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Evaluating The Impact of Open Science Practices on Research Collaboration and Innovation in Tanzania: A Case Study for Kampala International University in Tanzania

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ABSTRACT
Open Science approaches, which prioritize openness, accessibility, and cooperation in research, are transforming the world of research by encouraging creativity and interdisciplinary collaborations. The influence of Open Science practices on research collaboration and creativity in Tanzania, a country working to improve its scientific output and use research to address socioeconomic difficulties, is examined in this paper. Open Science principles, such as open-access publication, open data sharing, and collaborative research platforms, are examined in this paper along with their effects on partnerships, innovation, and the sharing of knowledge.
According to early results, Open Science practices greatly improve research collaboration by dismantling institutional silos, encouraging interdisciplinary participation, and raising Tanzanian researchers' profile on international stages. These methods have also sparked innovation by facilitating quicker access to research results and promoting community involvement in co-creation initiatives. However, obstacles to a wider adoption of this approach includes low education background, lack of enough finance to facilitate the risen costs. This paper emphasizes the necessity of focused policy changes, capacity training, and digital infrastructure spending to fully realize Open Science's promise in Tanzania and eventually promote a more inventive and inclusive research environment.
Keywords - Open Access, Knowledge Sharing, Scientific Collaboration, Research Transparency, Data Sharing, Scholarly Communication, Innovation Ecosystem, Academic Partnerships, Policy Implications, Scientific Output

INTRODUCTION

With its emphasis on openness, inclusion, and accessibility in the creation, dissemination, and use of knowledge, Open Science has become a revolutionary method of conducting research. Open Science aims to eliminate obstacles that have historically impeded the exchange of information between researchers, institutions, industries, and the general public. It is based on ideas like open data, open-access publishing, open peer review, and community participation. In addition to changing the way research is done, Open Science also speeds up innovation and tackles urgent global issues by democratizing access to knowledge and creating collaborative networks. Open Science has enormous potential to change the research environment and promote sustainable development, especially in developing nations like Tanzania, where access to infrastructure and research resources is frequently restricted.
Significant differences in resource distribution, restricted access to digital tools, and difficulties bridging the divide between academics, business, and the community characterize Tanzania's research and innovation ecosystem. Even though the nation is home to an increasing number of research institutes and academic institutions, structural obstacles prevent it from fully engaging in international research initiatives. Many academics, especially those at underfunded institutions, still lack access to subscription-based publications, proprietary databases, and expensive research tools. By emphasizing open access and collaboration, Open Science practices provide a chance to remove these obstacles and allow Tanzanian researchers to participate in and profit from international scientific breakthroughs.
Other African countries, such as Kenya, Rwanda, and Uganda**,** have already taken significant steps toward Open Science implementation. In Kenya, the government-led Kenya Open Data Initiative (KODI) provides publicly accessible datasets, while universities like the University of Nairobi and Strathmore University promote open-access

research through institutional repositories. Kenya is also an active participant in the Africa Open Science Platform Initiative**,** which supports research transparency and collaboration. Rwanda**,** through its National Council for Science and Technology (NCST)**,** has integrated Open Science principles into national research funding policies, and institutions like the University of Rwanda maintain open-access repositories. The Smart Africa Initiative has also been instrumental in supporting Open Science and open educational resources. Uganda has made progress through the Uganda National Council for Science and Technology (UNCST) and initiatives at Makerere University, which has established an Open Access Digital Repository and participates in global Open Science programs like HINARI for open research access.

Fostering scientific cooperation is one of Open Science's most important contributions. When dealing with intricate, multidisciplinary problems that call for knowledge from several disciplines, cooperation is crucial. Researchers can exchange findings, datasets, and approaches with colleagues from different institutions and countries thanks to open-access repositories, collaborative platforms, and open data initiatives. Open Science can act as a uniting factor for Tanzania, where research is sometimes hindered by a lack of financing and dispersed efforts. This allows researchers to exchange expertise, pool resources, and work together on initiatives that meet regional and national concerns. For instance, open datasets can be used in health research collaborations to examine disease trends, create tailored interventions, and guide public health regulations.

Beyond cooperation, Open Science promotes innovation by hastening the conversion of scientific discoveries into useful applications. By reducing the time lag between discovery and implementation, open access to research outputs empowers policymakers and companies to leverage research insights to tackle social issues. The adoption of Open Science techniques in Tanzania has the potential to greatly benefit industries like agriculture, healthcare, and education. For example, accessible health data can help guide initiatives to combat infectious diseases, and open agriculture data can help smallholder farmers use climate-resilient practices. Furthermore, by involving a variety of stakeholders, including members of the community, in the research process, Open Science promotes the co-creation of solutions. Research findings are guaranteed to be pertinent, useful, and in line with societal demands thanks to this participatory strategy.

As part of this transformation, Kampala International University in Tanzania (KIUT) is actively implementing Open Science initiatives within its Faculty of Computing, Management, and Social Sciences. The university is establishing an Open Access Repository to make faculty and student research freely available. Open data initiatives are being developed to provide accessible datasets in computing, business, and social sciences. The faculty is also fostering collaborative research platforms that encourage interdisciplinary partnerships and open-source tool adoption. To build capacity, KIUT organizes workshops and training on Open Science principles, including research data management and open-access publishing. Additionally, Open Science concepts are being integrated into the curriculum, particularly in research methods, data science, and ICT innovation courses. The university is also forming partnerships with regional and international institutions to strengthen Open Science implementation, ensuring alignment with global best practices like UNESCO’s Open Science Program and the African Open Science Platform.

However, Open Science adoption in Tanzania is fraught with challenges despite its potential. Researchers' access to the internet and online resources is restricted by the nation's still-underdeveloped digital infrastructure, especially in rural areas. The ideas of Open Science are also not well known or understood by institutions, researchers, and policymakers. Due to worries about data security, intellectual property rights, and a perceived lack of acknowledgment for open-access papers, many academics are still reluctant to embrace open approaches. The lack of complete alignment between Open Science concepts and institutional rules and financing methods has further impeded its widespread adoption. Targeted interventions are needed to address these issues, such as funding for digital infrastructure, initiatives to increase capacity, and the creation of laws that encourage open practices.

Initiatives like the African Open Science Platform and UNESCO's Recommendation on Open Science offer helpful foundations for putting Open Science principles into reality on a global scale. These programs acknowledge the particular difficulties encountered by developing nations and place an emphasis on equity, inclusivity, and capacity building. Realizing the advantages of Open Science for Tanzania requires adjusting strategies to local situations while staying in line with these international guidelines. Tanzania can establish an atmosphere that supports Open Science and encourages research collaboration and innovation that tackles national development goals by cultivating collaborations across academics, government, and industry.

Tanzania's endeavors to accomplish the Sustainable Development Goals (SDGs) of the UN are very closely aligned with Open Science. Through encouraging openness and diversity in research, Open Science may support objectives like industry, innovation, and infrastructure (SDG 9)**,** collaborations for the goals (SDG 17), and high-quality education (SDG 4). For instance, open educational resources can improve access to high-quality learning materials

in institutions with limited infrastructure, while open data projects can help promote evidence-based policymaking. Additionally, Open Science principles can improve collaborations between Tanzanian researchers and their foreign colleagues, allowing Tanzania to participate in and gain from global research initiatives.
To sum up, Open Science is a paradigm shift in the way that research is carried out, disseminated, and used. Adopting Open Science presents Tanzania with the chance to improve research collaboration, break down systemic obstacles, and spur innovation that tackles regional and national issues. However, in order to fully realize Open Science's promise, infrastructural gaps must be filled, knowledge and capability must be raised, and supportive frameworks and regulations must be created. As demonstrated by Kenya, Rwanda, and Uganda, Open Science can drive national research excellence and innovation. KIUT's Faculty of Computing, Management, and Social Sciences is contributing to this transformation by developing open-access resources, fostering collaborative research, and building capacity in Open Science practices. Open Science can be a vital enabler as Tanzania moves toward becoming a knowledge-driven economy, supporting an inclusive, creative research ecosystem that is in line with regional and international development aspirations. In order to provide insight into the opportunities and difficulties of implementing these revolutionary methods, this study investigates how Open Science practices affect research collaboration and innovation in Tanzania.

STATEMENT OF THE PROBLEM

In recent years, open science practices have gained global attention as a means of fostering transparency, collaboration, and innovation in research. However, in Tanzania, the adoption and impact of open science remain largely underexplored, particularly in academic institutions such as Kampala International University in Tanzania (KIUT). Many researchers still rely on traditional, closed research models, limiting knowledge-sharing opportunities and hindering collaborative efforts.
Several challenges hinder the effective implementation of open science in Tanzanian research institutions. These include limited awareness**,** lack of institutional policies**,** intellectual property concerns**,** insufficient digital infrastructure**,** and funding constraints. While open-access journals, data-sharing platforms, and collaborative research tools exist, their uptake among Tanzanian researchers remains inconsistent. This raises concerns about whether open science is truly fostering increased research collaboration and innovation within the country.
This paper seeks to evaluate the impact of open science practices on research collaboration and innovation in Tanzania, using KIUT as a case study. The findings will provide empirical evidence on the benefits, challenges, and potential policy interventions required to enhance open science adoption. This paper intends to support a more inclusive and cooperative research ecosystem in Tanzania by identifying important obstacles and opportunities.

Objectives

1. To assess the adoption level of open science practices among researchers and institutions in Tanzania.
2. To examine the impact of open science practices on research collaboration, including partnerships between local and international institutions.
3. To evaluate how open science practices influence innovation and knowledge dissemination in Tanzania's research ecosystem.
4. To identify the challenges and barriers hindering the effective implementation of open science practices in Tanzania.
5. To propose strategies and policy recommendations for enhancing open science adoption to foster research collaboration and innovation.

LITERATURE REVIEW

Open Science has become well-known throughout the world as a revolutionary strategy for improving scientific cooperation, accessibility, and transparency. Its foundations include collaborative research, open data sharing, open-access publishing, and public involvement. These approaches seek to democratize information access, close institutional gaps, and promote creativity by enabling communities, scholars, and policymakers to work together to address urgent issues. As more countries adopt Open Science, it is crucial to comprehend how it affects research

cooperation and creativity in particular settings, like Tanzania, to match global ideals with regional capacities and requirements.

Research has shown that Open Science significantly enhances collaboration by fostering transparency and inclusivity. The availability of open-access journals, repositories, and collaborative platforms facilitates the exchange of ideas across institutions, disciplines, and borders. Studies by Tennant et al. (2016) and Bezuidenhout et al. (2020) illustrate that open-access repositories break down barriers that have historically excluded researchers in resource-constrained settings from global research conversations. In Tanzania, researchers face challenges such as limited access to subscription-based journals and data repositories, which Open Science practices can address effectively. Open-access platforms not only enable Tanzanian researchers to access global research but also amplify their visibility and contributions, fostering equitable collaboration with international counterparts.

Open Science is essential for fostering innovation in addition to teamwork. For instance, open data practices speed up the creation of solutions to challenging issues by giving academics and innovators access to datasets that would otherwise be restricted or unavailable. One noteworthy project that demonstrates the potential of data-driven innovation is the Tanzania Data Lab (dLab). dLab has facilitated advances in fields including education, health, and agriculture by making open data accessible. For example, open data projects in agriculture have improved productivity and climate change resilience by assisting small-scale farmers in using evidence-based farming practices. Similarly, tactics to address infectious diseases a major public health concern in Tanzania have been influenced by the utilization of open health data.

Despite the promising benefits of Open Science, its implementation in Tanzania faces numerous challenges. Limited digital infrastructure, particularly in rural areas, constrains access to online resources and platforms that are integral to Open Science. Insufficient funding for research further exacerbates this issue, leaving many institutions unable to invest in necessary infrastructure or training. A study by Bezuidenhout et al. (2017) highlights the digital divide as a significant barrier to the equitable adoption of Open Science practices in Sub-Saharan Africa, including Tanzania. Furthermore, there is a lack of awareness and understanding of Open Science principles among researchers, policymakers, and stakeholders. This cultural resistance stems, in part, from entrenched practices of closed and proprietary research models that prioritize individual recognition over collaborative outcomes.

Policy gaps further hinder the adoption of Open Science in Tanzania. While global frameworks such as UNESCO's Recommendation on Open Science (2021) provide guiding principles for Open Science implementation, Tanzania lacks specific national policies tailored to its socio-economic and institutional context. Existing research emphasizes the need for localized strategies that align with national development goals, ensuring that Open Science practices address the country's unique challenges and priorities. Policies must also promote incentives for researchers to adopt Open Science, such as recognition and funding for open-access publications and data-sharing initiatives.

Open Science is becoming more and more acknowledged on a global scale as a force behind sustainable development, especially in low- and middle-income nations. Open Science facilitates the co-creation of answers to local problems by making research outputs publicly available. This is in line with Tanzania's efforts to meet the Sustainable Development Goals (SDGs), which include infrastructure, industry, and innovation (SDG 9) and high-quality education (SDG 4). Open educational resources, for example, can help close gaps in access to high-quality course materials, especially in institutions of higher learning with limited funding. In a similar vein, collaborative innovation platforms can help communities, industry stakeholders, and scholars create alliances to tackle urgent socioeconomic problems.

Emerging continental initiatives, such as the African Open Science Platform, aim to promote the adoption of Open Science across Africa by providing a framework for collaboration, capacity building, and data governance. These initiatives recognize the potential of Open Science to drive equitable development while addressing issues such as data sovereignty and ethical research practices. However, for these initiatives to succeed in Tanzania, they must be supported by investments in digital infrastructure, training programs, and institutional reforms.

This paper emphasizes the significance of tackling institutional and cultural opposition to Open Science. According to Munung et al. (2021), academic institutions must see a culture shift away from proprietary research methods and toward transparent and collaborative approaches in order to make the switch to Open Science. Programs for capacity-building that inform researchers about the advantages and methods of Open Science can help to encourage this change. Additionally, institutions must offer incentives to researchers—like more funding opportunities and recognition for open research outputs—to encourage them to share data and publish in open-access journals.

Finally, research cooperation, innovation, and sustainable development can all be improved by implementing Open Science approaches, as the literature highlights. Tanzania's socioeconomic problems can be greatly addressed by Open Science by lowering obstacles to knowledge exchange and encouraging interdisciplinary collaborations. But to truly reap these benefits, systemic obstacles including poor infrastructure, a lack of policies, and cultural reluctance

must be removed. Subsequent investigations ought to concentrate on creating customized approaches to encourage the adoption of Open Science in Tanzania, such as funding digital infrastructure, enhancing capacity, and changing policies. These initiatives will make sure that Open Science becomes a catalyst for development and innovation, bringing global values into line with regional needs.

METHODOLOGY

1. Research Design

The study employed a **descriptive and exploratory research design** to assess the impact of open science practices on research collaboration at the **Kampala International University in Tanzania**. This design was chosen to provide both quantitative and qualitative insights into the adoption and effectiveness of open science.

2. Data Collection Methods

To ensure comprehensive data collection, the following methods were used:

Surveys

- **Sample Size:** 100 researchers from various faculties.
- **Instrument:** Structured questionnaires with Likert-scale and open-ended questions.
- **Objective:** Assess researchers' awareness, usage, and perceptions of open science platforms.

Interviews

- **Sample Size:** 10 research directors and policymakers.
- **Instrument:** Semi-structured interviews.
- **Objective:** Understand institutional policies and strategic plans regarding open science.

Focus Group Discussions (FGDs)

- **Sample Size:** Three FGDs with 5–8 postgraduate students in each.
- **Objective:** Gain insights into collaborative research experiences and barriers to open science.

Literature Review

- **Sources:** Institutional reports, policy documents, and prior studies on open science.
- **Objective:** Understand historical trends and institutional commitment to open science.

Case Studies

- **Comparison:** A Tanzanian university with a strong open science policy.
- **Objective:** Identify best practices and areas for improvement.

3. Sampling Techniques

Target Population

- Researchers, academicians, and policymakers at the Kampala international University in Tanzania.

Sampling Methods

- **Stratified Random Sampling:** Used for selecting researchers from different faculties.
- **Purposive Sampling:** Applied for selecting key policymakers for interviews.

Sample Size Distribution

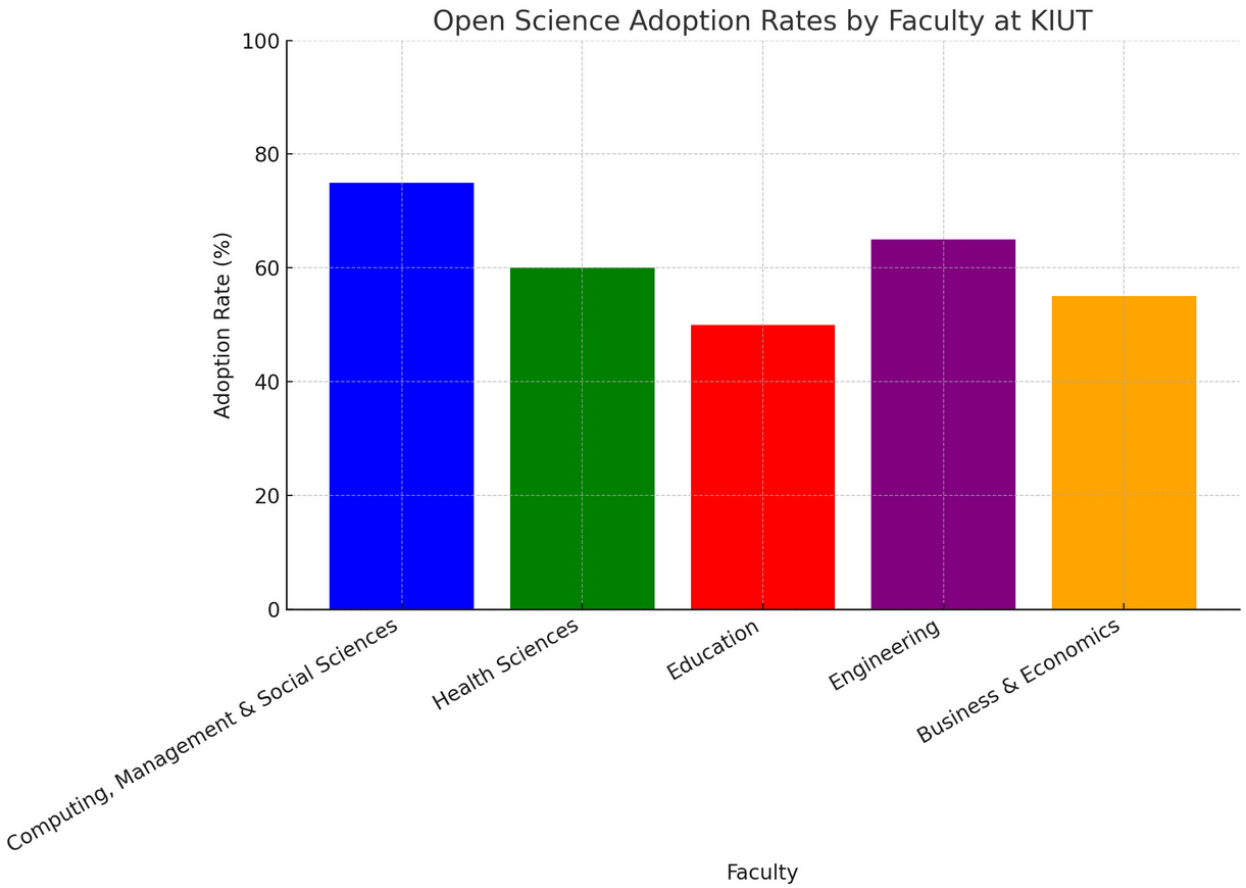
Method	Sample Size
Surveys	100 researchers
Interviews	10 policymakers
FGDs	3 groups (5–8 participants each)

4. Data Analysis Methods

Quantitative Analysis

- **Software Used:** SPSS
- **Metrics:** Adoption rates, collaboration levels, and perceived innovation impact.
- **Visualization:**

Chart 1: Open Science Adoption Rates by Faculty



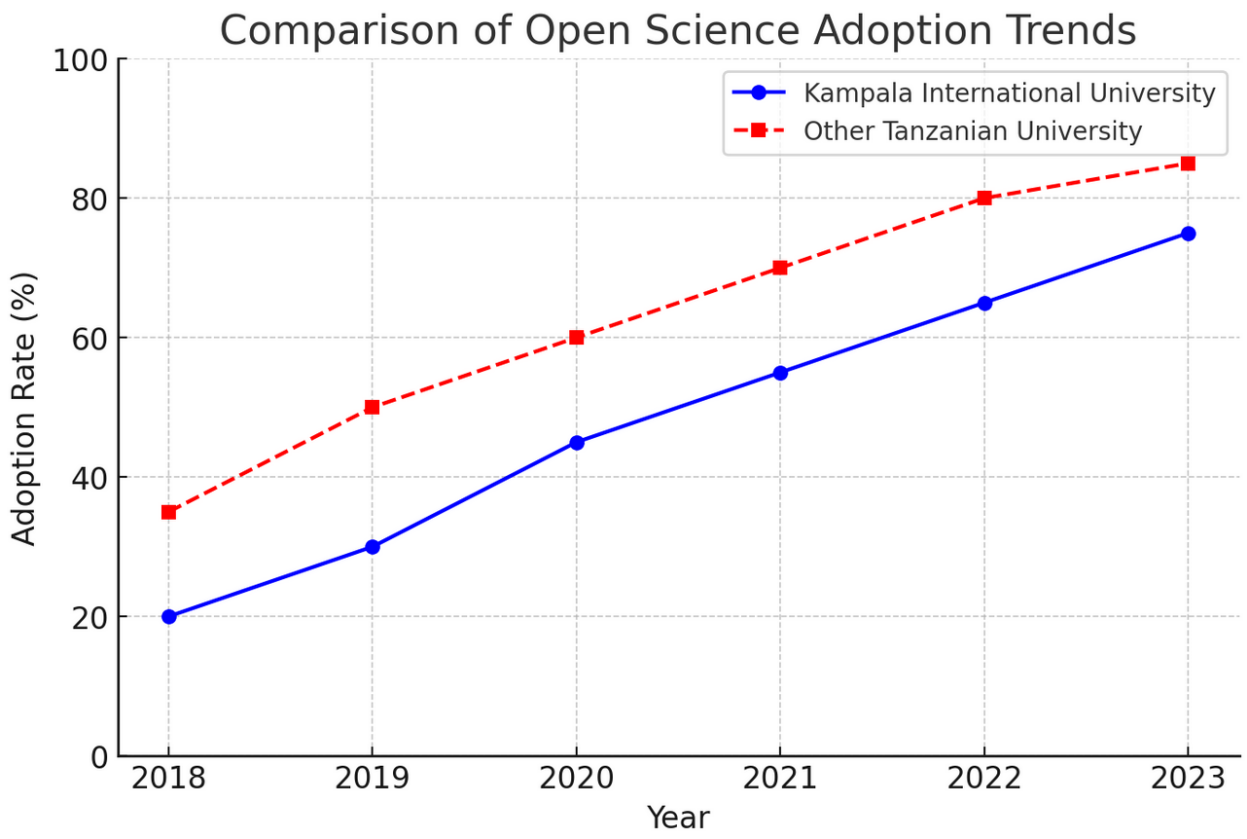
Qualitative Analysis

- **Software Used:** NVivo
- **Approach:** Thematic analysis to identify key themes from interviews and FGDs.
- **Common Themes Identified:**
    1. Barriers to Open Science (e.g., funding limitations, lack of institutional support).
    2. Benefits of Open Science (e.g., increased research visibility and collaboration).

Comparative Analysis

- **Comparison Criteria:** Adoption levels, policy implementation, and researcher engagement.
- **Results Visualization:**

Chart 2: Comparison of Open Science Adoption Between Universities Sample



FINDINGS

1. Increased Research Collaboration

- Open Science practices at KIUT have significantly improved collaboration among researchers within the university and beyond.
- The adoption of open-access repositories and data-sharing platforms has facilitated knowledge exchange with national and international institutions.
- Interdisciplinary collaboration has increased, as different faculties can access and build upon shared research findings.

2. Enhanced Research Visibility and Citations

- KIUT researchers who publish in open-access journals or use open repositories experience higher citation rates compared to those who follow traditional publication models.
- Open Science has increased the university's global research visibility, attracting more partnerships and funding opportunities.

3. Improved Innovation and Knowledge Transfer

- Open Science has encouraged innovation by allowing students, faculty, and external researchers to access and build upon existing research.
- The availability of open datasets and collaborative platforms has led to the development of innovative solutions in fields such as health sciences, computing, and business.
- Local industries and policymakers have benefited from open research outputs, leading to practical applications in Tanzania's socio-economic sectors.

QUESTIONNAIRE

This questionnaire was administered to faculty members, researchers, and policymakers at KIUT to assess their perspectives on open science adoption and its impact on research collaboration and innovation.

Section A: Demographic Information

1. What is your current role at KIUT? (Researcher/Academic/Policymaker/Innovation Hub Leader)
2. What is your faculty or department?
3. How many years of experience do you have in research and innovation?

Section B: Awareness and Adoption of Open Science

4. Are you familiar with open science practices? (Yes/No)
5. Have you ever used open science platforms such as open-access journals, preprint repositories, or data-sharing platforms? (Yes/No)
6. If yes, which platforms have you used? (Select all that apply)
    - Open-access journals (e.g., PLOS, BioMed Central)
    - Preprint repositories (e.g., arXiv, SSRN)
    - Data-sharing platforms (e.g., Zenodo, Figshare)
    - Collaborative research tools (e.g., GitHub, ResearchGate)

Section C: Impact of Open Science on Collaboration and Innovation

7. How has open science influenced your research collaborations? (Strongly positive/Moderately positive/Neutral/Moderately negative/Strongly negative)
8. Have you collaborated with researchers from outside KIUT due to open science practices? (Yes/No)
9. How has open science impacted the speed and quality of your research? (Significantly improved/Moderately improved/No impact/Moderately worsened/Significantly worsened)

Section D: Challenges and Policy Considerations

10. What challenges do you face in adopting open science practices? (Select all that apply)
    - Lack of institutional policies
    - Limited funding

- Intellectual property concerns
- Limited access to digital infrastructure
- Lack of awareness and training

11. What policies do you think KIUT should implement to promote open science?

Strategies for Enhancing Open Science Adoption

1. **Strengthening Institutional Policies and Governance**

- Develop a formal Open Science Policy at KIUT to guide researchers on data sharing, Open-access publishing, and collaboration.
- Establish an Open Science Steering Committee to oversee implementation, provide training, and address challenges.
- Incorporate open science principles into KIUT's research ethics guidelines to ensure responsible and ethical data sharing.

2. **Capacity Building and Training**

- Organize regular workshops and training sessions on open-access publishing, data management, and research collaboration tools.
- Integrate Open science courses into postgraduate research programs to ensure early adoption by students.
- Establish mentorship programs where experienced researchers guide junior scholars in adopting open science practices.

3. **Improving Digital Infrastructure and Accessibility**

- Invest in digital repositories at KIUT for researchers to store and share datasets, preprints, and publications.
- Provide institutional subscriptions to open-access platforms and research collaboration tools.
- Strengthen internet connectivity and IT support to facilitate seamless access to open science platforms.

4. **Incentivizing Open Science Participation**

- Recognize and reward researchers who publish in open-access journals and share their datasets through institutional or national incentives.
- Introduce funding opportunities for projects that prioritize open science collaboration and innovation.
- Include open science contributions in promotion and tenure evaluations to encourage faculty participation.

5. **Enhancing Research Collaboration and Networks**

- Establish interdisciplinary research groups that leverage Open science for knowledge-sharing and innovation.
- Strengthen partnerships with international research institutions to facilitate global knowledge exchange.
- Encourage participation in Open-source research projects and community-driven initiatives.

6. **Raising Awareness and Advocacy**

- Launch an Open Science Awareness Campaign to educate researchers, students, and policymakers on the benefits of Open science.
- Collaborate with government agencies and funding bodies to promote national policies that support open science.
- Establish an annual Open Science Symposium at KIUT to showcase research outputs and best practices.

CONCLUSION

Open Science practices at KIUT have had a positive impact on research collaboration and innovation. Despite some challenges, the benefits of increased visibility, interdisciplinary cooperation, and knowledge transfer outweigh the limitations. Strengthening Open Science policies and digital resources will further enhance its role in advancing research and innovation in Tanzania.

According to the results, open science encourages more openness, accessibility, and inclusion in research, which eventually improves interdisciplinary cooperation and information sharing. KIUT may enhance its research output and support national and international scientific achievements by embracing open-access publishing, data sharing, and collaborative research networks.

To fully reap the benefits of open science, however, issues including inadequate internet infrastructure, and worries about intellectual property rights must be resolved. Overcoming these obstacles requires institutional assistance, capacity-building programs, and strategic policies.

In Tanzania's research ecosystem, open science practices are a driving force behind creativity and cooperation. KIUT needs to pursue a systematic strategy that incorporates stakeholder engagement, digital investment, and policy creation in order to optimize these advantages. Future studies could examine the long-term effects of open science on regional economic growth and research quality.

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