

Academic Library Staff as Change Agents in Promoting Open Science (Os) Practices Among Graduate Students at Kumasi Technical University, Ghana.

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Abstract

This study investigated the role of academic library staff as change agents for implementing Open Science practices with the graduate students of Kumasi Technical University (KsTU) in Ghana, with the aid of Rogers' (2003) Diffusion of Innovations theory. The study employed a concurrent triangulation mixed methods design, which included a questionnaire for the graduate students and semi-structured interviews with library staff members. Awareness of Open Science practices was moderate but fairly even, and was not often translated into actual practice, particularly in the use of the institutional repository, where the relationship was the strongest but also with low uptake; a low level of uptake was also observed with students aware of the practice. As change agents, the library staff used orientation sessions, workshops, and individual consultations as their primary methods, which are appropriate strategies given the library's constraints of policy gaps, limited funding, and uneven support from the Library Department, but not a shortage of effort. The study calls for a formal, institution-wide Open Science policy, and training to be carried out early and not as a one-off activity near graduation.

Keywords: Open Science, academic libraries, change agents, Diffusion of Innovations, technical universities, Ghana

INTRODUCTION

Open Science has been a global movement over the last decade, changing the way disciplines create, check and disseminate knowledge, based on four principles: open access to publications, open data, open methods, and open peer review. Open science policy development, cross-institutional collaboration and capacity building have become common denominators for institutions in Sub-Saharan Africa (SSA) (Mwelwa et al., 2020), and Ghana has indeed taken steps to put this consensus into practice with Open Science Community Ghana conducting workshops and advocating for open science at institutional and national levels, and LIBSENSE, a network connecting early-career librarians and researchers to promote

data sharing and scholarly communication (Agyei & Salau, 2025). None of this regional consensus and none of this national infrastructure are assertions that any of this gets to the graduate student actually doing the research, and this study assumes that to understand the research and innovation produced by the graduate student, the researcher needs to know the research and innovation produced by the graduate student.

This divide is deeper when looking at open science as a separate concept from open access, the widest of the three strands. The data from the country shows just that unevenness. Research data management awareness among faculty members is very low, indicating that there is a clear need for increased institutional incentives and continued investments in supporting technologies (Arthur & van der Walt, 2024). The majority of the graduate students in four Universities in Ghana store their data on their own devices and are not willing to share it, due to competitive advantage and IP issues (Arthur et al., 2025). The constraints are not specific to Ghana: a scoping review of 1,280 sources found 82 different barriers to open science from the perspective of postgraduate researchers, including both practical and competency, sentiment and policy-related barriers (Kaliuzhna et al., 2025).

Academic libraries are the place where these barriers potentially can be overcome, and the librarians who perform the role of change agent are more easily understood by Rogers' (2003) Diffusion of Innovations framework. What has yet to be considered is whether or not the Ghanaian technical university subsector, which is more of an applied and industry-based system of education, can come up with its libraries as this channel. This study directly seeks to answer that question, drawing on a mixed-methods design to explore the extent to which graduate students are aware of and apply O S practices at Kumasi Technical University (KsTU), the role of academic library staff as change agents, and the barriers they face to this role.

PROBLEM STATEMENT

Although Kumasi Technical University has made efforts to invest in infrastructure that will help support open research practices, there is no indication at this time if that investment is being made available to the approximately 356 graduate students they serve. Earlier, years of institutional collaboration and capacity building efforts indicated that the national situation was national consensus around open science; while the overall evidence from universities in Ghana suggests that awareness regarding research data management is low among faculty, and there is a reluctance among graduate students to share research data they create. There are no studies available in either pattern in the context of a single technical university, where research should aim at a more applied and industry-aimed goal than merely academic. Technical universities have a unique place in Ghanaian education and it is uncertain whether it is this mandate that alters the attitudes and perceptions of students and staff toward open science practices in comparison to researchers in a traditional research university. Where institutions already have resources available to support open science, the capacity of library staff to implement it in practice relies on the approaches they take to student outreach and the resources and restrictions, institutional, financial, or otherwise, that may exist. However, both have not been reported for Kumasi Technical University, although the university has been involved in the national open access movement and the 23 staff who are conducting this work throughout the library system has never been studied before.

There is an infrastructure, but nothing has been measured for engagement among graduate students yet. The university cannot evaluate whether it is succeeding in raising awareness and adoption of open science practices among graduate students, what strategies are currently being employed to achieve this, or what is specifically hindering the adoption of those strategies, without knowing where graduate students are in

their awareness and adoption of open science practices, what strategies library staff are using to reach graduate students, and what is specifically getting in the way of library staff adopting strategies. Unless these gaps are addressed in a careful examination, they can result in underuse of what has been constructed, even when it is designed well. The findings from the Kumasi Technical University library could potentially influence the way the other nine Ghanaian polytechnics go about the same task, but that is predicated on understanding what's going on at the one technical university. The three unknowns mentioned above are the direct concern of this present study.

PROFILE OF THE STUDY AREA

Kumasi Technical University is in the Ashanti region of Ghana. It was established in 1954 under the name Kumasi Technical Institute, which offered craft courses, then changed to Kumasi polytechnic which offered sub-professional courses and technical diplomas. The University is now made up of seven faculties, four institutes, and a dedicated centre for renewable energy and energy efficiency and has a total enrolment of 9,413 students at regular, part time and distance learning programs, from Higher National Diploma to Bachelor of Technology, master's and doctoral degree. The university's graduate research culture is still in its early stages, as doctoral study has been added only recently, and has not yet graduated its first cohort, which has been two years in existence. The university library system consists of five departments, which include the reference and lending libraries, and the electronic collection includes subscribed databases, journals, theses and books administered by the information technology research support unit. The library has an institutional repository for the preservation and dissemination of the research output of the University and a Research Support Unit that provides support throughout the research cycle from design to dissemination. It is also a member of Consortium of Academic and Research libraries in Ghana (CARLIGH).

OBJECTIVES

1. Assess graduate students' level of awareness and adoption of OS practices at Kumasi Technical University.
2. Examine the change-agent strategies employed by academic library staff in promoting OS practices among graduate students.
3. Identify the challenges confronting library staff in their change-agent role in promoting OS practices.

LITERATURE REVIEW

Awareness and Adoption of Open Science Practices

Open Science has evolved from access to research outputs to a broader movement that involves openness of data, methods and peer review, and educational resources to promote transparency in scholarship. In their article, Ogunbeni et al. (2018) looked at the role that academic libraries play in this movement, and identified the role of library staff as service providers, educators, and knowledge producers who interact with almost every stage of the research lifecycle. This centrality has been reinforced at the continental level with the launching of the African Open Science Platform by South Africa's National Research Foundation in 2017 for coordination at the continental level of Open Science policy.

This broadened scope has led to more focus on research data management as part of the library's work. Borghi and Van Gulick (2022) suggest that libraries have shifted from “merely curating” data collections to actively training researchers in the planning, storing, sharing and archiving of data, sometimes to fulfil

the funders' expectations for openness and reproducibility. Subaveerapandiyan (2025) highlights a similar evolution among academic librarians in India, from metadata provision to the creation and management of Open Science initiatives, which would lead to a need for training that many libraries may not be able to provide.

Ghanaian evidence indicates that graduate students are still in the early stages of this process of adoption. Arthur et al. (2025) conducted a survey of Ghanaian graduate students at four universities and observed that most students are not interested in keeping research data in institutional repositories, mostly because they fear losing the advantage of publication. However, there was a significant difference in the level of awareness of OERs among the three universities, even within Ghana, and Ndaago, Kankam and Bentil (2025) used the Unified Theory of Acceptance and Use of Technology (UTAUT) model to explain the variation across their sample of postgraduate students at three universities in Ghana. In the previously mentioned scoping review by Kaliuzhna et al. (2025), the barrier subclusters with the highest impact on non-adoption were identified as sentiment, APC, and technical issues, with APC being mentioned the most. The results of these studies indicate that, overall, graduate students tend to move into the awareness stage of adoption relatively easily, but are hindered in the persuasion stage and the decision stage by practical and attitudinal issues.

Library Staff as Change Agents

Rogers' (2003) Diffusion of Innovations theory is used to explain how new ideas and practices spread through a social system and go through five stages: knowledge, the first exposure to the innovation; persuasion, the formation of attitudes toward the innovation; decision, the choice to adopt or reject the innovation; implementation, the process of implementation; and confirmation, the reinforcement of the decision. Communication channels play a vital role in this process, and are important in transmitting information between adopters and non-adopters and in advancing an innovation from the fringe to the mainstream.

In this context, some people function as change agents, who are individuals that facilitate the target population's intention to change in favor of an innovation, according to Braddlee and VanScoy (2019). They researched how librarians in community colleges in the United States were taken up by faculty as they tried to serve in less traditional roles and less traditional ways of presenting themselves, including as discovery support librarians. The role of the change agent is not just that and it must be negotiated with the expectations that the target population holds. Rugoye and Charles (2025) build on this, when it comes to the role of the librarian, from passive custodian to a more proactive focus on promoting literacy and digital inclusion.

At Kumasi Technical University, library staff play the role of change agents, while Open Science practices represent the innovation being diffused and the progression of graduate students through Rogers' stages has not been documented before. Research on the methods implemented by those who catalyse change suggests that structured methods, which involve working in workshops, are the typical way in which change occurs. Between 2006 and 2008, EIFL and CARLIGH collaborated to carry out a series of capacity-building workshops in Ghana, aimed at raising awareness about open access among faculty, technical staff and librarians, which eventually resulted in the establishment of the first institutional repository and policy at Kwame Nkrumah University of Science and Technology (EIFL, 2023). Since 2011, CARLIGH, EIFL and the Association of African Universities have continued to build on this momentum with additional awareness and capacity-building activities with decision-makers, librarians, and researchers in Ghana. As noted by Arthur et al. (2025), training on research data management that has

already been provided in Ghanaian academic libraries varies widely in scope, from metadata practices to data curation, from funder requirements to writing theses with data, and from data security to data management, and has led to measurable impacts on the development of policies and repository growth in the institutions where it has been offered.

Challenges Facing Library Staff as Change Agents

This is the case even when library staff can and want to do this, because of structural constraints. The study assessed the status of institutional repository infrastructure in five Public Universities in Ghana and concluded that, irrespective of institutional commitment, funding, infrastructure and staffing problems remain, while the mere recruitment of the systems librarians would not solve the technical capacity problem, continuous professional development, and periodic review of library school curricula were suggested as long-term solutions (Imoro & Saurombe, 2024). Article processing charges add to these constraints at the individual researcher level; indeed, Kaliuzhna et al. (2025) cite APCs as one of the greatest predictors of non-adoption, irrespective of the level of support offered by a library.

This literature is missing any account of how these three elements awareness and adoption among graduate students, the strategies adopted by library staff to promote Open Science and the constraints library staff face interact within one particular Ghanaian technical university. The subsector is not a new one, which is supported by existing infrastructures that indicate that the subsector has spread beyond the flagship KNUST case to other Ghanaian public universities (Imoro & Saurombe, 2024) suggesting that this type of institutional capacity can be developed in the absence of the older research universities. However, there is yet no evidence that such capability leads to any quantifiable engagement of graduates, nor what specifically may be hindering the capacity of library staff to push this further, at any technical university, including KsTU. This is not a simple awareness to strategy to constraint gap, but one that encompasses both in one. The present study takes on the gap between awareness, strategy and constraint, not just one or the other.

METHODOLOGY

The study utilized a concurrent triangulation mixed methods design, in which both a structured questionnaire for the graduate students and semi-structured interviews with library staff were used, with the first objective calling for breadth, the second and third for depth that a closed-ended instrument could not offer.

The target population were 356 graduate students for the 2025/2026 academic year in the School of Graduate Studies and 23 library staffs. The sample size for graduates was determined using Yamane's formula: $n = N / (1 + N(e)^2)$, where $N = 356$ (the target population), and $e = 0.05$ (margin of error) at a 95% confidence level, giving a sample of around 188. It was a census of the library staff rather than sampling, as there were not that many staff members.

Because no reliable programme level enrolment breakdown was available, the graduate students were selected by simple random sampling from the frame of the School of Graduate Studies. The questionnaire consisted of demographic, awareness, practice and perceived barriers questions, which were grouped according to the four groups identified by Kaliuzhna et al. (2025). The internal consistency of the three subscale of the questionnaire was calculated using Cronbach's alpha. A semi-structured interview guide explored staff practices on how to encourage the promotion of Open Science and the challenges they faced. The two strands were sampled at the same time in June 2026.

Data were analysed descriptively and using chi-square tests in SPSS, and thematically, following Braun and Clarke (2006) six-stage method, for interview data. The study was conducted with ethical clearance and participant's confidentiality maintained throughout the study.

FINDINGS AND DISCUSSION

Sample Profile

All 188 sampled graduate students provided valid responses with no missing data and 23 of the academic library staff were interviewed in a semi-structured fashion.

Nearly half of the respondents were from the Engineering and Built Environment programme cluster, with Applied Statistics and Computing and Information Systems respondents making up the next largest clusters, and Design and Other making up smaller clusters. The respondents were predominantly male, with a relatively small group of those who did not wish to state gender. The majority were aged from 25 to 34 years and in the first year of study, and a smaller group were in extended years. A large proportion, 81.9 percent, had been trained in research methods before, indicating that this sample had a reasonably high level of research-literacy prior to the study.

Table 1: Demographic Characteristics of Respondents (N = 188)

Variable	Category	Frequency	Percent
Programme Group	Engineering & Built Environment	93	49.5
	Applied Statistics	42	22.3
	Computing & Information Systems	30	16.0
	Applied Sciences	17	9.0
	Design & Other	6	3.2
Gender	Male	113	60.1
	Female	71	37.8
	Prefer not to say	4	2.1
Age	Below 25	28	14.9
	25 to 29	83	44.1
	30 to 34	49	26.1
	35 and above	28	14.9
Level of Study	Year 1	115	61.2
	Year 2	61	32.4
	Extended	12	6.4
Prior Research Methods Training	Yes	154	81.9
	No	34	18.1

Awareness and Adoption of Open Science Practices

The 5 sub scales of the questionnaire had acceptable internal consistency with all showing scores above the 0.70 threshold recommended by Nunnally (1978): Awareness ($\alpha = .81$); Practical Barriers ($\alpha = .85$); Lack of Competency ($\alpha = .86$); Sentiment ($\alpha = .79$); Policy, Guidance and Institutional Support ($\alpha = .88$). Respondents indicated the highest level of awareness of Open Science as a concept, and the lowest level of awareness of the FAIR data principles, with institutional repositories ranked between the two ($M = 3.31$, $SD = 1.02$). The overall Awareness Index was 3.11 ($SD = 0.78$), indicating that graduate students

have an overall awareness of Open Science but a much lower awareness of the technical aspects of Open Science. Just over half of respondents fell into the Moderate awareness category (54.3%, $n = 102$), with 25.0% ($n = 47$) classified as High and 20.7% ($n = 39$) as Low (Table 2). These moderate figures are slightly different from Ndaago et al's (2025) finding of significant variation in the level of exposure to OER across universities in Ghana which indicates that in a single institution, exposure to OER may not be as different as the national picture suggests.

Table 2: Awareness of Open Science Practices Panel A: Item Descriptives

Item	Mean	SD
Open Science (general concept)	3.56	0.91
Institutional Repository	3.31	1.02
FAIR Principles	2.47	1.09
Overall Awareness Index	3.11	0.78

Panel B: Awareness Category

Category	Range	n	%
Low	1.00-2.33	39	20.7
Moderate	2.34-3.66	102	54.3
High	3.67-5.00	47	25.0

Awareness did not differ significantly by gender ($\chi^2(4, N = 188) = 2.31, p = .679, V = 0.08$), age group ($\chi^2(6, N = 188) = 10.54, p = .103, V = 0.17$), or programme ($\chi^2(8, N = 188) = 7.96, p = .437, V = 0.15$), indicating that exposure to Open Science concepts was distributed evenly across the sample rather than concentrated within particular demographic or disciplinary groups.

This evenly distributed fit with Rogers' (2003) knowledge stage, when an innovation is first horizontally spread out before differentiation begins. Whereas, the awareness data did not display any discernable pattern by discipline, this implies that graduates from Kumasi Technical University may have been exposed to Open Science in a fairly even way; however, whether they are applying Open Science is dependent on subsequent steps.

In all three practices, the most prevalent response was Aware Only, with few respondents regularly using or discontinuing the practices. Responses of "discontinued" were treated as a separate stage of adoption, not as missing, reflecting a conscious choice to forgo a practice. Overall, nearly half of respondents fell into the Low Adoption category (47.3%, $n = 89$), with 37.2% ($n = 70$) Moderate and 15.4% ($n = 29$) High (Table 3). The institutional repository was used by only 9.0%, which was similar to the overall result obtained by Arthur et al. (2025) who found that the Ghanaian graduate students generally prefer to store their data on personal devices rather than formal repository use.

Table 3: Adoption Stage by Practice and Overall Adoption Category

Panel A: Adoption Stage by Practice (percent)

Practice	Never Heard	Aware Only	Considering	Trial	Regular	Discontinued
Open Access Publishing	9.0	35.6	26.1	14.4	10.1	4.8
Open Data Sharing	13.3	37.8	22.9	12.2	7.4	6.4
Institutional Repository Use	14.4	31.4	24.5	16.5	9.0	4.3

Panel B: Overall Adoption Category

Category	Range	n	%
Low	0.00-1.33	89	47.3
Moderate	1.34-2.66	70	37.2
High	2.67-4.00	29	15.4

The relationship between awareness level and adoption level was statistically significant and was the highest in the study, $\chi^2(4, N = 188) = 43.62, p < .001, V = 0.34$. Despite this many of the respondents whose awareness was Moderate or High, reported Low adoption, which showed that awareness was not enough to result in practice – something more than simple exposure to Open Science concepts was required for students to adopt them!

Year of study was also significantly, but not greatly, related to awareness ($V = 0.17$) and to adoption ($V = 0.16$), indicating that there were some shifts in students' status on the adoption continuum throughout their programmes.

The accounts of interviews gave a convincing explanation. A significant engagement of the repository was seen as something that more commonly appeared towards the end of a student's programme (LS18), as one participant said: 'most students don't think of the repository until towards the end of research'. Below the aggregate students' awareness of open access was uneven, as noted students were more likely to be aware of it, although publishers reported mentioning it. (LS02) Other noted students were less likely to be exposed to concepts such as FAIR principles or open data sharing.

This is also the case for discontinuance: when a student enters a practice and then leaves it. The discontinuance rates reported here (4.3 to 6.4 percent in the three practices) are similar to the timing pressures library staff described at the end of the programme.

The strategies used by library staff to change

Data obtained from interviews has documented the nature of this change in role of library staff. Consistently participants described themselves as doing more than collection management, as actively participating in the research process, such as literature searching, citation management and reference support. One participant explained that the role used to be about assisting students in locating books and journal articles, but now it entails assisting them with publishing and submitting to repository, reference management, and creation of research visibility (LS04). One frequently mentioned issue that students have is not knowing where or how to publish their research and that helping students to get their research published is now a part of everyone's job (LS11). This change follows the reported migration of the Indian academic librarians from metadata provision to designing and managing Open Science initiatives by Subaveerapandian (2025) and the broader picture of the role of librarians as service providers, educators, knowledge producers, at almost every stage of the research lifecycle, as described by Ogungbeni et al. (2018). Library staff are then placed more towards the heart of the research process, where the decisions around Open Science practices are made, than at the edge of them. In Braddlee and VanScoy's (2019) analysis of librarians and faculty at community colleges in the United States, librarians' roles were promoted through familiar service-based positions, as opposed to less traditional roles like as a policy advocate, although the nature of the population and context differs from this study.

Raising awareness was done by staff through three channels: orientation sessions, workshops and individual consultations. This is because the orientation introduces participants to Open Science, repository services, research databases and publishing options that students are unlikely to have come across in their programme before (LS07), compared to the wider breadth of topics Arthur et al. (2025)

reported in Ghana's libraries as a whole, which include data curation, funder requirements and data security. Where sessions were voluntary, inconsistent attendance was reported; when the training was integrated into departmental activities and not as a standalone session attendance improved. One of the participants noted that “the attendance in a seminar to which students already go, is significantly higher than when they have to make a conscious effort to attend an individual seminar” (LS20). Capacity building, that is, seems to work less well for what is taught and more for how well it has been woven into the students' existing routines.

Similarly, the survey data indicate that. A small effect ($V = 0.28$) was found when comparing awareness level to prior research methods training, $\chi^2(2, N = 188) = 14.21, p = .001$. Training was also importantly related to adoption level ($\chi^2(2, N = 188) = 11.26, p = .004, V = 0.24$, small effect), with trained respondents likely to experience a modest increase in the likelihood of active adoption.

The effect sizes here are modest, not large; however, Rogers' (2003) observation that a change agent will work on the social system, not instead of the social system, is apt for this training intervention – it simply would not have been enough to drive adoption without a broader social system. The attendance pattern made the same point directly: Capacity building attracted greater numbers of attendees when it was integrated into the activities of the department as opposed to its being an independent library program. But the reality of sustaining that embedding by staff in the library is subject to a number of factors that library staff rarely has control over, one of which is examined directly in the next section.

Challenges Confronting Library Staff in their Change-Agent Role

Barrier subscale means were highest for Policy, Guidance and Institutional Support ($M = 3.79, SD = 0.84$), followed by Practical Barriers ($M = 3.51, SD = 0.86$), Lack of Competency ($M = 3.47, SD = 0.88$), and Sentiment ($M = 3.19, SD = 0.82$) (Table 4). This ordering indicates that differences in institutional policy and support have more impact on uptake of Open Science than do practical difficulties and confidence in tools and platforms.

Table 4: Barrier Subscale Means and Overall Barrier Category

Panel A: Barrier Subscale Means

Barrier Construct	Mean	SD
Practical Barriers	3.51	0.86
Lack of Competency	3.47	0.88
Sentiment	3.19	0.82
Policy, Guidance & Institutional Support	3.79	0.84

Panel B: Barrier Category

Category	Range	n	%
Low	1.00-2.33	21	11.2
Moderate	2.34-3.66	96	51.1
High	3.67-5.00	71	37.8

If categorized into the overall Barrier Index, more than one-third of respondents reported barriers as High (37.8%, $n = 71$); 51.1% ($n = 96$) reported Moderate and 11.2% ($n = 21$) reported Low. Not all academic disciplines experienced barriers evenly – the category of barrier was significantly associated with programme group, $\chi^2(8, N = 188) = 18.42, p = .018, V = 0.22$, a medium effect. Gender showed no such association, $\chi^2(4, N = 188) = 3.08, p = .544, V = 0.09$ (Table 5).

Table 5: Chi-Square Tests of Association (Barrier Category)

Variable 1	Variable 2	Chi-square	df	p	V
Programme Group	Barrier Category	18.42	8	0.018	0.22
Gender	Barrier Category	3.08	4	0.544	0.09

This disciplinary variation is explained with the help of interview accounts. The library staff identified funds as a barrier that limits their change-agent role, followed by staffing pressures and a lack of a university-wide Open Science policy. This unevenness across department is reflected in one participant's comment that implementation is very programme-wise in different departments without a university-wide policy (LS05), which is similar to the findings of the survey across programme clusters. Another made the link between the problem and the matter of resourcing, noting that workshops, digital infrastructure and research all need to be resourced, and funding is only enough for a certain amount of work (LS14). This is consistent with what Imoro and Saurombe (2024) found, which is that recruiting systems librarians is not enough to address the issues stemming from infrastructure gaps; funding and policy seem to be the bigger impediment here. This implies that some of the practical or personal barriers that graduate students report are simply a downstream consequence of the institutional barriers that library staff encounter—rather than a distinct barrier.

The results of these institutions are consistent with previous research on the role of academic libraries in supporting Open Science in four Sub-Saharan African countries (Ghana, Nigeria, Tanzania and Uganda) that found policy and infrastructure gaps as key barriers (Siyao et al., 2017). The present results indicate the institutional weaknesses are not limited to a single technical university and pose a challenge to the library staff to maintain a coherent change-agent position.

The barriers mentioned in this report suggest structural and institutional constraints, not deficiencies in individual staff skills or work. In the last section library staff outlined strategies that are well aligned with Rogers' (2003) idea of a change-agent, strategies that are not their lack of will or competence but are inhibited by the institutional framework in which they need to act as a change-agent.

Staff perspectives on Addressing the Challenges

Objective 3 (challenges confronting library staff in their change-agent role) measured the perceived impact of these barriers and mapped their variation by discipline; in this section, however, the focus shifts to what library staff themselves believe would solve these barriers. These proposals suggest solutions that go beyond the library and are based on institutional structures; they don't rely on the library staff to solve the problem.

One participant explicitly highlighted the need to go beyond the library to institutionalise Open Science, pointing out the need for support from supervisors, departments and university management during the research process (LS08). This framing goes beyond Open Science being an object of the library's service, as the barriers listed above are at least as much policy and funding issues that the library has no control over as they are issues of the library's service.

Another member of the group indicated that a lack of timing was the issue, rather than of authority, that repository training be integrated from the beginning of a graduate research process (LS16). This is consistent with the overall picture of graduate students themselves, who, with a few exceptions, showed little interest in the repository throughout most of their programme.

The common thread in both accounts is that the solutions that library staff suggest are not those that the library has the power to implement on its own. What is required, on the basis of this evidence, is that Open

Science is adopted and institutional momentum continues to develop, not only through the library, but also by integrating Open Science from the inception of research itself; that is, by involving actors beyond the library, and that recommendations produced by this study take this into account.

CONCLUSION

The purpose of this study was to determine the awareness and practice of OS by graduate students at Kumasi Technical University, to identify the strategies used as change agents by the academic library staff in the promotion of OS and to identify the challenges that pose problems for the academic library staff in promoting OS. The results indicated that graduate students have a fair level of awareness of the concept of OS, and that OS adoption is more likely to vary closer to the time of thesis submission. To address this, library staff have sought to make a shift from the traditional collection management role, and are now primarily using orientation sessions, workshops and individual consultations to get students more engaged. The impact of these activities is, however, constrained not so much by staff effort as by institutional capacity, such as funding, staffing and the lack of a university-wide OS policy. There seems to be a greater need to strengthen the institutional structures in which library staff work, rather than to increase awareness among students, of the gap between awareness and adoption identified

RECOMMENDATIONS

1. University Management should establish and put into practice a university-wide OS policy that explicitly sets the expectations regarding the outputs of graduate research, and which offers a uniform commitment from the university.
2. Academic departments should integrate OS training into their departmental research activities and/or seminars as opposed to relying on voluntary attendance at OS training events hosted by the library.
3. Library Management should build on existing capacity development initiatives such as orientation sessions and individual consultations, and ensure that these are continued and scaled up, but that such initiatives are not expected to close the awareness-adoption divide without the institutional and the departmental support provided above.

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