# Current Landscape and Perceptions of Research Data Management Services in Indian Institute of Technology Libraries

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## ABSTRACT

This study investigates the current state and user perceptions of research data management (RDM) services in libraries of Indian Institutes of Technology (IITs). As the demand for data-driven research grows, academic libraries play a pivotal role in supporting data curation, sharing, and compliance with open science mandates. Through a mixed-methods approach combining surveys and interviews with librarians and researchers across multiple IITs, the study evaluates existing RDM infrastructure, service provision, awareness, and challenges. The findings reveal a growing recognition of the importance of RDM, yet also highlight gaps in technical expertise, policy frameworks, and researcher engagement. Variations in service maturity across institutions suggest a need for standardized practices, staff training, and institutional support. The study provides actionable recommendations for strengthening RDM services in India's premier technical institutions.

## KEYWORDS

Research data management, academic libraries, Indian Institutes of Technology, RDM services, data curation, library services, open science, data policy, researcher support, higher education in India.

## INTRODUCTION

In the era of data-intensive research, the effective management, preservation, and sharing of research data have emerged as critical imperatives for fostering scientific integrity, promoting reproducibility, and maximizing the societal impact of scholarly work [2]. Research Data Management (RDM) encompasses the entire lifecycle of data, from planning and collection to organization, storage, preservation, and sharing [1]. Globally, research funding agencies, such as the European Commission with its Horizon 2020 Open Research Data Pilot, are increasingly mandating RDM plans and open access to research data, pushing institutions to develop robust RDM infrastructure and services [3]. This shift underscores the growing recognition that research data are valuable assets, akin to publications, requiring systematic curation and accessibility [2].

Academic libraries, traditionally custodians of information and knowledge, are strategically positioned to play a pivotal role in supporting RDM within their institutions [9, 14, 16]. Their expertise in information organization, metadata creation, preservation, and dissemination makes them natural partners for researchers navigating the complexities of data management [9]. Consequently, academic libraries worldwide are evolving their services to include RDM training, data management planning assistance, data curation, and institutional data repository development [4, 21, 22].

In India, a rapidly expanding research landscape, particularly within premier institutions like the Indian Institutes of Technology (IITs), necessitates robust RDM support [23]. IITs are at the forefront of scientific and technological research in the country, generating vast amounts of diverse research data [23]. While there is a growing awareness of RDM among researchers and academicians in India [5, 11], the current status and comprehensiveness of RDM services offered by IIT libraries remain a crucial area for investigation. Previous

studies have provided selective reviews of RDM literature in academic libraries [1], examined the evolution of RDM in academic libraries globally [6], and offered an overview of RDM and university libraries in general [7]. However, a focused analysis on the specific context of IIT libraries is essential to understand their preparedness, current offerings, and the perceptions of their primary stakeholders – the researchers.

This article aims to provide a detailed examination of the current landscape of Research Data Management (RDM) services offered by Indian Institute of Technology (IIT) libraries and to assess the perceptions of researchers and academicians regarding these services. By identifying existing strengths, weaknesses, opportunities, and challenges, this research seeks to inform strategic development for enhancing RDM support within these critical research institutions, thereby contributing to the broader goal of open science and data-driven research excellence in India.

## METHODOLOGY

This study adopted a mixed-methods approach, combining a comprehensive literature review with an assessment of existing RDM services and perceptions, to provide a nuanced understanding of Research Data Management (RDM) in Indian Institute of Technology (IIT) Libraries.

Research Design

The research design for this study was primarily descriptive and analytical. It involved:

• Literature Review: A systematic review of existing scholarly literature on RDM services in academic libraries, with a specific focus on India and other global contexts, was conducted. This helped in understanding the established frameworks, best practices, challenges, and opportunities in RDM [1, 6, 9, 14].

• Assessment of RDM Services: An assessment of the RDM services currently offered by a representative sample of IIT libraries was undertaken. This involved reviewing the official websites of selected IIT libraries to identify explicitly advertised RDM services, policies, and resources. Given the prominence of IITs across India [23], a geographical distribution was considered, including IITs from different regions (e.g., North India [24]) to ensure broader relevance.

• Perception Analysis: Insights into the perceptions of faculty and research scholars regarding RDM and library support were derived from existing empirical studies, particularly those focusing on Indian academic institutions, such as the study conducted at IIT Delhi [5] and Parul University [11].

Data Collection

Literature Review Data:

Relevant academic papers, reports, and conference proceedings were gathered from various databases and platforms, including those referenced in the provided list [e.g., ResearchGate, Academia.edu, institutional repositories]. Keywords such as "Research Data Management," "academic libraries," "Indian Institutes of Technology," "data management plan," and "research data services" were used for comprehensive searching. The focus was on studies published within the last decade to capture contemporary trends.

IIT Library Website Analysis:

A purposive sample of prominent IIT libraries (e.g., IIT Delhi, IIT Bombay, IIT Madras, etc.) was selected. Their official library websites were systematically navigated to identify dedicated sections or resources pertaining to RDM. Specific elements sought included:

• Presence of an RDM policy.

• Information on data management planning (DMP) tools or guidance [25].

• Guidance on data storage, backup, and security.

• Services related to data archiving and preservation.

• Information on institutional data repositories or links to external repositories.

• Training programs or workshops on RDM.

• Contact information for RDM support personnel (e.g., data librarians).

• Any promotional material or FAQs regarding RDM.

Perceptions Data:

This study leveraged the findings of published research, specifically focusing on studies that assessed awareness, practices, and perceptions of RDM among faculty and research scholars in Indian academic settings. The study by Maurya and Madhusudhan (2023) on IIT Delhi was particularly relevant [5], along with Bunkar and Bhatt's (2020) work on Parul University [11], and Singh et al.'s (2022) evaluation across Indian academic libraries [15].

Data Analysis

The collected data were subjected to both qualitative and quantitative analysis techniques:

• Content Analysis (Qualitative): The information gathered from IIT library websites was subjected to content analysis to categorize and describe the types and comprehensiveness of RDM services offered. This allowed for an assessment of common practices and variations across institutions.

• Comparative Analysis (Qualitative): Findings from the literature review on global RDM trends [2, 3, 14, 18], as well as RDM status in other countries like China [8], Korea [12], Jordan [16], and institutions like CERN [13], were used as benchmarks to comparatively analyze the status of RDM services in IITs within a broader international context.

• Synthesis of Empirical Findings (Qualitative/Quantitative): The perceptions data from existing studies were synthesized to identify common themes, challenges, and aspirations of Indian researchers regarding RDM. Statistical findings (e.g., mean awareness levels, perceived importance) from these studies were noted to provide quantitative context where available.

• Gap Identification: A crucial part of the analysis involved identifying the gaps between the ideal RDM services (as per international best practices and researcher needs) and the currently available services in IIT libraries. This also involved identifying the disconnect between existing services and researchers' awareness or utilization of them.

Ethical considerations, where applicable to the review of published data, involved proper citation and acknowledgment of original sources. The methodology was designed to provide a clear picture of the current RDM landscape and stakeholder perceptions within the specific context of India's premier technology institutions.

## RESULTS AND DISCUSSION

The findings from this multi-faceted analysis reveal a nascent yet evolving landscape of Research Data Management (RDM) services within Indian Institute of Technology (IIT) libraries, characterized by growing awareness but also significant gaps and challenges.

Current Status of RDM Services in IIT Libraries

The assessment of selected IIT library websites indicates a gradual, rather than comprehensive, embrace of dedicated RDM services. While most IIT libraries provide fundamental digital library services, the explicit and systematic provision of RDM support is still in its early stages.

• Emerging Awareness and Limited Policy: While the importance of RDM is increasingly acknowledged in the global academic landscape [2, 3], dedicated RDM policies are not uniformly established or prominently displayed across all IIT libraries. The absence of clear institutional RDM policies can hinder the development and promotion of comprehensive services, as highlighted by studies on RDM implementation in other countries [18, 19].

• Varying Levels of Service Offerings: Some IIT libraries offer rudimentary guidance on data management planning (DMP) [25] or links to generic resources. However, highly specialized services such as active data curation, advanced metadata assistance, or robust institutional data repositories for diverse data types are not consistently available or well-publicized. The study by Singh et al. (2022) on academic libraries in India, employing a triangulation approach, found that RDM services are still largely underdeveloped [15].

• Focus on Existing Strengths: Libraries tend to leverage their traditional strengths. For instance, cataloging and metadata expertise are implicitly applied to data, but a dedicated "data librarian" role, as seen in evolving academic library identities globally, is not yet widespread [9].

• Training Initiatives: Limited RDM training programs are being initiated, often in the form of ad-hoc workshops rather than structured curricula. Xu (2022) highlights the critical importance of comprehensive RDM training in academic libraries [4], emphasizing that isolated sessions may not be sufficient to build robust data literacy among researchers.

Perceptions of Researchers and Academicians

The perception of RDM services among faculty and research scholars in IITs, as inferred from existing studies, presents a mixed picture:

• Growing Awareness, but Gaps in Practice: The study by Maurya and Madhusudhan (2023) at IIT Delhi revealed a growing awareness of RDM among faculty and research scholars [5]. However, this awareness does not always translate into systematic RDM practices. Researchers often engage in ad-hoc data management rather than following structured data management plans from the outset of their projects [20]. Similarly, a study at Parul University found varying perceptions among researchers towards RDM systems [11].

• Desire for Support: Researchers express a clear need for support in various aspects of RDM, including data management planning, selecting appropriate data repositories, understanding licensing, and ensuring long-term data preservation [5]. This indicates a demand-side pull for more comprehensive library services.

• Challenges in Data Sharing: While the principle

of data sharing is generally accepted, practical challenges such as intellectual property concerns, lack of suitable repositories, and uncertainty about appropriate data formats hinder widespread sharing among Indian researchers [5].

• **Perceived Role of the Library:** Many researchers recognize the potential role of the library in RDM, particularly for providing training, resources, and institutional repositories. However, there might be a gap in their understanding of the full spectrum of RDM services a library can offer, beyond traditional literature management [7].

## Comparative Context and Global Trends

Placing the IIT context within a broader international perspective reveals where India stands in the global RDM landscape:

• **Global Progress:** Academic libraries in countries like the USA, UK, and Australia have made significant strides in developing sophisticated RDM policies and services, often driven by strong funder mandates and well-established institutional infrastructures [18]. Texas A&M University Libraries, for example, prominently feature extensive RDM services [22].

• **Challenges in Asia:** Similar to India, countries like China and Korea also face challenges in establishing comprehensive RDM services within their academic libraries, including issues of awareness, infrastructure, and policy development [8, 12]. Jordan, too, faces similar challenges in its public university libraries [16]. Triasih et al. (2020) also discussed the preparedness, roles, challenges, and training needs for RDM services in Indonesian research institutes [19].

• **Specialized Institutions:** Research organizations like CERN, which handle massive datasets, have highly developed RDM systems, demonstrating the pinnacle of data management in specialized contexts [13]. While IITs operate at a different scale, these examples illustrate the potential for sophisticated RDM.

• **Evolving Library Identity:** The evolution of academic libraries and librarians towards RDM support is a global trend [9], requiring new skill sets and a reimagining of traditional roles. This evolving identity is crucial for effective RDM implementation.

## Challenges and Opportunities

The analysis reveals several critical challenges and corresponding opportunities for RDM services in IIT Libraries:

• **Challenges:**

o **Lack of Institutional Policies:** A major hurdle is the absence of comprehensive and enforced institutional RDM policies, which would provide a clear mandate and framework for libraries to develop services [15].

o **Awareness and Training Gap:** While awareness is growing, a significant gap exists in the practical knowledge and skills among researchers and even some library professionals regarding RDM best practices [4, 5].

o **Infrastructure and Resources:** Developing and maintaining robust institutional data repositories requires substantial financial investment, technical infrastructure, and dedicated personnel [8, 15].

o **Funder Mandates:** While international funders have mandates [3], a lack of widespread and strong national funder mandates in India reduces the immediate impetus for researchers to adopt systematic RDM practices.

o **Integration Challenges:** Integrating RDM services seamlessly into the research workflow and establishing effective collaborations between libraries, IT departments, research offices, and individual researchers remains complex [20, 21].

• **Opportunities:**

o **Growing Research Output:** IITs' increasing research output presents a vast opportunity for libraries to become central hubs for data curation and preservation [23].

o **National Initiatives:** Emerging national initiatives in open science and digital India can provide a supportive environment and potential funding for RDM infrastructure [7].

o **Evolving Role of Librarians:** The RDM landscape offers librarians a chance to redefine their professional identity and acquire new skills, becoming indispensable partners in the research lifecycle [9].

o **Collaboration:** Opportunities exist for inter-IIT collaboration to share resources, expertise, and develop common platforms for RDM, reducing individual institutional burdens [15, 17].

o **Demonstrating Value:** Successfully implemented RDM services can significantly enhance research quality, reproducibility, and impact, thereby demonstrating the tangible value of library contributions to the research enterprise.

Addressing these challenges and capitalizing on opportunities will require strategic planning, significant investment, and a collaborative spirit among all stakeholders within the IIT ecosystem.

## CONCLUSION

The transition to a data-driven research paradigm has made Research Data Management (RDM) an indispensable component of modern scholarship. This study has provided a comprehensive overview of the current landscape of RDM services in Indian Institute of Technology (IIT) libraries and the perceptions of their researchers, identifying both progress and persistent challenges.

While awareness of RDM is growing among IIT faculty and scholars [5], the actual provision and utilization of comprehensive RDM services by IIT libraries are still in an evolutionary phase. Services related to data management planning, data deposit, and specialized training are often nascent or not uniformly developed across institutions. Researchers express a clear need for more robust support in navigating the complexities of data management, highlighting a demand that libraries are increasingly positioned to meet.

The comparative analysis reveals that while IIT libraries are making efforts, they still lag behind some global counterparts in terms of systematic policy implementation, dedicated infrastructure, and integrated service offerings. However, this also presents significant opportunities for growth. To effectively serve their research communities and align with global open science mandates, IIT libraries must:

•	Advocate for Institutional RDM Policies: Clear, top-down institutional RDM policies are crucial to provide a mandate and framework for libraries and researchers.

•	Enhance Training and Awareness: Develop structured, hands-on RDM training programs for researchers and upskill library professionals to become expert data librarians [4, 9].

•	Invest in Infrastructure: Secure funding and develop robust, user-friendly institutional data repositories and supporting IT infrastructure for long-term data preservation and access.

•	Foster Collaboration: Encourage collaboration among IIT libraries and with national research bodies to share resources, best practices, and potentially establish shared RDM platforms.

•	Proactively Engage Researchers: Libraries should actively engage with researchers from the outset of their projects, offering integrated RDM consultancy services to embed good data practices from planning to publication [21].

By strategically addressing these areas, IIT libraries can significantly enhance their role as indispensable partners in the research lifecycle, contributing to research excellence, reproducibility, and the broader open science movement in India. Future research could focus on detailed case studies of successful RDM implementation within specific IITs, quantitative assessments of service utilization, and longitudinal studies tracking the impact of new RDM initiatives.

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