



Designing Digital Repositories Framework for Advancing Open Access and FAIR Principles in Tanzania



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Background

- The global shift to Open Science establishes Open Access (OA) and the FAIR principles as essential for accelerating discovery.
- Tanzania's growing higher education sector produces substantial research, but it remains largely untapped and trapped in silos.
- Key barriers include a lack of FAIR/OA awareness, weak policies, inadequate infrastructure, and unsustainable funding.

Background (*Cont...*)

- Consequently, most research is neither FAIR nor openly accessible, leading to duplication and a weak evidence base for decisions.
- This study aims to address this systemic failure by developing a contextual framework for FAIR-aligned repositories in Tanzania.

Study Objectives

The general objective of this study was:

➤ To develop a FAIR repository framework for Tanzania, maximizing national research visibility and impact.

Specific Objectives:

- i. Evaluate current OA and FAIR awareness and implementation.
- ii. Identify key challenges to sustainable, FAIR-compliant repositories.
- iii. Develop a context-specific framework for FAIR-aligned repositories.
- iv. Provide actionable guidance for stakeholders and policymakers.

Literature Review

- The study adopted a number of literature that shows digital repositories are now a vital FAIR-compliant infrastructure for Open Science.
- Successful models in countries like Kenya and South Africa use strong policy and shared infrastructure (Gichiri et al., 2017).

Literature Review (*Cont...*)

- In contrast, Tanzania faces barriers like unclear policies, funding shortages, and a critical skills gap.
- A key strategic failure is misclassifying repositories as IT projects, not core academic infrastructure (Gideon & Samzugui, 2024; Jati et al., 2025).
- This contrast reveals a critical gap for a contextual framework tailored to Tanzania.

Figure 1: Conceptual Framework for Advancing OA and FAIR Principles in Tanzania

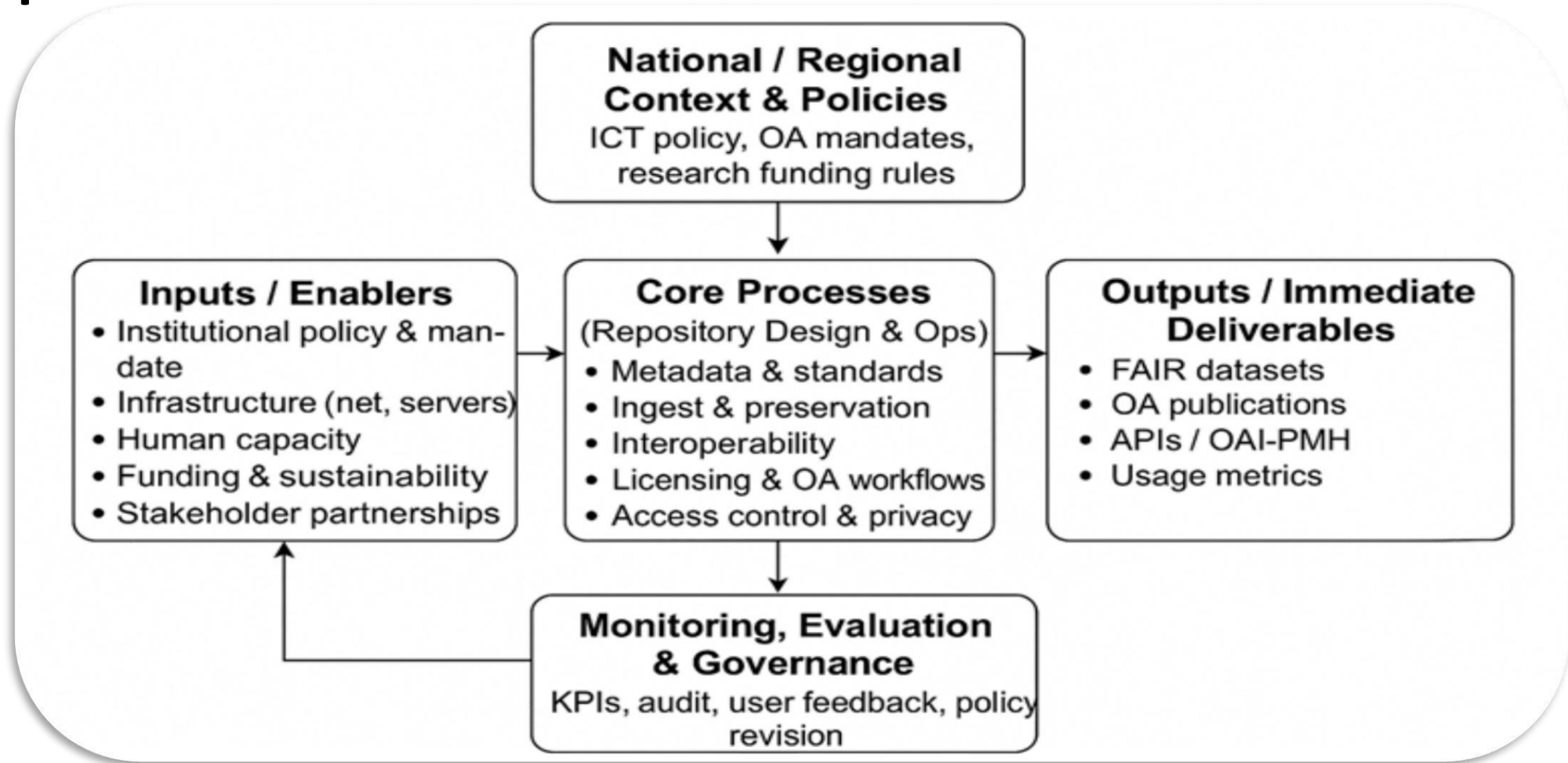


Fig 1: The conceptual framework designed by Sora (2025)

Methodology

- A pragmatic mixed-methods approach was employed.
- The design integrated qualitative document analysis with a quantitative survey.
- Data was gathered via a review of national policies, institutional repository guidelines, and relevant literature.
- International frameworks, including the UNESCO OER Recommendation, were also analyzed.
- This process provided the foundational data for the development of the proposed framework.

Data Collection

- Also, surveys were used through an online, structured questionnaire that was distributed to a purposive sample of 120 participants from five Tanzanian universities and research institutes with active or developing digital repositories.
- The sample included librarians (40%), ICT staff (30%), researchers/academics (20%), and institutional leaders (10%).

Data Analysis

- Hence, quantitative survey data were examined through descriptive statistics such as frequencies, percentages, and means, using IBM SPSS Statistics Version 28.
- The findings were displayed visually with graphs and charts.
- Qualitative data from open-ended survey responses and document analysis were thematically reviewed to pinpoint the main challenges, opportunities, and needs for an effective repository framework.

Findings

Figure 2: Shows the implementation status of key repository functionalities

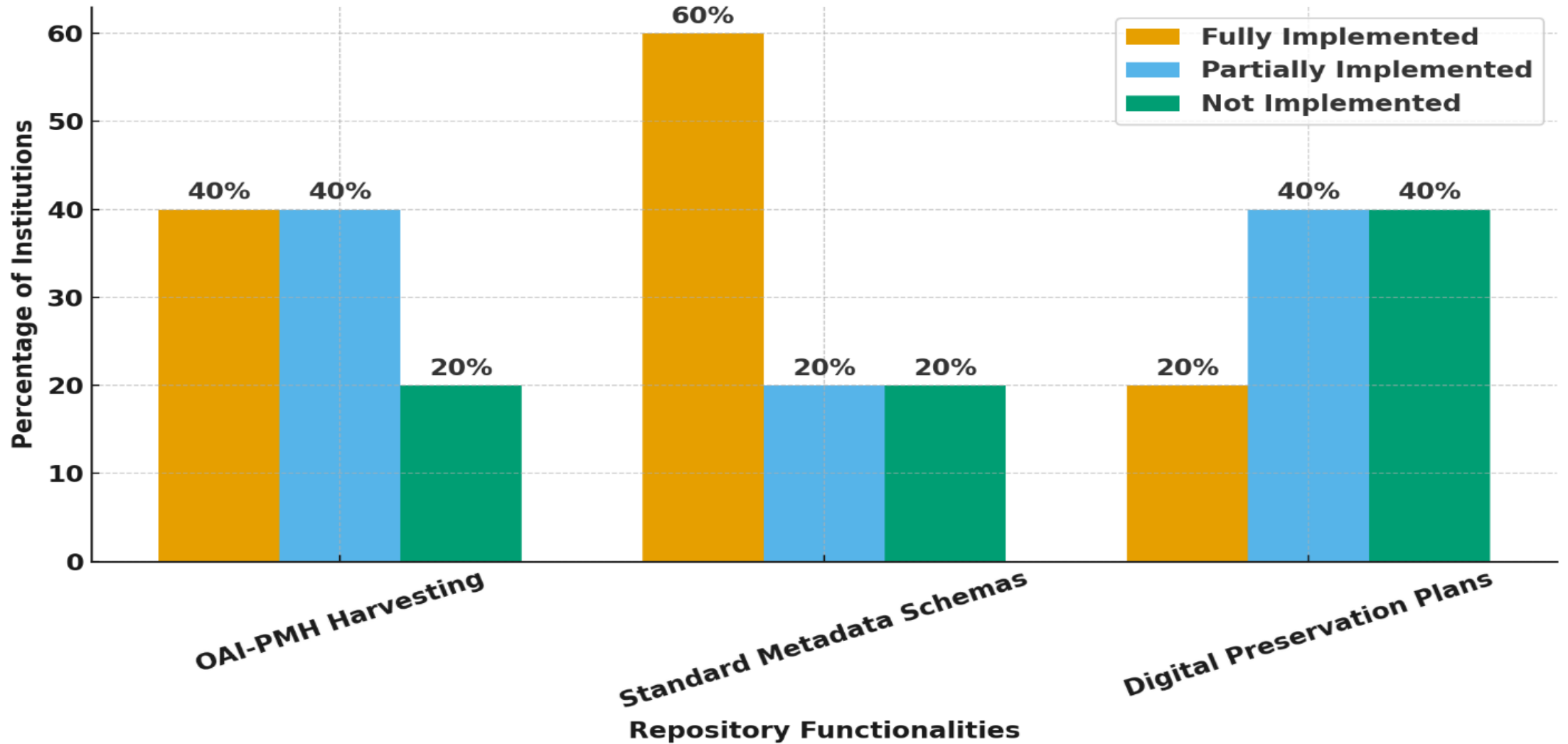


Fig 2: A bar chart generated by Sora (2025)

Awareness and Implementation of FAIR Principles

Figure 3 illustrates the perceived level of FAIR principle implementation.

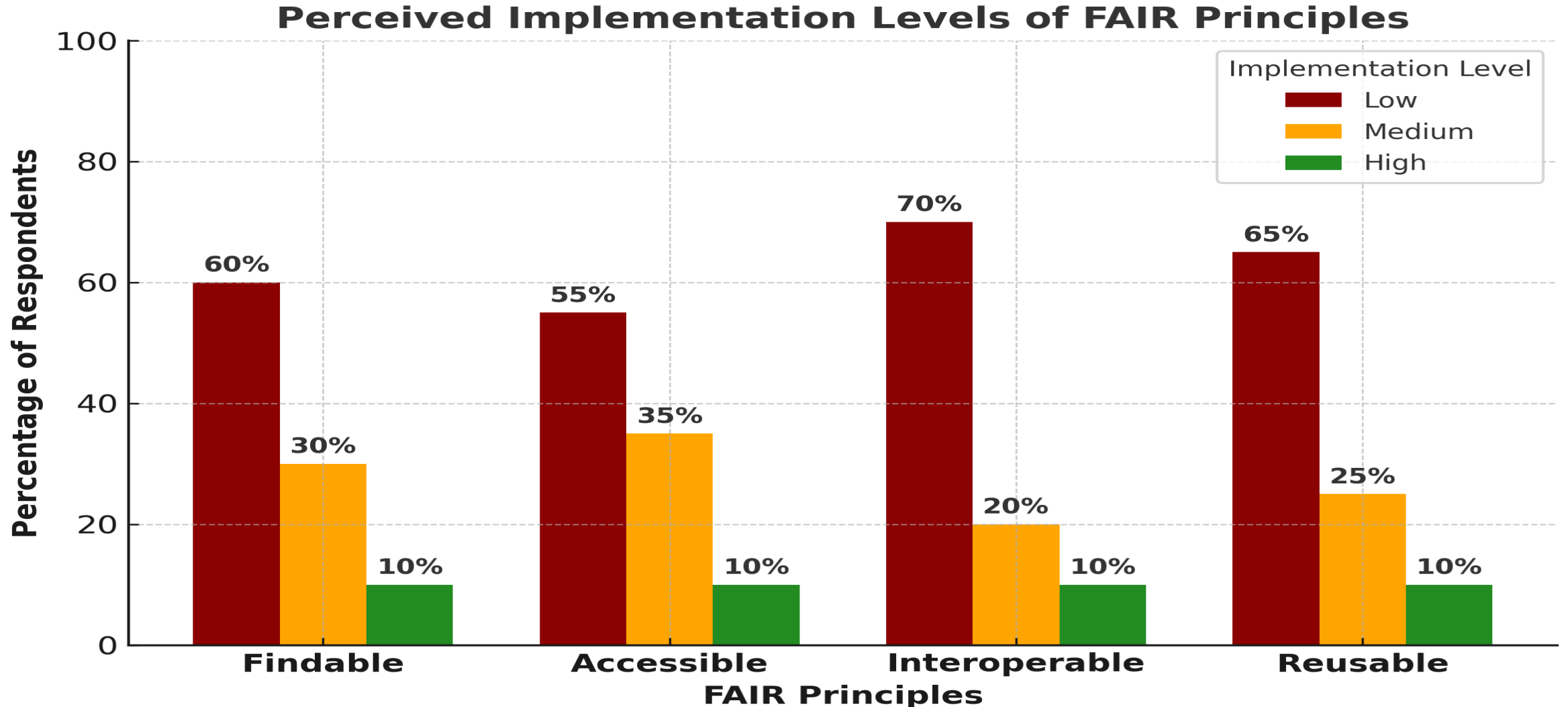


Fig 3: A bar chart generated by Sora (2025)

Key Challenges

Thematic analysis identified the five main challenges:

- i. **Funding & Expertise:*** Insufficient funding (affecting 85% of institutions) is the primary barrier, closely followed by a **lack of skilled personnel** (75%) for tasks like metadata management and digital curation.
- ii. **Policy & Engagement:*** The majority of institutions (70%) **lack a mandatory deposit policy**, creating a governance gap. This is compounded by **low researcher engagement** (65%), driven by a lack of incentives and awareness.
- iii. **Technical Infrastructure:*** **Technical challenges** (60%), including unreliable infrastructure and system incompatibility, present a significant operational hurdle.

The Six-pillar Framework for FAIR Digital

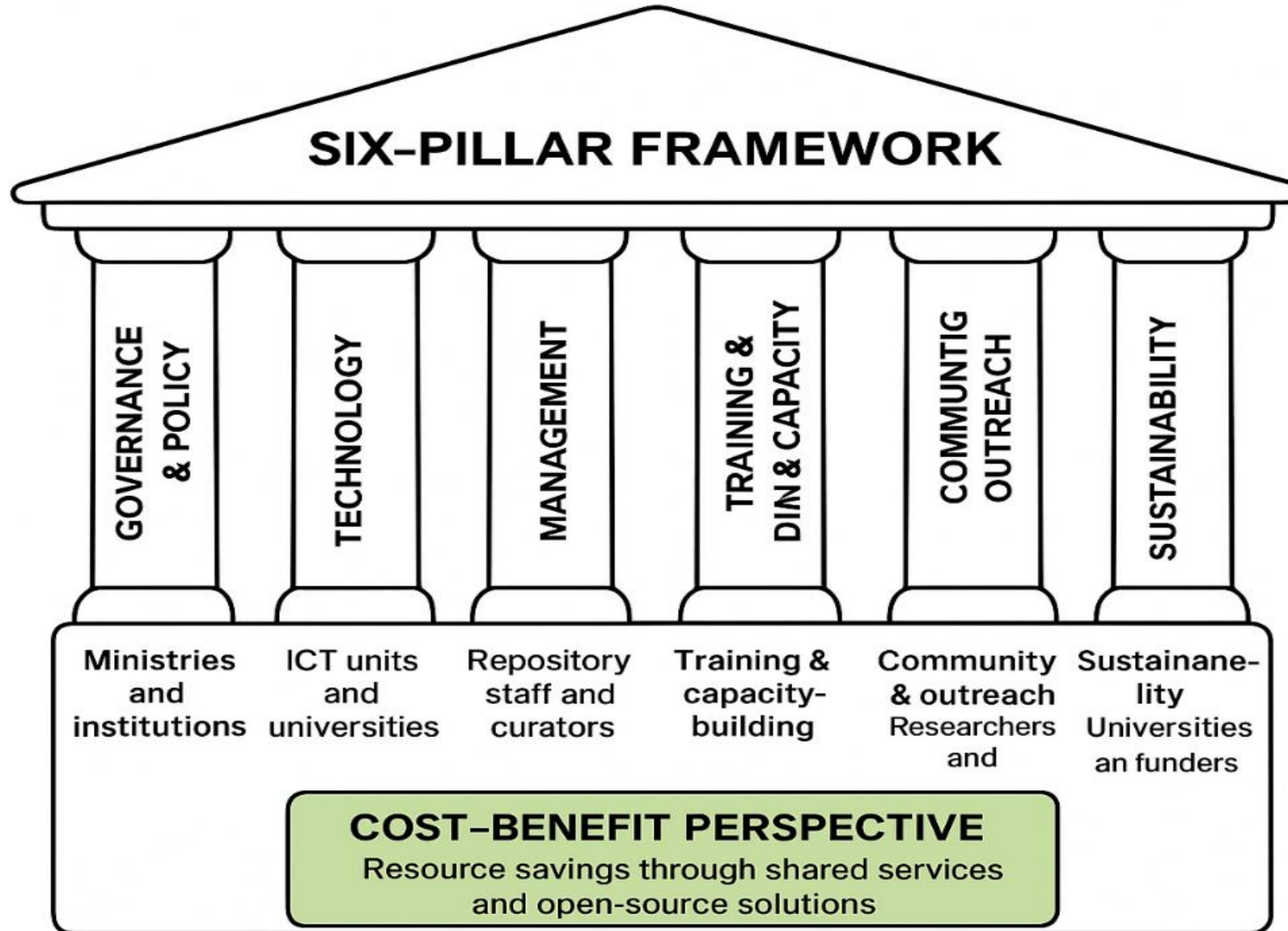


Fig 4: A six-pillar framework generated by Sora (2025)

A Six-pillar Framework (*Cont...*)

- ❑ An analysis of the results in comparison with models from South Africa and Kenya led to the development of a six-pillar framework:
 - i. **Governance & Policy:** Develop national OA policies, define institutional roles, and secure leadership buy-in.
 - ii. **Metadata & Standards:** Implement universal standards: Dublin Core, DataCite DOIs, and OAI-PMH harvesting.
 - iii. **Technical Architecture:** Leverage open-source platforms (e.g., DSpace), cloud hosting, and APIs for integration.
 - iv. **Financial Sustainability:** Secure diverse funding through government grants, institutional funds, and public-private partnerships.
 - v. **Capacity Building:** Deliver ongoing training for all stakeholders on OA, FAIR principles, and digital curation.
 - vi. **Monitoring & Evaluation:** Track impact with KPIs on content growth, usage statistics, and global visibility.

- ❑ **This integrated solution addresses technical, human, and strategic challenges.**

Discussion

❑ **Current Reality: A System at a Crossroads**

Systemic challenges stall Tanzania's progress in establishing digital repositories:

- ✓ **Limited FAIR Principles Comprehension:** Even accessible assets are poorly organized, restricting their discovery and reuse.
- ✓ **Strategic Misalignment:** Repositories are viewed as technical IT projects, not strategic research infrastructure, leading to a lack of sustained leadership and policy support.
- ✓ **Broader African Challenges:** These issues reflect continent-wide problems, including short-term funding and critical digital skills deficits.

❑ **The Solution: An Integrated Framework**

Our framework's novelty lies in its **holistic approach**, which directly addresses this critical gap:

- ✓ It moves beyond isolated technical fixes to **simultaneously integrate** FAIR data stewardship, robust policy development, and long-term sustainability planning.
- ✓ This makes it a critical tool for transitioning from **fragmented projects** to an **enduring, fit-for-purpose national research infrastructure**.

The Six-pillar Framework: From Concept To National Impact

❑ A Holistic Solution for Tanzania

- Adopt a holistic framework that integrates five core pillars, underpinned by a resource-efficient, cost-benefit perspective.

❑ The Core Pillars:

- i. Establish strong Governance & Policy to align repositories with national strategy and secure support.
- ii. Implement an Open-Source Technical Architecture for a cost-effective and adaptable foundation.
- iii. Prioritize Training & Capacity Building to address the critical digital skills deficit.
- iv. Develop robust Management & Sustainability plans to ensure long-term operational and financial viability.
- v. Launch Community Outreach to foster engagement and build a vibrant scholarly ecosystem.
- vi. Shift to a united national strategy, creating a collaborative network to replace isolated institutional efforts.

The expected Outcomes

- Build resilient, inclusive digital knowledge infrastructure
- Foster a dynamic open science culture and accelerate innovation
- Advance national development objectives and UN Sustainable Development Goals
- Position Tanzanian research for global impact through a sustainable repository ecosystem

Conclusion

- Tanzania's current ad-hoc approach to research data is a major brake on innovation and national development.
- A deliberate, nationally coordinated effort to build FAIR-compliant repositories is essential.
- This infrastructure is the bedrock for Open Science, ensuring Tanzanian research is discoverable and reusable for solving critical challenges.

Recommendations

□ National Policymakers

- Mandate Open Access through a comprehensive national policy requiring the deposit of publicly-funded research
- Establish a high-level national steering committee for governance and standards oversight

□ University & Research Leadership

- Embed OA into institutional strategic plans and develop aligned policies
- Commit dedicated annual funding and integrate repository contributions into promotion criteria

Recommendations (*Cont...*)

Libraries & ICT Units

- ✓ Adopt universal standards (Dublin Core, DataCite) and open-source platforms (DSpace, Eprints).
- ✓ Invest in continuous staff training on FAIR principles and digital preservation.

National Collaboration

- ✓ Create a shared service centre with a national toolkit, technical expertise, and coordinated training.
- ✓ Provide a unified advocacy platform to prevent duplication of efforts.

Suggested Future Research Directions

- **Framework Validation:** Pilot implementation in selected universities to refine the model.
- **Interoperability Metrics:** Develop a quantifiable scorecard for repository integration assessment.
- **Economic Impact Analysis:** Quantify ROI through cost savings and collaboration benefits.
- **Researcher Behaviour Studies:** Investigate adoption drivers and barriers for tailored incentives.



Thank You for Listening
Asante sana!