

DEMOCRATIZING FINANCIAL ACCESS: HOW REAL-TIME PAYMENT RAILS, OPEN BANKING, AND AI-POWERED INTELLIGENCE ARE BRIDGING THE GLOBAL FINANCIAL INCLUSION GAP

Ratnadeep Simhadri

PayPal, USA

Abstract

Financial exclusion remains a structural barrier to economic participation for approximately 1.3 billion adults globally, compounded by the rapid growth of gig and contract work that creates irregular income patterns incompatible with traditional financial service designs. This article examines how three convergent technologies—real-time payment infrastructure, open banking frameworks, and AI-powered financial analytics—are collectively dismantling the structural barriers that have historically excluded low-income populations, gig workers, immigrants, and small businesses from formal financial systems. Drawing on the Federal Reserve's FedNow service, which processed \$246 billion in quarterly transaction volume by mid-2025, open banking regulatory frameworks in Europe and the United States, and demonstrated performance of retrieval-augmented generation systems for financial data analysis, the article analyzes both the inclusion mechanisms and the governance risks these technologies introduce. The article identifies the compounding effect of deploying these technologies together: real-time payment rails enable instant income access, open banking enables alternative data-based credit underwriting for thin-file borrowers, and AI analytics democratize business intelligence previously available only to enterprises. A governance framework addressing algorithmic bias, privacy, and information asymmetry is presented as a prerequisite for equitable deployment. The article concludes that the technical barriers to financial inclusion are largely solved, and the critical remaining challenge is ensuring that these technologies are deployed with explicit attention to fairness, transparency, and the protection of vulnerable populations whose financial data powers these systems.

Keywords: Financial Inclusion, Real-Time Payments, Open Banking, AI-Powered Analytics, Gig Economy, Alternative Credit Scoring, Algorithmic Fairness.

1. Introduction

Financial inclusion remains one of the most significant barriers to economic participation and wealth creation for billions of people globally. The World Bank's Global Findex Database 2025 indicates that 79% of adults worldwide now have access to an account at a financial institution or mobile money provider, representing substantial progress from 62% in 2014, with approximately 1.3 billion adults remaining unbanked [1]. However, account ownership statistics mask a deeper problem: many formally banked individuals cannot access credit, insurance, or investment services due to insufficient credit history, irregular income patterns, or geographic distance from financial service providers. The FDIC's 2023 National Survey of Unbanked and Underbanked Households found that 4.2% of US households remained unbanked and 14.2% were underbanked—meaning they had bank accounts but relied on check cashers, payday lenders, or other alternative financial services for basic transactions [2].

The rise of the gig economy has created new urgency around financial inclusion challenges. As of 2025, over 59 million Americans participate in the gig economy, generating income through freelancing, ride-sharing, task-based platforms, and independent contracting. Traditional banking systems were designed for bi-weekly payroll cycles, creating structural mismatches for workers whose income arrives in small, irregular payments from multiple sources. These workers struggle to establish the stable employment and income documentation that traditional financial institutions require for account opening, credit approval, and loan underwriting. The structural barrier is not behavioral—gig workers are not less financially responsible than traditional employees—but systemic: the financial infrastructure was built for a labor market that no longer describes the majority of economic participants in many sectors.

Three converging technologies offer a pathway to structural change. Real-time payment infrastructure eliminates the multi-day settlement delays that make small, irregular payments economically unviable for financial institutions and practically insufficient for workers dependent on same-day access to earned income. Open banking frameworks establish authorized, consent-based channels through which transaction history and cash flow data can be shared with financial service providers, enabling alternative credit assessment that substitutes behavioral data for the formal credit history that thin-file borrowers lack. AI-powered financial analytics democratize access to business intelligence and financial management tools previously available only to enterprises with dedicated analytical staff. Research from the FinDev Gateway indicates that instant payment systems are fundamentally changing financial inclusion by reducing transaction friction, enabling on-demand wage payments, and creating the data footprint required for alternative credit assessment [4]. This article examines how these three technologies interact and compound in their inclusion impact.

This article is organized as follows. Section 2 analyzes real-time payment infrastructure as the foundational layer of financial inclusion technology. Section 3 examines open banking frameworks and their role in enabling alternative credit access. Section 4 addresses AI-powered financial analytics and their democratizing impact on SMB intelligence. Section 5 analyzes the compounding convergence effect when these three technologies are deployed together. Section 6 presents a governance framework for equitable deployment. Section 7 concludes with an assessment of the remaining challenges.

Population Segment	Geographic Scope	Primary Barrier to Full Financial Access	Typical Financial Service Gap
Unbanked adults	Global	No account at bank or mobile money provider	Cannot receive formal payments, save, or borrow
Unbanked households	United States	Documentation requirements, distrust, minimum balance fees	Rely on check cashers and money orders for basic transactions
Underbanked households	United States	Insufficient credit history or income documentation	Have accounts but use payday lenders or check cashers for credit
Gig and contract workers	United States	Irregular income incompatible with traditional underwriting	Cannot qualify for credit, mortgages, or standard loan products
Thin-file borrowers	Global	No formal credit history to score	Excluded from credit regardless of actual financial management capability

Table 1: Structural Profile of the Financially Excluded Global and US Segments [1, 2]

2. Real-Time Payment Infrastructure as Foundation

2.1 FedNow and the Transformation of Payment Velocity

Traditionally, the U.S. payment system ran on settlement cycles measured in days: ACH transfers took one to two business days to clear, wire transfers had to be initiated before a cut-off time, and personal checks could take three to five days to settle. Launched on July 28, 2023, the Federal Reserve's FedNow system provided participating financial institutions with 24/7/365 real-time gross settlement features processing transactions in seconds at any hour, even on federal holidays and weekends. The adoption path has been remarkable: FedNow processed \$246 billion in quarterly transaction volume by Q2 2025; by 2028, the wider real-time payment market in the United States is

projected to reach 13.9 billion transactions annually at a compound annual growth rate of 31.7% [5]. Reflecting both pent-up demand from the current financial system and deliberate financial institution investment, this growth rate far surpasses historical rates for payment rail adoption.

The switch from multi-day to real-time settlement is more than a small convenience change for economically vulnerable groups; it is a structural revolution in how financial assets might be handled. Instant payment systems get rid of the structural need for safety cash reserves that compel low-income people to keep more liquid reserves than their financial circumstances justify. A gig worker who formerly needed to keep seven to fourteen days of operating expenses in liquid reserves to span the gap between service completion and payment settlement can function with a single-day buffer when payment settlement occurs in seconds. ACI Worldwide's 2025 study on real-time payment adoption shows how this decrease in settlement friction disproportionately favors low-income populations, for whom the cost of maintaining larger-than-necessary cash buffers accounts for a significant share of total income [6].

Global real-time payment infrastructure has demonstrated measurable financial inclusion impact in markets that deployed earlier than the United States. India's Unified Payments Interface, Brazil's PIX system, and various African mobile money networks collectively demonstrate that real-time, low-cost payment infrastructure expands financial participation by reducing the cost and friction of transacting for populations previously dependent on cash. The IMF's analysis of financial technology and its intersection with financial inclusion documents how real-time payment infrastructure creates the transactional data footprint that enables subsequent financial services: each real-time transaction generates a timestamped, verified record of income receipt or payment that can be used to establish financial history for populations lacking formal credit files [8].

System	Country / Region	Launch Year	Operating Model	Primary Inclusion Impact
UPI (Unified Payments Interface)	India	2016	Interoperable mobile-first rail connecting all banks	Enabled digital payments for previously cash-only micro-transactions
PIX	Brazil	2020	Central bank-operated instant payment scheme	Expanded financial access for unbanked and underbanked populations
Mobile money networks	Sub-Saharan Africa	2007–present	Telco-operated accounts independent of traditional banking	Created first-ever formal account access for large rural populations
FedNow	United States	2023	Federal Reserve-operated 24/7 gross settlement rail	Enables instant wage disbursement and working capital compression for gig workers
RTP (Real-Time Payments)	United States	2017	TCH bank-consortium operated	Complements Fed Now primarily serves larger financial institutions

Table 2: Global Real-Time Payment Systems Comparative Landscape [5, 8, 13, 14]

2.2 Instant Disbursements and Gig Worker Cash Flow

Real-time payment capability enables a new class of financial service: instant disbursement of earned income. Visa's OCT (On-Demand Credential Transfer) technology, in partnership with real-time

payment networks, enables gig workers to access earned wages within minutes of task completion rather than waiting for the weekly or bi-weekly payment cycles of platform employers. For a ride-share driver who completes twenty rides in a day, the ability to access that day's earnings immediately to purchase fuel for the next day's work, pay a utility bill before a late fee accrues, or respond to an unexpected expense represents the difference between financial stability and the cycle of high-cost short-term borrowing that traps many gig workers in financial fragility.

The financial inclusion impact of instant disbursement extends beyond individual gig workers to the broader ecosystem of small businesses and independent contractors. Research on real-time payment system adoption documents how improved payment velocity enables small businesses to maintain leaner working capital positions, reducing the cost of capital required to operate and enabling businesses that would otherwise be unviable due to working capital constraints [7]. The interaction between instant disbursement and open banking data creates a compounding effect: the real-time transaction records generated by instant disbursement provide the cash flow data that open banking platforms can use to assess creditworthiness, enabling thin-file borrowers who establish income patterns through gig work to access formal credit based on their demonstrated earning capacity.

The implementation of instant disbursement at scale requires careful attention to fraud prevention and identity verification. The speed that makes real-time payments valuable for financial inclusion also makes them attractive for fraudulent schemes: authorized push payment fraud, where victims are deceived into authorizing transactions to fraudulent recipients, has grown significantly with real-time payment adoption. Effective inclusion-oriented real-time payment deployment requires fraud prevention systems that protect vulnerable users who may be less familiar with digital payment security risks without creating verification friction that re-creates the barriers that real-time payments are designed to eliminate. The balance between security and accessibility represents an active area of both technical development and regulatory attention across the global real-time payment ecosystem.

3. Open Banking and Alternative Data for Credit Access

3.1 Cash Flow-Based Underwriting and Thin-File Borrowers

Traditional credit scoring systems were designed for workers with stable employment histories and established credit files. A credit score requires years of documented credit behavior: credit card payments, installment loan history, and inquiry records accumulated over multiple credit products. For the estimated 45 million Americans with thin or no credit files including recent immigrants, young adults entering the workforce, and individuals recovering from financial hardship this creates a self-reinforcing exclusion: you cannot build credit history without access to credit, and you cannot access credit without credit history. Research on alternative credit scoring using aggregated financial data demonstrates that behavioral indicators observable in bank transaction data income regularity, expense management patterns, savings rates, and overdraft frequency are predictive of credit performance for thin-file borrowers at accuracy levels competitive with traditional credit scores [9].

The FinDev Gateway's research on instant payment systems and financial inclusion indicates that alternative data-based underwriting is fundamentally changing access to credit for thin-file borrowers in markets where it has been deployed [4]. By using authorized open banking data access to retrieve six to twelve months of bank transaction history, lenders can construct a behavioral credit profile that captures the actual financial management capability of applicants who lack formal credit history. This approach is particularly powerful for gig workers, whose irregular income patterns appear as credit risk under traditional scoring models but, when properly analyzed through cash flow underwriting, reveal income stability and expense management capability that may compare favorably with traditionally employed borrowers. The technical prerequisite is the open banking data access framework that enables lenders to retrieve this transaction data with consumer consent, in a standardized format suitable for automated underwriting.

The credit inclusion potential of alternative data-based underwriting is substantial. The IMF's analysis of AI and financial inclusion estimates that extending credit access to thin-file borrowers using alternative data could expand credit availability to 150 million previously underserved individuals globally, with the financial inclusion impact concentrated in emerging markets where formal credit infrastructure is least developed [8]. The technical foundation for realizing this potential open banking APIs providing authorized access to transaction data, machine learning underwriting models trained on behavioral data, and real-time payment infrastructure enabling instant loan disbursement is largely in place in markets that have implemented open banking mandates. The primary remaining barriers are regulatory certainty around permissible data use and the consumer trust required for voluntary data sharing.

Dimension	Traditional Credit Scoring	Cash Flow-Based Underwriting (Open Banking)
Primary data source	Credit bureau records (credit cards, installment loans)	Bank transaction history via authorized API access
Minimum history required	Typically 6–24 months of credit account activity	6–12 months of bank transaction data
Works for gig / irregular income	No irregular income appears as elevated risk	Yes income variability is analyzed as a pattern, not a disqualifier
Works for thin-file borrowers	No absence of credit file means no scoreable profile	Yes financial behavior replaces formal credit history
Geographic availability	Dependent on formal credit bureau infrastructure	Dependent on open banking API framework in jurisdiction
Consent mechanism	Implicit (credit bureau reporting)	Explicit consumer consent for data sharing required

Table 3: Traditional Credit Scoring vs. Cash Flow-Based Underwriting Structural Comparison [4, 9]

3.2 Account Verification and Low-Friction Onboarding

Beyond credit access, open banking simplifies financial service onboarding in ways that directly address the non-credit barriers to financial inclusion. Historically, opening a bank account required proof of identity, proof of residence, and documentary evidence of income documentation requirements that systematically exclude immigrants, individuals experiencing housing instability, and workers in informal employment. Open banking-enabled identity verification, which can confirm identity by matching the name on an open banking data request against existing bank account holder information, provides a digital verification pathway that supplements or in some cases replaces documentary requirements that present high barriers to underserved populations.

The competing approaches to account verification highlight tensions in open banking implementation that have direct inclusion implications. Screen scraping where users share login credentials with third-party services provides broad account access but exposes users to credential theft risk and is prohibited under PSD2 in Europe for authorized third-party access. API-based open banking access provides more secure, consent-governed data access but is available only for institutions that have implemented compliant APIs. For the populations most in need of alternative onboarding pathways who may lack documentation and be most vulnerable to security risks the transition from screen scraping to API-based open banking must be accompanied by consumer education and fraud protection that ensures security improvements do not create new vulnerability for populations with limited digital security literacy.

4. AI-Powered Financial Analytics for SMB Intelligence

4.1 Democratizing Business Analytics Through Natural Language Interfaces

Small and medium-sized businesses historically faced a critical analytical disadvantage relative to large enterprises: enterprise retailers employed teams of analysts and data scientists to extract actionable intelligence from business data, while SMBs operated on intuition and manual review of basic financial statements. The deployment of AI-powered financial analytics platforms changes this dynamic fundamentally. Retrieval-augmented generation systems integrated with business transaction data enable SMB owners to ask natural language questions such as how their average transaction value compared across the prior two quarters, which customer segments showed the highest retention rates, or what the projected revenue impact of a proposed price change would be and receive data-grounded, analytically sound responses in seconds.

Research on intelligent financial data analysis systems using LLM-RAG architecture demonstrates that these systems achieve 78.6% accuracy on financial data queries, representing a 23-percentage-point improvement over baseline generative approaches without retrieval augmentation [10]. For SMB owners without analytical training, the practical implication is that they can engage with their business data at a level of sophistication previously requiring professional financial analysis, enabling better-informed decisions about pricing, inventory, staffing, and capital allocation. The democratization of this analytical capability has the potential to improve the survival rates of small businesses, which disproportionately fail due to cash flow mismanagement and inadequate financial planning rather than fundamental business model problems.

The inclusion dimension of AI-powered SMB analytics extends beyond developed-market small businesses to microenterprise owners in emerging markets. A street vendor in Lagos, a smallholder farmer in Indonesia, or a mobile money agent in Kenya each operating a real business with real cash flows gains the ability to analyze financial performance, plan for seasonal variation, and identify growth opportunities that were previously accessible only through expensive professional advisory services. The mobile-first design of payment platforms serving these markets enables the same RAG-based analytics interfaces that power enterprise financial intelligence to be delivered through smartphone applications accessible to entrepreneurs without formal business education.

4.2 Algorithmic Bias, Privacy, and Information Asymmetry Governance

The deployment of AI-powered financial analytics and alternative credit scoring at scale introduces three governance challenges that must be actively managed to ensure these technologies advance rather than undermine financial inclusion. First, algorithmic bias: credit underwriting models trained on historical data that reflects past discriminatory lending practices can encode and perpetuate those biases in automated systems, systematically disadvantaging protected classes even when no protected class characteristic is explicitly included as a model feature. Proxy discrimination where geographically or behaviorally correlated features serve as proxies for race, ethnicity, or other protected characteristics is a documented risk in machine learning credit models that requires explicit fairness testing and mitigation in model development and deployment processes.

Second, privacy: the deployment of open banking data access at scale creates detailed behavioral profiles of consumers that have value far beyond their intended use in financial services applications. The same transaction data that enables alternative credit scoring also reveals political affiliation (through donations), religious practice (through charitable giving), health status (through pharmacy and medical provider payments), and relationship status (through shared household expense patterns). Governance frameworks must impose strict purpose limitation on open banking data use, prohibiting the use of financial transaction data for purposes beyond the scope of explicit consumer consent, and enforcing these limits through technical controls rather than relying solely on contractual prohibitions. Third, information asymmetry: if AI-powered analytics are deployed asymmetrically available to lenders and large platforms but not to the borrowers and SMBs whose data powers them the

technology could increase rather than decrease information asymmetry in financial markets. Ensuring that the individuals and businesses whose data is analyzed also have access to the insights derived from that analysis is a design principle that must be built into open banking and AI analytics governance frameworks. Regulatory frameworks should require that financial service providers using alternative data for credit decisions provide consumers with access to the specific data and derived features used, enabling the informed consent and dispute resolution that equitable financial services require.

5. Convergence Effect: Compounding Impact on Financial Inclusion

The three technologies examined in this article create multiplicative rather than merely additive benefits when deployed together. The convergence effect is most clearly visible at the individual borrower level: without real-time payments, alternative data-based underwriting cannot address working capital constraints because loan disbursement takes days or weeks. Without open banking, cash flow-based underwriting cannot operate because there is no authorized mechanism to access transaction history. Without AI analytics, loan servicing and financial management remain opaque and difficult, increasing default risk even for qualified borrowers. But when all three converge, the result is a fundamentally different financial service: a borrower establishes a cash flow track record through open banking data sharing, receives instant loan disbursement through real-time payment rails, and gains AI-powered insight into financial management through natural language analytics.

The convergence effect operates across multiple dimensions simultaneously. Economic velocity increases as real-time rails accelerate payment settlement, open banking enables credit decisions that previously took weeks, and AI analytics reduce the time to extract business insight from hours to seconds. Access democratization expands as alternative data underwriting extends credit to millions of thin-file borrowers, open banking enables low-friction onboarding, and AI analytics put sophisticated business intelligence in the hands of entrepreneurs for the first time. Cost reduction follows as real-time infrastructure lowers payment costs, algorithm-driven underwriting reduces information asymmetry and improves capital allocation efficiency, and AI analytics eliminate the need for expensive professional advisory services. The FinDev Gateway's analysis suggests that the combination of these three technologies could enable financial inclusion for an additional 500 million previously unbanked or underbanked individuals globally by 2030, compared to an estimated 200-250 million achievable through any single technology in isolation [4].

Technology Layer	Without This Layer	With This Layer	Compounding Role in Full Stack
Real-time payment rails	Loan disbursement takes days; gig workers hold excess cash buffers; instant earned income access is impossible	Payment settled in seconds; working capital compression enabled; same-day wage access viable	Creates the transaction data footprint that open banking uses for underwriting
Open banking framework	Credit underwriting relies solely on formal credit bureau data; thin-file borrowers excluded regardless of actual behavior	Authorized transaction history enables alternative underwriting; 150 million additional credit-eligible borrowers globally	Generates behavioral credit profile that makes real-time lending decisions possible

AI-powered analytics	Business intelligence requires dedicated analytical staff; SMBs and microenterprises operate without data-driven insight	Natural language queries return analytical responses in seconds; SMB intelligence democratized	Reduces default risk by improving borrower financial management; closes the advisory services gap
Full convergence (all three)	Each technology operates in isolation; inclusion impact is additive and limited	Borrower establishes track record → receives instant disbursement → manages finances with AI insight	Estimated 500 million additional individuals financially included by 2030 vs. 200–250 million from any single technology

Table 4: Convergence Effect Technology Interaction and Inclusion Outcome [4, 5, 8, 10]

6. Governance Framework for Equitable Deployment

Realizing the financial inclusion potential of real-time payments, open banking, and AI analytics requires deliberate governance to ensure that these technologies serve the populations most in need rather than primarily serving already-advantaged users. Regulatory frameworks must require that financial institutions subject to open banking mandates provide compliant APIs that meet minimum quality and uptime standards, preventing the creation of a two-tier system where large institutions provide high-quality API access while smaller institutions which often serve underserved communities provide degraded or non-functional APIs that undermine the inclusion promise of open finance.

Algorithmic accountability in AI-powered credit decisioning requires mandatory bias auditing; periodic evaluation of model outputs across demographic groups to identify disparate impact, with required remediation when models produce systematically different outcomes for protected classes that cannot be justified by legitimate risk differences. Consumer data rights must be protected through strong purpose limitation that prevents financial transaction data from being used for purposes beyond explicit consent, with technical enforcement mechanisms rather than contractual-only controls. Access to insights must be symmetric: if a financial platform derives credit scores or risk assessments from a consumer's data, that consumer must be entitled to access the derived assessment and the data inputs used to produce it.

International cooperation in governance is essential because financial inclusion technology operates globally while regulation remains primarily national. The populations most in need of inclusion in sub-Saharan Africa, South and Southeast Asia, and Latin America are served by fintech platforms that operate across multiple regulatory jurisdictions and may face weaker domestic regulatory frameworks than their developed-market counterparts. International standard-setting bodies including the Financial Stability Board, the Basel Committee on Banking Supervision, and the World Bank's financial inclusion initiatives have important roles in developing governance frameworks that extend inclusion-oriented fintech regulation to markets where domestic regulatory capacity is limited. The goal is a global financial technology ecosystem in which the same data protection standards, algorithmic fairness requirements, and consumer rights that protect users in Europe and the United States apply to users in emerging markets who are often more financially vulnerable and less equipped to navigate the consequences of biased or privacy-invasive financial technology deployments.

Conclusion

Structural obstacles have long hindered financial inclusion: the cost and lag of payment settlement, the difficulty of evaluating creditworthiness without official credit history, and the information asymmetry that favors small firms and vulnerable customers against big financial institutions. Real-time payment systems are removing payment velocity barriers; FedNow's increase to \$246 billion in quarterly transaction volume by mid-2025 and planned growth to 13.9 billion yearly transactions by 2028 are examples. Open banking systems are allowing alternate data-based underwriting that spreads creditworthiness analysis to thin-file borrowers before excluded from official finance. Through retrieval-augmented creation, financial data searches powered by artificial intelligence attaining 78.6% accuracy are democratizing corporate intelligence formerly only accessible to companies having committed analytic personnel.

With a disproportionate impact on the most vulnerable low-income groups, gig workers, immigrants, young adults, and SMBs in developing countries the convergence of these three technologies opens a route to financial inclusion for maybe 500 million more people by 2030. In countries with open banking requirements, the technical foundation is mostly in place; the major remaining difficulty is governance ensuring that these technologies are deployed with clearly stated emphasis on algorithmic fairness, data privacy, and the prevention of new kinds of information asymmetry that might turn inclusion tools into instruments of exploitation. Whether the digital financial revolution of the next ten years raises or lowers economic opportunity for the groups most in need of it depends on the researchers, engineers, and legislators that combine technical depth with financial inclusion commitment.

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