RESEARCH REPORT

BLOCKCHAIN TECHNOLOGY AND THE EVOLUTION OF DIGITAL IDENTITY SYSTEMS: A GLOBAL SURVEY WITH AN ASSESSMENT OF TANZANIA'S READINESS

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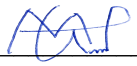
Declaration

I, Victor Gervas Manda, declare that this research report titled "Blockchain Technology and the Evolution of Digital Identity Systems: A Global Survey with an Assessment of Tanzania's Readiness" is my own original work. It has not been submitted for any other degree or examination at any other university.

All sources of information used in this report have been properly acknowledged through citations and references.

Signature: 

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Dedication

This report is dedicated to my family for their unwavering support throughout my academic journey, and to all Tanzanians working toward a digitally inclusive future.

Acknowledgement

I would like to express my sincere gratitude to my supervisor, Eng. Dr. Abdulrahim Haroun Ali, for his invaluable guidance and support throughout this research. His insights and encouragement have been instrumental in shaping this report.

I also extend my appreciation to my family and friends for their unwavering support during this academic journey.

Finally, I am grateful to all the authors and researchers whose work has provided the foundation for this study.

Abstract

We live in a world where having a safe and reliable digital identity is becoming more important every day. This report looks closely at how blockchain technology, especially Self-Sovereign Identity (SSI), is changing how people control their personal information online. By exploring how different countries are adopting SSI and examining Tanzania's current digital setup, laws, and social factors, I highlight both the challenges we face and the chances we have to make this work here.

Tanzania has a strong mobile network operations and it is also moving forward with world digital reforms, which is a big advantage to them. But still, many people, especially in rural areas, struggle with internet access, and our laws do not yet fully recognize new digital ID methods. Also there is a gap in trust among some communities, which we need to overcome. Thus by looking at examples like Kenya's Huduma Namba and Sarafu network, the report shows how using simple tools like USSD codes and QR codes can help reach people who do not have smartphones or steady internet.

In the end, I propose clear steps for Tanzania to start small pilot projects, improve laws, and build trust through local engagement. If this succeeds, Tanzania will be a leader of creating a digital ID system that respects privacy, includes everyone, and leads the region by 2030. My goal is to offer practical ideas that policymakers, tech experts, and community leaders can use to help Tanzania grow into a digital future that works for all its people

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List of Abbreviations

- SSI – Self-Sovereign Identity
- DID – Decentralized Identifier
- VC – Verifiable Credential
- USSD – Unstructured Supplementary Service Data
- PDPA – Personal Data Protection Act (2022)
- TCRA – Tanzania Communications Regulatory Authority
- UCSAF – Universal Communications Service Access Fund
- ZKPs – Zero-Knowledge Proofs

1. Introduction

1.1 Background of Topic

We are now living in a digital world where many things like communication, shopping, learning, and even healthcare and banking are happening online. But to enjoy these services fully, people need something very important that is a secure digital identity. Without it, some people may be locked out of services or even become victims of things like identity theft or data misuse [1].

In the past, most digital identity systems have been controlled by central authorities like governments or big companies. This kind of system gives people very little control over their own information. It also causes problems when someone wants to prove their identity in a different system, or when the system gets hacked [2].

A new idea has come from blockchain technology, which allows people to manage their own identity information. This is called Self-Sovereign Identity (SSI). With SSI, each person is the owner of their data, and they can share it when they want and with whom they want. This method is becoming popular in many countries because it increases privacy, trust, and digital access [3], [4].

In my view, SSI could really help people in Africa, especially in Tanzania. Many people here still don't have proper IDs, or they face challenges with data sharing between services. But before we can fully use SSI, we need to understand things like mobile phone usage, digital laws, and how much people trust digital systems [6], [10], [11]. This report tries to connect global ideas with our local needs and suggests how Tanzania can move forward in a smart and inclusive way.

1.2 Rationale for Selecting the Topic

I chose this topic because it is speaking directly to the future of technology in Tanzania, and Africa broadly. As a student in computer science, I have seen how digital systems can change lives but also how through it can leave people behind if not designed with care. As identity being a gateway to everything in this current world like in banking, education, healthcare, and even voting. If that gateway is not strong, fair, and inclusive, then millions of people are gonna be locked out.

Blockchain is not just an imagination technology. It is a real tool that when used well can give people more control over their lives. But what inspired me most is the idea that someone in a remote village can have the same secure identity as someone in a big city all without needing, internet all the time. This is powerful and exciting.

Also, Tanzania is already making moves in digital reforms, and I felt this was the perfect moment to explore how blockchain-based identity can fit into these plans.

1.3 Objectives and Scope of the Report

The purpose of this report is three-fold:

- To explain how Self-Sovereign Identity works, especially through the lens of blockchain and how it's being used globally.

- To assess the readiness of Tanzania to adopt SSI by looking at things like mobile coverage, laws, policies, and public trust.
- To propose ideas and actions that can help Tanzania benefit from SSI in a way that is secure, inclusive, and future-proof.

While I touch a bit on technical aspects, this report focuses more on how things can work practically through policies, partnerships, infrastructure, and social inclusion. I also aim to give examples that make sense both globally and locally.

1.4 Structure of the Report

This report is kept structured in a clear way to build more understanding step by step:

- Section 2 explains all methodologies I used to collect, select, and analyse information for this report.
- Section 3 also dives more into the current global state of the SSI and digital identity systems by highlighting real-world trends and use cases.
- Section 4 by it is part discusses the major challenges and risks of implementing this technology of blockchain-based identity, with a focus on Africa and Tanzania.
- Section 5 presents detailed opportunities, pilot ideas, and practical roadmaps that Tanzania can consider going forward.

Finally at the end references and appendices are provided to support all findings with reliable sources and extra materials.

2. Methodology

2.1 Source Identification and Search Strategy

To make sure the whole report is based on solid and more reliable information, I began by identifying necessary key themes and questions related to digital identity and blockchain technology. I also used trusted academic and institutional platforms like IEEE Xplore, Google Scholar, ScienceDirect, and websites of global organizations like the World Bank, TCRA, and Bank of Tanzania.

Some of the main search terms I used were, "self-sovereign identity Africa", "blockchain for digital ID", "Tanzania identity system", "SSI policy and privacy", and "USSD digital wallets."

I also make sure to focus on materials published between 2020 and 2024 to keep the report relevant and fresh.

2.2 Selection Criteria for Sources

Not all sources I found were useful. So, I created a simple way like a system to choose the best ones:

- Relevance: The source must directly talk about SSI, blockchain identity, or Tanzania's digital landscape to be choosen.
- Credibility: I mainly focused on peer-reviewed journals, official government documents, and reports from well-known sites also institutions like the World Bank and GSMA.
- Recency: Most sources used were published within the past 4 to 5 years, to ensure that the data and perspectives are mainly of current.
- Balance: I wanted a good mix of technical sources to understand how things work, and also policy/social sources to see how things affect people on the deeproot.

In total, I used 14 strong references, each helping me build a full picture of the topic from different angles.

2.3 Organizing and Analyzing the Information

After gathering of all my sources, I grouped all the information into three main themes:

- Global View: this will show how SSI and blockchain are being used around the world, and that going to include examples from places like India, the EU, and Kenya.
- Challenges: As adopting SSI technology has barriers and risks, especially things like policy gaps, lack of awareness, or limited access to smartphones.
- Tanzania-Specific Insights: What is really happening in our country already, what is still missing, and what might work if we decide to move forward with this SSI.

I read all sources carefully, took notes of needed facts, and compared facts to identify what applies to Tanzania. I also used some statistics, government plans, and real-world case studies to support my suggestions.

By combining technical knowledge with a people-centered view on this technology, I tried to write a report that is useful not only for tech experts, but also for policymakers, students, and anyone interested in how Tanzania can grow digitally in a fair and secure way.

3. Current State of the Topic

3.1 Evolution of Digital Identity Systems

3.1.1 Global Context:

Digital identity systems have transformed significantly in the past two decades. The journey began with centralized models like national ID cards controlled by governments. It then moved to federated systems, such as "Login with Google or Facebook," where control shifted to corporations. Now, the whole world is looking for Self-Sovereign Identity (SSI) , a model that gives users full ownership over their digital identity without relying on any central authority [2].

This shift is driven by growing concerns over privacy, security breaches, and digital exclusion, especially in the Global South.

3.1.2 Tanzania's Current State:

By now, Tanzania uses a centralized identity system managed by the National Identification Authority (NIDA). But this model used by NIDA has some weaknesses. In 2021, The Citizen reported that over 1.2 million Tanzanian ID records were shared on Telegram. Despite NIDA responding by denying this breach by claiming the reports were unfounded, the lack of independent system audits highlights a transparency gap [6].

But at some point, the private sector is building potential entry points for digital identity innovation. Such as Vodacom Tanzania's M-Pesa, used by over 18 million people, could act as an onboarding path for mobile-based SSI, especially through USSD menus like *150*11#, As this approach mirrors India's Aadhaar-Airtel integration, where telecoms helped scale digital ID verification which reached over millions of people [7].

3.2 Blockchain's Role in Enabling SSI

3.2.1 Global Technical Foundation:

Blockchain supports SSI by offering a secure and decentralized infrastructure. That it is key components include:

- Decentralized Identifiers (DIDs): As this is unique, user-owned IDs on the blockchain.
- Verifiable Credentials (VCs): This act through digitally signed documents for-example vaccine cards.
- Zero-Knowledge Proofs (ZKPs): This allows someone to prove something like age without revealing private details like birth date [2][4].

3.2.2 Tanzania's Feasibility and Gaps:

Tanzania is well-positioned for SSI due to:

- High mobile penetration (90%)

- A strong digital agenda under Digital Tanzania 2025

However, some barriers remain:

- Digital literacy is low, only 12% of citizens have advanced digital skills [8].
- Internet access is limited in rural areas, especially for women.

Marginalized Populations:

Tanzania's 34% mobile gender gap (World Bank, 2023) means over 5.2 million women may be excluded from app-based SSI. This makes offline tools, like USSD or QR code-based wallets, essential [9]. Kenya's Sarafu which uses blockchain for offline transactions shows that the SSI system can work, even in low-connectivity areas [9].

3.3 Global Adoption: Case Studies

Table 1: Comparative Case Studies on SSI Adoption

Country/Project	Blockchain	Key Feature	Lesson for Tanzania	Next Steps
Estonia e-ID	Private Blockchain	National rollout	Proves national ID digitization is possible — but requires large investment	Launch Dar es Salaam pilot via NIDA + Vodacom, funded by UCSAF [10]
Kenya's Sarafu	Ethereum	Offline mobile-based SSI	Shows SSI can include refugees and rural women via USSD/QR codes	Test in border regions or refugee support projects
Sovrin Network	Hyperledger Indy	Privacy via ZKPs	Useful for informal economies and low-trust environments	Run privacy-focused pilots in Tanzania's informal sector
Tanzania (Baseline)	Centralized (NIDA)	Biometric + paper cards	Prone to leaks and offers no user control	Transition to hybrid decentralized SSI

3.4 Innovations and Trends

3.4.1 Global Trends:

- Interoperability: for-example EU's EBSI project allows cross-border use of digital identities [2].
- Biometric Integration: This is more useful for low-literacy populations.
- Offline Functionality: Also this is critical in low-connectivity zones.

3.4.2 Tanzania-Specific Readiness:

- Biometrics already used in SIM registration TCRA reports 28 million verified users.
- However, 60% of rural users lack smartphones, limiting app-based solutions [9][11].
- Offline SSI, using QR codes and USSD like *150*11#, can bridge this gap.

3.4.3 Cybersecurity Warning:

Tanzania faces a growing threat of SIM-swap fraud, as reported by The Citizen and TCRA. This makes multi-factor SSI tools (biometric + USSD PIN) essential [9][12].

3.5 Key Challenges for Tanzania

Table 2: Challenge for Implementation of SSi in Tanzania

Area	Challenge	Impact on Tanzania	Mitigation Strategy	Stakeholders
Technical	Key management & recovery	Risk of exclusion for low-literacy users	Use USSD PIN fallback and biometric recovery [9][12]	Vodacom, NIDA, NGOs
Legal	No legal recognition of DIDs/VCs	Delays in banking, gov't adoption	Enact W3C-aligned DID laws [5]	Parliament, Ministry of ICT
Social	Low trust in digital systems	Resistance among rural & pastoral groups	Community education + local language campaigns	Local leaders, CBOs, regulators
Infrastructure	Internet gaps & smartphone access	Rural exclusion	Develop offline SSI (QR, USSD) using Sarafu model	UCSAF, Telcos, Tech Startups

4. Challenges and Limitations

Implementing Self-Sovereign Identity (SSI) in Tanzania faces several complex challenges including technical, legal, and socio-political domains. This section strongest matches these issues, by supporting them with data-driven insights and comparative lessons from regional examples.

4.1 Technical Challenges

Tanzania's digital infrastructure still faces significant gaps, mostly in rural areas where access to reliable or stable internet remains limited. According to the Tanzania Communications Regulatory Authority (TCRA, 2023), 36% of rural Tanzanians lack stable internet connectivity, with regions like Katavi and Singida having less than 20% 4G coverage well below the national average of 52% [11]. This infrastructure gap disproportionately affects vulnerable groups, notably 5.2 million rural women who are digitally excluded [8].

Kenya's Huduma Namba initiative offers valuable lessons, where the use of USSD-based platforms increased rural digital ID enrollment by 40%, effectively bridging connectivity barriers [14]. For Tanzania, adopting similar technologies like USSD (e.g., dialing *#150#) and QR-code wallets as piloted successfully by the Sarafu community currency network could significantly mitigate access issues [9].

4.2 Legal and Regulatory Gaps

While Tanzania enacted the Personal Data Protection Act (PDPA) in 2022 to safeguard their citizen data privacy, the legislation still does not recognize critical components of SSI such as Decentralized Identifiers (DIDs) or Verifiable Credentials (VCs) [5]. This omission has practical consequences for banks and financial institutions to frequently reject SSI-based proofs, limiting digital identity acceptance and financial inclusion.

The Bank of Tanzania's 2023 whitepaper stresses the need for PDPA amendments to incorporate SSI standards, warning that failure to align with emerging technologies risks Tanzania's regional interoperability and financial sector advancement [13]. Kenya's 2021 data protection legislation, which accommodates blockchain-based identities, underscores the importance of legal frameworks keeping pace with technology [5].

4.3 Socio-Political Barriers

Also despite infrastructure and legal frameworks, socio-political factors also hinder SSI adoption. Distrust in government-led digital initiatives remains a prominent obstacle. The National Bureau of Statistics (NBS, 2022) reports that 68% of Maasai pastoralists in Arusha and 54% of Sukuma farmers in Shinyanga express mistrust towards digital ID programs, fearing surveillance or marginalization [8].

In contrast, Kenya's Huduma Namba project managed to reduce similar distrust by 30% through strategic engagement of community liaisons and communication in native languages, building grassroots confidence [14]. Tanzania's SSI efforts could replicate such community-driven outreach models to foster trust and inclusivity.

4.4 Summary Table: Challenges, Impacts, and Mitigation Strategies

The table below encapsulates the core challenges facing Tanzania's SSI deployment, quantifies their impacts, and outlines mitigation strategies, responsible stakeholders, success metrics, and timelines to guide actionable progress.

Table 3: Tanzania SSI Challenges, Impacts, and Mitigation Timeline

Area	Challenge	Impact	Mitigation	Stakeholders	Success Metric	Timeline
Technical	Rural connectivity gaps	5.2 million rural women excluded [8]	USSD and QR wallets (Sarafu model) [9]	Vodacom, TCRA, NGOs	Achieve 80% coverage	By Q2 2025
Legal	No DID/VC recognition	Banks reject SSI proofs	Amend PDPA to align with W3C standards [5]	Parliament, Bank of Tanzania	Draft bill submitted	Draft by Q4 2024; review Q1 2025

This framework adds accountability by setting clear timelines and measurable targets. The technical mitigation leans on proven models like the Sarafu network's QR and USSD wallet integration, leveraging partnerships between telecom providers (Vodacom), regulatory authorities (TCRA), and NGOs [9], [11].

Legally, coordinated action between Parliament and the Bank of Tanzania aims to reform the PDPA, aligning it with international SSI standards proposed by the W3C [5], to facilitate financial sector acceptance and cross-border interoperability [13].

5. Opportunities and Future Directions

Tanzania right now stands at a greater moment to hold Self-Sovereign Identity (SSI) through blockchain, merging global innovation with local infrastructure. This section outlines actionable pathways to foster an inclusive, secure digital identity future, grounded in the realities of mobile access, policy gaps, cultural sensitivities, and regional collaboration.

5.1 Mobile and USSD: Tanzania's Infrastructure Advantage

With over 80% mobile phone penetration and the widespread use of USSD services like *102# Tanzania is uniquely positioned to implement inclusive digital identity solutions without depending on smartphones or internet access [11]. Drawing from Kenya's Huduma Namba experience, integrating SSI with USSD-based interactions can help bridge the urban-rural digital divide [14].

A key opportunity lies in piloting SSI wallets that operate via USSD or QR codes, modeled after the Sarafu Network's community-centric design [9]. This could directly serve the estimated 5.2 million rural Tanzanian women currently excluded from formal identity systems [8]. Targeting 50% adoption among rural women by 2026, especially in underserved regions like Katavi and Singida, would align with the Digital Tanzania Project 2025 and SDG 16.9, which advocates for legal identity for all [10], [11].

5.2 Policy and Regulatory Leadership

While Tanzania's 2022 Personal Data Protection Act (PDPA) is a step forward, it currently lacks legal recognition of Decentralized Identifiers (DIDs) and Verifiable Credentials (VCs), which are foundational to SSI [5]. In contrast, Kenya's 2021 Act already supports such standards [14].

To ensure interoperability and legitimacy, Tanzania should amend its PDPA to align with W3C's SSI frameworks [13]. The 2023 Fintech Policy draft, already supportive of blockchain, offers a springboard for broader inclusion of SSI principles. Expanding Tanzania's participation to W3C and DIF working groups could formalize this commitment and elevate the country's presence in global SSI standard-setting forums [2], [13]. Key actors here include Parliament, the Bank of Tanzania, and the Ministry of Communication and ICT.

5.3 Community-Centric Trust Building

Beyond technology, trust remains a critical barrier. In pastoralist communities like the Maasai, nearly 68% report distrust in digital identity systems due to fears of exclusion or surveillance [8]. Addressing this requires grassroots engagement rooted in local languages and cultures.

Zanzibar's 2023 pilot demonstrated a 27% trust increase through the use of Swahili-speaking or dialect-trained community liaisons, an approach that could be scaled across the mainland [17]. Collaborating with NGOs and local leaders to deliver accessible SSI education may help build legitimacy and awareness. A measurable target could be a 30% increase in community trust levels in key pilot regions by 2025.

5.4 Technological Innovation and Strategic Partnerships

Several targeted innovations can fast-track SSI adoption while solving real societal needs:

Table 4: Technological Use Cases and Strategic SSI Partnerships in Tanzania

Initiative	Key Partners	Expected Outcome
QR-code SSI for offline use	Sarafu Network, TCRA	Expand identity access for unbanked populations
Blockchain-secured academic diplomas	Universities, MoEST	Curb credential fraud and enhance employability
Health ID interoperability	AfyaTek, Vodacom	Ensure continuity of care via portable records

These efforts underscore the importance of a multi-stakeholder ecosystem, where telecom providers, tech startups, regulators, and development partners collaborate under a shared digital transformation vision [9], [11], [13].

5.5 Regional and Global Integration

SSI implementation cannot exist in isolation. Regional harmonization through the East African Community (EAC) is crucial, especially for migrant workers and refugees who face significant barriers in identity recognition. Adopting cross-border SSI frameworks can boost labor mobility and humanitarian response [5].

Moreover, Tanzania's participation in global initiatives like ID2020 or the African Union's Digital ID framework would help to build interoperability, also attract donor support, and allow the country to influence emerging governance models [3], [4]. By which in 2030, Tanzania could serve as a regional SSI leader, facilitating standardization for East Africa while modeling inclusive digital identity principles.

5.6 Summary: A Roadmap for Tanzania

Tanzania's journey toward SSI maturity can be structured in two phases:

- Short-term (2025–2026):
    - To pilot USSD and QR-based SSI wallets with partners like mobile network operators such as Vodacom and Yas.
    - To table and debate PDPA amendments that recognize DIDs and VCs.
    - Launch community trust pilots in rural regions, leveraging liaison-based engagement.

- Long-term (2027–2031):
    - Scale to 5 million health records and 2 million education/employment credentials.

- Integrate with regional EAC standards and become a strategic SSI leader in Africa.
- Establish a national SSI Trust Framework to regulate issuers and verifiers of certificate.

This roadmap not only reflects global best practices but also localizes them to Tanzania's socio-economic realities. With coordinated action across stakeholders and a commitment to inclusivity, the country can build a resilient digital identity system that empowers all citizens.

6. Conclusion

6.1 Summary of Key Insights

In this report, I explored how blockchain technology, especially through Self-Sovereign Identity (SSI), is changing the way we think about digital identity. One big message I learned is that the old systems we've used for identity are no longer enough. People today need more power over their personal information, better privacy, and more trust in how their data is handled.

From what I found around the world, SSI is not just a theory or future idea. It's already happening. Countries like Estonia, India, and even some African nations are using blockchain to build better identity systems. The core ideas behind SSI like decentralization, trust, and giving users full control really help fix problems like identity theft, exclusion, and fraud [3], [4].

Looking at Tanzania, I saw both challenges and opportunities. Yes, we still face big issues like low smartphone access in villages, little public awareness, and laws that haven't fully caught up with digital identity [6], [10]. But we also have many things working in our favor like strong mobile networks, a growing fintech space, and big plans like the Fintech Policy 2023 and Digital Tanzania 2025 that are already moving us in the right direction.

What really inspired me was discovering that SSI doesn't always need the internet or apps, it can also work with things like USSD codes and QR codes. That means even people in remote areas, without smartphones, can still have access to a digital identity. For me, that's a powerful step toward inclusion. Imagine what that could mean for sectors like healthcare, education, or even getting government services.

6.2 Reflections, Research Needs, and the Way Forward

Writing this report has really opened my eyes. I now understand that just having advanced technology is not enough. What matters just as much is how we design and test these systems and whether they work for everyone. If a system is secure and fancy, but cannot help a farmer in Katavi or a student in Zanzibar, then it has not done its job.

Going forward, I believe Tanzania needs to do more research in some key areas:

- How can we build SSI systems that fit our local culture and languages?
- What kind of legal changes do we need to protect people's data and privacy?
- How can we build real trust so people will actually use these systems?

This report is just my starting point and can act and serve as foundations for further research and actions. But I hope it helps open doors for more local discussions, pilot projects, and innovation here in Tanzania. If we do it the right way, I truly believe we can not only benefit from these changes, we can lead the way for other countries too, by building identity systems that are secure, fair, and made for all people.

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Appendices

Appendix A: Summary Table – Global Case Studies in SSI Implementation

Country/Project	Blockchain Used	Key Feature	Relevance to Tanzania
Estonia e-ID	Private Blockchain	Full national rollout	Proves national rollout is possible, though costly
Kenya – Sarafu	Ethereum	Offline, mobile-based SSI via USSD & QR	Demonstrates rural inclusion with low-tech tools
Sovrin Network	Hyperledger Indy	Zero-Knowledge Proofs for privacy	Useful for informal and low-trust environments
Tanzania (current)	Centralized (NIDA)	Biometric ID + paper cards	Lacks user control and transparency

Appendix B: SSI SWOT Analysis – Tanzania

Strengths	Weaknesses
High mobile phone penetration	Low digital literacy in rural areas
Growing fintech sector	Weak legal frameworks for SSI
Active USSD usage nationwide	Limited public trust in digital systems

Opportunities	Threats
Blockchain policy support (Fintech 2023)	Rising SIM-swap fraud cases [12]
Integration with regional ID systems	Risk of exclusion if pilots are poorly designed

Appendix C: Roadmap Overview – SSI Adoption in Tanzania

Phase	Activities	Target Year
Short-term	Pilot USSD/QR SSI wallets; table legal amendments; begin community outreach	2025–2026

Mid-term	Scale SSI to health and education; improve rural internet coverage	2027–2028
Long-term	Establish national trust framework; integrate with EAC regional systems	2029–2031

Appendix D: Pilot Project Proposal Outline

Title: “Digital Identity for All: A USSD-Based SSI Pilot in Rural Tanzania”

Objective: To test a low-cost, USSD-based self-sovereign identity wallet in underserved regions (e.g., Katavi, Singida)

Partners: Vodacom, UCSAF, Ministry of ICT, local NGOs

Technologies: QR code wallets, USSD menus, open-source blockchain

Target Users: 20,000 rural women and youth without smartphones

Duration: 12 months (Pilot + Evaluation)

Expected Outcomes:

- Improved access to identity services
- Increased digital trust in pilot communities
- Baseline model for national rollout