

Open Science and Academic Libraries: Awareness, Adoption, and Challenges in Higher Education Institutions

G A NARASIMHA RAJU ,M.A.,M.A.,MLISc.,B.Ed.,UGC NET,PGDCA

Research Scholar & Secondary Grade Teacher,

Dept. of School Education, Govt. of A.P.

ABSTRACT

Open Science has emerged as a global movement aimed at promoting transparency, accessibility, collaboration, and inclusiveness in scientific research. Academic libraries play a crucial role in supporting Open Science through open access initiatives, research data management, institutional repositories, and scholarly communication services. The present study examines the level of awareness, adoption, and challenges relating to Open Science among library professionals in higher education institutions.

The study is based on a survey of 200 library professionals working in universities and colleges across Andhra Pradesh. Data were analyzed using percentage analysis, mean scores, Chi-square test, and One-Way ANOVA. The findings reveal moderate to high awareness of Open Science principles among respondents, while the level of implementation varies across institutions. Major challenges include lack of institutional policies, inadequate training, limited infrastructure, and financial constraints. The study emphasizes the need for capacity building, policy support, and institutional commitment to strengthen Open Science initiatives in academic libraries.

Keywords: Open Science, Academic Libraries, Open Access, Scholarly Communication, Research Data Management, Higher Education.

1. INTRODUCTION

The digital transformation of research and scholarly communication has significantly changed the way knowledge is created, disseminated, and accessed. In recent years, Open Science has emerged as a global movement that seeks to make scientific knowledge more transparent, accessible, collaborative, and reusable. The concept promotes unrestricted access to research outputs, including publications, data, methodologies, software, and educational resources.

Open Science encompasses various components such as Open Access, Open Data, Open Educational Resources, Citizen Science, and Open Peer Review. International organizations including UNESCO, the European Commission, and research funding agencies have strongly advocated the adoption of Open Science practices to enhance research visibility, reproducibility, and societal impact. Academic libraries play a vital role in advancing Open Science by supporting institutional repositories, open access publishing, research data management, scholarly communication, and information literacy initiatives. As information intermediaries, libraries facilitate access to knowledge resources and assist researchers in complying with evolving research policies and data-sharing requirements.

Despite increasing recognition of Open Science, many higher education institutions continue to face challenges relating to awareness, infrastructure, policy frameworks, funding, and professional competencies. Understanding the current status of Open Science adoption among library professionals is therefore essential for strengthening institutional support mechanisms and enhancing research accessibility. Against this backdrop, the present study examines awareness, adoption, and challenges relating to Open Science among academic library professionals in higher education institutions.

2. REVIEW OF LITERATURE

Open Science has emerged as a transformative approach to scholarly communication, promoting transparency, accessibility, collaboration, and knowledge sharing. Vicente-Saez and Martinez-Fuentes (2018) described Open Science as a movement aimed at making scientific knowledge openly available and reusable for researchers and society. Their study highlighted the growing importance of openness in research processes and outputs.

Tennant et al. (2020) emphasized that Open Science enhances research quality, visibility, reproducibility, and public engagement. The authors argued that open access to publications and research data contributes significantly to scientific innovation and knowledge dissemination.

UNESCO (2021) adopted the Recommendation on Open Science, encouraging member states to promote open access, open data, open educational resources, and collaborative research practices. The recommendation recognized academic libraries as important stakeholders in advancing Open Science initiatives.

Ayris and Ignat (2018) observed that academic libraries have become central actors in supporting Open Science through repository services, scholarly communication programmes, and research data management activities. Their study highlighted the evolving responsibilities of librarians in open knowledge ecosystems.

Recent studies have examined awareness and adoption of Open Science practices among library professionals. Chiware and Becker (2022) reported increasing awareness of Open Science principles in higher education institutions but noted significant variations in implementation levels due to policy, infrastructure, and skill-related constraints.

Cox, Kennan, Lyon, and Pinfield (2023) found that librarians increasingly contribute to Open Science through research support services, data stewardship, and open access advocacy. However, challenges relating to professional competencies, institutional commitment, and financial resources continue to affect implementation.

Overall, the literature indicates that Open Science is becoming an important component of higher education and scholarly communication. Academic libraries play a crucial role in facilitating Open Science practices, although several institutional and operational challenges remain.

4. OBJECTIVES OF THE STUDY

The present study aims to examine Open Science awareness, adoption, and challenges among library professionals in higher education institutions. The specific objectives are:

1. To assess the level of awareness regarding Open Science among library professionals.
2. To examine the extent of Open Science adoption in academic libraries.
3. To identify the major Open Science practices implemented in higher education institutions.
4. To analyze the challenges affecting the adoption of Open Science initiatives.
5. To suggest measures for strengthening Open Science practices in academic libraries.

5. HYPOTHESES

H₁: Educational qualification is significantly associated with awareness of Open Science among library professionals.

H₂: Professional experience significantly influences the adoption of Open Science practices.

H₃: Participation in Open Science training programmes is significantly associated with Open Science implementation.

H₄: Significant differences exist among experience groups regarding perceptions of Open Science effectiveness.

6. METHODOLOGY

The study adopts a descriptive survey research design. Primary data were collected through a structured questionnaire administered to 200 library professionals working in universities, government colleges, aided colleges, and private higher education institutions across Andhra Pradesh.

Purposive sampling was employed to select respondents actively engaged in library and information services. The questionnaire consisted of items relating to Open Science awareness, adoption practices, institutional support, challenges, and future prospects.

Data were analyzed using descriptive and inferential statistical techniques. Percentage analysis and mean scores were used to assess awareness levels and respondent perceptions. The Chi-square test was employed to examine associations between selected demographic variables and Open Science awareness, while One-Way ANOVA was used to identify differences in adoption levels across professional experience groups. Statistical significance was tested at the 5 percent level.

7. RESULTS AND ANALYSIS

Table 1: Demographic Profile of Respondents (N = 200)

Variable	Category	Frequency	Percentage
Gender	Male	118	59.0
	Female	82	41.0
Qualification	MLISc	126	63.0
	M.Phil./Ph.D.	74	37.0
Experience	Below 5 Years	42	21.0
	5–10 Years	66	33.0
	11–15 Years	52	26.0
	Above 15 Years	40	20.0

Interpretation

The respondents represented diverse educational and professional backgrounds. The majority possessed MLISc qualifications (63%) and 33 percent had 5–10 years of professional experience, ensuring adequate representation of academic library professionals.

Table 2: Awareness of Open Science among Library Professionals

Awareness Level	Frequency	Percentage
High	84	42.0
Moderate	92	46.0
Low	24	12.0
Total	200	100.0

Interpretation

The findings indicate moderate to high awareness of Open Science among library professionals. While 42 percent of respondents demonstrated high awareness, nearly half (46%) reported moderate awareness, suggesting growing recognition of Open Science principles within academic libraries.

Table 3: Open Science Practices in Academic Libraries

Open Science Practice	Frequency	Percentage*
Institutional Repository Services	154	77.0
Open Access Support Services	148	74.0
Research Data Management Support	126	63.0
Open Educational Resources (OER) Promotion	118	59.0
Research Visibility and Citation Support	104	52.0

*Multiple responses permitted

Interpretation

Institutional repository services emerged as the most widely adopted Open Science practice (77%), followed by open access support services (74%). Research data management and OER promotion were also reported by a majority of respondents, indicating increasing engagement of academic libraries with Open Science initiatives.

Table 4: Perceived Benefits of Open Science

Benefit	Mean Score	Rank
Increased Research Visibility	4.48	I
Enhanced Knowledge Sharing	4.36	II
Improved Research Collaboration	4.22	III
Greater Research Transparency	4.15	IV
Increased Citation Impact	4.04	V

Scale: 1 = Strongly Disagree to 5 = Strongly Agree

Interpretation

Respondents perceived increased research visibility as the most important benefit of Open Science (Mean = 4.48), followed by enhanced knowledge sharing (Mean = 4.36). The findings indicate that Open Science is viewed as an effective mechanism for improving the accessibility and impact of research outputs.

Table 5: Challenges in Open Science Adoption

Challenge	Mean Score	Rank
Lack of Institutional Policies	4.42	I
Inadequate Training Opportunities	4.28	II
Limited Technical Infrastructure	4.16	III
Financial Constraints	4.01	IV
Copyright and Licensing Concerns	3.88	V
Resistance to Change	3.74	VI

Scale: 1 = Least Serious to 5 = Most Serious

Interpretation

Lack of institutional policies emerged as the most serious challenge (Mean = 4.42), followed by inadequate training opportunities (Mean = 4.28). The findings suggest that policy support and professional capacity building are essential for successful Open Science implementation.

Table 6: Institutional Support for Open Science Initiatives

Support Mechanism	Mean Score	Rank
Administrative Support	4.18	I
Access to Digital Infrastructure	4.11	II
Professional Development Programmes	3.96	III
Availability of Open Science Policies	3.82	IV
Financial Support	3.69	V

Scale: 1 = Very Poor to 5 = Excellent

Interpretation

Administrative support (Mean = 4.18) and access to digital infrastructure (Mean = 4.11) were identified as the most important institutional support mechanisms. However, lower scores relating to policy availability and financial support indicate areas requiring further attention.

Table 7: Chi-Square Test Results

Association between Educational Qualification and Open Science Awareness

Variable	χ^2 Value	df	p-value	Result
Educational Qualification $\times$ Open Science Awareness	9.68	2	0.008	Significant

Association between Open Science Training and Adoption of Open Science Practices

Variable	χ^2 Value	df	p-value	Result
Open Science Training $\times$ Adoption of Open Science Practices	12.84	2	0.002	Significant

Interpretation

The Chi-square analysis reveals a significant association between educational qualification and awareness of Open Science ($\chi^2 = 9.68$, $p < 0.05$). Similarly, participation in Open Science training programmes significantly influences the adoption of Open Science practices ($\chi^2 = 12.84$, $p < 0.05$). Therefore, Hypotheses H₁ and H₃ are accepted.

Table 8: One-Way ANOVA Results

Difference in Open Science Adoption Based on Professional Experience

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	18.36	3	6.12	4.74	0.003

Within Groups	253.08	196 1.29
Total	271.44	199

Interpretation

The ANOVA results indicate significant differences in Open Science adoption among respondents with varying levels of professional experience ($F = 4.74$, $p < 0.05$). Thus, Hypotheses H_2 and H_4 are accepted. The findings suggest that professional experience significantly influences Open Science implementation and engagement.

MAJOR FINDINGS

1. A majority of respondents (46.0%) possessed a moderate level of awareness regarding Open Science, while 42.0% demonstrated high awareness.
2. Institutional repository services emerged as the most widely adopted Open Science practice, reported by 77.0% of respondents.
3. Open access support services were provided by 74.0% of academic libraries, indicating growing commitment towards open scholarly communication.
4. Research Data Management support was reported by 63.0% of respondents, reflecting increasing integration of Open Science and data stewardship activities.
5. Increased research visibility emerged as the most important perceived benefit of Open Science (Mean = 4.48).
6. Enhanced knowledge sharing (Mean = 4.36) and improved research collaboration (Mean = 4.22) were also identified as significant benefits.
7. Lack of institutional policies was identified as the most serious challenge affecting Open Science adoption (Mean = 4.42).
8. Inadequate training opportunities recorded a high mean score of 4.28, indicating the need for professional capacity building.
9. Administrative support emerged as the strongest institutional support mechanism (Mean = 4.18).
10. Educational qualification was significantly associated with Open Science awareness ($\chi^2 = 9.68$, $p = 0.008$).
11. Participation in Open Science training programmes significantly influenced the adoption of Open Science practices ($\chi^2 = 12.84$, $p = 0.002$).
12. ANOVA results revealed significant differences in Open Science adoption across experience groups ($F = 4.74$, $p = 0.003$), indicating the importance of professional experience in promoting Open Science initiatives.

SUGGESTIONS

1. Academic libraries should organize regular awareness programmes and training workshops on Open Science principles and practices.
2. Universities should formulate institutional Open Science policies to support open access publishing, data sharing, and knowledge dissemination.
3. Library professionals should be provided with training in research data management, repository management, and scholarly communication services.
4. Institutions should strengthen digital infrastructure to facilitate Open Science implementation.
5. Greater financial and administrative support should be provided for Open Science initiatives and repository development.
6. Academic libraries should promote Open Educational Resources (OERs) and open access publishing among researchers and students.
7. Collaborative partnerships among libraries, researchers, publishers, and funding agencies should be encouraged to strengthen Open Science ecosystems.
8. Open Science concepts should be incorporated into Library and Information Science education and professional development programmes.

CONCLUSION

Open Science has emerged as a significant movement for enhancing transparency, accessibility, and collaboration in scholarly communication. The study found that library professionals possess moderate to high awareness of Open Science principles and actively support initiatives such as institutional repositories, open access services, and research data management. The findings reveal that Open Science offers important benefits, including increased research visibility, enhanced knowledge sharing, and improved research collaboration. However, challenges relating to institutional policies, training opportunities, infrastructure, and funding continue to affect effective implementation.

The statistical analysis confirmed that educational qualification, professional experience, and participation in Open Science training programmes significantly influence awareness and adoption levels. The study highlights the critical role of academic libraries in advancing Open Science and fostering an open knowledge environment.

Overall, strengthening policy frameworks, professional competencies, and institutional support mechanisms will be essential for promoting sustainable Open Science practices in higher education institutions.

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