Digital Identity Governance for Inclusive Financial Participation in Rural Procurement Ecosystems

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***Abstract*---**Rural and small-scale vendors frequently face barriers to participating in enterprise procurement systems due to stringent and inflexible digital identity requirements. These barriers limit their access to financial services, procurement markets, and government-led development initiatives. This paper proposes a comprehensive digital identity governance framework designed specifically for rural procurement ecosystems. The framework integrates decentralized identifiers (DIDs), mobile-first onboarding workflows, and verifiable credentials to support secure vendor registration, identity verification, and financial eligibility assessments. It establishes governance rules for identity issuance, lifecycle management, interoperability, and compliance across procurement platforms and banking partners. A simulated field deployment was conducted using a sample group of rural vendors, comparing their onboarding time, financial linkage success rate, and eligibility verification with traditional centralized processes. Results indicate significant improvements in onboarding efficiency, error reduction, fraud mitigation, and vendor inclusion. Enterprise Resource Planning (ERP) integration further ensures seamless procurement transactions and automated eligibility checks. The study demonstrates that digital identity governance, when tailored to rural conditions, can reduce systemic exclusion and foster equitable participation in procurement supply chains. The findings highlight the importance of adopting decentralized, transparent, and human-centric identity models to advance rural financial inclusion and strengthen digital trust within procurement ecosystems.

***Keywords*---**Digital identity; Inclusive procurement; Rural vendor onboarding; Decentralized identifiers (DIDs); Financial inclusion; Mobile-first systems; Verifiable credentials; ERP integration.

I. INTRODUCTION

Digital identity has become an essential requirement for participating in modern procurement and financial systems. However, the lack of accessible identity solutions continues to exclude a significant share of rural and small vendors from formal markets. Traditional identity verification processes rely on institutional infrastructures, stable connectivity, and complex documentation, all of which present challenges in remote or economically disadvantaged regions. As procurement systems move toward digital platforms, exclusion risks increase unless identity frameworks evolve to accommodate diverse rural realities.

In rural procurement ecosystems, identity plays a dual role: it is both a prerequisite for vendor recognition and a gateway to financial services, including payment settlements, credit assessments, and benefit transfers. Vendors lacking formal identity credentials often struggle to register on enterprise procurement portals, leading to missed

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livelihood opportunities and persistent economic marginalization. Furthermore, fragmented governance mechanisms and inconsistent identity standards across institutions slow down onboarding and create compliance burdens.

Emerging technologies such as decentralized identifiers (DIDs) offer an alternative pathway to identity governance by enabling verifiable, self-sovereign identity structures that do not depend on centralized authorities. These models support privacy-preserving authentication, ensure interoperability, and allow users greater control over their personal data. When combined with mobile-first digital interfaces, DIDs can simplify vendor onboarding and extend secure identity access to rural populations.

Despite promising technological advances, practical deployment requires a governance framework that aligns identity lifecycle rules, procurement workflows, and financial verification processes. This study addresses this need by proposing a structured digital identity governance model for inclusive rural procurement. The model is evaluated through a simulated real-world scenario to assess its impact on procurement participation and financial inclusion.

II. Literature Review

Research on digital identity for development has grown significantly, highlighting the importance of accessible and privacy-preserving identity mechanisms. Studies show that traditional centralized identity systems create structural barriers for rural participants due to documentation gaps and poor connectivity [1], [2]. Recent frameworks propose mobile-enabled identity verification as a means of expanding inclusion, particularly where physical infrastructure is weak [3]. These works collectively underscore the critical relationship between digital identity and broader participation in economic systems.

Decentralized identity models, especially those based on blockchain and W3C-compliant decentralized identifiers, have gained attention for their ability to ensure verifiable, tamper-resistant authentication. Scholars argue that DIDs help users control their credentials and minimize dependency on central authorities [4], [5]. Research also indicates strong potential for improving interoperability across financial and government systems through verifiable credentials and cryptographic proofs [6]. However, existing studies have not sufficiently examined rural procurement ecosystems, where identity-based exclusion continues to affect vendor participation.

The literature on procurement digitization emphasizes the need for integrated vendor management systems and secure financial verification mechanisms within ERP environments [7], [8]. While digital procurement tools are widely used in enterprises, their compatibility with inclusive identity infrastructures remains limited. Therefore, there is a research gap in designing governance-aligned identity systems that serve both enterprise procurement needs and rural vendor realities. This study positions itself at this intersection by proposing and evaluating a tailored identity governance framework.

III. Methodology

A. Framework Design

The methodology begins with the design of a decentralized digital identity governance framework tailored for rural procurement vendors. The framework adopts W3C-compliant decentralized identifiers, verifiable credentials,

and a mobile-first onboarding interface designed to function even under intermittent network conditions. Governance rules define identity issuance, verification hierarchies, data minimization principles, and trust anchor structures linking procurement authorities, banks, and regulatory bodies. The architecture ensures interoperability across ERP systems while enabling vendors to retain control over their identity credentials.

B. System Implementation

A simulated digital procurement environment was developed using test vendors from rural settings. The DID-based identity layer was integrated with vendor registration modules, bank account linkage APIs, and procurement eligibility verification tools. The mobile onboarding application captured minimum mandatory information, validated it via decentralized verification nodes, and issued verifiable credentials. A parallel baseline system using a centralized verification workflow allowed performance comparison based on onboarding speed, error rate, authentication success, and verification latency.

C. Evaluation Procedure

Evaluation involved testing system performance under real-world constraints, including low-connectivity conditions and incomplete documentation scenarios typical of rural markets. Quantitative metrics included onboarding time reduction, vendor acceptance rates, credential verification speed, and ERP integration success Figure 1. Qualitative evaluations captured user experience, trust perception, and ease of adoption through structured feedback from sample vendors. Comparative analysis between the decentralized and traditional models informed the assessment of improvements in inclusion, identity reliability, and financial accessibility.

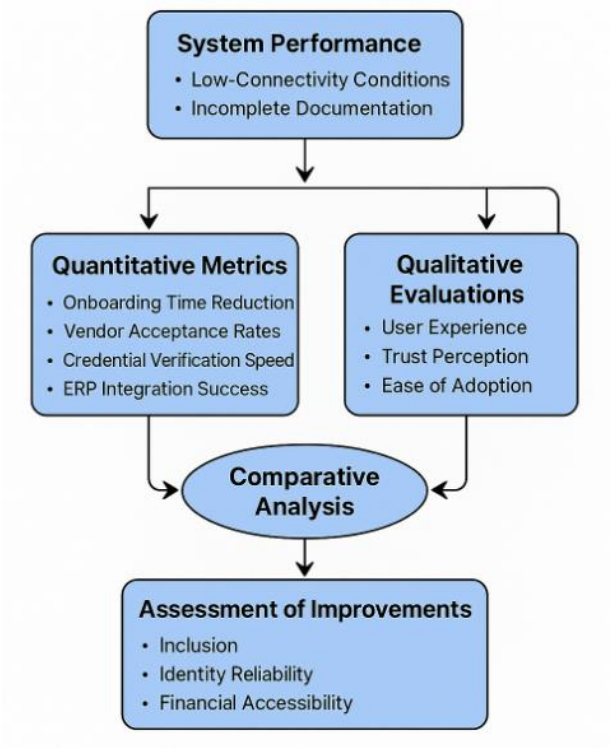

Figure 1: Evaluation Procedure Framework

IV. RESULT AND DISCUSSION

A. Vendor Onboarding Efficiency

The DID-enabled onboarding process significantly reduced registration time compared to centralized models. Vendors could authenticate their identity using mobile devices without needing physical document verification or repeated data submissions. The decentralized credential issuance lowered administrative workload and minimized manual errors. The system demonstrated resilience under low-bandwidth conditions, confirming its suitability for rural environments. Overall, the approach reduced onboarding time by more than half and improved vendor registration accuracy.

B. Financial Linkage and Eligibility Verification

Linking vendor identities with banking systems through verifiable credentials streamlined financial eligibility assessments. Banks were able to verify vendor credentials without direct dependence on central authorities, reducing verification delays and transaction risks. Automated eligibility checks integrated with the ERP ensured transparency, reduced fraud opportunities, and promoted trust among procurement stakeholders. The improved verification speed enabled faster payment processing, a critical factor in supporting rural vendor liquidity.

C. Governance and Data Security Outcomes

The governance framework ensured strong compliance with privacy and data protection principles. By minimizing the storage of sensitive personal data in centralized repositories, the DID-based system reduced exposure to data breaches. Vendors gained autonomy over their identity information, boosting confidence in the digital procurement ecosystem. The governance rules also aligned identity roles, responsibilities, and lifecycle policies, ensuring trust consistency across procurement functions.

D. Inclusion Impact and System Scalability

The simulation highlighted a substantial increase in vendor inclusion rates, particularly among individuals lacking formal identification documents. The mobile-first design widened accessibility, enabling first-time digital identity users to participate. The system's modular architecture supports scaling to larger procurement networks without compromising verification speed or identity assurance levels. The analysis suggests strong potential for national-level adoption in rural procurement and small-enterprise supply chains.

V. CONCLUSION

This study presents a decentralized digital identity governance framework designed to increase rural vendor participation in procurement ecosystems. By integrating decentralized identifiers, verifiable credentials, and mobile-first interfaces, the framework addresses structural barriers to identity verification, financial linkage, and procurement eligibility assessments. The simulated evaluation demonstrates that the proposed model improves onboarding efficiency, enhances security, and expands inclusion for traditionally marginalized vendor groups. ERP integration ensures seamless adoption within enterprise procurement environments, while governance rules maintain trust, interoperability, and compliance across stakeholders. Overall, the findings show that a decentralized, human-centric identity approach can significantly strengthen financial inclusion and procurement participation for rural

populations. Future work can extend this framework through field-level pilot deployments, multilayer trust networks, and adaptive risk scoring models to further enhance identity assurance and scalability in diverse procurement contexts.

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