Institutional Repository Initiatives in Tanzania: Opportunities and Challenges

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Abstract
The changing model of scholarly communication on knowledge sharing and dissemination has brought a new demand for creation of digital repositories to facilitate collection, preservation and archival of scholarly assets created by academics within academic and research institutions. This study investigated the perceptions of the Tanzania academic communities on establishing Institutional Repositories (IR), It also assessed the ICT basic infrastructures and technical capabilities for hosting IR in 10 higher learning institutions in the country. Furthermore, the study assessed the opportunities and challenges for establishing IR. The findings revealed that there is varying perceptions among academics on establishing IR. The findings further revealed that most institutions, although had adequate ICT infrastructure, they had slow Internet connectivity. The study noted lack of technical expertise on managing Free and Open Source Software (FOSS). It also revealed that the majority had limited knowledge about the Open Access. The findings revealed a number of challenges including, low bandwidth, unstable power supply, lack of awareness on IR, lack of knowledge on Intellectual Property Right (IPR), lack of repository policy and lack of funds to run repositories. Furthermore, results show a number of opportunities such as: government's efforts to create enabling environments to improve Internet connectivity and growing number of institutions establishing repositories. This study therefore recommends increased advocacy on creation of local content repositories, creation of awareness to academics, researchers, students and institutional top leaders. Collaboration between IR managers and IT personnel in managing IR should also be encouraged.

INTRODUCTION

In recent years, scholarly communications have been changing in response to the changing digital and technological environment. It has been noted that scholarly communications are being restructured to suit the digital environment (Yeates, 2003). The new trends in scholarly communication have affected the manner in which academic institutions manage research output and data used for learning, teaching, and research. Information delivery and access has equally changed from traditional to electronic, whereby collection, preservation, dissemination and access are mostly performed electronically. In order to respond to this new demand, institutions around the world are establishing Institutional Repositories (IRs) to collect, preserve and disseminate the institution's scholarly output. Institutional repositories provide an

opportunity to capture content, collect in one location, and provide open access to the intellectual output of a university as well as preserve content that may otherwise be unavailable or out of publication (Starkman-Van Earwage, 2008). Borgman (2000) noted that this new wave of digital scholarship has affected information-related behaviour of scholars. In this case, academics, researchers and students are increasingly relying on online literature in undertaking their educational and research activities.

As information and communication technologies flourish, intellectual assets generated by universities are increasingly being harvested and disseminated by commercial publishing companies (Yeates, 2003). At the same time, many researchers are denied access to scholarly materials published by their parent institutions and their fellow researchers. It has also been noted that denial of access to scholarly content extends to materials locally produced by an institution, let alone those published in the international journals. Academic and research institutions have responded to this situation by creating their Institutional Repositories in order to bridge the gap of access to knowledge. Institutional Repositories address two strategic issues facing academic institutions; first, they serve as tangible indicators of an institution's quality, thus increasing its visibility and prestige. Scond, they provide a central component in reforming scholarly communication by stimulating innovation in a disaggregated publishing structure (Crow, 2002).

Establishment of Institutional Repositories has to a large extent been fueled by Open Access (OA) movement. This encourages two roots of scholarly communication including publishing in OA journals and archiving the same to freely accessible databases. This is an alternative to the increasing cost of commercial journals that has caused not only "Serial Crisis" but a general crisis in scholarly communications (Chang, 2006). This situation is likely to encourage more academic institutions to consider Open Access publishing and archiving as an alternative to save cost, while creating an opportunity for their academic communities to access scholarly materials.

LITERATURE REVIEW

Different sources of information were consulted to achieve the objectives of this study that sought to investigate academics' awareness on IR, provide the status of ICT infrastructure, assess human capability in managing repository systems and revealing the challenges of operating a repository. The researchers conducted a documentary review from both published and grey literature in print and the electronic formats.

Overview of Open Access Model of Scholarly Communication

Open Access as a new model of scholarly communication has gained momentum over the past few decades, aided by the internet and the World Wide Web. The internet has provided new ways of sharing and using the intellectual capital generated by academic and research institutions, and at the same time used as an indicator of academic quality(Yeates, 2003). BOAI (2001) defines open access as: "free availability on the public internet, permitting any users to read, download, copy, distribute and/or print, with the possibility to search or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself".

Open Access model of scholarly communication has legitimized sharing of scholarly content since 1991, where Paul Ginsparg found arXiv with the aim of collecting and sharing preprints of scientific publications (Albert, 2006). Since then, Open Access movement has gained momentum, archiving contents of large universities such as Cornell, Harvard and Massachusetts Institute of Technology (MIT). These institutions decided to say "no" with what is referred to as a "bid deal" (or-all-you-can-eat) (Ball, 2004).This situation forces universities to subscribe bundles of e-resources regardless of their demand, resulting into cost-ineffective (Frazier, 2008). Open Access movement also gained support from funders. Recently, UK Research funding councils declared to support OA, which means eight publicly funded research councils in the UK joined the National Institutes for Health (NIH) in the USA and the Welcome Trust in supporting OA. Therefore, that means results of research supported by these funding bodies should be made available to the widest audience (SHERPA, 2015). Africa is lagging behind regarding OA publishing and archiving its intellectual asset. McVeigh (2004) mapped the trend of publishing through Thomson ISI statistics and found Africa and the Middle East combined together has 57 journals of which 5 are Open Access journals, as compared to 19 from Eastern Europe, 33 South Central America, 45 Western Europe, 58 North America and 79 Asia Pacific. Regarding proportion of Repositories by content, in October 2011 The Directory of Open Access Repositories (www.opendoar.org), indicated that Africa had established 50(2%) repositories as compared to 147(7%) from South America, 369(17%) from Asia, 485(23%) North America and 970(46%) from Europe.

Awareness and the Use of IRs

In the study conducted by Dulle (2010) to analyze Open Access scholarly communication in Tanzania, it was discovered that researchers' awareness had a direct impact on their behavioural intention of Open Access usage. In the survey that assessed the needs of having an Institutional Repository at UDSM in 2009, it was discovered that many academics were unaware of the concept of Institutional Repository (Muneja, 2010). This is an indication that Open Access and Institutional Repository initiatives are new concepts among the scholars in Tanzania. Thus, an effort needs to be taken by information professionals to provide advocacy campaigns on this new wave of scholarly communication.

Basic ICT Infrastructure for IR

Information and Communication Technologies have shaped the creation, access, use and preservation of resources in ways that has never been before (Alemneh & Hastings, 2006). ICT and the World Wide Web (WWW) are regarded as key infrastructure in teaching and research of any academic and research institution. According to Mutula (2008), application of ICT has increasingly influenced virtual education system and new dynamics in the way research is conducted. KENET (2008) noted the potential of ICT in enhancing the quality of teaching, learning and research productivity of scholars as well as the management and effectiveness of universities, citing a number of remarkable initiatives that have been made. For example the survey that was done by the Kenya Education Network (KENET), to assess the E-readiness of East African Universities in 2006 reveals that although the response was low, the ICT networks were growing in the continent.

In addition to the internet and WWW, Institutional Repository requires hardware and software that are used as main infrastructural facilities for creating IR. The required hardware depends on the specifications and the version of the repository software. See an example on system

requirements for Dspaces specified by Barton & Waters, (2004). The software used in creating institutional repositories include both proprietary and free ones.

Free and Open Source Software (FOSS) has been developed since 2000s to support development of IRs this include Dspace and Eprints. Eprints was created in 2000 by the University of Southampton for the purpose of supporting OA initiatives (Eprints, 2015). Since then, the software has been widely used for developing repositories. Users are increasingly relying on Eprints because of its strongest developers' team based at the University of Southampton. Dspace was released in 2002 by MIT in collaboration with the HP Labs to support the same initiatives. Reprints and Dspace are repository software with large user communities (OpenDoar, 2006). There are several OA repository software but selecting the right one for building IR has been a challenge to most practitioners, especially those with low technical know-how. D-Lib, (2015) highlights evaluation criteria for selecting repository software to include checking the functionality of the software, scalability, extensibility, interoperability, ease of deployment, system security, system performance, physical environment of the software, platform support, demonstrated successful deployment, stability of development organization and strength of technology roadmap for the future. These criteria can be used to securitize a software that could be reliable for developing IR.

METHODOLOGY

Both quantitative and qualitative data were collected to answer research questions that sought to know the awareness, ICT readiness, human capacity and challenges of establishing Institutional Repositories. 60 and 20 staff were selected purposively for survey and interview respectively. A response rate of 82.5% was realized. The selection of these institutions was based on the fact that they were involved in a number of Institutional Repository sensitization workshops that were conducted in 2009. These institutions were the University of Dar es Salaam (UDSM), State University of Zanzibar (SUZA), Zanzibar University (ZU), Saint Augustine University of Tanzania (SAUT) –Mwanza, Bugando University College of Health Sciences (BUCHS), Ruaha University College (RUCO), Mkwawa University College of Education (MUCE), Moshi University College of Cooperative and Business Studies (MUCCoBS), Agakhan University College (AKU) and Mzumbe University (MU). Heads/Directors of libraries and one system administrator of the institutions in the respective institutions were involved. Three teaching staff and three postgraduate students from each institution were involved in the survey.

Methods of Data Collection

Data was collected using questionnaires, in-depth interviews and observation. Self-administered questionnaires were distributed to the teaching staff and postgraduate students while in-depth interview was conducted with the heads of libraries and systems administrators. A checklist for ICT infrastructure was developed to guide the observation of enabling environment for IR hosting. The observation involved visiting server rooms and computer labs to see how adequate ICT facilities are supporting the establishment of IR. The data was analyzed quantitatively and qualitatively. Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS), while qualitative data were analyzed using content analysis.

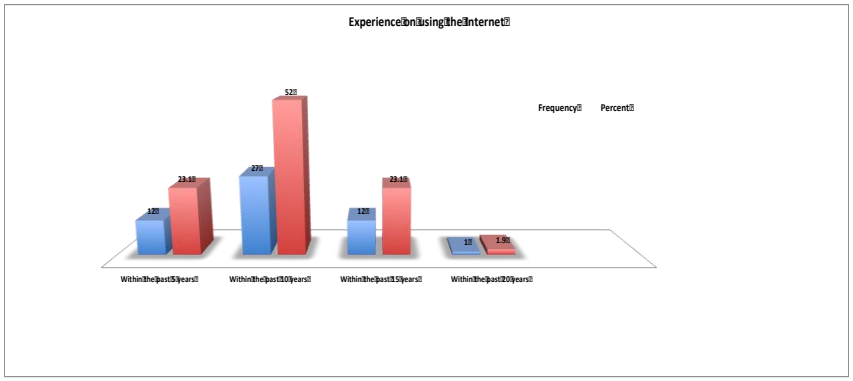
FINDINGS AND DISCUSSIONS

Biographical information of respondents

Distribution of respondents per each institutions were as follows; UDSM 69(11.5%), AGAKHAN 6(11.5%), ZU 9 (9.6), SUZA 3(5.8%), SAUT 6(11.5%), RUCO 6(11.5%), MU 5(9.6%), MUCE 4 (7.7%), MUCCoBS 6(11.5%) and BUCHS 5(9.6%). 52 percent participated in the survey. Questionnaires were distributed to postgraduate students and academic staff from various disciplines as follows 23(44.2%) from social science, 12(23.1%) from science related disciplines, 10(19.2%) from education, 4(7.7%) from law and 3(5.8%) from Business Management. The level of education ranged from Masters 37(71.2%), and PhD 14(26.9%) and one did not indicate his/her level of education. The age of respondents varied between 20 and above 51 years. 33(63.5%) respondents were aged between 31 and 40 years. The oldest category (51 and above) was 10(19.2%). Only 2(3.8%) were of age between 41-50 years, while the youngest cadre (20-30) were 7(13.5%). Among 52 respondents who filled the questionnaire, 39(75.0%) were male, and 14(25.0%) were female.

Experience on the Internet use in accessing and disseminating information

One of the objectives of this study was to understand the level of awareness of the respondents on Institutional Repositories. In order to achieve this objective, respondents were asked a couple of questions to measure their understanding on the phenomenon. The first question intended to measure their experience in internet use in accessing and disseminating information. The results are summarized in Figure 1.



Source: Field data

Figure 1: Experience in the internet use in accessing and disseminating information

The findings show that, most respondents have used the internet for the past 10 years. 27 (52%) respondents have used the internet within the past 10 years, while only one participant (1.9%) has experience in using the internet for the past 20 years. This shows that postgraduate students and academic staff have used the internet to access and disseminate information. This data suggest that at least there was no one who has never used the internet in his/her academic activities.

Internet usage skills in terms of accessing information

Respondent were asked to rate their Internet usage skills using a scale in terms of accessing information. Data show that 22(42.3%) respondents have "Very Good" skills in accessing information, followed by those who have "Good" 17(32.7%) usage skill and only 7(13.5%) and 6(11.5%) have "Average" and "Excellent" usage skills respectively. Generally, the data show that respondent had satisfactory skills of using the internet in accessing information.

Table 1: Internet usage skills in terms of accessing information

Internet usage	Frequency	Percent
Excellent	6	11.5
Very Good	22	42.3
Good	17	32.7
Average	7	13.5
Total	52	100.0

Knowledge about Open Access

The study also sought to understand the respondent's knowledge about Open Access. Data show that 4(7.7%) respondents indicated that they had knowledge and 14(26.9%) had little knowledge. However, 19(36.9%) and 15(28.8%) knew nothing and had never heard on OA respectively. Figure 3 summarizes these results.

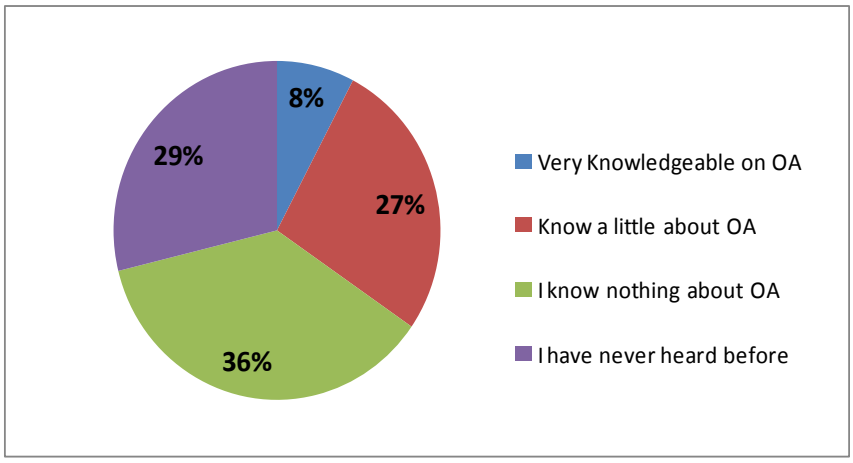


Figure 3: Knowledge about OA

Open Access databases used

Respondents were asked to list down the OA databases which they use in their scholarly undertakings. They indicated the following: www.Unitha.com, JSTOR, Oxford Journals, Science Direct, Emerald, Library.nu, HINARI, PUBMED, UDSM-Library Local Content,

Wikipedia, Bio Med Central, PLOS Medicine, Hindawi, BMC, AJOL, www.Scribd.com, http://inside.bl.uk, http://ww.inasp.info/ajol, http://www.orl.org/sparc/ir.html, and www.bookboon.com. These are the tools they used to access online information.

However, respondents listed both commercial and Open Access databases. For example Emeraldinsight.com and Science Direct databases provide resources on commercial basis, while PUBMED, AJOL and BioMed Central, provide Open Access journals. This implies that respondents could not differentiate between Open Access and commercially- based databases. This corresponds with the low understanding on OA issues as indicated in Figure 3.

Awareness of the opportunity to publish on OA journals

Respondents were asked on whether they were aware of the opportunities to publish online. A large percentage, 57.7(58%) of the respondents were not aware of the opportunities to publish, while 42(42.3%) were aware of this opportunity. This is consistent with the findings on knowledge on Open Access databases.

Willingness to deposit articles on OA Institutional Repository (IR)

Respondents were asked if their institutions have established an Open Access repository and if they would like to have their work pre-published, or work-in-progress research outputs or articles deposited in the repository for free access by users. The majority 42 (80.8%), were willing to deposit their materials on OA Repository. Only 9 (17.3%) indicated they couldn't comply. One (1.9%) did not agree or disagree. Figure 4 summarizes their results.

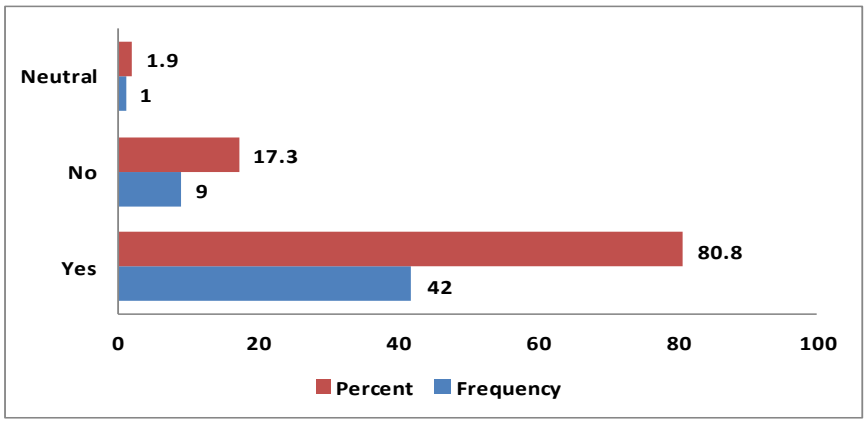


Figure 4: Willingness to deposit articles on OA IR

The findings imply that most of the respondents are ready to share their academic output through OA repositories to enable other users to use their work for academic purposes. From these findings, it can be observed that the majority of the respondents see the benefits of sharing their intellectual products through Institutional Repositories unconditionally.

IR Mandates

The respondents were asked about their reactions if their institutions develop an institutional repository and mandates to deposit copies of their articles in the repository that would be made freely accessible to users via an IR. Data reveals that 31(59.6%) would comply, 8(15.4%)

would reluctantly comply, while 4(7.7%) would not comply and 1(1.9%) did not choose any of the responses.

Reasons for Having IR

The respondents were asked to explain the reasons for establishing IR. Most respondents 22(42.3%) mentioned the issue of access as the key factor in establishing IR followed by the inability of most users to pay for online materials by 17(32.7%). Others 7(13.5%) said IR enhances wider dissemination of scholarly information. It was also observed that 6(11.5%) combined free materials, access and dissemination as reasons for establishing IR. These findings show that the issue of access was felt as a major drive for the respondents to encourage the establishment of IRs.

Institutional Repository was seen as a good avenue for disseminating scholarly information to the research community. To answer this question, respondent said, *"Institutional Repository facilitates dissemination of the research done at the institution to learners and the general public"*. Another reason as noted by respondents was that IR was seen as an avenue for preservation of scholarly information. This was attributed to the importance of ensuring long retention of scholarly information. One respondent noted that "*IR stores and keeps track of what is produced and makes it available to others*". Another reason mentioned by the respondents was the issue of showcasing institutional intellectual outputs and products. Finally, respondents viewed IR as a means of sharing/exchanging knowledge among scholars.

Experience in Publishing

Respondent were asked whether they have published any research articles online. The majority of the respondents 42(80.8%) indicated that they have never published any articles online. Only 10(19.2%) had published online. These findings correlate with the data presented in the literature review on Open Access Publishing that indicate low publishing skills and infrastructure in Africa, and Tanzania in particular. Respondents recommended training on how to publish online.

Publishing on OA

Respondents were further asked to indicate the publishing model they prefer if they are given an option to publish their research articles online. Most respondents 40(76.9%) opted for Open Access publishing model, while 12(23.1%) respondents chose the closed model. Respondents were further asked to provide reasons for choosing closed or open access as the publishing model they prefer. Most respondents who chose Open Access publishing model indicated the following reasons: In Open Access, everyone can access scholarly works, hence the findings could be disseminated globally and efficiently. Dissemination and free access to scholarly materials was the major reason that was mentioned by many respondents. The following were among the reasons mentioned for choosing Open Access publishing model: sharing of information and widening of readership, enhancing recognition of one's academic capability and also enhancing the impact of researches. There were few respondents who chose closed access publishing model. Those who chose it were of the opinion that, the model protected intellectual property rights and avoided plagiarism. These findings reveal that publishing on any of the publishing model did not mention "economic gain" as the reason for publishing.

Preference for types of materials to be deposited on IR

The respondents were asked about their choice on materials to be deposited on an IR. Thirty-three (63.5%) preferred research reports, journal articles and other research-based papers. 9(17.3%) prefered wanted conference papers to be deposited in the repository, while 8 (15.4%) said all the materials, including research-based articles, conference papers, teaching materials, theses and dissertations and administrative materials should also be deposited. Their results are summarized in Table 2.

Table 2: Materials to be deposited

Materials to be deposited	Frequency	Percent
Research Based Materials	33	63.5
Conference papers	9	17.3
All materials produced by an institution	10	19.2
Total	52	100.0

Most respondents chose research-based materials because of their research value. The respondents mentioned different materials to be included in the repository. These include; academic papers, theses, dissertations, conference papers, books, journal papers, technical reports, manuals, teacher guides, working papers, academic letters, academic bulletins, research proposals, multimedia files, constitutions, bylaws, speeches, textbooks, dictionaries, policies, teaching/learning materials and lecture notes. The type of materials to be deposited on IR should be stated in the repository policy of a particular institution.

Proposed unit to manage IR

The respondents were asked to recommend a unit or department to manage the IR. Twenty-six (50.0%) respondents chose the library to manage the IR and research and publication unit was chosen by 13(25.0%). Departments and colleges were chosen by 5(9.6%) and 5(9.6%) respondents respectively. Furthermore, 2(3.8%) indicated the ICT section while 1(1.9%) chose the ICT Department and the Library to manage the repository.

The library was proposed by a number of respondents as a suitable unit to manage the IR because its staff has knowledge and skills of organizing scholarly content, and it is the unit with professionals whose daily activities include identification, collection, preservation, dissemination and the general management of knowledge. The respondents noted the library as strategically and technically better placed to serve the readers. It was noted further that the library is a central unit which is open to all members in accessing scholarly materials. Respondents observed that the library is a centralized information center where everyone can access scholarly resources.

The respondents who chose research and publication as a unit to host IR explained that this unit is concerned with promotion and support knowledge creation through research projects. Thus, the unit can motivate the academic staff and postgraduate students to conduct research and publish their academic papers within its mandate. The respondents pointed out that, in a situation where the library is not well established, the research unit can take the responsibility

of managing the repository. Other respondents recommended both the research unit and the libraries because the research unit coordinates research activities and the library acts as a custodian of research outputs. The respondents recommended further that the ICT department is well equipped and therefore it would be relevant to manage the IR. Other respondents recommended the ICT unit and the library, noting that the former provides technical maintenance of online repository, while the library has knowledge on archiving. Although academics have competing interest on where the repository should be hosted, the decision can be made when formulating the IR policy.

Challenges of access and dissemination

The respondents were asked their opinions on the challenges they anticipated on hosting and managing the IR and the solutions for overcoming them. The respondents noted the following challenges:

- Poor internet connectivity (low speed)
- Power rationing/power cuts
- Cost barrier in accessing e-resources and password restriction
- Inadequate computers for students to access e-resources
- High cost of internet access
- Restrictive format of some internet content e.g. some articles are accessed on pdf
- Lack of knowledge on how to buy online articles
- Poor information literacy skills to search online materials

Poor internet connectivity was one of the concerns. Some institutions reported to have poor internet connectivity in terms of the internet speed. Respondents mentioned the issue of power cut in Tanzania being a major problem in utilizing the potential of ICTs in accessing information. Another problem, which the respondents mentioned was related to cost and password restriction in accessing e-resources. High cost of internet access was felt as a major problem in accessing e-resources. They were also concerned with restrictive format of some internet content because some files need special software installed in one's computer in order to access documents. For example some files open only in portable document format (pdf). Other respondents lacked knowledge on how to buy online articles, even if they had the money to pay for them. Lack of skills on how to search, access and retrieval of e-resources was also felt to be among the factors which hindered access to e-resources..

The respondent recommended the following: with regard to the internet connection respondents recommended the increase of speed in order to enable the fast download of online resources. They also proposed to have reliable power supply to ensure computers are operational throughout the day. Acquisition of non-restricted databases was felt to be important to avoid discouraging users to access these resources. In addition, strategies be identified and implemented to encourage publishing on OA journals and archiving on repositories, as it is with traditional journals. This will promote massive publishing and hence enhancing access to many research materials available for free. The respondents recommended further that users' need to be trained on how to access online materials.

Respondents' general comments on access and dissemination

When asked to provide comments with regard to access to online scholarly materials on IR. One respondent noted that "*the idea is very good if established and properly managed…it*

should be encouraged." Another respondent insisted that, "*this idea is useful, helpful, easy and convenient. It is highly recommended."*

Another respondent added that "*access is limited to those who can afford. If it would be accessed cheaply, it would have helped many students.*" From the above quotations, it seems that establishment of the IR is inevitable. This is because scholars are concerned with the cost and the restriction to access scholarly materials. On the contrary, one respondent argued that, "*You should ensure the materials come from a reputable journal/book….Best materials are those available at a price.*" The respondent was of a view that materials published in Open Access repositories are not of good quality. This is an indication that some respondents have limited knowledge on Open Access initiatives. They really need to be educated on the benefits of Open Access, especially on issues related to the quality of OA materials and copyright issues.

With regard to scholarly publications, many respondents were of the opinion that they need training on issues related to publishing online. This was a concern to most respondents that they have never been exposed to any training on how to publish online. Both students and academics had the same concern that they need training for the same purpose.

One respondent recommended that:

"*More scholars need to publish their works in the open access repositories for people to read. This helps to pull down the cost of learning materials which hinder the majority of educators and learners from obtaining quality education.*"

Another respondent argued that:

"*With the internet, knowledge is not any longer a problem, but access to relevant knowledge. This is because access to high quality e-content from the Tanzanian context is made difficult. This forces Tanzanians to cite from World bank; IMF, UNESCO and CIA, among others, to access information about our country".*

Another respondent added:

"In my opinion, online publishing is becoming a strong discourse in scholarly information dissemination, which is bound to replace the bureaucratic paper publishing discourse existing to date."

Another respondent said:

"May I urge the pioneers in the new publishing discourse to ensure that quality standards are observed in order to avail publications which demonstrate professional rigor. Moreover, initiatives need to be made in encouraging publications from young scholars. This will help them grow in producing professional publications."

Interview with heads/ directors of libraries:

Library top leaders were interviewed regarding different issues including awareness on OA, establishment of the IR, the kind of support they would provide and challenges they encountered.

Awareness on OA

The heads/directors of libraries were asked to explain the term Open Access. Six out of ten heads of libraries were able to explain it. The common definition of OA to them was that it *is a kind of opportunity to access online information without any restriction, either by paying or by being granted* user rights. Furthermore, the findings show that none of heads/directors interviewed had published on OA IR before. However, they encouraged creation of OA IRs to enhance access to scholarly materials for the benefit of many scholars.

Sustainability of the IR

In order to sustain the Institutional Repository, the following opportunities were mentioned: development of the institution's intellectually, abundance of academic research and other writings, abundance of e-learning and scholarship environment, existence of ICT Infrastructure and service and the support of Open Access Initiatives. Respondents were asked to provide their opinions on the factors to be considered to ensure sustainability of the IR. They mentioned that installation of ICT facilities as an essential factor for sustainability of the IR.

Challenges faced in the establishment of IR

The respondents anticipated the following challenges that would affect the establishment of IR: lack of trained technical staff, availability of computers connected to the internet, unreliable power supply, resistance by corporate organs and academicians, lack of support from the management, lack of funds, existence of reliable and sustained resource-for example human, and finance.

Generally, the heads of libraries recommended having training on Open Access Institutional Repositories to the academic community in Tanzania, with the purpose of creating awareness and supporting the idea. One respondent recommended that establishment of their IR has to be incorporated into the first library's five-year rolling strategic plan 2011/2016, so as to feature in the institution's plans.

Interview with Heads of ICT/Systems Administrators

This section presents the data obtained from the interview conducted with Heads of ICT/Systems administrators. The section covers knowledge on OA, technical consideration for hosting IR, funding for ICTs, internet hosting, disaster management plan and the technical skills needed.

Knowledge on OA

Interview was conducted with 8 ICT personnel. These had different understanding of Open Access and all respondents were able to define the term. However, when asked to mention the databases that are useful in Open Access scholarly communication model, they were not able to

mention one. For instance, one respondent mentioned Google as an OA repository. This indicates that even some technical personnel lacked knowledge on issues related to Open Access initiative.

Technical consideration for hosting IR

Respondents were asked to mention the basic requirements if their institution were to establish IR. They mentioned modern computers, access points, power back-up systems for example UPS, skilled staff, management communication and networking (teamwork), storage devises and fibre backbones.

Funding for ICTs

Most public academic institutions are still getting funds from the government but are mainly not directed to ICTs. Respondents pointed out that they received donor funding for installing their ICT facilities. For example the University of Dar es Salaam has been receiving funds from Sida, Carnegies, PITRO, and INASP for buying PCs, digitization of library materials and information literacy training. On the contrary, private institutions such as Agakhan Universities and Ruaha University College acquire funds from within their budget line and rarely get donor funds.

Internet Speed

Most institutions are hooked to the Tanzania Telecommunication Company and SimbaNet's back bone. They were comfortable with the current internet connection speed.

Disaster management plan

Apart from conducting daily backups, the surveyed institutions did not have disaster management strategies to safeguard their data.

Technical skills needed

Skills needed to establish an institutional repository include rudimentary skills of installing repository software like Dspace, Greenstone and Fedora. Training is also highly needed on issues related to Open Access Institutional Repository for academics, students and researchers. Generally, ICT personnel are highly needed to get involved in IR initiatives as they are the ones who are knowledgeable about technical management. They need to work together with the librarians to support each other.

IR Initiatives in Tanzania

The study's findings show that some of the institutions have initiated establishment of repositories. It was established that the University of Dar es salaam Library was the first to start this initiatives in 2008 followed by other higher learning institutions. These initiatives are explained case by case hereunder:

University of Dar es Salaam (UDSM)

The University of Dar es Salaam Library started these initiatives in 2008. In 2009, a needs assessment survey was conducted to establish scholars' insights on IR awareness, their interests and perceptions on hosting IR. This step was followed by the IR Guidelines/Policy formulation, and the third step was testing and installation the IR system (Dspace). This initiative faced several challenges; including:

- Treating this initiative as a project rather than a routine program.
- Slow process to adapt the IR guideline/policy.
- Internally transferring an experienced library systems administrator to another department, hence restarting installation.
- Slow process of acquiring a public IP address
- Delay to populate and register the IR to the directories such as the Dspace registry www.dspace.org, www.opendoar.org and http://roarmap.eprints.org/., due to unoperational IR guideline.

Mzumbe University (MU)

It was informed that Mzumbe University Library initiated IR in 2010 by conducting a needs assessment which was followed by the IR system installation (Dspace). The needs assessment revealed that 90% of Mzumbe University community members accepted the idea. The University Management also supported the idea. Installation was done by a university-wide system administrator and it is now operational at the university's local area network. Since the library does not have a systems librarian with appropriate knowledge and skills in installation and customization of Dspace, they requested a technical support from a university–wide systems administrator who managed to install and customize the Dspace. Librarians started practicing on how to create user community and uploading documents into the IR. Unfortunately, these efforts were interrupted when the IT personnel who installed the system went on study leave. This suggests there is a need for having a well structured human resource coordination that is guided by a policy.

In addition, Mzumbe University's Librarian reported other challenges on the initiative as follows:

- Lack of guiding policy.
- Lack of awareness among the academic community.
- Lack of technical knowhow on the IR software management.
- Lack of digitization skills among the librarians.
- Lack of data disaster recovery management plans.
- Another challenge was financial.

AgaKhan University (AKU)

The Aga Khan University Institute of Educational Development initiated establishment of IR in 2010. The initiative was preceded by a workshop to members of the academic staff with the

purpose of creating awareness and soliciting suggestions on the project. Installation of the IR system was done successful by an expert from the University of Dar es Salaam Library.

During the initial stage of working with Dspace they faced the following challenges:

- Difficulty experienced in securing a public IP.
- Lack of technical skills of the systems administrator to manage Dspace.
- Getting a server that could run on UNIX which is the platform for Dspace.
- Striking a balance between open access and commercial publishing, versus faculty promotion issues.

While working on the public IP address, the initiative was stopped and instead they got a recommendation from Aga Khan University overall Librarian based in Karachi, Pakistan to hold on the implementation plans for Dspace in individual campuses. It was discovered that they wanted to use a common software across all Agakhan universities. They decided to use a purely subscription-based software called Digital Commons for all their institutions. This is a university wide repository that would manage all AKU globally digitized and digitally born resources.

Sokoine University of Agriculture (SUA)

Sokoine University has not yet embarked on creating its own IR but the library is leading an initiative to create a jointly managed system for the Climate Change Impacts Adaptation and Mitigation (CCIAM) program that could collect, preserve and disseminate information related to climate change from the CCIAM program members. The library commissioned experts to design a guideline that was discussed by SUA academics and stakeholders in October, 2011 in Morogoro. It was anticipated that, the policy would guide the operations among five members of the program, that is SUA, ARU, UDSM, University of Oslo and the Tanzania Metrological Agency (TMA). The repository was expected to operate in early 2012.

State University of Zanzibar (SUZA)

The State University of Zanzibar Library created an IR using Greenstone in 2009. This was an initiative by the Free and Open Source Software (FOSS) from the Commission for Science and Technology (COSTECH). There was low understanding on how to manage the repository in terms of data depositing, preservation and technical management of the software. Initially, there was no sensitization of the academic members and the Library on the establishment and operationalization of the repository, and as a result the take-off speed wasn't promising. The repository was operating on the university LAN and only two librarians had a one day training.

General Challenges on IR initiatives

General challenges which were common to the surveyed institutions; these include: lack of awareness on Open Access (OA) and the Institutional Repository (IR). These two terms seem to be new to all categories of the academic community, from students to professors, from senior librarians to library assistants, from the Deans to course coordinators. The main reason was the lack of sensitization on OA and IR.

Another challenge was lack of experts in managing Free and Open Source Software (FOSS), which is the enabling factor for the creation of Open Access Institutional Repositories. There were no training opportunities for IT personnel on this aspect. Efforts have been made by UDSM's library staff with support from INASPs to empower the systems librarians to manage the repository software. A good example was the IR - sensitization workshops which were conducted in 2009 country-wide, including other training workshops which were being conducted at different times. The FOSS regional training seminar that was organized by UDSM Library, with a support from EIFL laid ground for IT personnel and librarians to continue learning the usefulness of FOSS for library services. The seminar was conducted in Dar es Salaam on 4th and 5thNovember 2011, and it included 8 Tanzanian delegates.

This study also noted the lack of knowledge on Intellectual Property Rights (IPR) among the academics. These issues have created fear among scholars to think that IR will be a source of generating disputes between authors and the libraries. There is a concern that IR will be used as a channel of exposing scholarly output, while losing scholars' financial returns for their time and effort wasted to produce the work. In the institutions that had already installed the IR software, it was observed that there were difficulties to secure the public IP address from their internet service providers. This was partly the reason for most of the installed IR to run on their LAN and not on the Internet.

The study also noted the lack of IR guidelines/policy as a hindrance to make IR operational. Most of those who initiated the IR did not embark on formulating IR guidelines/policy at their initial stage to guide its smooth running. The Lack of the IR policy explains why some of the initiatives failed. There were also lack of financial support from mother institutions as most of the initiatives relied on donor funds in order to take off. The cost associated with acquisition of hardware such as server, digitization equipment, power supply and server need both internal and external financial support.

Opportunities

This study has noted that there is a change in user behavior to online culture. Users are relying heavily on the internet resources. This trend is a good move to create and support the IRs for users to access their locally produced institutional research materials. The study has also noted an increased number of institutions that are establishing the IRs. Between 2008 and 2011 initiatives have increased from 0 to 5 IR initiatives, regardless of the challenges they are facing.

The ongoing sensitization campaigns on Open Access Initiatives (OAI), Free and Open Source Software (FOSS), and Intellectual Property Rights (IPR), which are supported by UNESCO, INASP, (Electronic Information for Library (EIFL) and other actors, are an enabling environment towards establishment of IRs in Tanzania. Another opportunity is the government's effort to create good environments to improve the internet infrastructure in Tanzania. The connectivity to the SEACOM is viewed as a trigger to most internet initiatives, including IR in the country. Some institutions such as the UDSM are connected to the cable and there is an improvement on the internet speed.

CONCLUSION

There are many benefits which the IRs hold for academic institutions and their libraries. Building of IRs in Tanzania certainly will improve the dissemination of research findings from the country. It will provide institutions with the opportunity to collect, store and disseminate institutional output, while enhancing visibility of an academic institution as well as each individual faculty. However, there are still many challenges affecting those creating and operating the IRs. Advocacy and collaboration efforts are central to creating a successful relationship between the library/IR staff and the academic community without which IR initiatives will not expand. Collaboration is an important key to both the success of meeting the IRs' goals of creating Open Access to knowledge, as well as combating some of the challenges staff members are facing in operating an IR.

RECOMMENDATIONS

Given the current information needs in teaching, learning and research, whereby users want to have much freedom in accessing, managing and sharing information, this study therefore recommends that:

- Institutions should create IRs to enhance access to locally produced intellectual output and their visibility to the global intellectual society.
- Advocacy campaigns be undertaken by information managers on the creation of the IRs in order to collect, store and disseminate scholarly materials.
- There should be a mechanism for encouraging collaboration between IR managers and IT personnel in managing the IR because both professions are mutually dependent.
- Training of the academic staff and students on the search and retrieval of scholarly content on IR need to be structured to empower them to exploit the available resources for their studies.
- Institutions in Tanzania should establish networks of IR information sharing among themselves and beyond, in order to complement each other because there is no academic institution which is self-sufficient.
- Increasing campaign on OA, FOSS and IPR is an essential endeavor if institutions want to increase the confidence of users, authors, librarians and the IT personnel in performing their duties smoothly.
- Institutional top leadership support should be sought on the establishment of the IRs. Institutional leadership/management is key machinery for decision-making. The management needs to be informed, not only to be aware, but also to assume a leading role, including commissioning the relevant persons to implement the initiatives, while providing financial support whenever needs arise.

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