Review Article

RESPONDING TO THE REALITY: EMERGING ROLES OF OPEN ACCESS INSTITUTIONAL REPOSITORIES AND THEIR CHALLENGES IN THE TECHNICAL UNIVERSITIES OF GHANA

Abstract

This paper discussed open access (OA) as an academic journal that is accessible online to readers without financial, legal, or technical barriers other than those inseparable from gaining access to the internet. The paper has also identified that in recent times where libraries are struggling to get e-resources to support teaching, learning, and research, harvesting the institutions' artifacts and research work has become the 'saviour' that Technical Universities in Ghana must embrace. In addition, the paper discusses the benefits of institutional repositories, as well as the challenges institutions such as Technical Universities face in the use of these resources in Ghana. The paper further suggests some steps academic libraries in Ghana could adopt in building effective institutional repositories.

Keywords: Open Acess; Institutional Repository; Benefits, Challenges; Technical University; Ghana**.**

Introduction

Institutions and organizations around the world have resources that have been concealed in archives or annals, vaults, attics, print formats, and in a variety of storage devices. These treasures span from scientific, technological, cultural, artistic, and historical materials mostly unavailable to searchers, academics, students and the public (Johnson, 2002) as cited in Ball et al (2016).

According to Li and Yong (2015), institutions of higher learning have been contending with how to manage their digital intellectual output spawned by members of its community which comprises journal articles, conference papers, reports, theses and dissertations, teaching materials, artwork, and research data. Agyen-Gyasi et al. (2012) also assert that the development in information communication technology (ICT) has made it easy to create, store and access digital materials. The World Wide Web has therefore enhanced the generation, dissemination and sharing of information among academics, researchers, students and the general public, shrinking geographical barriers. Also, coming in the wake of this development is electronic publishing and networked communication which have further opened new vistas for academics to communicate and disseminate their findings to the larger society. There are more channels for academics, researchers, and scholars to make their publications have a greater research impact, wider readership, and boost visibility.

Ironically, while this potential exists, Jain et al. (2013) reported that about 80-85% of the digital intellectual output of universities is marooned on computers and other places within faculty buildings and never made accessible to the public. In addition, the rising cost of online journals hamper subscription, and is becoming increasingly difficult for academic libraries to maintain a subscription to or let alone subscribe to new ones (Warren, 2003). Arguably, one can assert that no one library in Sub-Saharan Africa has the capacity to afford all the resources users need.

As a way of mitigating this challenge, institutions such as Massachusetts Institute of Technology (MIT) embarked on a research project titled DSpace. According to DSpace Project 2000, its aim is to build and sustain a long-term digital storage repository that gives an opening to explore problems surrounding access control, rights management, versioning, retrieval, community feedback, and malleable publishing capabilities.

In recent times, one important issue that has taken the centre stage in academia is the issue of open access institutional repositories. This has been occasioned by a plethora of writings as well as advocacy in support of open access to research outputs. According to Jantz and Wilson (2008) as in Agyen-Gyasi et al. (2012), academic libraries are currently in the middle of three important changes in the world of scholarly communication. These are the sudden upsurge in the number of journals that are now available on the internet, the development of internet technology which has allowed and inspired the democratization of knowledge and the means to make knowledge generally and inexpensively available. The library in a sense, can now transform itself into a publishing and archival institution by creating mechanisms whereby information could be collected, organized, preserved and broadly disseminated outside the confines of traditional publication format. One surest avenue to bring this to fruition is through an institutional repository.

Lynch (2003) regards IRs as essential infrastructure for modern scholarship. He points out that "the development of institutional repositories emerged as a new strategy that allows universities to apply serious, systematic leverage to accelerate changes taking place in scholarship and scholarly communication". To confirm this, Markey et al. (2007) remarked that "a considerable portion of scholarly records are born digital, and some scholarship are also produced in digital formats. The proliferation of digital scholarship raises serious and pressing issues about how to organize, access, and preserve scholarly materials. The response of academic institutions has been to build and deploy a well-established institutional repository. It is for this reason that this paper discusses the benefits and challenges of institutional repositories in the technical universities in Ghana.

Literature review

Open Access (OA)

In recent times, it is the expectation of students and faculty that they could have easy access to information. As such, open access provides easy access to information online. Open access has been defined differently by different people. Open Access (OA) are academic journals that are accessible online to the reader without financial, legal, or technical barriers other than those

inseparable from gaining access to the internet itself (Wikipedia, 2010). OA literature or journal entails free online copies of peer-reviewed journal articles and conference papers as well as technical reports, theses, and working papers. Open Access (OA) literature is digital, online, free of charge and free of most copyright and licensing restrictions (Suber, 2005).

The Budapest Open Access Initiative says:

> "*OA literature ensures free availability on the public internet, permitting users to read, download, copy, distribute, print, search or link to the full-text of these articles, crawl them for indexing, pass them as data to software, or use them for any lawful purpose without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself."*

Very often, there are no limitations on the use of open access materials because it is believed users use them for academic purposes only. In a publication entitled "*focusing on open access to peer-review research articles and their preprints*" Suber (2005) hints that OA removes price restrictions. This includes subscriptions, licensing payments, and pay-per-view fees. Open access grants flexibility about which permission barrier to remove. This stems from the fact that while some OA providers allow derivative works, some do not. While some do not restrict commercial re-use, some do. The main objective of OA is to 'tear' down or remove all the restrictions to access to research publications since it is a hinge to future scientific development.

Authors could provide open access by self-archiving on an IR for the institution or publishing in open access journals. Self-archiving, also called *Green Open Access* is the instance where authors deposit their works in the institutional repository by themselves. There are several varieties of OA journals including full-text open access to contents of scholarly, peer-reviewed journals which could be available either electronically or both electronic and print formats, hybrid open access journals permit some of the contents to be open access and delayed open access journals make content open access after 12 or 24 months. However, OA ought to be immediate rather than delayed, and should apply to full-text, not just abstracts or summaries.

Green OA open access is provided by authors publishing in any journal and then self-archiving their post-prints in their institutional repository or on some other OA websites. Green OA journal publishers sanction speedy OA self-archiving by their authors. Gold OA is provided by authors in an open-access journal that provides instant OA to all its publications on the publisher's website.

Institutional Repositories (IRs) defined

Several authorities including Lynch (2003) define IRs as "a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members." He goes on to say institutional repositories "will contain the intellectual works of faculty and students both research and teaching materials and also documentation of the activities of the institution itself. . ."

In the view of Crow (2002), IR is a "digital collection capturing and preserving the intellectual output of a single or multi-university community." In a similar vein, Johnson (2002) defines an IR as "a digital archive of the intellectual property created by faculty, research staff, and students of an institution and accessible to end-users both within and outside of the institution with few if any barriers to access."

An IR, therefore, is a locus for collecting, preserving, and disseminating in digital form the intellectual output of an institution, particularly an academic or research institution. In an institution of higher learning, this would encompass materials such as scholarly articles, before undergoing peer review or pre prints; and digital versions of theses and dissertations. IR also includes other digital assets generated by normal academic life, such as administrative documents, course notes, or learning objects (Dike, 2017). An IR is an avenue that ensures that published works of academics, researchers, and students are available to the academic community even after increases in subscription fees or budget cuts within libraries (Bhardjaw, 2014 & Boufarss, 2011).

IRs offer academics a common platform so that everyone in the institution can contribute scholarly materials to promote interdisciplinary research. IRs have a number of benefits, including access to resources, visibility of research, and presentation of content. The main goal of IR is to provide open access to institutional research output by self-archiving it, to create global visibility for an institution's scholarly research and to store and preserve other institutional digital assets, including unpublished works, working papers or technical reports.

According to Jain et al. (2012), a vital characteristic of an IR is that it is institutionally defined but may entail teaching, research and administrative materials, academic in scope (both published and unpublished), cumulative and perpetual, open and interoperable and enhances the process of scholarly communication.

Agyen-Gyasi et al. (2012) indicated that in an institution of higher learning, a gamut of materials are generated which is very dissimilar. They include different types of grey literature and other emphemeral and unpublished materials which comprises statistical reports, technical documentation, surveys, committee reports, memoranda, research and technical reports, departmental and research centre news letters and bulletins, conference proceedings, papers in support of grant applications, status report to funding agencies, preprints, working papers, theses and dissertations. According to SPARC (2002) and Crow (2002), the grey literature are essential part of informal scholarly communication process.

IRs give global visibility to an institution's research works, offer open access to institutional research output through self-archiving and store and preserve other institutional digital assets including unpublished works. They enable access to research and raise competition while reducing the monopoly power of journals, thereby bringing financial respite to the institutions and libraries.

Open Access (OA) and Institutional Repository (IR) Nexus

IRs are partly connected to the notion of digitalinteroperability which is in turn linked to the Open Archive Initiative (OAI) and its Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). The OAI in turn had its origins in the idea of a "Universal Preprint Service", since superseded by the open access movement. IRs are one of the commended means to attain the open access vision described in the Budapest Open Access Initiative. The Confederation of Open Access Repositories (COAR) states in its manifesto that "each individual repository is of limited value for research: the real power of open access lies in the possibility of connecting and tying together repositories which is why we need interoperability. OA relies on interoperability, the ability for systems to communicate with each other and pass information back and forth in a usable format".

Benefits of Open Access Institutional Repositories (OAIRs)

Institutional repository has benefits for institutions that have them as well as those authors who have their works on them. Earlier works done by Swan (2013); Daly and Organ (2009); Bankiers (2009) indicated the benefits as discussed below:

Benefits of OAIR to an Institution

In their briefing papers on open access repository, they highlighted a number of benefits that repositories bring to institutions that have them. They indicated that OAIRs give their institution's output a world wide audience, increases the prominence, prestige and impact of these output and showcase the institution to interested constituencies. The constituencies can include prospective staff and sudents, and other stakeholders. OAIRs serve as marketing tool to attract high quality staff, students and funding.

Another benefit is the centralization and storage of all types of institutional output, collect and curate digital outputs and afford institutions the ability to manage, track, measure and analyze research performance. It also provide workspace for work-in-porgress, and for collaborarive or large-scale projects enabling interdisplinary approach to research. Again, breaking down of publishers'cost and permission barriers.

They enhance the standardization of institutional records and promotion of a philosophy of wider communication. Support teaching and learning. Links may be made with the virtual teaching environment and library catalogues. They facilitate the development and sharing of digital teaching materials. In addition, they support students' endeavour, provide access to theses and dissertation and a location for the development of e-portfolios. Alleviation of requirement to trust publishers to maintain information in the long term, without any commercial benefit for the authors.

Benefits of OAIR to an Author

OAIR has manifold benefits to authors or content builders. It is an avenue to market an author or researcher through the display of his profile. Again, authors have access to wide range of information from experts in diverse disciplines. This enhances long-term accessibility to scholarly output. Besisdes, OAIRs ensure storage and security of scholarly works. As a way of preserving scholarly works since many a research do not have the competencies to ensure the longevity of such works.

IRs when established, becomes a way of monitoring, evaluating a 'pre-print' through feedback and commentary they receive from users. Again, it acts as a central archive for research works undertaken by authors in an institution. IRs give authors the opportunity to enjoy from valuable services added to the repository. Some of these services are hits count on papers, author list of published works, and citation analyses. IR provides authors with an avenue to communicate their research work or findings and to contribute to the advancement of knowledge in their field of study.

Dissemination and impact of scholarship. Studies have estimated that open access articles are cited 50%-250% more than non-open access articles. Lawrence (2001) confirmed that by indicating that with proper indexing coupled with adequate search mechanisms, open access articles turn to be cited more than the traditionally published articles.

Benefits to a Library

Firstly, IRs have the potential of increasing a library's invisibility among all the constituencies of an institution of higher learning. Secondly, as a platform that enhances more collaboration between librarians and faculty. Furthermore, Read (2008) asserts that as IRs become more valued, the status of librarians and other information professionals are recognized and respected within institutions which hitherto had not given them the due recognition and respect. Lastly, access to targeted audience increased since via internet those users accessed have access at any point in time.

Challenges of Open Access Institutional Repository

In spite of the numerous benefits that an open access institutional repository brings to an institution and individual authors or researchers, there are implications and potential barriers to its smooth running.

According to Barton and Waters (2004), the initial cost for open source software used by most institutions is not as high as the recurrent cost. This manifest itself in the time spent in training staff, supporting users, creating meta-data, consultancy, drafting of policy and operating guidelines, and publicizing. Many institutions are quick to adopt one open source software or the other but are able to cope with financial burden that comes along with it.

The challenge of generating content most often than not hampers the efficient running of an IR. A good IR is predicated on the willingness of authors to deposit or upload their research output, publications, etc. voluntarily (Primary Research Group, 2007). OpenDOAR (2008) asserts that to achieve this, since content generation is difficulty at the beginning, it behoves the institution to

demonstrate its importance to its community so as get them deposit their works in the IR. The best way according to Gibbson (2004) shows that the lasting worth of an IR and ensure its long-term existence is to speedily populate it.

Another challenge is eliciting support and commitment from councils/management members of institutions of higher learning and academic staff. This may come about as result of financial constraints, institutional culture, and institutional priorities, management failure or incompetence, technical challenges. Some have argued that there is the need for institutions to think seriously before launching institutional repository as it may disintegrate rapidly if all those who matter are not brought on board (Lynch, 2003; Crow, 2002; DSpace Project, 2000).

There is also the problem of working culture and politics. Creating and posting content on an IR could be very time-consuming and academics/researchers often are bereft of time. In their work entitled "the role of institutional repository in digital scholarly communication," Bently and Oladiran 2012 contends that: *contributing content to user-generated or self-service sites is time consuming; and time is something academics lack. They may be willing to contribute content but reluctant to do it themselves. This calls for mediated deposits service for them.*

According to the Computer Library Centre (OCLC, 2003), "the technical issues involved in creating institutional repositories are not necessarily difficult, but the developers of a repository will more likely face challenges related to the politics and culture of an institution from the stakeholders, namely the faculty, library staff, IT staff and instructional designers". Unhealthy institutional culture and politics could cause greater damage to the viability of an IR. Such damage could include the disruption of access, total and permanent loss of materials deposited in the IR. It could even affect the rank of the institution negatively as it happened to KNUST in July 2010 (Agyen-Gyasi et al., 2012).

Another major issue plaguing the development of OA-IR is ignorance or lack of knowledge of open access repository in developing countries. This dearth of knowledge or awareness of open access institutional repository is a general concern across Sub-Saharan Africa. Open access software and other issues pertaining to the establishment of institutional repositories are still rife. The only way to make meaningful strides is when this ignorance is cured.

Again, Jensen (2010) among other things cited inadequate ICT connectivity and infrastructure as one of the challenges confronting the development of OA-IR. A reliable and fast internet connection is the backbone of OA-IR. Most academic and research institutions do not have a reliable and fast internet connectivity, despite the growth in internet usage in Ghana. This stems from the fact that the high cost of internet bandwidth makes it much difficult for academic institutions to afford adequate bandwidth to host digital repositories. Agyen-Gyasi et al. (2012) makes a point that IRs ideally require dedicated internet connection and the cost of such dedicated services are beyond many institutions of higher learning. According to Jensen (2006), "bandwidth is the life-blood of the world's knowledge economy, but it is scarcest where it is most needed in the developing nations of Africa which require low cost of communications to accelerate their socio-economic development. Few schools and public libraries on the continent have internet access." Whereas not much is needed by way of infrastructure to set up repository,

much more is required to access the full benefit. Accessibility requirements include a network coverage of the entire institution, provision of access points, network equipment and other accessories which are too high for some institutions to deploy even as an internal service.

Besides, another problem that impedes the operation OA-IR is epileptic power supply which is very evident in countries in Sub-Saharan Africa. Irregular power supply does not engender smooth running of an IR even though other equipment may be in place. An IR ought to be accessible to every user at all times (24/7). This will therefore necessitate a constant and consistent electricity supply to power all the entire equipment or facility.

Chisenga (2006) enumerated that inadequate funds and advocacy, copyright or right management issues, and lack of motivation as some of the challenges that could retard the development of an OA-IR. Expatiating on inadequate funding, Agyen-Gyasi et al. (2012), indicated that academic and research libraries in developing countries grapple with the challenge of inadequate funding in their quest to establish repositories. The establishment of IR is not expensive in developed countries as compared to developing countries. Developed countries have state-of-the-art ICT infrastructure which reduces the cost of developing IR. With regard to developing countries, ICT infrastructure is not adequate and in some cases, requires total replacement in order to establish and sustain of the developing of IR. This calls for huge financial investment from academic and research libraries which suffer to raise because of tight budgets, inadequate government subvention and internally generated funds.

Inadequate advocacy had and continuous to plague the development of an OA-IR. Advocacy has been a very efficient tool for eliciting or galvanizing support from certain constituencies toward a particular course. In the view of Ghosh (2007), *stakeholders of an IR may include lecturers, researchers, librarians and students must be involved in order for such advocacy to be effective. Advocacy attracts contributors as well as stakeholders. Unfortunately, majority of this constituency have no knowledge of what OA-IR is about, to be able to act as advocates.* This has generated indifference in the scientific/research community. Hence very few understand the concept and willing to donate content.

Another challenge that affects the development of an IR is copyright and technical challenges. Sometimes researchers are uneasy about trespassing publishers' copyright and lack adequate awareness about their own intellectual property rights. They may be uncertain about making their works available online before it is published by a traditional publisher (Smith, 2003).

In situations where articles or works deposited in OA-IR are not considered in assessing and promoting faculty makes them unwilling to freely submit their works unto the platform and in turn affects the content or holding of an IR (Agyen-Gyasi, et al. 2012). Jain et al. (2012) concludes that faculty may not feel incentivized under the given scenario to provide even bibliographic particulars of their academic works.

Conclusion

In conclusion, as succinctly put by American Council of Learned Society (2006), an OA-IR is dynamic in all respects and it satisfies every element of digital scholarship characteristics. Thus, "building digital collections, creating tools for collecting, analyzing, and authouring digital information; using digital collections and analytical tools to generate new intellectual products". Lynch (2003) indicates that an IR is "recognition that the intellectual life and scholarship of our universities will increasingly be represented, documented, and shared in digital form, and that a primary responsibility of our universities is to exercise stewardship over these riches. It enables the management of digital data of all kinds for the present and future to be properly kept.

In this era of information explosion, crave for unfettered access to information, making research findings known to both the intellectual community and the large public, OA/IRs play central role. Currently, they are seen as a critical component to respond to the challenges of higher learning in the digital infosphere. Indeed, research is valuable when shared and sharing enables new research to build on earlier findings. There is no gainsaying that effeetive communication of research output/results/findings is a principal part of the research route and the best way of doing this is through an IR. Academics and researchers through OA/IR make their works enjoy world-wide visibility. Regrettably, institutions of higher learning of Sub-Saharan Africa are struggling to overcome the many challenging issues in their quest to establish an IR and make their scholarly work available through open access. Libraries in these institutions do not have the financial muscle to subscribe to the countless journals demanded and needed by researchers and students in face of increased printing cost vis-a-vis plummeting library budgets. This has made many institutions withdraw their scriptions. The establishment of consortium (Consortium of Academic & Research Libraries in Ghana (CARLIGH) has in no small way led to the increase in access to online journal to support teaching, learning and research functions of academic libraries in Ghana, and OA/IR could help gain access to those that are not subscribed to by the consortium.

Restrictive licensing terms on who can access, when to do so and how patrons can share the information with respect to electronic journals and other databases would no longer be a challenge since IRs enhances preservation and communication of research findings in institutions of higher learning.

The librarians and their staff ought to make a strong case for the establishment of an OA-IR by highlighting on its importance to academic institutions as well as researchers, lecturers and students alike. This could be done through writing of memos and letters, organizing conferences, workshops and seminars. Building a strong case calls for advocacy and lobbying of all members of the constituencies or the critical groups who would be involved in the establishment and use of the IR. They include management, faculty, researchers and students.

Technical Universities need to know that once they have transitted, the familiar refrain of no money should be shunned and should reprioritize. Things that improves the academic environment should take centre stage. An efficient internet service is a pre-requiste. An efficient OA-IR hinges on an efficient internet service. This may come with the purchase of new computers, servers, increased bandwidth allocated to the libraries to enhance and ease uploading

of research output as well as access to information. This would also ensure regular update of the repository. Wi-fi service at halls of residence and department is very critical at this stage

It is essential to have a policy to govern the operations of an institutional repository. Such a policy ought to include the inputs of the administration of the institutions and should cover such matters as what to accept/ what not to accept; copyright issues; self or mediated archiving; submission and withdrawal policies; types of materials to accept; and any other issue necessary to govern the operations of the institutional repositories for implementation.

It is imperative for institutions of higher learning to find means of helping researchers pay OA publication fees. To date, most institutions have found the traditional publication system and the payment of subscriptions to journals a very difficult. And some have rejected the payment for open access publishing. It is against this reasons that institutions must give their staff a thorough training in this regard to enable them manage their IR platform.

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