International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Special Edition: Volume: 04 PKDAL – 2025 DOI: 10.55041/ISJEM.PKDAL004
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

Best Practices and Innovative Model for OER-Based Institutional Repositories in Engineering Colleges

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Abstract

Institutional Repositories (IRs) have traditionally served as digital archives for preserving academic output. However, their role in promoting Open Educational Resources (OER) within research-intensive engineering colleges remains underexplored and underutilized. This theoretical study reimagines the IR not as a passive content storehouse, but as an interactive, learner-centric ecosystem that enables knowledge sharing, faculty visibility, and student participation.

Through a comprehensive review of global practices and conceptual synthesis, the paper identifies innovative best practices that align with the needs of modern engineering institutions. The core proposition of this study. is the development of the **R.E.A.C.H. Model**—a human-centered framework comprising Repository as Research Commons, Engagement Layer, Access by Design, Collaboration Pods, and Human-Centered Curation.

The findings underscore the importance of cultural, technological, and policy-level transformation in the design and deployment of OER-centric IRs. The paper offers actionable insights and a scalable model aimed at fostering openness, co-creation, and digital equity in higher education.

Keywords: Open Educational Resources (OER), Institutional Repository (IR), Engineering Colleges, Best Practices, R.E.A.C.H. Model, Library Innovation

1. Introduction

In an era where information is abundant and digital transformation is reshaping education, academic libraries and institutional repositories are stepping up to become key players in promoting accessible and collaborative learning. Engineering colleges, known for their innovation and research, produce a treasure trove of educational resources that often remain underused or stuck in personal storage, limiting broader academic

access. Open Educational Resources (OER) offer a groundbreaking way to democratize knowledge, encourage collaboration, and improve educational equity. However, the link between OER and Institutional Repositories (IRs) is frequently weak or even absent.

The emergence of Open Educational Resources (OER) and the global push for open-access scholarship are revolutionizing how knowledge is generated, shared, and showcased in higher education. This change is making academic work more reachable for learners and educators worldwide. At the heart of this movement lies the Institutional Repository (IR), a digital platform designed to collect, preserve, and share the scholarly output of academic institutions (Bailey, 2005). For engineering colleges that are heavily research-intensive, innovative and generate technical knowledge, IRs present a valuable opportunity to systematically host and make OER available that can promote academic visibility, collaboration, and digital equity.

The open-access movement, as formalized by the Budapest Open Access Initiative, emphasizes the dismantling of pay walls and institutional silos to ensure that knowledge is freely available for societal benefit (Suber, 2012). Institutional repositories support this ethos by providing equitable, permanent access to diverse scholarly outputs including e-theses, research articles, presentations, datasets, and learning objects (Pinfield, 2015). However, in the Indian context—despite national initiatives such as Shodhganga and the National Digital Library of India (NDLI)—the development and utilization of IRs remain uneven, fragmented, and institution-dependent (Rakesh Kumar, 2022).

Among the common obstacles are limited digital infrastructures, lack of awareness by the faculty, several business infrastructures that do not comply with metadata standards, and poor national policy with no unified OA mandate (Mukherjee & Kumar, 2020; Sengupta, 2020). Furthermore, many engineering institutions are mainstays in the road towards OA publishing but focus really on publishing in the higher impact subscription products, due to a lack of institutional emphasis on depositing scholarly work and engaging with repositories (Das, 2019). As a result, even though this knowledge is created from the knowledge system of engineering colleges, it remains inaccessible to students, peers, and others in the wider communities.

To bridge this gap, this study reimagines the IR as a dynamic ecosystem for OER within the framework of engineering education. It seeks to identify best practices that foster openness, engagement, and innovation—while proposing a scalable, human-centered model tailored to the pedagogical and research culture of engineering colleges. In doing so, it aligns with global imperatives around OA while addressing the unique technological and policy challenges in Indian academic institutions.

This paper aims to reimagining how institutional repositories are designed and used, by introducing a well-rounded model that blends theory with practical strategies. The R.E.A.C.H. Model is serving as a design that fosters collaboration in the integration of Open Educational Resources and Institutional Research.

2. Objectives of the Study

- To explore the theoretical foundations of OER and IR.
- To examine existing research and global practices in OER-based institutional repositories.
- To identify innovative best practices for implementing OER in IRs.
- To create a practical and flexible model that's rooted in human-centered design, specifically designed to meet the unique needs of engineering institutions in India.
- To pinpoint the main challenges in implementation and suggest tailored, actionable strategies to tackle them effectively.

3. Literature Review

Open Educational Resources (OER) are absolutely vital for making sure everyone has equal access to education. They offer high-quality academic materials without the hassle of financial, legal, or technical obstacles. Information and Communication Technology (ICT) has been a game-changer in the growth of OER, paving the way for digitization and the sharing of content through institutional repositories (Tella et al., 2024).

A number of authors have contributed to the understanding of OER. Butcher (2015) pointed out that OER are materials that are freely accessible and come with an open license, making them perfect for supporting teaching, learning, and research. Similarly, Atkins, Brown, and Hammond (2007) explained that OER are digitized resources that can be adapted, reused, and utilized under open licenses, which allows for easy access and remixing. UNESCO (2021) echoes this sentiment in their guidelines that advocate for the open sharing of educational resources to ensure equitable access to education worldwide.

According to Tella et al. (2024), OER are widely embraced by Library and Information Science (LIS) academics in Nigerian universities, mainly for teaching, learning, and academic preparation. Resources like open textbooks, lecture notes, quizzes, MOOCs, and courseware were among the most commonly accessed and used. The study also pointed out that mobile phones and laptops are the go-to devices for accessing OER, highlighting a strong dependence on portable, digital technologies for engaging in academic activities.

The positive impact of OER usage was noted in faculty members' ability to customize course materials and increase their instructional relevance. Respondents also reported that knowing others could access and use their materials enhanced their motivation to produce quality content. These findings support earlier work by McKerlich, Ives, and McGreal (2013), who observed that OER facilitate participatory learning environments through user-generated content and open peer review.

However, there are also challenges to be resolved in the implementation of OER, especially in developing contexts. According to Tella et al. (2024) and also observed by Percy and Van Belle (2012) and Anderson et al. (2017) these were: power outages; involuntary dependence on institutional support; institutional repositories being regularly slow to update; faculty not knowing about or understanding copyright; and faculty believing the open course materials were perceived to be "of lesser quality".

Also to consider are the constraints of infrastructure including limited internet bandwidth and poorly designed repositories for consumption and access, as well as usability (Harley et al., 2010; Orwenjo & Erastus, 2018).

The lack of precise institutional policy and training on the rules of licensing is problematic (e.g., Creative Commons). Indeed, these issues affect faculty when trying to incorporate OER in their respective disciplines (Harley et al., 2010; Orwenjo & Erastus, 2018). For fields centered around technology, this gap is not just noticeable—it's often a major hurdle including engineering, which relies on access to data sets, simulations, and specialized content that is poorly represented in OER repositories (Dhanarajan & Abeywardena, 2013).

Despite these challenges, the value proposition of OER remains strong. According to Wright and Raju (2012), OER has the potential to improve equity, reduce costs of education, and improve access for those in developing regions. The role of institutional repositories in facilitating all of these aims is crucial, but not often used effectively. Research shows, repositories are best utilized when they are integrated within the institutional policy framework and supported by professional development, incentives, and community-building initiatives (Tella et al., 2024; Bliss et al., 2013).

The literature on this issue continues to expand and provides necessary impetus to reconsider IRs as something other than repositories or archives, but as rich, interactive ecosystems that are aligned with the research and teaching cultures of engineering colleges. If we were to succeed in this reimagining,the range, relevance, and important of OER-oriented institutional repositories could be enhanced significantly.

4. Methodology

In this study, we take a conceptual approach, focusing on secondary data analysis to create a model that's both context-sensitive and grounded in theory for improving institutional repositories (IRs) through Open Educational Resources (OER) in engineering colleges. Instead of diving into fieldwork, we pull insights from a diverse range of existing literature, institutional policies, and various global and national initiatives related to OER and IRs. The main sources of data for this study include scholarly journal articles, conference papers, and reports from national organizations like UNESCO, UGC, and India's Ministry of Education, along with established global efforts in open access and repository development.

These resources provide a well-rounded perspective, helping us pinpoint universally relevant principles while also addressing localized challenges. Our methodology combines descriptive analysis, comparative reviews, and theoretical synthesis to outline current practices, highlight successful models, and create a cohesive, adaptable vision. The R.E.A.C.H. Model, which emerged from a process of iterative abstraction and reflection, stands as the main conceptual outcome of this work. Although it's tailored for Indian research-intensive engineering colleges, it has broader applicability. We also recognize the impact of institutional culture, policy environments, and infrastructure limitations. This methodology sets the stage for future empirical studies that aim to validate or refine the proposed model in real-world institutional contexts.

5. Key Insights from Theoretical Review

The theoretical review of literature offers some valuable insights that can help shape a successful institutional repository (IR) model in line with Open Educational Resources (OER). First off, IRs really excel when they're closely connected to the institution's teaching and research objectives, ensuring that content creation fits smoothly into academic workflows and priorities. Unfortunately, many existing repositories face challenges like low user engagement and minimal faculty involvement, resulting in a scenario where content accumulates without any active academic participation. Even though the digital infrastructure for these repositories is becoming more accessible, it's still not being fully leveraged due to a lack of awareness, training, and institutional support. Moreover, there's a significant opportunity for students to engage in creating and sharing OER, but this potential remains largely untapped. Theoretical models and successful practices from around the globe suggest that IRs can stay relevant by incorporating human-centered elements such as storytelling, interactivity, and collaboration among various academic roles, transforming them into vibrant ecosystems of shared learning.

6. Innovative Best Practices for OER-Focused IRs

For an engineering college to truly embrace a culture of open educational sharing, we need to look at Institutional Repositories (IRs) as more than just a place to stash digital documents. They should be viewed as vibrant, interactive, and creative ecosystems that actively serve both students and faculty. The best practices outlined below aren't just checklists to tick off; they can actually pave the way for a more open and innovative approach within the academic community.

6.1 The Scholar's Hour - One of these initiatives is called "The Scholar's Hour", where faculty members are invited to devote one hour each week to upload an amount of at least one teaching or research resource e.g., lecture slides, tutorial videos, code samples, reflective notes etc. within the IR. This ritual generates a shared culture of habitual scholarly sharing, while also creating a personal archive of contributions to increase

academic visibility. These contributions can be monitored and rewarded through repository dashboards that can provide real-time statistics on usage, including views and downloads.

6.2 OER Sprints with Students - Also noteworthy, “OER Sprints with Students” are short-term collaborative events wherein students and faculty co-create micro-OERs such as lab manuals, how-to video tutorials, or simulation demonstrations. These OER Sprints generate interdisciplinary participation, encourage project-based learning, and produce reusable digital content for successive cohorts. This process also shapes student skills in creating digital content and digital literacy.

6.3 QR Class Capsules - Utilizing QR Class Capsules presents opportunities for more access and utility. Each subject has a specific QR class code that connects students to a capsule of student learning resources that provides lecture notes, assignments, reference videos and exam materials from the past. The capsule can be accessed with a mobile device and can lead to self-paced learning and mobile learning, which is an emerging area of research that has many implications for exam times.

6.4 Reverse Publishing - In addition, “Reverse Publishing” is a particularly empowering best practice involving peer-reviewing and publishing the best quality student projects and theses as OERs under Creative Commons and open access licenses. The act of publishing continued student work as an institutional asset generates pride and ownership as well as authorship. This not only further diversifies the repository, but progresses a well-developed student portfolio.

6.5 OER Ambassadors - Institutions could also define and promote a culture of open access and adopt OER Ambassadors - one faculty member and one student each semester as peer mentors and awareness advocates for open access. OER Ambassadors conduct workshops, offer help to navigate the repository, and inspire others to help contribute. The actions of the OER Ambassadors normalize open-sharing behaviors across the various departments.

6.6 Reading Commons Corner - Libraries can create a Reading Commons Corner that showcases library-facilitated inspiration by displaying curated thematic OER collections, both physical and digital. The collections can represent student needs such as "GATE Preparation Toolkit", "A Beginner's Guide to AI and Data Science" or "Top 10 Faculty Picks for First-year Students." These curated corners will create a reading culture, support career readiness, and illustrate the unique curatorial role of the library.

6.7 Transformational Learning Design - Collectively, these best practices advance the IR from a transactional academic experience in content management to a transformational learning design as an active node of academic engagement and social knowledge sharing. All three additions create recognition for the faculty as authors, empower students as learners, and provide visibility to the institution.

7. The R.E.A.C.H. Model:

7.1 Visionary Model for OER-Integrated Institutional Repositories:

To assist in the reimaging the role of Institutional Repositories (IRs) in engineering colleges, we will propose the R.E.A.C.H. Model. The R.E.A.C.H. Model is a conceptual, human-centered framework, used to integrate Open Educational Resources (OER) into the fabric of institutional learning, research, and community engagement. The initials R.E.A.C.H. stand for: **R**epository as Research Commons, **E**ngagement Layer, **A**ccess by Design, **C**ollaboration Pods, and **H**uman-Centered Curation. Each pillar represents a specific need in the academic lifecycle of OER creation and use.

7.1.1 **Research Commons** - The first part, Repository as Research Commons, focuses on changing the institutional repository from merely a storage space for documents into a dynamic showcase of faculty research. Faculty members are encouraged to set up their own personalized "Knowledge Shelves" where they can share papers, codes, lecture videos, and datasets. By connecting with academic profiles like ORCID or Scopus, these repositories evolve into engaging scholarly portfolios that gain real-world visibility and can be effectively reused.

7.1.2 **Engagement Layer** - The Engagement Layer introduces tools that enhance visibility, recognition, and motivation. With real-time analytics, faculty can monitor downloads, citations, and the number of people engaging with their work, while dashboards provide a clear overview of their content's impact. To make participation more enjoyable and rewarding, features like badges (such as "Most Viewed Module" and "OER Star of the Semester") and contributor leader boards are introduced, nurturing a vibrant academic culture around contributions to the repository.

7.1.3 **Access by Design** – it is all about making sure everyone feels included and can use the resources, particularly first-generation learners and those in rural areas. The platform is designed with a mobile-first mindset, features voice-enabled search, and offers multilingual metadata tagging. With visual icons representing different types of content—like theory, practical exercises, videos, and code—navigating the site is a breeze. Plus, there's a community access gate that opens up opportunities for non-institutional users, such as school teachers and rural learners, to tap into shared Open Educational Resources (OERs), which aligns perfectly with the institution's commitment to social responsibility.

7.1.4 Collaboration Pods - The Collaboration Pods feature highlights the importance of co-creation rather than just one-way publishing. These small groups—made up of one faculty member, two or three students, and a librarian—work together to create subject-specific OERs, including explainers, lab demo videos, or simulation assignments. The library takes on a mentoring role, guiding them through licensing, metadata

tagging, and quality control, all while promoting experiential learning that meets accreditation standards (like NBA and NAAC).

7.1.5 Human-Centered Curation - Lastly, Human-Centered Curation and Storytelling injects a personal touch into the repository. Every upload comes with a "Why I Made This" note from the creator and a "Student Takeaway" comment, along with peer feedback and themed playlists like "AI for Beginners" or "GATE Preparation Toolkit." These practices transform Institutional Repositories into engaging, story-driven spaces that truly reflect the academic journeys of their contributors.

The R.E.A.C.H. Model thus redefines the IR not just as a repository, but as a **living academic space** where knowledge is shared, celebrated, and humanized.

Table No. 7.1 R.E.A.C.H. Model

Pillar	Focus	Outcome	Description	Key Components
R – Repository as Research Commons	Faculty-driven content visibility	Builds personal academic portfolios	Turn faculty content into visible, dynamic academic portfolios	KnowledgeShelves, ORCID/Scopuslinking, Multiformat uploads
E – Engagement Layer	Analytics, badges, and recognition	Motivates continuous participation	Motivate contributions through analytics and recognition	Dashboards, badges, download stats, email alerts
A – Access by Design	Inclusivity, multilingual access	Expands reach to underserved users	Ensure inclusion and usability for all users	Mobile-first UI, multilingual metadata, ISR access
C – Collaboration Pods	Co-creation with students and librarians	Encourages experiential learning	Foster co-creation among faculty, students, and librarians	Triads, mentoring, OER production sprints
H – Human-Centered Curation	Storytelling and emotional connection	Transforms IR into a vibrant knowledge space	Emotional connection through storytelling and feedback	"Why I Made This" notes, playlists, alumni insights

7.2 Engineering College Ecosystem -

How Does This Model Work in the Real Engineering College Ecosystem? Let's ground the vision with a **practical flow**.

Table No. 7.2 practical flow of REACH Model in the Engineering College Ecosystem

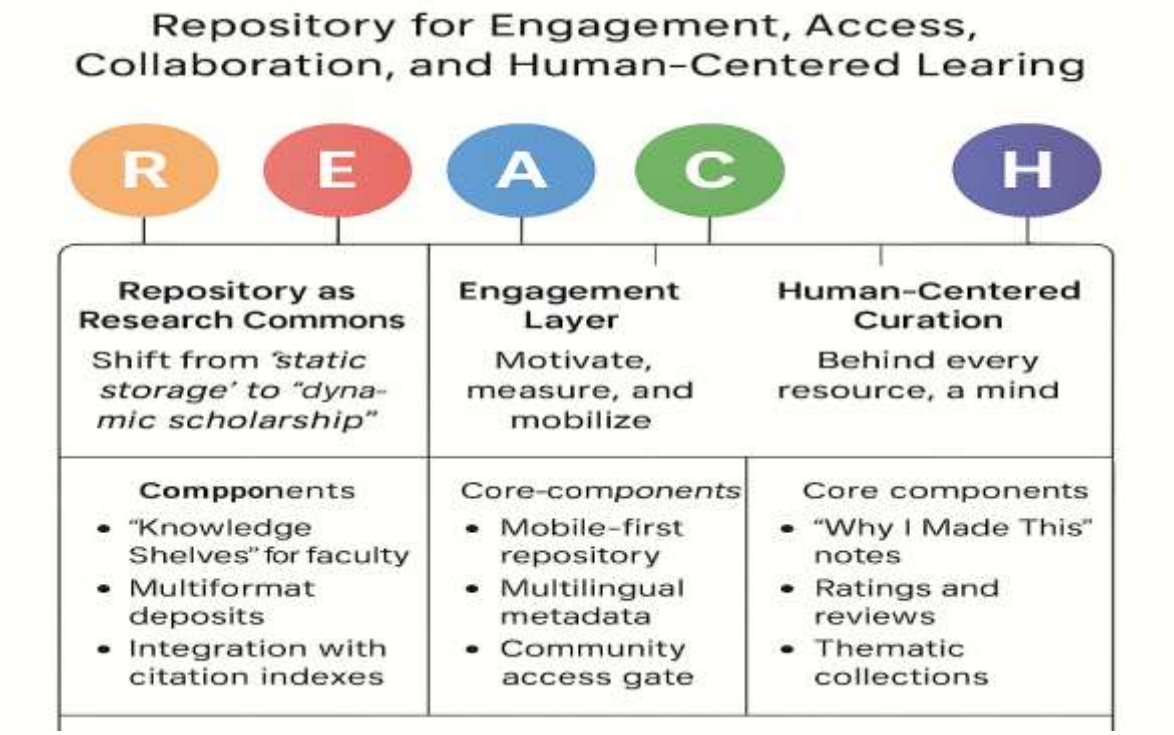
Stakeholder	Their Role in R.E.A.C.H.	Benefits
Faculty	Upload research-based OER, co-create with students, get recognition	Boosts academic visibility, appraisal scores
Students	Learn from localized content, contribute projects	Develops portfolio, increases engagement
Librarians	Act as curators, trainers, OER guides	Gains central role in teaching-learning process
Institution	Supports IR infra, aligns it with NAAC/NBA goals	Improves accreditation profile, branding
Community	Access curated OER from the institution	Part of social responsibility (ISR/DSR)

Table No. 7.3 Key Innovations in R.E.A.C.H. Model

Innovation	Description
Emotional Metadata	Adds “human notes” to each resource to make it relatable
QR Capsules	Every subject page gets a QR-linked capsule of full resources
Gamified Recognition	Leaderboards and badges to create excitement
Collaborative Pods	Faculty-student-librarian teams for live content creation
Mobile & Multilingual Design	Inclusivity-first approach for real accessibility

The **R.E.A.C.H. Model** doesn’t just solve IR problems—it **reimagines** the entire experience of educational resource sharing. The library transforms into a vibrant hub of knowledge rather than just a place to store books. It understands that the real value in academia lies not in the information itself, but in the connections we forge—between teachers and students, between research and its practical use, and between educational institutions and the wider community.

Graph No. 7.4 R E A C H



8. Challenges in Implementing the R.E.A.C.H. Model

The R.E.A.C.H. Model presents an exciting and inclusive vision for transforming Institutional Repositories (IRs) into vibrant platforms for Open Educational Resources (OER). However, bringing this vision to life—especially in engineering colleges—comes with its fair share of practical and systemic hurdles. These challenges touch on various aspects, including human, technical, institutional, and policy-related issues.

8.1 Faculty time constraints – One of the biggest obstacles to effectively rolling out OER initiatives within institutional repositories is the time crunch faced by faculty. In research-heavy engineering colleges, professors are already juggling a packed schedule filled with teaching, administrative tasks, supervising projects, and pursuing their own research. The added responsibility of curating, formatting, and uploading educational materials to repositories, while crucial, often takes a backseat to their primary duties. Without designated time or institutional incentives to encourage these contributions, faculty involvement tends to be sporadic and hard to maintain.

8.2 Technical literacy gap - Another significant challenge is the gap in technical literacy among faculty and support staff. While younger faculty and students may feel at ease with digital tools, many senior academics can struggle with navigating repository platforms, understanding metadata tagging, licensing protocols, and file conversions. Even librarians, who typically oversee institutional repositories, might lack the necessary training in the latest repository software or content licensing tools like Creative Commons. Without ongoing training opportunities, the technical side of the R.E.A.C.H. Model can quickly become a barrier**.**

8.3 Ambiguity surrounding copyright, intellectual property rights (IPR), and licensing - Navigating the murky waters of copyright, intellectual property rights (IPR), and licensing can be quite a challenge. Faculty members often express their concerns about how their content might be misused, the possibility of losing publication rights, or even the threat of plagiarism when they share their materials openly. The absence of clear institutional guidelines on licensing, paired with a limited grasp of tools like Creative Commons, only heightens this confusion. This legal gray area can make even the most enthusiastic contributors hesitant to engage in open sharing.

8.4 Misalignment between OER contributions and faculty evaluation systems - There's also a noticeable gap between contributions to Open Educational Resources (OER) and how faculty are evaluated at many institutions. Faculty members are typically driven to publish in high-impact journals, yet they seldom receive formal recognition for curating or sharing teaching materials through institutional repositories (IRs). If involvement in OER isn't acknowledged in promotions, awards, or performance reviews, initiatives like R.E.A.C.H. tend to attract only a few self-motivated individuals.

8.5 Libraries' limited role in institutional strategic decisions - Lastly, the limited role of libraries in strategic decision-making at institutions significantly hinders the growth of IRs. Libraries, which are vital in facilitating OER and IR, often find themselves sidelined in discussions about curriculum design, academic audits, or policy development. Without the necessary institutional authority or collaboration across departments, innovations spearheaded by libraries may struggle to secure the administrative support needed for lasting success. Tackling these challenges requires a holistic approach that includes gaining leadership support, investing in faculty development and digital infrastructure, reforming policies, and repositioning libraries as key players in the production and sharing of knowledge.

9. Key Findings

This study emphasizes that the true value of Institutional Repositories (IRs) goes beyond mere storage capacity; it lies in their ability to foster engagement, collaboration, and openness within the academic community. In engineering colleges, where research is plentiful but often isolated, the IR can evolve into a dynamic platform that connects research, teaching, and learning through Open Educational Resources (OER).

The literature review reveals a consistent gap between knowledge creation and sharing. Faculty members produce valuable academic content, yet there’s frequently no organized method or motivation to convert that into openly accessible educational resources. Meanwhile, students often find themselves as passive recipients rather than active contributors to the development of institutional knowledge.

To address these challenges, the proposed R.E.A.C.H. Model introduces a forward-thinking, inclusive design. It reimagines the repository as a collaborative hub, enhanced by engaging gamified tools, mobile-friendly access, co-creation groups, and thoughtful curation. Together, these elements redefine the IR as a vibrant, learner-centered environment that promotes academic innovation and equity.

The study successfully achieves its objectives by delving into the theoretical underpinnings of OER and IR, critically evaluating practices on both global and national scales, and proposing a progressive model specifically designed for Indian engineering colleges. By developing the R.E.A.C.H. framework, the paper showcases innovative best practices along with a structured, human-centered approach to enhancing repositories. Additionally, identifying key implementation challenges sets the stage for institutional strategies and future research validation.

10. Conclusion

This paper dives into some persistent challenges that scholars like Suber (2012) and Wiley (2009) have pointed out, advocating for institutional frameworks that not only support open access but also integrate openness into the core of academic culture. In light of Pinfield's (2015) call to make institutional repositories (IRs) truly effective, it proposes a model that goes beyond simple archiving to encourage academic engagement. While researchers such as Tella et al. (2024) and Kumar (2022) have highlighted that faculty disengagement and underutilization of resources are major hurdles, the R.E.A.C.H. Model offers a human-centered, scalable approach that redefines participation, visibility, and collaboration. This transformation turns institutional repositories into lively hubs for co-creation, recognition, and inclusive learning. Not only does this model resonate with the global open knowledge movement, but it also provides a practical, localized strategy for engineering institutions looking to foster future-ready, open academic ecosystems.

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