Digitus : Journal of Computer Science Applications
E-ISSN : 3031-3244
Volume. 3, Issue 3, July 2025
Page No: 153-163

Decentralized Identity in FinTech: Blockchain Based Solutions for Fraud Prevention and Regulatory Compliance

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Received : May 27, 2025
Accepted : July 17, 2025
Published : July 31, 2025

Citation: Yuni T., Soderi, A. (2025). Decentralized Identity in FinTech: Blockchain Based Solutions for Fraud Prevention and Regulatory Compliance. Digitus : Journal of Computer Science Applications, 3 (3), 153-163.

ABSTRACT: The FinTech sector is facing escalating threats from identity theft and digital fraud, with global losses exceeding US$42 billion annually. This study explores how blockchain based identity systems particularly Verifiable Credentials (VC), Decentralized Identifiers (DID), and selective disclosure protocols can enhance digital security, reduce onboarding time, and ensure compliance with evolving global standards. A qualitative and comparative methodology was applied, analyzing data from regulatory bodies (FTC, FATF, NIST), industry case studies, and technical frameworks (OpenID4VC, SD JWT, W3C). Results reveal that blockchain identity solutions reduce fraud risk by preventing synthetic identity use, while significantly improving authentication success rates through biometric and passkey based logins. Reusable KYC models integrated with VC/DID frameworks cut onboarding durations from weeks to days, demonstrating substantial operational efficiency. Furthermore, alignment with GDPR, eIDAS 2.0, and AML/CFT standards confirms the regulatory readiness of these systems. The findings suggest that decentralized identity offers a viable, scalable alternative to traditional identity verification, enabling secure, privacy preserving, and user controlled authentication. Despite challenges such as integration complexity and regulatory fragmentation, the strategic advantages in security and compliance position blockchain identity systems as essential tools for the future of FinTech.

Keywords: Blockchain Identity, Verifiable Credentials, Decentralized Identifiers, Fintech Compliance, Digital Onboarding, Selective Disclosure, Fraud Prevention.

INTRODUCTION

The rapid growth of digital financial services provides greater convenience but also raises serious concerns about identity theft and fraud. As financial systems become more integrated, weaknesses in identity management are increasingly exploited. Rising cyberattacks, synthetic identities, and account takeovers now represent critical risks to both consumers and institutions.

Recent global statistics underscore the magnitude of this issue. In 2022, the U.S. Federal Trade Commission (FTC) recorded over five million identity theft cases, including 1.4 million cases linked to new account fraud. Similarly, Javelin Strategy & Research reported that U.S. consumers faced nearly $56 billion in losses from account takeover and identity theft related fraud in 2021 (Ahmed et al., 2022). These figures align with broader international trends, with estimated global losses from digital fraud exceeding $42 billion annually (Vidhya et al., 2024). Such data not only indicate the scale of financial impact but also signal the systemic vulnerabilities inherent in current identity verification frameworks.

Beyond financial implications, institutions incur substantial indirect costs related to regulatory compliance and reputation management. FinTech firms, in particular, allocate as much as 15% of their operating budgets to meet identity related compliance requirements (Ahmed et al., 2022). These expenditures include investments in Know Your Customer (KYC) technologies, ongoing Anti Money Laundering (AML) surveillance, and customer support operations. Moreover, failure to effectively safeguard user identities can erode trust and lead to customer attrition.

Traditional e KYC systems, while widely adopted, have proven insufficient in countering the rise of identity fraud. Studies suggest that over 60% of industry professionals question the efficacy of current KYC processes in detecting synthetic identities (Schardong & Custódio, 2022). Additionally, cybercriminals increasingly exploit social engineering techniques to carry out account takeovers, thereby bypassing conventional authentication protocols (Chen et al., 2021). These dynamics underscore the urgency for a paradigm shift in identity management technologies.

Blockchain based identity systems have emerged as a promising solution to these challenges. Unlike centralized identity infrastructures, blockchain frameworks enable decentralized identity (DID) and verifiable credential (VC) architectures that empower users to retain control over their personal data. Through cryptographic protocols, such as zero knowledge proofs, individuals can authenticate themselves while disclosing minimal information (Wang et al., 2020). This "selective disclosure" mechanism enhances privacy and security, while reducing the likelihood of data misuse. Models like Self Sovereign Identity (SSI) exemplify this shift, offering user centric, resilient identity solutions that resist tampering and unauthorized access (Čučko et al., 2023).

The role of regulatory frameworks is also critical in facilitating the transition to decentralized identity. The European Union's eIDAS regulation (Regulation EU 2024/1183) requires member states to deploy interoperable Digital Identity Wallets by 2026, promoting standardization and cross border trust (Özdenizci et al., 2023). Similarly, the General Data Protection Regulation (GDPR) enforces data minimization and privacy by design principles that align closely with blockchain identity paradigms (Vidhya et al., 2024). Regulatory guidance from entities such as the Financial Action Task Force (FATF) and the National Institute of Standards and Technology (NIST) further shape the assurance models used to evaluate digital identity solutions.

While these technological and regulatory advancements present new opportunities, they also introduce fresh complexities. Concerns around privacy, data governance, and user autonomy persist. Users seek greater control over how their data is accessed and shared particularly in the

wake of high profile data breaches. Decentralized identity systems respond to these concerns by enabling transparent data flows, immutable logs, and user managed credentials (Heister & Yuthas, 2022). At the same time, technical implementations must remain intuitive and accessible, ensuring that heightened security does not translate into user friction.

The psychological effects of identity theft must not be overlooked either. Victims often report feelings of vulnerability, stress, and anxiety (Stuart et al., 2019). Consequently, digital identity systems must not only be secure but must also restore consumer confidence. Multi factor authentication, secure enclaves, and biometric safeguards are increasingly being embedded into blockchain based identity frameworks to meet these expectations (Ahmed et al., 2022).

In conclusion, the convergence of technological innovation and regulatory momentum is reshaping the future of identity verification in FinTech. Blockchain enabled identity systems, characterized by decentralization, selective disclosure, and compliance oriented design, offer a compelling alternative to traditional identity infrastructures. As these systems mature, they promise to deliver lower fraud exposure, enhanced user privacy, and streamlined compliance. Yet, to realize this potential, continued industry collaboration, user education, and policy support are essential. This study explores how such frameworks can be strategically deployed in FinTech to create a more secure and user centric digital financial ecosystem.

METHOD

This chapter outlines the qualitative and comparative methodologies employed to investigate the role of blockchain based identity systems in enhancing digital security and compliance in FinTech. It also elaborates on the selection of data sources and the frameworks used to evaluate fraud mitigation, authentication performance, and regulatory compliance readiness.

This study applies a qualitative and comparative approach. Qualitative analysis includes institutional reports, technical white papers, and user surveys to capture contextual challenges in FinTech identity systems. Comparative analysis is applied through cross-case evaluation of identity frameworks, enabling clearer comparison of outcomes.

Digital ethnography, as exemplified by Vivekananda & Christommy (2024), supports the investigation of user experience in decentralized identity systems, offering insight into how individuals navigate and interact with identity solutions in online financial environments. Additionally, the Theory of Large Technical Systems (LTS) (Choudhary et al., 2023) serves as a guiding framework to contextualize systemic influences on digital identity infrastructures.

This study relies on multiple credible data sources:

- Regulatory Reports**:** U.S. Federal Trade Commission (FTC), FATF Digital ID guidance, and EU eIDAS regulations provide quantitative data on identity fraud, compliance trends, and digital identity initiatives (Beduschi, 2019).

- Academic Literature**:** Peer reviewed articles contribute empirical findings and conceptual insights into authentication mechanisms and digital identity vulnerabilities (Parate et al., 2023).
- Industry Case Studies and Technical Standards: White papers from the FIDO Alliance, OpenID Foundation, and Ghaffari et al. (2021) deliver practical perspectives on blockchain based identity systems.
- **User Feedback and Survey Data**: Qualitative surveys, such as those described by Fehér (2019), enrich the analysis by incorporating end user perceptions of security and usability in identity solutions.

The study employs an integrated framework to assess compliance readiness, user experience, and fraud mitigation effectiveness:

- GDPR Compliance: Evaluated via Data Protection Impact Assessments (DPIAs), focusing on data minimization and consent management.
- NIST Cybersecurity Framework: Assesses identity assurance through standards related to incident response, continuous monitoring, and risk management.
- Self Sovereign Identity (SSI) Principles: Evaluates transparency, user control, and interoperability of decentralized identity systems s(Mir et al., 2020; Soltani et al., 2021).

Each blockchain based identity implementation reviewed in this study is mapped against these frameworks to determine its performance in the areas of privacy, regulatory alignment, user agency, and technical robustness.

In summary, this chapter establishes a rigorous methodological foundation combining qualitative depth with comparative breadth. The research draws on diverse, high quality data sources and applies established compliance and cybersecurity frameworks to ensure comprehensive analysis and policy relevance.

RESULT AND DISCUSSION

This chapter presents the key findings related to the impact of blockchain based identity systems on fraud mitigation, user experience, onboarding efficiency, and compliance alignment in FinTech. The analysis integrates industry metrics and empirical literature to highlight the measurable benefits and performance enhancements derived from decentralized identity adoption.

Fraud Impact

Metrics such as institutional Loss Rate and comprehensive Cost of Fraud indicators are used to quantify the financial impact of identity related fraud. Losses include direct theft and indirect costs like compliance penalties, legal expenses, and reputational damage (Dyck et al., 2023).

Blockchain based identity frameworks mitigate identity reuse and synthetic fraud through decentralization, immutable records, and cryptographic integrity. DID systems limit exposure to

centralized breaches, while timestamping ensures traceable identity verification (Khayati et al., 2024).

Case studies demonstrate the effectiveness of VC and DID integrations: large banks and FinTech startups implementing these frameworks report notable reductions in fraudulent activity and false account creation (Hoekstra et al., 2022; Shin & Park, 2022). Long term trend analyses suggest continued fraud reduction and systemic security improvements (Kim et al., 2020).

Table 1. Institutional Fraud Metrics and Blockchain Based Impact

Indicator	Traditional Systems	With Blockchain Identity
Cost per US$1 of fraud	US$4.41	US$2.10–US$2.50
Synthetic ID occurrence rate	High	Significantly reduced
Reported fraud related account openings	~3.5% annually	<1% post VC/DID

User Experience

Comparative usability studies show that passkey-based logins achieve higher satisfaction and fewer login failures than traditional methods. For example, survey data from 1,200 FinTech users reported a 40% drop in failed logins and a 35% improvement in perceived security (Peacock et al., 2023).

Selective disclosure techniques significantly influence user trust and increase conversion rates, as users prefer platforms that offer granular data control(Bugatti et al., 2024).

Biometric and device based wallets enhance identity workflows by speeding up verification and improving adoption rates (Noman & Jasim, 2021).

Key UX metrics for VC/DID systems include task completion rate, interface responsiveness, and satisfaction scores, all of which correlate with user retention and system effectiveness (Shreedhar et al., 2022).

Table 2. Comparative UX Metrics for Identity Systems

Metric	Traditional Login	Passkey/Biometric Wallet
Login success rate	~55%	~92%
Average authentication time	~18 seconds	<7 seconds
User satisfaction (1–5)	3.1	4.5

Onboarding Efficiency

Traditional corporate onboarding averages 21–30 days due to manual KYC and documentation (Feng et al., 2018). Reusable KYC solutions using VC/DID reduce this to under 10 days, with leading institutions achieving sub week onboarding timelines (Syropyatov et al., 2023).

Reusable credentials minimize redundant back office checks and streamline identity verification, leading to increased operational efficiency and productivity (Arcara et al., 2023).

Table 3. Onboarding Duration Pre and Post Blockchain Identity Adoption

Process Type	Traditional Duration	Post VC/DID Duration
Corporate onboarding (avg.)	21–30 days	5–8 days
Document verification	Manual, 3–5 days	Automated, ~1 day
Staff effort per onboarding	~12 hours	~3 hours

Compliance Alignment

FATF and NIST frameworks define identity assurance and reliability using risk based models, encouraging dynamic verification and anti fraud controls (Kitila et al., 2022).

Under eIDAS 2.0, digital identity wallets must support secure cross border verification while adhering to data sovereignty principles (Arnone & Leogrande, 2024).

Standards such as W3C VC Data Model and eIDAS technical specifications ensure regulatory compliant identity workflows (Stoiber et al., 2021).

Effective revocation mechanisms, essential under AML/CFT regimes, allow institutions to deactivate credentials when risk profiles change, thereby enforcing real time access control and due diligence (Verniero et al., 2021).

Table 4. Regulatory Standards and Technical Compliance Map

Framework/Standard	Coverage Area	Key Requirement or Feature
FATF Digital ID Guidance	AML/CFT Risk Compliance	Assurance criteria for Digital IDs
NIST SP 800 63	Identity Assurance Levels	AAL/IAL/FAL compliance and privacy design
eIDAS 2.0	EU Cross border ID System	Digital ID Wallet + legal recognition
W3C VC Data Model	Credential Interoperability	Secure issuance and selective disclosure
Credential Revocation	AML/CFT Compliance	Real time access revocation and auditability

The adoption of blockchain based identity systems in FinTech brings tangible benefits for fraud mitigation, compliance efficiency, and user experience. However, significant technical and regulatory challenges must be addressed to achieve widespread implementation.

One of the foremost technical barriers to adopting Verifiable Credentials (VC) and Decentralized Identifiers (DID) lies in their interoperability with existing systems. Legacy identity infrastructures in financial institutions are not designed to accommodate decentralized frameworks, leading to integration difficulties and operational inefficiencies (Singla et al., 2022). Additionally, scalability

concerns particularly related to transaction speed and network latency challenge the performance of blockchain based solutions in high volume environments.

Privacy assurance remains a critical challenge. While users demand confidentiality, implementing mechanisms such as zero-knowledge proofs and advanced encryption is technically demanding. Studies indicate that fewer than 25% of FinTech pilots achieve full privacy-preserving deployment at scale (Martins et al., 2016). Moreover, without user-friendly interfaces and clear education programs, consumer adoption will remain limited. Added to this, varying regulatory standards between regions such as differences in GDPR interpretation in the EU versus NIST guidelines in the U.S. complicate uniform deployment and increase compliance risks for FinTech firms (Bouncken & Barwinski, 2020).

These regulatory uncertainties significantly influence organizational strategies. In a landscape characterized by rapid legislative change, FinTech firms may hesitate to invest in VC/DID technologies for fear of obsolescence (Ginsberg et al., 2024). The lack of harmonized legal frameworks further complicates cross border service delivery, and inconsistent enforcement stifles innovation (Samsudin et al., 2023). Regulatory opacity can also erode user trust, as unclear protections discourage consumers from embracing new identity paradigms (Wolfgramm et al., 2022).

Amid these challenges, emerging interoperability frameworks offer a path forward. Protocols like OpenID4VC and SD JWT enable decentralized credential exchange across diverse platforms by adhering to open, secure standards (Chango, 2022). The Self Sovereign Identity (SSI) model, by giving users full control of their data, promotes transparency and simplifies consent management, aligning with global privacy expectations (Soltani et al., 2021). Industry collaborations continue to develop shared standards to facilitate cross border digital identity adoption (Wolfgramm et al., 2022).

In the long term, blockchain identity solutions offer strategic advantages that extend beyond security enhancements. Their decentralized structure removes single points of failure, providing resilient defenses against tampering and unauthorized access (Singla et al., 2022). Blockchain's auditability and immutability increase institutional accountability while enhancing consumer trust. For FinTech firms, operational efficiency is a key advantage automated verification, minimized intermediaries, and reusable credentials reduce compliance costs and accelerate onboarding (Wolfgramm et al., 2022).

Perhaps most importantly, blockchain identity frameworks are highly adaptable. Their modular architecture facilitates the integration of evolving standards and regulatory requirements. As user expectations shift towards secure, privacy centric digital interactions, these systems can be reconfigured without compromising foundational integrity. This adaptability ensures that FinTech organizations remain agile and responsive in a rapidly evolving market (Chango, 2022).

In summary, while the implementation of blockchain identity in FinTech is complex and requires coordinated efforts across legal, technical, and organizational domains, its strategic potential is vast. Addressing standardization, privacy, and usability challenges will be key to unlocking this potential at scale.

CONCLUSION

This study analyzed blockchain-based identity systems, focusing on Verifiable Credentials (VC), Decentralized Identifiers (DID), and selective disclosure, to evaluate their role in security, compliance, and user experience in FinTech. By reviewing regulations, usability studies, fraud data, and case evidence, the research demonstrates that decentralized identity offers strong potential as a secure and efficient solution.

Future studies should examine real-time implementation metrics, long-term impacts, and practical guidelines for safe deployment in diverse financial ecosystems. Collaboration between FinTech leaders, regulators, and technologists will be essential to standardize protocols, build user awareness, and design privacy-centric identity tools that protect both users and financial integrity.

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