



LIBRARIANS' ROLES IN FOSTERING OPEN SCIENCE ADVOCACY IN ACADEMIC LIBRARIES IN DELTA STATE

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Abstract

Open science has gained global recognition as a framework for promoting transparency, accessibility, and collaboration in scholarly communication. Academic librarians are increasingly positioned as key facilitators and advocates of open science practices within higher education institutions. This study examined the roles of librarians in fostering open science advocacy and support in academic libraries in Delta State, Nigeria. Specifically, the study investigated the extent of librarians' engagement in open science activities, identified the roles they perform, and examined the challenges they face in promoting open science. A quantitative research design was adopted, using a structured questionnaire as the instrument for data collection. The population comprised library professionals in selected academic libraries, with data analyzed using descriptive statistics. The findings revealed that librarians are actively engaged in several open science activities, particularly open access initiatives, data sharing practices, scholarly communication, and interdisciplinary collaboration. However, engagement in research data management was comparatively lower. Librarians identified their roles as open access advocates, data stewards and managers, information literacy instructors, scholarly communication experts, and promoters of open educational resources. Despite this active involvement, several challenges hinder effective open science advocacy, including limited resources, inadequate institutional support, rapidly changing technologies, copyright and licensing issues, and resistance to open data sharing. The study concludes that while librarians in Delta State demonstrate strong commitment to open science advocacy, structural and institutional barriers limit the full realization of their roles. It therefore recommends sustained professional development, improved funding, supportive institutional policies, and stronger collaboration between librarians and other research stakeholders to strengthen open science practices in academic libraries.

Keywords: Librarians, Open science, Advocacy, Academic libraries, Scholarly communication



Introduction

Open science has emerged as a global movement that seeks to democratize scholarly knowledge by promoting openness, transparency, participation, reproducibility, and unrestricted access to research outputs. Central pillars of this paradigm include open access publishing, open data sharing, collaborative knowledge creation, and responsible dissemination of scientific evidence. Academic libraries, as knowledge preservation and dissemination hubs, are increasingly positioned at the centre of this transition, and librarians, traditionally known as custodians of information resources, now assume expanded responsibilities as facilitators, advocates, and educators in open science ecosystems. In Nigeria, particularly at the level of academic libraries, open science uptake remains uneven, but the recognition of the imperative role librarians play is steadily gaining attention.

Librarians' roles in fostering open science advocacy reflect a broad spectrum of professional practices such as promoting open access resources, supporting research data management (RDM), assisting with institutional repositories, encouraging responsible scholarly communication, and guiding faculty and students in compliance with open science standards. Recent empirical work has demonstrated that Nigerian academic librarians are gradually adapting to these expanded roles. For instance, studies on open access utilization in Nigerian libraries have shown positive attitudes toward open scholarly systems, even as limitations in awareness, skills, and institutional support constrain active engagement. Ajisebutu et al. (2024) reported that many university librarians utilize open-access electronic journals but lack a comprehensive understanding of the strategic opportunities these platforms present for scholarly visibility and collaboration. Similarly, Adeyemi et al. (2025) observed that librarians in Kwara State perceive open access resources as essential to institutional sustainability, yet their levels of utilization are mediated by digital competencies, access to technological tools, and ongoing professional development.

It is observed that one of the core dimensions of open science is research data management, which supports transparency, reproducibility, and long-term preservation of scholarly data. Libraries, once focused mainly on publication outputs, have expanded their responsibilities into managing the full research lifecycle. Nitecki and Davis (2019) highlighted that academic librarians are now expected to support researchers from project conception to post-publication dissemination,



including the stewardship of research data. This shift aligns with Andersen's "data-driven library" perspective, which positions librarians as partners in data curation rather than passive resource managers. In the Nigerian context, Adekoya et al. (2024) and Igbinovia et al. (2023) provided evidence that librarians in university libraries are increasingly involved in RDM services; however, the scope of involvement varies widely, and many do not yet provide full-service support due to infrastructural gaps, limited policy frameworks, and insufficient training in metadata, repository management, and data stewardship.

The challenges documented in Nigerian studies reflect global trends. Milewska et al. (2022), in a study of medical researchers in Europe, reported poor awareness of research data management processes, underscoring the need for librarians to strengthen their advocacy and educational roles. The study similarly emphasized that data librarians could significantly improve researchers' competencies if given institutional support and strategic positioning. Parallel findings from Ng et al. (2024), who examined open science practices across medical journals, revealed deficiencies in transparency requirements such as preregistration, open peer review, and data availability statements, further demonstrating a gap between the ideal of open science and current scholarly communication practices. These studies collectively reinforce that librarians are critical actors in bridging the divide between vision and practice.

Despite the expanding discourse and gradual adoption nationally and globally, there is a limited understanding of how librarians within specific Nigerian states articulate and enact their roles in fostering open science. Delta State, like many regions in Nigeria, hosts a diverse range of academic institutions where librarians' practices, exposures, and institutional mandates may differ significantly. Examining librarians' involvement within this context is essential to illuminate gaps and opportunities that remain unexplored. It also provides empirical direction for policy development, capacity strengthening, and strategic investments necessary for institutionalizing open science.

If librarians are to effectively support open science advocacy, they must move beyond passive support roles and into proactive engagement as trainers, collaborators, research consultants, data stewards, advocates, and policy influencers. This expansion requires not only individual competence but also organizational readiness, including supportive leadership, ICT infrastructure, open policy frameworks, and access to sustainable funding. Therefore, understanding the extent to



which librarians in Delta State perceive and enact these roles is critical for advancing the national agenda of more transparent, accessible, and equitable knowledge systems. Against this backdrop, this study investigates librarians' roles in fostering open science advocacy in academic libraries in Delta State. It assesses their awareness of open science concepts, their involvement in open access and research data management services, and the institutional drivers and barriers shaping their participation.

Statement of the Problem

Despite increasing global momentum toward open science, its adoption within Nigerian academic institutions remains slow, fragmented, and limited by several contextual constraints. Although librarians are strategically positioned to drive awareness, advocacy, and implementation of open access practices, research data management, and institutional repository services, emerging studies show that Nigerian librarians often lack the skills, institutional mandates, and policy frameworks required to perform these expanded roles effectively. Existing studies conducted in other regions of Nigeria point to gaps in awareness, inconsistent utilization of open access resources, and limited engagement in research data management activities; however, little evidence exists on how librarians in Delta State contribute to fostering open science advocacy within their academic libraries. The absence of empirical data on their level of involvement, capacity, and institutional support creates a knowledge gap that constrains informed planning, training, and policy development. Therefore, this study examines the roles librarians currently play in promoting open science advocacy in academic libraries in Delta State, with the intent of identifying prevailing practices, challenges, and opportunities for strengthening open scholarship in the region.

Research Questions

1. What is the extent of librarians' engagement in open science activities?
2. What are the specific roles librarians play in open science
3. What are the challenges faced by librarians in fostering open science?



Literature Review

Studies across Nigeria and beyond show increasing but uneven participation of librarians in open science-related activities. Research on open access utilization indicates moderate levels of engagement, with librarians making use of open access (OA) platforms but not always to their full potential. Ajisebutu et al. (2024) found that Nigerian university librarians access OA electronic journals but display inconsistent utilization patterns due to limited awareness of broader scholarly implications. Similarly, Adeyemi et al. (2025) reported positive perceptions of OA use for institutional sustainability among librarians in Kwara State, yet participation was restricted by technological limitations and inadequate support.

Research data management (RDM) represents another major component of open science practice. Adekoya et al. (2024) observed that librarians in Nigerian universities have begun offering RDM services, though often on a limited scale. Evidence from Igbinovia et al. (2023) confirms that RDM is gradually being integrated into library services, yet full-scale adoption remains minimal. Abiodun-Asanre et al. (2024) assessed health librarians and found only modest RDM skills, showing that while librarians are aware of data-related tasks, confidence and capacity remain low. Alex-Nmecha and Onifade (2023) also reported limited preparedness among librarians for RDM, reinforcing the idea that engagement is emergent rather than established. Milewska et al. (2022) revealed low awareness of RDM among medical researchers, which indirectly suggests limited librarian engagement in advocacy. Ng et al. (2024) similarly documented poor adoption of transparency practices in medical journals, highlighting that open science structures remain underdeveloped.

Beyond data management and OA, librarians' involvement extends to related open knowledge practices. Akullo and Nsibirwa (2024) found low adoption of linked open data (LOD) in Ugandan university libraries, implying limited engagement in semantic-web-driven openness. Okoroma (2023) similarly reported modest awareness of linked data in Nigeria, suggesting librarians are not yet fully participating in this open knowledge dimension. Studies on open source technologies also serve as indicators of open science readiness. Tella et al. (2021) and Oyedodun and Adetoro (2024) reported moderate usage of open source library systems in Nigerian universities, driven more by need than by open science philosophy. Lastly, Redkina (2021) emphasized that libraries globally are repositioning within the open science ecosystem but often remain at the periphery, which



mirrors the Nigerian experience. Overall, engagement is occurring, but at a restrained and uneven level across institutions and service domains.

Empirical evidence highlights several roles librarians already assume. In relation to open access, Baro and Eze (2017) found that librarians actively guide users toward OA publishing routes, functioning as promoters and educators of scholarly communication alternatives. Ajisebutu et al. (2024) similarly observed librarians' involvement in supporting access to OA journals. Adeyemi et al. (2025) showed librarians help institutions leverage OA to reduce acquisition costs and support sustainability objectives. Several studies document librarians' emerging role as data stewards. Adekoya et al. (2024) identified librarians offering advisory services on research data organization, metadata, and repository submission. Abiodun-Asanre et al. (2024) indicated health librarians apply basic RDM competencies to support researchers. Igbinovia et al. (2023) described librarians acting as custodians of institutional data infrastructure. Ojo et al. (2024) further found librarians participating in data cleaning, storage, and curation activities, suggesting expanding technical responsibilities.

Specialized librarian roles also manifest in niche areas. Anyaoku (2019) highlighted medical librarians engaging in open data services, awareness creation, and training. Anyaoku and Anike (2021) reported that medical librarians provide advisory support for OA publishing. Beyond traditional roles, Oladokun & Gaitanou (2024) emphasized librarians' use of open data to enrich reference services, illustrating growth beyond access provision. Likewise, Oladokun et al. (2024) demonstrated librarians integrating OA repositories into collection development decision-making. Scholarly publishing support is another emerging role. Okechukwu et al. (2024) found LIS scholars relied on librarians to identify credible journals and avoid predatory outlets, a role echoed in Okwu and Oladokun (2023). Globally, Nitecki and Davis (2019) outlined librarians' task expansion across the research life cycle, from proposal planning to dissemination, which aligns with Sugihartati et al. (2025), who reported Southeast Asian librarians evolving into research partners, trainers, and consultants, roles increasingly echoed in Nigeria.

Despite progress, several recurring constraints hinder librarians' ability to advocate for open science effectively. Skills and knowledge deficits are widely documented. Abiodun-Asanre et al. (2024) found health librarians lacked advanced RDM competencies. Alex-Nmecha and Onifade (2023) noted limited preparedness for data stewardship, and Adekoya et al. (2024) reported uneven



capacity to support RDM activities. Likewise, Ajisebutu et al. (2024) and Adeyemi et al. (2025) highlighted gaps in OA literacy and technical familiarity.

Institutional barriers also constrain adoption. Ukwoma and Onyebinama (2021) noted librarians struggle to facilitate OA use due to infrastructure deficits, user resistance, and weak policy support. Okoroma (2023) and Akullo and Nsibirwa (2024) identified similar institutional readiness challenges regarding linked data. Also, Tella et al. (2021) and Oyedodun and Adetoro (2024) found that limited systems integration, cost constraints, and inadequate training resources affect open source use, barriers transferable to broader open science implementation.

Professional role uncertainty also hinders participation. Ojo et al. (2024) and Igbinovia et al. (2023) observed librarians uncertain about institutional mandates for RDM, while Sugihartati et al. (2025) highlighted global ambiguity around research librarianship identity. Moreover, sociocultural and operational anxieties shape attitudes toward emerging technologies. Ng et al. (2024) and Milewska et al. (2022) show weak open science norms among researchers, suggesting librarians operate within systems not yet ready for transparency reforms. Redkina (2021) concludes that without systemic support, libraries risk remaining reactive rather than transformative.

Methodology

This study adopted a quantitative research design to systematically examine librarians' roles in fostering open science within academic libraries in Delta State. A structured questionnaire served as the primary instrument for data collection, enabling the gathering of standardized responses suitable for numerical analysis. The study population comprised library professionals employed in academic libraries across Delta State, including professional librarians and para-professional staff directly involved in delivering library and research-support services. Given the dispersed nature of the libraries and the need to access respondents efficiently, a convenience sampling technique was used to select participants who were available and willing to complete the survey. This approach ensured the inclusion of individuals actively engaged in day-to-day library operations and therefore positioned to provide firsthand insights.

Data collection was accomplished through a self-administered online questionnaire distributed electronically to librarians. Respondents were provided adequate time to complete the instrument and return their responses. The questionnaire items were designed to elicit information on the



extent of librarians' involvement in open science activities, the specific roles they perform, and the challenges encountered.

The completed questionnaires were collated and analyzed using descriptive statistical techniques. Measures such as frequencies, means, and standard deviations were employed to summarize respondents' perceptions and quantify patterns in their responses. These procedures enabled clear interpretation of trends relating to open science engagement across academic libraries in the state. Ethical standards were strictly upheld throughout the study. Participation was voluntary, informed consent was obtained from all respondents, and anonymity and confidentiality were protected through the use of coded identifiers in place of personal information. Data were stored securely and used solely for academic purposes.

Results

The results were presented in line with the study's specific objectives. In so doing, questionnaires were administered to 38 respondents, and only 34 completed the questionnaires which indicates 89.5%.

Table 1: Extent of librarians' engagement in open science activities

S/n	Variables	Total	Mean	Std. Dev	Decision
1.	Scholarly communication	34	2.56	0.703	High Extent
2.	Research data management	34	2.23	0.698	Low Extent
3.	Open access initiative	34	3.46	0.622	Very High Extent
4.	Data sharing protocols	34	3.13	0.781	High Extent
5.	Open access publishing	34	2.71	0.512	High Extent
6.	Interdisciplinary collaborations	34	2.59	0.711	High Extent

Data in Table 1 indicates the extent in which librarians engage in open science activities. Data further shows that library professionals understudied engaged in open access initiative, data sharing, interdisciplinary collaborations, open access publishing and scholarly communication to a high degree. This implies that librarians engaged in open science activities.

Table 2: Specific roles librarians play in open science

S/n	Variables	Total	Mean	Std. Dev	Decision
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7.	Open access advocates	34	3.20	0.703	Accepted
8.	Data stewards and managers	34	3.29	0.698	Accepted
9.	Information literacy instructors	34	3.46	0.622	Accepted
10.	Scholarly communication experts	34	3.13	0.781	Accepted
11.	Advocates for open educational resources	34	3.12	0.778	Accepted

Data in Table 2 shows the specific roles librarians play in open science. Data further indicates that librarians' roles include information literacy instructors, data stewards and managers, open access advocates, scholarly communication experts and advocates for open educational resources.

Table 3: Challenges faced by librarians in fostering open science

S/n	Variables	Total	Mean	Std. Dev	Decision
12.	Limited resources	34	2.81	0.654	Accepted
13.	Changing landscape of technology	34	3.13	0.553	Accepted
14.	Lack of coordination	34	3.29	0.615	Accepted
15.	Copyright and licensing issues	34	2.65	0.701	Accepted
16.	Changing research workflows	34	2.96	0.571	Accepted
17.	Institutional resistance	34	3.10	0.765	Accepted
18.	Resistance to open data sharing	34	2.51	0.621	Accepted

Data in Table 3 indicate the challenges faced by librarians in fostering open science. Data reveals that the challenges facing librarian in promoting open science ranged from lack of coordination, changing landscape of technology, institutional resistance, changing research workflows, limited resources, copyright and licensing issues, and resistance to open data sharing.

Discussion

The findings reveal that librarians in academic libraries in Delta State are substantially engaged in multiple dimensions of open science, particularly open access support, data sharing culture, and scholarly communication activities. The strongest evidence of engagement lies in advocacy and promotion of open access resources, as well as participation in data dissemination practices. These findings reinforce a large body of literature that positions librarians as pivotal actors in broadening scholarly access and enabling more transparent knowledge flows. Ajisebutu et al. (2024) and



Adeyemi et al. (2025) reported similar trends, noting that librarians are increasingly utilizing and promoting open access materials for academic and research purposes. In this regard, the present study aligns with findings by Baro and Eze (2017) and Anyaoku and Anike (2021), which emphasized librarians' growing commitment to democratizing access to scholarly materials.

Engagement in scholarly communication and interdisciplinary collaboration in the present study further corroborates assertions from Nitecki and Davis (2019), who observed a shift in librarian responsibilities beyond traditional roles toward integrated support across the research lifecycle. The active participation of Delta State librarians in facilitating communication between researchers mirrors global reports that librarians are becoming connectors and coordinators in open science environments (Redkina, 2021). However, the more modest engagement in research data management activities appears consistent with findings from multiple Nigerian studies, which show that RDM participation remains emergent. Adekoya et al. (2024), Abiodun-Asanre et al. (2024), and Alex-Nmecha and Onifade (2023) each identified limited competencies and slow uptake in data-related services, suggesting that research data functions remain underdeveloped in most academic libraries. Similar gaps have also been observed internationally, where Milewska et al. (2022) documented inadequate RDM knowledge among researchers and insufficient librarian expertise in supporting data workflows.

Findings concerning the specific roles librarians perform in supporting open science revealed that respondents perceive themselves as active contributors across a spectrum of open knowledge functions. Librarians identify their responsibilities as including open access advocacy, data stewardship, scholarly communication advisory support, information literacy instruction, and promotion of open educational resources. These reported roles strongly align with evidence from Nigeria and globally. For instance, Anyaoku (2019) and Igbinovia et al. (2023) noted that librarians are already facilitating access to open research outputs while developing emerging competencies in data curation and open data services. Similarly, Oladokun and Gaitanou (2024) and Oladokun et al. (2024) found librarians applying open data and open repositories to improve reference service and collection development. The current study therefore reinforces literature that positions librarians as active agents rather than passive observers within the scholarly communication transformation (Sugihartati et al., 2025). In addition, the finding that librarians perceive their instruction and training responsibilities as central confirms earlier conclusions by Anyaoku and



Anike (2021) and Ukwoma and Onyebinama (2021), who highlighted librarians' growing educational and facilitative functions in user engagement with open access ecosystems.

Despite evidence of substantial involvement and evolving role identities, the study highlights a number of persistent challenges limiting librarians' ability to fully participate in open science advancement. Respondents identified shortages of resources, limited institutional support, resistance to change, and concerns around copyright and licensing as major barriers. These challenges have been repeatedly documented in the empirical literature. Ukwoma and Onyebinama (2021) underscored resource scarcity and policy gaps as primary obstacles to open access delivery in Nigerian universities, while Tella et al. (2021) and Oyedodun and Adetoro (2024) noted that technology costs, inadequate staff training, and instability of digital systems reduce the adoption of open infrastructure. The challenge of institutional resistance and weak collaboration echoes findings from Ojo et al. (2024) and Alex-Nmecha and Onifade (2023), where librarians expressed uncertainty over their role legitimacy within evolving research environments.

Similarly, the concerns raised regarding changes in research workflows and hesitancy toward open data sharing align with the conclusions of Ng et al. (2024) and Milewska et al. (2022), who reported that both librarians and researchers remain cautious about data openness due to skill, cultural, and ethical considerations. The persistence of copyright concerns in the present study also confirms the conclusion by Okwu and Oladokun (2023), who noted that lack of clarity on copyright and predatory outlets creates fear among stakeholders.

Conclusion and Recommendations

This study investigated librarians' roles in fostering open science advocacy in academic libraries in Delta State, focusing on their engagement in open science activities, the specific roles they perform, and the challenges they encounter. The findings demonstrate that librarians are actively involved in several core dimensions of open science, particularly the promotion of open access resources, scholarly communication, interdisciplinary collaboration, and data-sharing practices. Librarians also perceive themselves as key contributors to open science, providing support as open access advocates, information literacy instructors, scholarly communication facilitators, and data stewards. These roles reflect the expanding professional responsibilities associated with the global open science movement. However, the study also shows that librarians' capacity to fully participate in open science advancement is constrained by structural and institutional barriers, including



inadequate resources, insufficient technological infrastructure, unclear policy guidance, and resistance to new data-sharing norms. Copyright concerns and rapidly changing research workflows further complicate their efforts. These challenges suggest that while librarians in Delta State possess strong commitment and emerging competencies, the broader institutional environment has not fully matured to support sustained open science implementation.

Based on the findings, the following recommendations can be made:

1. Institutional administrators should provide dedicated budgetary support for open science initiatives, including repository development, data curation tools, and training resources. Also, they should develop and implement clear institutional policies on open access, research data-sharing, and copyright that formally empower librarians to carry out expanded duties.
2. Library management should establish a coordinated open science unit or designate open science leads within the library to streamline advocacy, training, and support services.
3. Librarians and library staff should pursue ongoing learning through workshops, online courses, and professional networks to build confidence in areas such as RDM, metadata, open licensing, and repository management. They should also engage proactively with faculty and students by delivering training sessions, embedding open science into information literacy instruction, and promoting responsible knowledge-sharing practices.
4. Government and regulatory bodies should provide national guidelines and frameworks for the integration of open science practices across academic libraries. In addition, they should mandate open access compliance requirements for publicly funded research to encourage institutional adoption.
5. Academic faculty and researchers should collaborate with librarians as co-partners in research planning, publishing, and data management, rather than viewing them solely as information providers.

Limitations and Suggestions for Further Studies

This study has some limitations. First, the study relied solely on a quantitative survey design, which restricted the depth of insight obtainable from respondents. While the questionnaire provided a broad overview of librarians' engagement and challenges, it did not capture nuanced perspectives, personal experiences, or institutional dynamics that may influence open science practices. Second, the study focused on a single academic institution in Delta State. Although the



findings provide valuable insight into librarians' roles within the selected institution, the results cannot be generalized to all academic libraries in the state or Nigeria, as institutional cultures, infrastructure support, and staffing capacities may differ significantly. Third, the use of self-reported data may have introduced response bias, as participants may present themselves as more proactive or knowledgeable than they actually are, particularly on emerging concepts such as research data management and open data sharing.

Suggestions for Further Studies

Based on the limitations identified, future research can extend the scope and depth of inquiry into librarians' roles in open science. First, studies involving multiple higher education institutions across Delta State or Nigeria would provide comparative insights and enhance the generalizability of results. Such multi-institutional research could reveal regional differences in support structures, professional readiness, and open science cultures. Second, future studies should adopt mixed methods or qualitative approaches, such as interviews, focus groups, or case studies, to capture richer and more detailed narratives about librarians' experiences, challenges, and evolving role identities. Third, further research should incorporate the perspectives of other academic stakeholders, including faculty researchers, postgraduate students, ICT staff, and university administrators. Exploring these groups would help identify alignment gaps between policy expectations, library capacities, and researcher needs.

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