

Strategies for the use of open access institutional repositories at universities in Ghana

Use of open access institutional repositories

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Abstract

Purpose – This article suggests strategies for the usage of open access institutional repositories (OAIR) at university libraries in Ghana.

Design/methodology/approach – Pragmatism paradigm, mixed methods research approach and convergent parallel mixed method design was adopted. Simple random sampling, stratified random sampling, purposive sampling techniques and the sample size converter were the sampling procedures and methods employed. The questionnaire and interview guide were used as research instruments to gather relevant data for the study. Descriptive statistics and inferential statistics were used as statistical tools to analyze quantitative and thematic analysis was used to analyze qualitative data.

Findings – Factors such as software, staffing, advocacy, marketing and policies are crucial in the development of OAIR strategy at the University of Ghana.

Research limitations/implications – Information from the National Accreditations Board (NAB) of Ghana (2018) indicates that Ghana has 92 Higher Educational Institutions (HEI). These are categorized into nine national public universities, eight technical universities, ten professional institutions and 65 private universities and university colleges. This article focuses only on five university libraries with the understanding that they were the only universities on the Directory of Open Access Repositories, authoritative international registries of repositories that provide data on the number of registered Institutional Repositories throughout the world.

Practical implications – It is envisaged that the findings will benefit policymakers, academic staff, university library management and librarians. Academic staff will recognize the need to use OAIR. OAIR managers and administrators will be able to determine the factors affecting the usage of OAIR in university libraries and will be able to design strategies on how OAIR can be sustained and managed.

Originality/value – The article suggests strategies for the usage of OAIR that are instrumental for university libraries in Ghana. The strategies consist of an Institutional Guideline that requires adequate marketing, policies, software and staffing. The research also provided an understanding of OAIR through the lenses of technology acceptance model (TAM) an extension of the Theory of Reasoned Action (TRA) to explain the usage of OAIR in university libraries in Ghana.

Keywords Academic libraries, Ghana, Institutional repositories, Open access, Strategies, Technology acceptance model, University libraries

Paper type Case study

Introduction

The open access (OA) movement in academic/university libraries has brought forth the concept of open access institutional repositories (OAIRs) (Dlamini and Snyman, 2017). Technology and interoperability requirements now provide libraries in developing countries with more opportunities to disseminate local research and, in so doing, to bridge the knowledge gap. Most academic libraries have embraced OAIRs to effectively communicate their institutions' research output, and in so doing provide researchers with opportunities to enhance the visibility of their publications (Bryson, 2017). The sharing of resources could lead to improved teaching and learning efficiency, the exchange of good practice, greater consistency, and a heightened sense of community growth.



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OAIRs provide authors with a worldwide audience – more so than any subscription-based journal could do, no matter how prestigious or popular – as the exposure and influence of their research is demonstrably enhanced (Ali *et al.*, 2013; Jain, 2012). Abrizah *et al.* (2017) state that many universities around the world have launched projects to build repositories which will enable faculty and researchers to upload and access academic literature, and to share resources within their institution or across the country. One of the pathways being used to enhance the availability, accessibility and visibility of content from Africa, is through OAIRs (Dlamini and Snyman, 2017).

According to the Association of College and Research Libraries (ACRL), increasing numbers of institutions are setting up repositories to house the publications stemming from their faculty, thereby granting users open access as a way of disseminating and viewing their academic performance (Dawson and Yang, 2016, p. 3). Although the growth of OAIRs in developed nations (and some developing countries such as Brazil and India) has been remarkable, not much has happened in sub-Saharan Africa, except at South African, Kenyan and Nigerian universities (Adeyemi *et al.*, 2017). The Directory of Open Access Repositories (DOAR, 2018) indicates that there are 33 (21%), 29 (18%) and 21 (13%) active OAIRs in university libraries in South Africa, Kenya and Nigeria respectively. This situation is cause for concern, as the use of OAIRs can potentially minimize problems and promote information flow, access, retrieval and sharing amongst national and regional universities alike.

In terms of research performance, developing countries in Africa rank lowest (Dlamini and Snyman, 2017). Most of the research outputs of African academics and researchers gather dust in the various departmental offices and institutional libraries, without being published (Mohammed, 2013). According to Dlamini and Snyman (2017), African academics strive to publish in internationally renowned peer-reviewed journals, to ensure academic promotion. The work of many scholars is not, however, taken up in these journals, whose subscription rates are too high for most African university libraries. This makes the African researcher highly dependent on research generated in developed countries – research which is often not truly relevant to African information consumers (Ezema, 2011). The use of OAIRs in African academic institutions currently faces serious developmental challenges, amidst the fourth industrial revolution and the quest to transform and decolonize universities on this continent.

The small number of OAIRs in African countries is partly the result of the limited information that potential contributors have, and the lack of government policies on the implementation of such repositories (Abrizah *et al.*, 2017). Amongst the 158 (100%) institutional repositories in Africa, only five (3%) are in Ghana, notwithstanding the volumes of research output emanating from Ghanaian universities (DOAR, 2018; ROAR, 2018). Although research is compulsory for both academic staff and students at Ghanaian universities (either by job description or prescribed academic program of study), those research outputs reside in obscurity, invisible to those who need them. Many university libraries in Ghana continue to battle to make their research outputs open and accessible through OAIRs.

Repository policies are largely undefined and under-analyzed, with metadata reuse policy and full data item policy remaining explicitly undefined, as is the case with content, submission and preservation policies (Adeyemi *et al.*, 2017). The state of OAIR in Ghana emphasizes the need for an effective process of information collection and dissemination at universities. In the light of this scenario, and the fact that OAIRs are largely unused, the current study will seek to investigate the state of affairs and suggest a strategy for the use of OAIRs at university libraries in Ghana. The aim is that the empirical study reported on here, will help to bridge the existing knowledge gap.

Statement of the problem and purpose of the study

OAIRs increase the visibility of an institution in terms of sourcing funds for potential new researchers and students (Abrizah *et al.*, 2017; Dlamini and Snyman, 2017; Ibinaiye *et al.*, 2015;

Lagzian *et al.*, 2015). A major benefit of OAIRs is that they facilitate the recognition of individuals' academic outputs, highlight researchers' work and academic activities to the world (Agyen-Gyasi *et al.*, 2010), and provide access to the world's research, by ensuring the long-term preservation of large volumes of academic outputs (Ibinaiye *et al.*, 2015; Lagzian *et al.*, 2015). Nonetheless, there is a reluctance among academic staff in Ghana to contribute to such repositories – most do not submit their research outputs for this purpose, as is evident from the low number of deposits, while analytics also show there is a low number of OAIR users at libraries. This article investigates the trends in OAIRs at university libraries in Ghana and recommend strategies to enhance future prospects for improved its use.

In this article is guided by a number of research questions:

- (1) Do OAIR guidelines exist at university libraries in Ghana?
- (2) Why are OAIR guidelines needed at university libraries in Ghana?
- (3) What strategies can be developed to improve the use of OAIRs at university libraries in Ghana?

Theory and literature review

This section highlights theoretical perspective and review OAIRs.

In this article, the Technology Acceptance Model (TAM) – an information-systems theory – was adopted as the theory and model to demonstrate the acceptance and use of technology. The model suggests that many factors influence users' decisions about how and when to use any new technology they are presented with. Notable factors influencing decision-making are perceived usefulness (PU) and perceived ease of use (PEOU), with PU being the degree to which a person believes using a particular system will enhance job performance, and PEOU being the degree to which a person believes it would be effortless to use a particular system (Davis *et al.*, 1989). TAM has been continuously studied and expanded: major upgrades include TAM2 (Venkatesh, 2000; Venkatesh and Davis, 2000), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003) and TAM3 in the context of e-commerce, including trust effects and perceived risk on system usage (Venkatesh and Bala, 2008).

Overview of OAIRs

Globally, the systems development of information and communication technologies (ICTs) has become a core and vital component of organizational operations. ICT-based approaches are increasingly valued by organizations (including universities) for providing and enhancing the delivery of quality services to clients (Ondieki Makori, 2013). ICTs have eliminated many of the limitations which are traditionally associated with access to knowledge, such as geographical barriers, time constraints, delays in dissemination, and usability barriers which restrict the range of sources a single person can access (Rahman and Panda, 2012). According to Kakai (2018), the principle of OA is supported by OAIR through authors self-archiving copies of their already-published research articles in their respective institutional archives. Those copies are made available for free and disseminated as widely as possible, to contribute to knowledge building in their institutions, without constraints related to access and costs.

Notably, OAIRs include courseware, back copies of journal articles, subject-specific repositories, conference papers, technical reports, theses, dissertations and other institution-specific materials. Information from DOAR (2018) and the Registry of Open Access Repositories (ROAR, 2018) catalogues revealed that, globally, OAIRs have largely

multiplied the number of materials deposited in this format. OAIRs have a tendency to increase academic communication, but as a mode of disseminating information their use is not yet pervasive in developing countries, compared to advanced nations such as the United States, the United Kingdom and many European countries (Abrizah *et al.*, 2017).

OAIRs grant international exposure to the academic research which an institution undertakes, by offering OA to self-archived outputs. These repositories also store and preserve other electronic institutional resources, including unpublished or grey literature (materials produced outside the traditional commercial publishing distribution channels). By offering critical components that expand access to research and increase competition they reduce the monopolistic power of journals, thereby providing economic relief to the institutions and libraries supporting them. OAIRs act as concrete indicators of the excellence of a university, and boost its prestige, reputation and public value. Institutional repositories provide the current scholarly publishing model with an immediate and useful component, while promoting creativity in a new disaggregated publishing system that is bound to develop and improve over time. Therefore, within the current scholarly journals framework, OAIRs provides a strategic solution to problems (Adeyemi *et al.*, 2017).

Okumu (2015) describes OAIRs as a means by which diverse digital materials, produced locally, can be both collected and accessed. OAIRs house the collection of an organization's intellectual capital (Okumu, 2015), being tools/systems that allow the intellectual output of an institution to be recorded, stored, preserved and disseminated in electronic form. Their scope differs from institution to institution: some capture theses and dissertations, while others capture published papers, unpublished preprints, working papers, conference presentations, datasets, teaching materials and similar texts (Okumu, 2015). Thus, as a database, OAIRs provide services which include recording, storing, archiving, preserving and redistributing a university's research outputs in various digital formats (Dlamini and Snyman, 2017). Such electronic intellectual product repositories may be created by an institution's faculty, researchers and students, and are open to end users within and outside the institution, with few (if any) barriers to entry (Ezema and Onyancha, 2016; Ibinaiye *et al.*, 2015). For this reason, Dlamini and Snyman (2017) define OAIRs as digital/electronic archives/repositories which store and disseminate the findings of institutional research.

At research-intensive institutions, OAIR is becoming part of the technical infrastructure and a preferred option for retrieving research output free of charge, thanks to a web-based online archive that shows the full text of the items available, and offers free and immediate access without restrictions. Ibinaiye *et al.* (2015) note that, regardless of intent or source, OAIR may consist of any collection of digital material which is hosted, owned, managed or disseminated by a college or university. According to Adeyemi *et al.* (2017), OAIR is an online locus for collecting, preserving and disseminating (particularly academic or research) institutions' intellectual output in digital form. This includes documents such as research articles (pre-peer review or printing) and digital versions of theses and dissertations. OAIR may include other digital assets created in the course of normal academic life, such as administrative records, course notes or objects of learning (Adeyemi *et al.*, 2017). Consequently, OAIR is institutionally defined; the content may be purely academic, but it may include administrative, teaching and research material (both published and unpublished), it is cumulative and perpetual, accessible and interoperable, and it fosters academic interaction (Adeyemi *et al.*, 2017). Therefore, OAIR is one of the strategies different groups can use to address user information needs, although it face several challenges as it evolves. Nonetheless, it is crucial to maintain a critical view of how OAIRs can best be employed to disseminate research results, despite their technical drawbacks.

Open access

Key to the provision of worldwide information and knowledge in OA is Internet connectivity. Access to online information requires the use of the Internet, preferably without any financial, legal or technical barriers (Loan, 2014). A number of concepts and terms are associated with OA, as its scope continues to evolve. Nevertheless, the best current definition builds on concepts proposed by, amongst others, the Budapest Open Access Initiative (2002), the Bethesda Statement on Open Access Publishing (2003), the Berlin Declaration on Open Access to Knowledge in Science and Humanities (2003) and the Bangalore Open Access Commitment (2006) (Mgonzo and Yonah, 2014).

Increasing interest in OA scholarly communication is mainly due to the marked opportunities which such initiatives provide for the wider dissemination of research findings, particularly in and among developing countries. Access to scholarly information has traditionally been restricted by subscriptions, licenses or other fees payable to commercial publishing houses (Bjork, 2017). OA is a platform that offers researchers greater opportunity to disseminate their findings widely, without concomitant article processing charges (Van Noorden, 2013).

OA grants researchers freely available information (Nwagwu and Ojemeni, 2015), as it increasingly breaks down barriers to access which have, for years, slowed down the universal availability of data. A study by Bjork and Solomon (2012), however, found that research grantors have begun requesting OA publishing from their grantees. For instance, the National Institute of Health (NIH) requires OA publishing for all its funded research, to reduce the cost of subscription of health researchers (Ezema and Onyancha, 2016). In particular, OA has become more pressing since the development of the world wide web (WWW) in the 1990s, as researchers found a new platform for disseminating their research on the Internet (Ezema and Onyancha, 2016).

Challenges in using OAIRs

Amongst the challenges of using OAIRs in Africa are funding shortages, language barriers, inadequate ICT infrastructure and a lack of highly qualified personnel (Ezema, 2011). The technological challenges are linked to low web usage and a lack of access to pertinent yet global scientific information on the web (Nwagwu and Ibitola, 2010) – the latter has resulted in a skewed distribution of knowledge in favor of the West. Other hindrances to OAIRs are associated with institutional inertia, with some questioning their acceptability of their content for the purposes of promotion, the retention of tenure and access to research grants (Singeh *et al.*, 2013). In spite of creating increasing awareness of OA publications, the tool has limited use as a publication channel (Kakai, 2018).

Wacha and Wisner (2011) concur, arguing that this problem could be solved if libraries moved their focus from their own needs, to those of faculty. Educational and research institutions are, however, yet to fully exploit the benefits provided by institutional repositories (Adeyemi *et al.*, 2017). Generally, the slow uptake of institutional repositories can be attributed to inadequate advocacy, different publication types, multiple versions, intellectual property rights and copyright issues, as well as problems with Internet self-efficacy, ICT connectivity and infrastructure, the institutional culture/politics/commitment, OAIR policies, limited awareness of OAIR, inadequate funding of OAIRs, a lack of reward systems and incentives, and inefficient power supply across the continent.

Strategies for using OAIRs

Technology, management, advertising and advocacy policies are amongst the factors to be considered in the use of OAIR. Securing reliable back-up power in most African countries

remains a challenge (Agyen-Gyasi *et al.*, 2010). Agyen-Gyasi *et al.* (2010) notes that, regardless of the service selected, the software will still need to be evaluated, specifically as regards the hardware requirements, user interfaces, functionalities, the acceptable data formats that can be uploaded to the platform, the ability to accept imports/exports and integrate into existing library management programs, and the standard harvesters that could be collected. When selecting software for OAIRs, it is imperative to determine the security levels offered (against hacking) and what auxiliary software is required (e.g. for Portable Document Format [PDF] and picture managers) (Agyen-Gyasi *et al.*, 2010). Currently, Dspace, Eprints and Fedora software are used by most universities with institutional repositories (Agyen-Gyasi *et al.*, 2010).

A growing body of literature has explored the roles librarians play in creating OAIRs (Adeyemi *et al.*, 2017; Agyen-Gyasi *et al.*, 2010; Dlamini and Snyman, 2017; Ibinaiye *et al.*, 2015; Kakai, 2018). Electronic collection management and open archive information system management skills are now mandatory for library staff. To prepare documents in an appropriate format and apply material to OAIR using a simple interface, library staff and researchers must be suitably qualified. The library at Glasgow University has, for instance, created a fully mediated service for faculty members, where library staff manage the entire submission process – from metadata entry to uploading file conversion. Library staff thus need to develop content management policies in terms of identifying the collection. In finding, describing, storing and organizing information content, library workers can negotiate with users on content priorities (e.g. what metadata to store and present, whether to include teaching materials, and how to handle successive drafts of the same paper). The current author of this paper also suggests that Librarians can also evaluate the performance of the collection and subsequently make decisions on access, sustainability and preservation. Ideally, voluntary research submissions will seed each OAIR and support its development. Currently, even if researchers support this plan in theory, very few take voluntarily action. Therefore, library staff should take a proactive position in the collection of OAIR material, and strive to implement a sustainable approach. Their role has expanded to include working with IT staff and academics, and managing and disseminating research output/learning objects from their own institutions. Libraries have thus gone beyond their custodial role, to actively contributing to the evolving process of academic communication.

A crucial factor is the promotion of OAIR amongst staff. To this end, library staff need to support OAIRs relentlessly. Changing the culture of academic communications is no easy task, and academic acceptance is bound to remain slow. For many researchers, OAIR is an uncommon term. Advocacy is thus a critical aspect of any OAIR project. In this regard, library staff at the University of Melbourne visited departments, maintained a promotional website and showed impressive usage statistics on specific articles. They also published in their university journals and held related seminars (Kakai, 2018). Nowadays, the general consensus is that the central challenge for developing an OAIR lies not in its technical implementation, but in effecting a mind-shift amongst researchers, so that they make self-archiving an integral part of their academic life. While investors also need to be involved in OAIR advocacy, engaging researchers to sensitize their colleagues and include more library staff in promoting OAIR could go a long way towards reaching a broader university community. This approach worked quite well at the University of Kansas, the Grand Valley State University of Michigan and the University of Oregon libraries (Kakai, 2018). Kakai (2018) suggests that the top-down development of OA policies should begin with government and funding agencies, to smooth the path institutions take to develop OAIR policies, as stakeholders would then have prior knowledge of OA policies and easily implement OAIR policies.

In a review of web-linked citations in scholarly articles, Carlson (2010) found that almost one-third were no longer active, while another third no longer referred to information relevant

to the citation. Updating data is therefore vital for scholarly research. This is more difficult to measure as a success factor, but researchers who are familiar with OAIR from both the input and search sides, should be encouraged to use it. Together with an institutional mandate, these inducements may encourage more scholars to deposit their work.

Methodology

Pragmatism was adopted as a paradigm, along with the mixed-methods research approach. Using mixed-methods design, quantitative and qualitative data were concurrently collected in a single phase. The data were subsequently analyzed separately, then compared and combined. Here, simple random sampling and purposive sampling were used. Five university libraries in Ghana, from amongst the country's 92 higher education institutions, were purposively selected because they were the only universities listed on the [DOAR \(2018\)](#). They are the University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Cape Coast (UCC), University for Development Studies (UDS) and Ashesi University (AU). These libraries were obligated to meet certain operational criteria in respect of infrastructure and resources, the number of qualified and permanent staff, how well equipped they were, the postgraduate programs on offer, and the operational status of their OAIRs.

The target population of the study was the 3 451 academic and the library staff who served as OAIR managers at the five selected universities: 3 439 academic staff were identified for the quantitative phase, and 12 library staff in the qualitative phase. The population was deemed to be uniform, because the researcher believed the participants were stakeholders who sought to enhance the learning environment through instruction, applied research, scholarly activity and service, all of which support the mission of a university. Academic staff have various ranks, therefore the study participants were stratified prior to being randomly selected, so that each rank would be fairly represented. The study used a statistical power analysis software package known as the Sample Size Calculator of Creative Research System to calculate the sample size for each rank (Creative Research Systems, 2003). Of the 3 439 academic staff, 1 085 were randomly selected to participate in the quantitative study. In the end, 998 respondents completed the questionnaire which had been distributed face to face – a response rate of 91.98%. [Bryman \(2012\)](#) notes that a response rate of 60–69% is already acceptable. For the qualitative phase, 12 library staff (OAIR managers) were purposively selected.

A data collection technique is determined by the researcher's chosen research design. After carefully examining the research questions, the type of information the researcher wished to obtain, the paradigm and the purpose of the study as well as related studies, the researcher chose a questionnaire for the quantitative phase and semi-structured interviews (using an interview guide) for the qualitative phase as instruments. Thus, the quantitative and qualitative data were collected together, using both questionnaires and interviews. The data were presented in frequencies, percentages, mean and standard deviations, using a five-point Likert scale. The findings from the qualitative and quantitative data are presented in the next section.

Findings and discussion

The quantitative and qualitative data, which sought to establish the strategies for OAIR use at university libraries, are presented and discussed in this section. With regard to the findings, the need to create OAIR institutional guidelines, the reasons for such guidelines, and strategies universities could employ to enhance the use of OAIRs were emphasized. This section provides findings on the following three research questions:

- (1) Do OAIR guidelines exist at university libraries in Ghana?
- (2) Why are OAIR guidelines needed at university libraries in Ghana?
- (3) What strategies can be developed to improve the use of OAIRs at university libraries in Ghana?

The first research question sought to determine whether institutional guidelines on OAIRs exist at the respective universities. According to the findings, almost half of the respondents (512; 51.3%) answered in the affirmative, 486 (48.7%) answered in the negative (see Table 1).

The qualitative analyses sought to examine whether interviewees' institutions had OAIR policies that guided the day-to-day running of the repository (administrative and supervisory). In this regard, UGP2 stated:

UCCP3 added:

As for UCC we have a policy, but it is not functional. What we have as policy and what we do, do not align. So yes, there is a policy, but it is not operational.

As UCCP1 explained:

We have the policy, it should be enforced. Though we have it, it is not enforced.

As AUP1 observed:

Yes, we have it, IR (institutional repository) policy is not formal, we are still on it.

KNUSTP1 expressed this view:

For the policy, I am to find out whether we have the policy or not.

As AUP2 stated:

Yes, we have, it helps to improve OAIR usage.

The interview data further highlighted the details in the guidelines. It emerged that the way in which the contents are archived, are enshrined in those guidelines. UGP1 noted:

Yes, we have guidelines for the collection of content, storing content and the sharing of content.

The second research question focused on the reasons for creating institutional guidelines on OAIRs. To this end, a medium mean of means and SD ($M = 3.71$, $SD = 0.930$) were obtained. The individual mean score of ten items identified was also above the test value. Some of the reasons which the respondents identified, included a general lack of awareness about OAIRs ($M = 3.94$, $SD = 0.885$), the absence of national guidelines/mandates/policies by research funders and/or unclear legal frameworks ($M = 3.91$, $SD = 0.964$), the unclear distribution of responsibility and a lack of institutional coordination among the different stakeholders (researchers, departments, libraries, funders) ($M = 3.82$, $SD = 0.912$) and a lack of infrastructure/the absence of funds to develop the necessary infrastructure ($M = 3.82$, $SD = 0.967$) (see Table 2).

The interviewees mentioned the need for OAIR guidelines at university libraries in Ghana. As UCCP1 explained:

Does an institutional guideline exist on OAIR?		Frequency	%
Yes		512	51.3
No		486	48.7

Table 1.
Descriptive analysis of institutional guideline existence of OAIRs

Source(s): Field data

The guidelines will be in the policy, it will help us to stay focused.

UGP2 stated:

The policy will keep the staff on their toes. It will help structure the OAIR to conform to an international standard. The guide or a manual will help us to know what to do. It will also help other universities to call on us if they want to have a repository.

The third research question focused on the strategies universities could employ to enhance the use of OAIR among staff. Here, a medium mean of means and SD of $M = 4.14$, $SD = 0.907$ were obtained. The individual mean score of four items identified was also above the test value. These strategies include advocacy and marketing ($M = 4.41$, $SD = 0.823$), software ($M = 4.23$, $SD = 0.954$), staffing ($M = 4.11$, $SD = 0.968$) and policies ($M = 3.80$, $SD = 0.881$) (see Table 3).

The interviewees highlighted the need for funding guidelines and also the need to educate potential users as reported in the following. UCCP1 explained:

The institution can have maybe another backup power system so that the system will run 24/7, and then also [offer] training or workshop[s] or seminar[s] for the users, so that publicity can be wide, and [occur] from time to time when the need arises. The seminar or workshop [will] let users know what to do when using the platform.

UGP3 added:

We will need continuous education of management of the platform. We should get a standing budget for this, we should go out there and see what other universities outside are doing, and add to ours. We need to be sponsored, go out there to be trained. They should push a lot of money into replacing broken-down items.

Reasons for institutional guidelines on OAIRs	Mean	SD
General lack of awareness on the topic	3.94	0.885
Absence of national guidelines/mandates/policies by research funders and/or unclear legal frameworks	3.91	0.964
Unclear distribution of responsibility and lack of institutional coordination among different stakeholders	3.82	0.912
Lack of infrastructure or absence of funds to develop the necessary infrastructure	3.82	0.967
Lack of expertise on the topic at institutional level	3.79	0.976
Priority given implementing institutional policy on OA to research publications	3.67	0.876
Novelty of the topic	3.58	0.854
Low interest levels from researchers	3.58	0.921
Technical complexity in implementing OA to research data	3.49	0.989
Complexity of the topic	3.46	0.957
Mean of means	3.71	0.930

Source(s): Field data

Table 2.
Descriptive analysis of reasons for institutional guidelines on OAIRs

Strategies for usage of OAIRs	Means	SD
Advocacy and marketing	4.41	0.823
Software	4.23	0.954
Staffing	4.11	0.968
Policies	3.80	0.881
Mean of means	4.14	0.907

Source(s): Field data

Table 3.
Descriptive analysis on strategies for usage of OAIRs

UCCP2 commented:

We should integrate this into our orientation programmes for first-time academic staff, give them training, and we are good to go. We have the print policy and the soft copy, it addresses the main fundamentals of the repository and explains some terms in there, and deals with copyrights.

Other strategies which emerged from the interview, were effective advocacy and marketing. The interviewees were of the view that when OAIRs are properly promoted amongst the university community, that will go a long way towards highlighting their usage and benefits. As AUP1 observed:

Advocacy, marketing, funding and IT (whether outsourcing) are key. Just the marketing – we can advocate for the faculty to bring their work. It will help to promote and regulate its use.

KNUSTP1 expressed this view:

We should train academic staff to do self-archiving and upload. It will reduce OAIR our workload. Everybody has to embrace the effort that we are making, so that everyone can play their role well, so that we can have a roster system. The servers are housed elsewhere, but we control them and manage them ourselves.

It emerged from the data that the only way of improving use, is to create greater awareness. As AUP2 stated:

We can advocate for the faculty to bring their work.

The interview data further highlighted the details in the guidelines. It emerged that the way in which the contents are archived, are enshrined in those guidelines. UGP2 stated:

I think OAIR should be promoted, people do not promote it. There are a lot of schools running institutional repositories, but people do not know [this]. And the universities must highlight the link of the OAIR, do orientations, talk about it to new students. Also, the OAIR should be openly accessible, because there are some IRs which are not openly accessible.

KNUSTP2 added:

We need a strong policy spelling out how OAIR is important to the university, the roles to be played by staff.

UCCP3 also said:

There will be only one suggestion from me that is to make it a policy for faculty members to use it for their scholarly work. Make it compulsory. They should submit their work, so that they can be promoted. It will help us to promote the OAIR all the time.

AUP2 remarked on current endeavours:

For files they are all in the cloud. We buy cloud space for anything we want to work on.

In respect of possible solutions, UCCP2 noted:

To get usage we need to get more contents into it, and to do more advocacy, to strengthen and minimise the unfired use of some of the contents, so we can increase our ratings and findings.

AUR1 commented:

Funding, technological know-how and IT experts should be taken seriously, they are the backbone of AOIR. They say they will provide, but when the time comes they say “no funds”. The awareness is not properly done; we should start creating awareness for people to patronise the platform.

These responses emphasize the need for librarians to be in charge of repositories, to collaborate with academic staff in driving the use of OAIRs. They all agreed that hosting their own workshops or training would allow them to invite OAIR experts or specialists not only to inform them, but also to support them where processes were already in place.

Discussions

The findings on research question one reflects the need to create institutional guidelines because although some university libraries had such guidelines, they were not official implemented. Participants were in favor of a university mandates requiring researchers to deposit their research output in the OAIR, a finding corroborated by several researchers (Dutta and Dibyendu, 2014; Chilimo, 2016; Kakai, 2018; Singeh *et al.*, 2013; Yang and Li, 2015). The Consortium of Uganda University Libraries (CUUL) has integrated mandatory statements in its OAIR policies. Although these are highly recommended, Quinn (2010) points out that making it mandatory will not overcome researchers' mental aversion to participating in OAIRs by sharing their work. Kakai (2018), noted the need for other strategies to encourage faculty to deposit their output in OAIRs provided the authors feel secure in doing so. Kakai (2018) further observed that institutions which initiate repositories do not usually have related policies from the outset, and this hampers efforts at implementation. With the training and guidance provided the situation is improving, as universities with stringent OA policies seem more able to attract content to their repositories

The findings from research question two revealed several reasons for creating institutional guidelines on OAIRs. Amongst the reasons are a general lack of awareness on the topic, the absence of national guidelines/mandates/policies on the part of research funders. Also, unclear legal frameworks, the unclear distribution of responsibility, a lack of institutional coordination amongst stakeholders (researchers, departments, libraries, funders) was further highlighted as possible reasons for creating institutional guidelines on OAIRs. Furthermore, lack of infrastructure and funds to develop infrastructure, a lack of expertise on the topic at the institutional level, no priority given to implementing institutional policy on OA to research publications was also identified. In addition the novelty of the topic, minimal interest from researchers, technical complexities in implementing OA to research data, and the general complexity of the topic was noted. The need to involve more stakeholders in OAIR advocacy was also highlighted. OAIR advocacy may take the form of engaging researchers in sensitizing their colleagues and involving more library staff in the marketing of OAIR, as it could help to reach a wider community within the university.

The third research question draws from the findings of research question one and two to identify various strategies that can be adopted to enhance the use of OAIRs in university libraries. Amongst which are advocacy and marketing, policies software and staffing. These strategies summarized in Figure 1 below are discussed in the subsequent sections

Advocacy and marketing OAIR amongst faculty requires that library staff tirelessly promote their institutional repositories. Changing the culture of scholarly communications is challenging, and uptake remains slow amongst academics. By developing the infrastructure and encouraging early adoption, a critical mass of content will attract other researchers and illustrate to administrators how OAIRs are able to meet institutional needs. The general consensus is that the central challenge for developing OAIRs lies not in the technical implementation, but in changing researchers' mindsets so that they make self-archiving an integral part of their academic lives.

The dire need for priority on pertinent policies in the implementation of institutional policy on open access to research publications is evidence in the absence of national guidelines/mandates/policies by research funders, unclear legal frameworks, the unclear distribution of responsibility and the lack of institutional coordination among the different stakeholders An

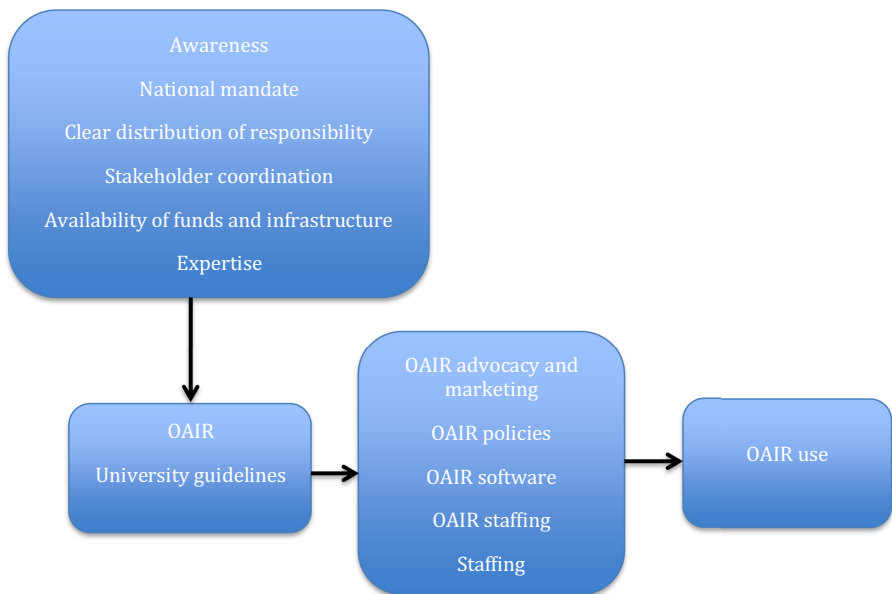


Figure 1.
OAIR strategies
(Kodua-Ntim, 2019)

incentive plan for adding material to the OAIR is whereby faculty compete for grants, which are then used to develop and add content to the OAIR an innovative way, to increase funding and stimulate the interest of researchers in archiving their work. (Carlson's 2010) The supposition is that researchers who are familiar with OAIRs, and can input materials and search for texts, will be keener to use the system. Perhaps these inducements, combined with an institutional mandate, will encourage scholars to deposit their work. Clear mandates and policies may ensure that deposits are made, thereby enlarging the available body of knowledge.

The need for software is reflected in the technical complexity in implementing OA research data, the lack of infrastructure and absence of funds to develop the necessary infrastructure. It is important to note that software will still have to be evaluated in several areas, namely hardware requirements, user interfaces, functionalities, the acceptable formats of data which can be uploaded onto the platform to integrate existing library management programs, (Agyen-Gyasi *et al.*, 2010). The security needed to protect data from hackers, and the auxiliary software required to support the software in use (e.g. PDF, picture managers) are essential when selecting software for OAIRs. There is also the need to have a reliable back-up power supply (a challenge in most African countries) (Agyen-Gyasi *et al.*, 2010).

A growing pool of literature focuses on the roles of staffing in developing OAIRs. Library staff must be conversant with digital collection management and have open archive information system management skills. Library and academic staff alike need to be trained to prepare documents in an acceptable format, and to submit content to their OAIR using a simple interface. Most university libraries in Ghana (UG, KNUST, UCC, UDS and AU) offer a fully mediated service for their academics, with library staff managing the entire submission process – from metadata entry to file conversion to uploading.

These issues may be due to the fact that library staff perform most OAIR-related activities, while academic staff participate in the creation and sharing of knowledge through teaching, learning, research and innovation. It is worth noting that academic staff and libraries showed the highest level of OAIR use at most of the visited universities. Thus, it is believed that

academic staff and libraries need to be empowered to expand the use of OAIRs. University libraries need to identify the knowledge expertise existing within individuals working at universities. In terms of defining the collection, library staff need to establish content management policies, as they are already experienced at selecting, describing, storing and managing information content. They can negotiate with users on content priorities (e.g. what metadata to store and present, whether or not to include teaching materials, and how to handle successive drafts of the same paper). OAIR managers should evaluate the performance of the collection and make decisions relating to access, conservation and preservation.

Ideally, voluntary submissions from academic staff will help to develop OAIRs and sustain their growth. While academic staff might support such projects in principle, very few take action voluntarily. Since libraries have moved beyond their custodial role, to contribute actively to the evolving scholarly communication process, library staff have to take a proactive stance in garnering content for OAIRs and working towards a sustainable approach. Their role should thus expand to include collaboration with IT and academic staff, to manage and disseminate the research outputs and learning objects generated by their own universities.

Conclusion and recommendation

This article proposed strategies for OAIRs at academic libraries in Ghana. Notably, university libraries continue to experience challenges in their day-to-day running, which vary from university to university, but nonetheless affect OAIR use. Amongst these challenges are insufficient advocacy, inadequate ICT connectivity and infrastructure, insufficient technological skills, copyright issues, a lack of knowledge/awareness of OAIR, inadequate funding, an institutional culture and politics which are not conducive, the absence of incentives, inadequate power supply and a lack of institutional repository policy. However, attending to gaps in software provision, the up-skilling of staff, advocacy and marketing efforts as well as the implementation of policies, will enhance the use of OAIRs. Moreover, in this age of ICTs, access to full-text information resources should be readily available from OAIRs, if we as Africans are to meet the demands of the fourth industrial revolution.

In order to develop OAIR-related strategies for university libraries, a number of recommendations can be made:

- (1) Universities should ensure that there is adequate capacity for managing and developing repositories (including training and support).
- (2) University libraries should adopt a strict enforcement policy regarding copyright issues, the quality of content and access to the OAIR.
- (3) Universities should prepare mandatory policies for the submission of all types of intellectual output, including research articles.
- (4) Universities country-wide should promote the use of OAIRs for the global dissemination of their institutions' research outputs.
- (5) Library staff need to establish content management policies, since they are experienced at selecting, describing, storing and managing content. They can negotiate with academic staff on which content to prioritise.
- (6) OAIR managers should evaluate the performance of the collection, before making decisions relating to access, conservation and preservation.

It is crucial that a meeting of all stakeholders be held under the auspices of the university, to initiate targeted conversations (university and library management, academic and library staff). Such a meeting will provide answers to the following key questions:

- (1) What problems are repositories trying to solve?
- (2) What repository behavior would we like to see?
- (3) How can stakeholders work together to incentivize the use of repositories?
- (4) How can they stakeholders attend to different scholarly communication needs across different fields?
- (5) How can stakeholders make everyone accountable: university management, library management, academic staff and OAIR managers?
- (6) How can university achieve a sustainable, decentralized, networked system, while gaining efficiency through higher levels of aggregation.
- (7) How can the university minimize waste and maximize value in the OAIR ecosystem.

The suggested meeting seems a necessary first step in affecting changes within the world of repositories, many of which suffer due to insufficient resources. This could create a powerful and efficient worldwide hub of openly accessible, available and visible information. OAIRs were, for the most part, initially set up to meet the needs of their institutions, but are now meeting a broad demand for research by providing suitable infrastructure.

This article presents findings on the specific set of strategies of OAIR usage in universities. These strategies go beyond the remit of the current research, contacts have already been established with universities to explore how these strategies can be achieved collaboratively soon. The study provides indications to universities regarding several necessary technological skills that OAIR managers and users may need to have to manage and use the OAIR. The ultimate promise of technology is to make us masters of our world by the push of a button and the first rule of any technology is that automation applied to an efficient operation magnifies the efficiency. The article is timely considering the calls on universities to become more abreast with current OAIR technologies. Given the findings and based on the conclusion of the study, the following areas have been suggested for further research:

- (1) The study is limited to the academic staff of UG, KNUST, UCC, UDS and AU. Further studies can be replicated in different universities to compare the results.
- (2) Studies can be done to compare the usage of OAIR in public and private universities.
- (3) The study's sample is the university academic staff. Further studies can be done at different educational levels.
- (4) Similar studies can be done in other countries or cross-cultural studies can be done.
- (5) University management's influence on the usage of OAIR in the university libraries in Ghana can also be looked into.

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Further reading

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