

Global Recommendation on Open Science and ETDs: Current Status and The way Forward for India

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Abstract

The study examines the alignment of the Shodhganga ETD portal with UNESCO's open science Recommendation and proposes strategies for enhancing open science through ETDs in India. The analysis focuses on the current state of Shodhganga and evaluates its adherence to UNESCO's Recommendation. The study involved a review of ETDs in India followed by a detailed case study of the Shodhganga portal conducted to assess its alignment with the UNESCO Recommendation on open science. The results indicate that the Shodhganga portal in India partially aligns with UNESCO's Recommendation on open science. While the portal exhibits certain elements of openness, such as providing free access to research outputs, there are gaps in fully embracing the principles of transparency, collaboration, and inclusivity advocated by UNESCO. The analysis of the Shodhganga portal's policies, procedures, and user interface revealed several areas where improvements can be made to enhance synergy with open science Recommendation. The study proposes a set of strategies to address these challenges and promote open science through ETDs in India. These strategies include bettering the infrastructure and functionality, promoting more collaboration, strengthening the practices of data management, while increasing awareness regarding open science in the academic community. The findings of this study contribute to the ongoing efforts to promote open science in the country and provide valuable insights for policymakers, administrators, and institutions seeking to enhance the accessibility, inclusivity, and transparency of scientific research in India.

Keywords: Electronic Theses and Dissertations (ETD), India, Open Science, Shodhganga, UNESCO Recommendation

1. Global Recommendation on Open Science and ETDs: Current Status and The way Forward for India

Open Science as a movement towards more open, transparent, and collaborative research, is crucial for achieving sustainable development and disseminating knowledge globally (Drach et al., 2022; Rachovitsa, 2018). Open Science has the ability to address complex global issues that require international cooperation through open availability of data and knowledge (Wilbanks & Wilbanks, 2010). The adoption of Open Science for development and knowledge production could be particularly crucial for the Global South including India (Camkin et al., 2022). The higher education system led by Universities can play a crucial role in mainstreaming Open Science and promoting models of knowledge freedom (Drach et al., 2022). Recently,

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best practices around sharing data, code, and samples have emerged with a focus on their findability, accessibility, interoperability, and reusability (FAIR) (Wilkinson et al., 2016). This FAIRness can contribute to attaining the actual goals of the Open Science movement.

A breakthrough for the Open Access movement has been the publication of UNESCO's Recommendation on Open Science (UNESCO, 2021). The Recommendation has resulted from considerable consultation and deliberations with different stakeholders (Hampson et al., 2020; UNESCO, 2020). The UNESCO Recommendation was adopted unanimously by 193 countries including India in November 2021. It has been pointed out that the Recommendation and related actions should adopt a dynamic character to cater to the diverse needs of the scientific community and public sphere of the developing world (Camkin et al., 2022). Existing open access platforms and the higher education system across the globe should also align themselves with the changing landscape of Open Science, while also paying attention to the existing power and knowledge divide between the Global North and Global South (Kieeva & Maksimov, 2021).

Electronic Theses and Dissertations (ETD) hold the potential to promote Open Science, especially when they conform to the new best practices of FAIRness (Ratanya, 2010; Schöpfel et al., 2014; Song, 2007). They can contribute to various elements of Open Science, including data sharing, collaboration, open access, reproducibility etc. (Schöpfel et al., 2014). Better alignment with Open Science principles can also help address the declining scientific impact of theses (Larivière et al., 2008). Visibility and discussion on theses and dissertations are particularly important in the context of evidence that points to methodological issues being prevalent (Govil et al., 2015). The UNESCO Open Science Recommendation provides an opportunity to align ETDs in India with global best practices to improve their utility and value for knowledge production and dissemination.

Shodhganga is a platform provided by the INFLIBNET Centre in India that serves as a repository for Higher Education institutions to make Ph.D. theses open access by depositing and making them available free of cost. Shodhganga provides services for the capture, indexing, storage, dissemination, and preservation of scholarly works submitted by researchers through Higher Education institutions in India (Panda, 2016).

Drawing on the latest developments in Open Science and ETDs, the present study examines the alignment of the Shodhganga ETD portal with UNESCO's Open Science Recommendation and proposes strategies for enhancing open science through ETDs in India. There is also an overall analysis of ETDs in India from the Open Science perspective. The analysis focuses on the current state of Shodhganga and evaluates its adherence to UNESCO Recommendation on Open Science. It also addresses the challenges and opportunities associated with promoting open science in India, suggesting methods to improve the accessibility, inclusivity, and transparency of scientific research through ETDs and other open science initiatives. The study aims to contribute to the ongoing endeavours aimed at promoting open science in India.

2. Objectives

- ❖ To discuss the significance of ETD repositories in the present world, especially in Low and Middle Income Countries (LMIC) including India.

- ❖ To analyze the current state of ETD repositories in India, especially Shodhganga, and evaluate the alignment with the UNESCO Open Science Recommendations.
- ❖ To suggest ways to enhance the accessibility, inclusivity, and transparency of scientific research through ETDs in India
- ❖ To contribute to the ongoing efforts to promote open science in India by highlighting the potential of ETDs as a key tool for advancing this goal.

3. Method

The study involved an initial review of published studies on ETDs in India, followed by a detailed case study of the Shodhganga portal. The case study was conducted to assess the alignment of the Shodhganga portal with UNESCO's Open Science Recommendation. As part of the case study, a review of Shodhganga portal's policies, procedures, and user interface was done. Based on the findings of the case study, a set of strategies for enhancing open science through ETDs in India are also proposed.

4. Results and Discussion

4.1 ETDs in India

ETDs have become an integral part of open sharing of research in India and the ETD landscape is growing (Lihitkar & Lihitkar, 2014; Mishra et al., 2007). Studies on the initial implementation of ETDs through Shodhganga showed some issues with wide adoption (K. Gupta & Gupta, 2014) and discoverability capabilities (Chakravarty, 2019). Universities have differed in their contributions to the Shodhganga portal (Nanthini & Varghese, 2018) and the participation is not uniform. As per available evidence, the difference in participation in the ETD initiative exists among states as well (Sheeja & Surendran, 2011). There have been some initiatives to launch ETDs in specialized areas such as agriculture (Das et al., 2015).

Some studies have shown that the usage of ETDs, especially Shodhganga was not optimal by students and academics (Francis et al., 2017; Sinha & Purkayastha, 2018). Alignment to Open Science best practices could be one way to address this issue of underuse leading to information gaps. Lately, some work has been done by extracting advanced bibliometric data from Shodhganga (Kumar et al., 2023). Such bibliometric information is not directly available on Shodhganga. Hence, while India has a growing number of ETD repositories and projects led by Shodhganga, more work is needed to raise awareness of and increase access to these valuable resources.

4.2 Shodhganga and UNESCO Recommendation on Open Science

4.2.1 Areas of Alignment

The core values of Open Science as per the UNESCO Recommendation include Quality and Integrity, Equity and Fairness, Diversity and Inclusiveness, and Collective Benefit (UNESCO, 2021). An analysis of the

design and functioning, and related systems of the Shodhganga portal showed that the portal had considerable alignment with these core values. The portal can capture, index, store, disseminate, and preserve ETDs. A related project of the INFLIBNET Centre, named ShodhShuddhi provides plagiarism detection services. The centralized storage system can be considered a first step towards quality and integrity, while the plagiarism detection system is a definitive measure towards this direction.

Considering the capabilities of the portal, it can be argued that Shodhganga promotes diversity and inclusiveness by providing a platform for researchers from all parts of India to share and make their research available to the public and scholarly community. This also plays a role in ensuring equity and fairness in the processes. Once the knowledge produced through the theses and dissertations is available in the public domain in an accessible and user-friendly manner, it could serve the Open Science core value of collective benefit.

4.2.2 Areas of Concern: Where Alignment Needs Work

It can be seen that owing to differences in formatting and structure practices followed by different institutions, there is no uniformity in the content, especially regarding the order, nomenclature, etc. being uploaded to Shodhganga. This is a hindrance to the core value of quality and integrity. Quality and integrity guidelines framed in line with the UNESCO Recommendation could solve this issue to some extent. Such guidelines could also address the other core value of collective benefit.

The geographical and institutional coverage of theses and dissertations in Shodhganga is not uniform. This hinders the core value of diversity and inclusiveness. Support for languages other than English is also minimal in the portal. With the introduction of advanced translation systems such as the AI4Bharat Artificial Intelligence-assisted platform, translation services may be integrated into Shodhganga for increased diversity and inclusiveness. The issue of accessibility for the disabled is also closely linked to the core value of diversity and inclusiveness. There are no specific accessibility features in the portal which could help disabled users access the contents. This also runs contrary to the values of equity and fairness.

It has been pointed out that the awareness levels of referencing techniques is low among Indian students and researchers. This, and other concerns raised by scholars regarding the present approach to plagiarism and academic integrity (Tripathi & Patel, 2021) need to be addressed for the quality and integrity measures to be more effective.

4.3 The Way Forward: Suggestions

Based on the analysis of the existing landscape of ETDs and Shodhganga, the following suggestions are put forward to further improve the alignment of the Indian ETD ecosystem, particularly Shodhganga with the UNESCO Recommendation on Open Science.

4.3.1 Promotion of Best Practices

Promotion and incentivization of best practices is a way to improve the adoption of open science practices by researchers (Morey et al., 2016). Incentives need not be monetary for this to be achieved. Innovative

practices such as the use of gamification principles can improve the adoption of open science practices by researchers (Mazarakis & Bräuer, 2020). Hence Shodhganga can be transformed into a hub to implement the Open Science Recommendation guiding principles and core values. Pre-registration services, registered reports, and resources on academic integrity can all be integrated into the platform. Besides these, building up an open science community will help the wide adoption of open science practices (Armeni et al., 2021).

4.3.2 Metadata Handling

Metadata is a crucial element in open data and Open Science as a whole (Terra et al., 2021). Metadata elements including keywords have a crucial role to play in making ETDs FAIR (Mckenna-Foster et al., 2022). Hence particular attention needs to be given to the metadata schema and its handling. Shodhganga could incorporate additional metadata standards that are commonly used in the scientific community and major academic databases. At present keywords available on Shodhganga are not much distinguishable from subject/area names. Better handling of metadata can help increase transparency and accountability of published research, which is essential for building public trust in scientific findings. Integration or communication with metadata stored on major academic databases could also improve the discoverability of data within Shodhganga.

4.3.3 Interoperability

Standardization of metadata such as numbers and dates could be a first step towards better interoperability. Increased interoperability can lead to more efficient data sharing and better data discovery capabilities (Potvin & Thompson, 2016). Secondary data-based research such as meta-analyses and bibliometric analysis could become easier with better interoperability. Existing research suggests that interoperability protocols themselves differ in their capabilities and features and some, such as Object Reuse and Exchange (ORE) may have increased utility (Hakimjavadi & Noorman Masrek, 2013). Hence the interoperability capabilities of Shodhganga need to be evaluated and possible modifications for greater compatibility with Open Science core values and guiding principles need to be made.

4.3.4 Collaboration and Data Sharing

Collaboration and data sharing can have several benefits, such as the possibility to act as baseline data for future research, promotion of reuse of data, ensuring integrity, better reliability, transparency, and greater collaborations (Christian & Wetterberg, 2023). Data sharing can also act as a tool for equity in research whereby the lesser advantaged researchers can have access to data for research (Staunton et al., 2021). Shodhganga can make greater contributions towards data sharing and collaboration by establishing a dedicated platform for data sharing or initiating integration with existing data-sharing platforms. A national policy on data sharing can also be developed in consultation with other stakeholders and institutions. Licensing of data and content also needs to be taken up as a policy matter.

4.3.5 Open Engagement with Society

Making research accessible to the public and making the public a partner in the scientific process through citizen science are ways to promote Open Science (Drach et al., 2022). These particular forms of science communication have a significant role in promoting sustainable development. Shodhganga could play a major role in engaging the public with published research by way of providing lay language summaries of research and promotion of such provisions. Many academic publishers have already adopted this model of providing plain language summaries as a way of improving equity and accessibility (Rosenberg et al., 2023). In the Indian context, such provisions can bring the public closer to the scientific process and scientific temper, as envisaged in the Constitution.

5. Conclusion

This study has attempted to outline the evolving landscape of ETDs in India, with a focus on the Shodhganga repository. The core values and guiding principles of UNESCO's Recommendation on Open Science were used as the reference point. The study identified areas of alignment and concern between Shodhganga and the UNESCO Recommendation. Suggestions are put forward to improve the alignment of the Indian ETD ecosystem, particularly Shodhganga, with UNESCO's Open Science Recommendation and the evolving global movement of Open Science. The suggestions put forward include best practices promotion, better handling of metadata, better interoperability, collaboration and data sharing, and open engagement with civil society.

The global Open Science landscape is now more standardized and organized than ever, and the existing infrastructure and policies in India need to be better aligned with the global scenario to reap the best fruits for scientific progress. It is hoped that the suggestions put forward would help build a more standardized, open, equitable, and accessible Open Science ecosystem in India with Shodhganga playing a central role.

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