
TrustNet Africa: A Federated AI Platform for Formalizing the Informal Economy While Preserving Privacy

Author

Moonze
Muyeeke

With
Apart Research

Abstract

Africa's informal economy accounts for over 80% of employment in many countries, yet remains largely excluded from formal financial systems, credit markets, social protections, and tax frameworks. Existing digitization efforts often require centralized data collection, creating significant privacy, security, and sovereignty risks.

TrustNet Africa proposes a federated AI platform that enables governments, banks, mobile money operators, and micro-enterprises to collaboratively build financial inclusion without requiring the movement of sensitive personal or commercial data. The platform combines federated learning, decentralized digital identity, community-governed data trusts, and AI-powered fraud detection to create trusted digital financial footprints for informal businesses.

Rather than forcing immediate registration and taxation, TrustNet Africa incentivizes participation through access to credit, insurance, savings products, and business growth opportunities. AI models are trained locally across institutions, ensuring privacy preservation

while enabling continent-wide insights into fraud patterns, financial behavior, and economic activity.

The project demonstrates how privacy-preserving AI can simultaneously improve financial inclusion, strengthen economic governance, reduce fraud, and support responsible formalization of the informal sector. The key contribution is a framework that aligns AI safety principles with economic development goals in the Global South.

1. Introduction

Across Africa, millions of micro-enterprises operate outside formal financial systems. While mobile money has improved access to financial services, many individuals and businesses remain excluded from credit markets, insurance, formal savings products, and government support programs.

Governments face another challenge: a significant portion of economic activity remains invisible, limiting effective policy design and resulting in tax systems that disproportionately rely on formally employed workers.

Current approaches to formalization often require businesses to register before receiving meaningful benefits. This creates resistance because registration is perceived as increasing compliance burdens without delivering immediate value.

At the same time, AI-driven financial systems increasingly rely on centralized data collection, raising concerns regarding privacy, cybersecurity, surveillance, and data sovereignty.

Our main contributions are:

- 1. A federated AI architecture that enables collaborative learning without sharing raw customer data.*
- 2. A data trust governance model that gives communities collective control over how their data is used.*
- 3. An incentive-based pathway for formalizing micro-enterprises through financial benefits rather than regulatory enforcement.*
- 4. An AI-powered fraud detection framework designed specifically for mobile money and informal sector transactions.*

2. Related Work

Several developments inform this work.

Federated Learning

Federated Learning was introduced by researchers at Google as a privacy-preserving machine learning approach where models are trained locally and only model updates are shared.

While widely applied in healthcare and mobile devices, adoption within African financial ecosystems remains limited.

Data Trusts

Data trusts have emerged as governance mechanisms that allow groups of individuals to collectively manage and benefit from data assets. Organizations such as Open Data Institute have explored data trusts as alternatives to platform-controlled data ownership.

Digital Financial Inclusion

Mobile money platforms have significantly increased access to financial services. However, these systems often operate in fragmented silos, limiting interoperability and reducing opportunities for broader economic insights.

Gap Addressed

Existing solutions typically focus on either financial inclusion or privacy preservation.

TrustNet Africa addresses both simultaneously by integrating:

- *Federated AI*
- *Community data governance*
- *Digital identity*
- *Fraud prevention*
- *Economic formalization*

within a single framework.

3. Methods

System Architecture

TrustNet Africa consists of five components.

Component 1: Digital Business Identity

Each micro-enterprise receives:

- *Verified digital identity*
- *Business profile*
- *Financial activity record*
- *Reputation score*

This creates a trusted digital footprint.

Component 2: Local Data Storage

Transaction data remains within:

- *Banks*
- *Mobile money operators*

- *Microfinance institutions*
- *Government systems*

No centralized citizen database is created.

Component 3: Federated Learning Layer

AI models are distributed to participating institutions.

Each institution:

1. *Trains the model locally.*
2. *Generates model updates.*
3. *Shares only updates.*
4. *Retains ownership of raw data.*

This significantly reduces privacy risks.

Component 4: Data Trust Governance

Communities contribute data through approved frameworks.

The trust:

- *Defines access policies.*
- *Audits AI usage.*
- *Ensures transparency.*
- *Protects participant rights.*

Component 5: AI Fraud Detection Engine

Machine learning models identify:

- *Account takeover attempts*
- *SIM swap fraud*
- *Suspicious transaction patterns*
- *Identity manipulation*
- *Mobile money fraud networks*

Alerts are generated without exposing personal data across institutions.

Formalization Journey

The proposed onboarding process follows four stages:

Stage 1: Digital Participation

Users join voluntarily through mobile registration.

Stage 2: Financial Footprint Creation

Transactions establish economic activity records.

Stage 3: Benefit Access

Participants receive:

- *Micro-loans*
- *Insurance*
- *Savings products*
- *Government support programs*

Stage 4: Gradual Formalization

Businesses transition into formal economic participation through simplified tax structures and business registration incentives.

4. Results

Because this hackathon project focuses on system design rather than deployment, results are presented as expected outcomes derived from the proposed architecture.

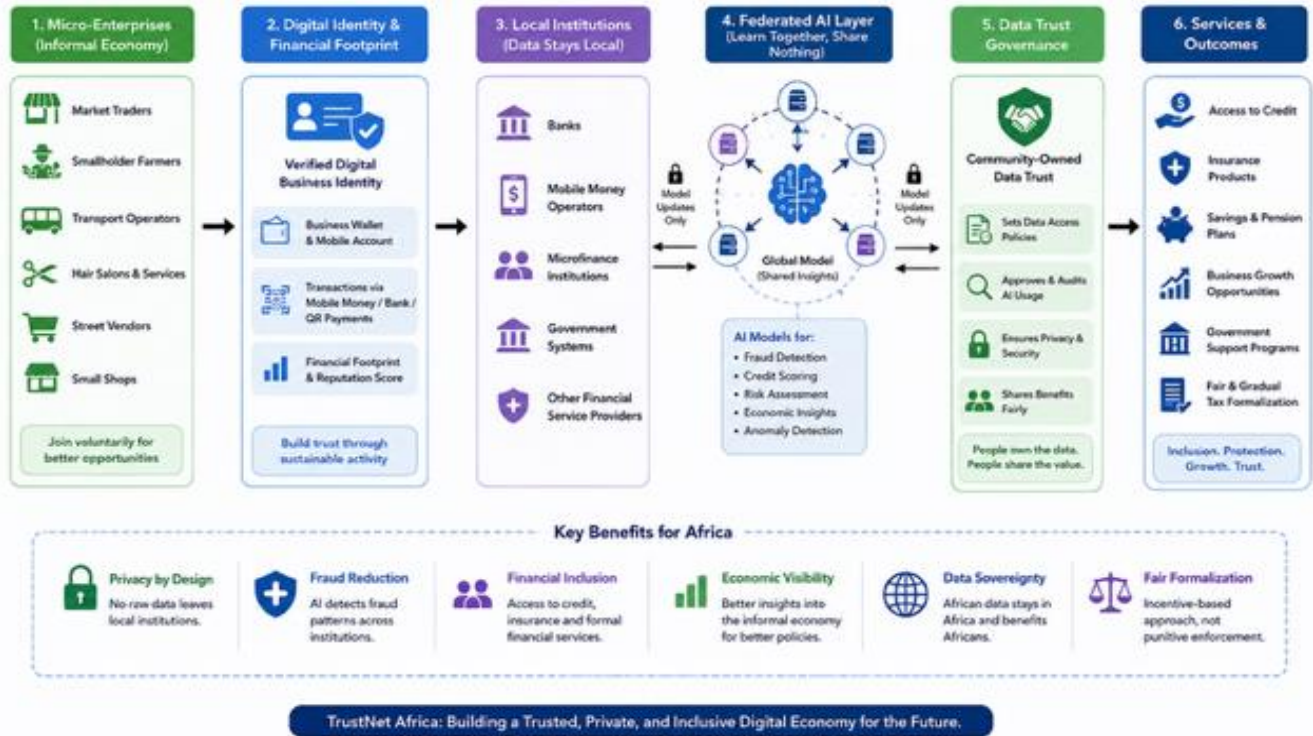
Table 1

<i>Outcome</i>	<i>Expected Impact</i>
<i>Financial Inclusion</i>	<i>Increased access to credit and insurance</i>
<i>Privacy Protection</i>	<i>No centralized storage of citizen financial data</i>
<i>Fraud Reduction</i>	<i>Early detection of fraud patterns across institutions</i>
<i>Economic Visibility</i>	<i>Better understanding of informal sector activity</i>
<i>Data Sovereignty</i>	<i>Local ownership and control of sensitive information</i>
<i>Tax Base Expansion</i>	<i>Gradual formalization through incentives</i>

Figure 1: TrustNet Africa Ecosystem

TrustNet Africa Ecosystem

A Federated AI Platform for Formalizing the Informal Economy While Preserving Privacy



Key Observation

TrustNet Africa transforms data from a compliance burden into an economic asset while maintaining privacy and local control.

5. Discussion and Limitations

Implications for AI Safety

TrustNet Africa demonstrates how AI safety principles can be embedded into economic infrastructure.

The project addresses several AI governance concerns:

- Privacy preservation
- Data sovereignty
- Transparency
- Responsible AI deployment
- Equitable access to AI benefits

Rather than treating safety as a constraint, the platform uses safety mechanisms as enablers of adoption and trust.

Limitations

Several limitations remain.

1. Federated learning requires technical infrastructure that may not yet exist in all regions.

2. *Data trusts remain an emerging governance concept with limited large-scale implementation examples.*
3. *Regulatory alignment across African countries would require significant coordination.*
4. *Real-world effectiveness of fraud models would require extensive validation using operational data.*

Future Work

Future development could include:

- *Prototype development with a bank and mobile money provider.*
- *Pilot implementation in Zambia.*
- *Cross-border federated learning networks.*
- *Integration with digital identity programs.*
- *AI explainability tools for financial decision-making.*
- *Development of an African Federated Financial Intelligence Network.*

6. Conclusion

TrustNet Africa presents a privacy-preserving pathway toward financial inclusion and economic formalization in Africa. By combining federated learning, data trusts, digital identity, and AI-powered fraud detection, the platform enables institutions to collaborate without sacrificing citizen privacy or national data sovereignty.

The project demonstrates that AI safety and economic development are not competing priorities. When properly designed, safety mechanisms such as decentralized governance and privacy-preserving machine learning can become foundational infrastructure for inclusive growth across the Global South.

Code and Data

Code Repository: Prototype planned.

Datasets: To be developed using synthetic financial transaction datasets and privacy-preserving federated learning simulations.

Other Artifacts:

- *Architecture diagrams*
- *Prototype wireframes*
- *Policy framework*

References

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LLM Usage Statement

Large Language Models were used to support ideation, literature exploration, architecture design, and drafting of this report. All concepts, claims, and recommendations were reviewed and refined by the author before submission.