regulators, providers,

and consumer advocates collaborate to proactively identify and mitigate risks (Organisation for Economic Co-operation and Development, 2023).

RESULTS AND FINDINGS

The comprehensive investigation into the nexus of financial inclusion and digital systems yields several significant findings that are critical for future policy formulation:

1. **Transition to Usage and Quality**: Global and national metrics indicate a clear shift in focus from account ownership (access) to active engagement (usage) and the safety of the financial experience (quality). The RBI's FI-Index rise to 67.0 in 2025 is largely credited to improvements in these latter two dimensions.
2. **Digital Public Infrastructure (DPI) as an Equalizer**: The JAM trinity and UPI have demonstrated that interoperable, zero-cost digital architecture can effectively close the income and gender gaps in financial access. UPI's role in processing 15 billion transactions monthly shows that digital payments have become the default for everyday transactions in India.
3. **Financial Resilience through Formal Savings**: There is a growing trend of formal savings in developing economies, with the fastest rise in over a decade reported in 2024–2025. Access to formal savings is highly correlated with an individual's ability to withstand natural disasters and medical emergencies.
4. **The Persistence of the Digital Divide**: While technology bypasses physical barriers, it introduces cognitive and economic ones. Affordability of data, digital literacy, and cultural norms remain the primary inhibitors for women and rural populations.
5. **Cybersecurity as a Barrier to Entry**: Cybercrime and system unreliability are the leading causes of customer dissatisfaction and trust erosion. The increasing sophistication of AI-driven fraud highlights the urgent need for integrated digital financial literacy programs.
6. **Positive Correlation between Digital Payments and the Formal Economy**: Digital transactions create a verifiable trail that enhances tax compliance and facilitates access to formal credit for small merchants and the informal sector.

Discussion: Theoretical Implications

The results support the "Banking Made Easy" theory and the Technology Acceptance Model, where convenience and security are the primary drivers of adoption. However, the findings also suggest that "Perceived Usefulness" is context-dependent. For urban users, it is about lifestyle efficiency; for rural users, it is about accessing essential services like Direct Benefit Transfers (DBT).

Furthermore, the "mechanism of financial inclusion" is currently being reshaped by emerging technologies. As 2025 unfolds, the convergence of AI, blockchain, and open banking is expected to enable even more

personalized and inclusive financial products. AI-augmented predictive risk assessment can help extend credit to individuals without traditional credit scores, thereby furthering the reach of formal finance (OECD, 2023).

CONCLUSION

Financial inclusion is no longer a peripheral development goal but a core component of a resilient and equitable global economy. The proliferation of digital financial systems has demonstrated an unparalleled capacity to integrate the unbanked and underbanked populations into the formal economic fold. The transformation of India's payment landscape through UPI and the PMJDY scheme serves as a global case study for the power of digital public infrastructure. However, the study concludes that account ownership is merely the first step. The true impact of inclusion is measured by how effectively these accounts are used to build resilience, manage liquidity, and achieve long-term financial goals.

The digital divide and the evolving cybersecurity landscape remain the two most significant threats to the progress made so far. Policymakers must move toward a more holistic, "Responsible Digital Finance Ecosystem" that prioritizes consumer protection and digital literacy alongside technological expansion. This involves not only investing in broadband and power infrastructure but also in the human capital required to navigate digital systems safely.

As we look toward 2030, the integration of AI and potential Central Bank Digital Currencies (CBDCs) offers further opportunities to reduce transaction costs and increase transparency. However, the success of these innovations will ultimately depend on the trust of the end-user. Ensuring that digital finance is safe, affordable, and inclusive for the most vulnerable members of society—including women, rural populations, and the elderly—must remain the primary objective for all stakeholders in the global financial ecosystem.

Policy Recommendations

Based on the findings of this study, the following recommendations are proposed for government authorities and financial institutions:

- **Deepen Digital Literacy**: Launch large-scale, localized education programs focusing on "cyber hygiene" and the safe use of digital payments to protect users from increasingly sophisticated fraud.
- **Strengthen Infrastructure**: Expand broadband and mobile network coverage, particularly in "last-mile" rural areas, to ensure the reliability of digital financial transactions.
- **Promote Gender-Responsive Design**: Develop financial products and interfaces tailored to the needs and socio-economic realities of women to close the persistent gender gap in digital access.
- **Implement Proactive Consumer Protection**: Transition from reactive to proactive protection frameworks, utilizing AI-driven fraud analytics and transparent grievance redressal mechanisms to maintain user trust.

- **Leverage DPI for MSMEs**: Facilitate the transition of small merchants to the formal economy by integrating payment records with credit assessment models, thereby improving access to affordable loans.
- **Enhance Regional Cooperation**: Develop harmonized standards for cross-border digital payments and cybersecurity to facilitate remittances and protect the global financial system from fragmented risks.

By adhering to these strategies, nations can ensure that the digital financial revolution translates into sustainable and inclusive growth for all.

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