Open access institutional repositories in universities in East Africa

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Abstract

Purpose – Given that repositories were proposed as one of the routes to open access (OA), this study sought to establish the achievements universities in East Africa had attained in initiating institutional repositories (IRs), the challenges in providing OA and strategies for the way forward.

Design/methodology/approach – Data were collected through literature searches, using the internet, journal databases and university websites in Kenya, Tanzania and Uganda for information about OA and IRs in East Africa. Some of the findings were based on the author's PhD "The management and accessibility of OA IRs in selected universities in East Africa", which used face-to-face interviews with six librarians and self-administered questionnaires responded to by 183 researchers at Kenyatta University, Muhimbili University of Health and Allied Sciences and Makerere University.

Findings – Universities in East Africa were still in the intermediate stages of embracing OA, and only 40 libraries out of 145 universities had implemented IRs. However, most of the repositories had less than 1,000 items, with this challenge attributed to the absence of institutional and government/funder mandates that affected the collection/provision of OA, in addition to the lack of awareness of IRs among researchers.

Originality/value – The value in this research was establishing the extent of IR initiatives in universities in East Africa and their contribution to OA, which is regarded as more visible and accessible to scholars and government personnel who could leverage the information for further development in the region.

Keywords Open access, Kenya, East Africa, Universities, Tanzania, Uganda, Institutional repositories

Paper type Research paper

Introduction

Open access is the "free availability and unrestricted use" of publications or scholarly literature/information online (Suber, 2015). According to Shearer (2002/2003, p. 90), "the philosophy of open access grew out of the dissatisfaction with the traditional pricing system of scholarly publishing in the west, where universities and research institutions were forced

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to cancel a significant number of subscriptions." Johnson (2002) noted that IRs were a strategic response to the opportunities of the digital networked environment and the problems in the traditional scholarly journal system. The Budapest Open Access Initiative (BOAI, 2002) that first defined the open access concept proposed two avenues through which it would be achieved, that is, through publishing in open access journals (the Gold route to open access) and depositing copies of articles published in traditional journals in open access repositories (the Green route to open access). Richardson and Wolski (2012, p. 2602) acknowledged the fact that "it is open access (OA), which has driven the creation of repositories, especially institutional repositories." The network of open access repositories was envisioned as the backbone of the open access movement as libraries around the world began implementing and capturing the intellectual assets of their institutions. Harnad (2007) envisioned that about 5 per cent of the research would be archived by the open access journals, while the remaining 95 per cent could be freely accessed via repositories if all researchers immediately began self-archiving their work that they publish in traditional journals.

Although Harnad (2016) has hinted on retiring from active OA advocacy because of the general slow pace of self-archiving by the research community and the feeling that he has said all that needs to be said and could be only repeating himself, a number of institutions have acknowledged IRs as the major achievements of OA at their institutions (Mamtora *et al.*, 2014, p. 10). In a developing country like Nigeria, OA IRs are considered the most viable means of ensuring the global visibility and impact of national scholarship (Ezema, 2011). Koutras and Bottis (2013, p. 1501) noted that "this model is promoted alongside the Gold route by the open access community of researchers and librarians, and is often preferred." The preference is also because IRs contain more than journal articles, with "works that were largely inaccessible to the greater public, such as theses and dissertations, made available in order to increase the impact of work stemming from a particular institution" (Williamson and Mirza, 2015, p. 212). Access to full-text documents in IRs has also been optimally achieved in a number of institutions, especially in Australia where low rates of non-full-text documents, with a percentage as low as 5 per cent or less was noted (Xia and Sun, 2007), although this seems to have been affected by the Excellence in Research for Australia programme, which started in 2010 (Kingsley, 2012).

Crow (2002) defined an IR as a:

> [. . .] digital archive of the intellectual product created by the 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.

IRs can generally be regarded as a mechanism for ensuring access to knowledge produced at a college or university. Yeates (2003) noted that IRs expand the range of knowledge that can be shared. Crow (2002) pointed out that IRs that constitute the disaggregated model of scholarly publishing included not only pre-prints and research papers, but also extended to research data sets, digital monographs, theses and dissertations, conference papers, listserv archives and other grey literature. According to RamKumar and Ragavan (2013), "depending on the goals established by each institution, an IR could contain any work product generated by the institution's students, faculty, non-faculty researchers, and staff". This could include virtual any digital material that the institution wishes to preserve. An IR is, therefore, a tangible indicator of a university's scholarly information that preserves the intellectual output of the institution (Giesecke, 2011) and helps increase its visibility, accessibility, prestige, public value and can be used as a marketing tool for the institution to potential funders, prospective staff and students. Lagzian, *et al.* (2015, p. 197) noted that "IRs

have been increasingly recognised as a vital tool for scholarly communication, an important source of institutional visibility and a viable source of institutional knowledge management." The IR can be used for a number of purposes, some of which have not yet been appropriately exploited in East Africa. The IR is mostly used to manage collections of scholarly information and preserve them for future use/access. However, IRs also increasingly serve as scholarly communication and collaboration tools for interdisciplinary researchers, journal publishing platforms and as a source of information for funding bodies (Shearer, 2015), Research Assessment Exercises and bibliometrics.

Problem statement

IRs have been around since the early 2000's and in East Africa since 2006, specifically at Makerere University in Uganda. Universities in East Africa are still in the intermediate stages of embracing open access and libraries have taken the lead in initiating and implementing IRs. They have popularly been known for increasing an institutions visibility on the web because of the scholarly information being displayed from universities. By 30th March 2018, there were 40 IRs in East Africa registered in the Directory of Open Access Repositories (OpenDOAR)[1], 28 from Kenya, 10 from Tanzania and 2 from Uganda. Nine of these repositories were, however, not from universities, and four of the university-based repositories had dead links. There were 15 other universities in East Africa that had IRs accessible online, but not yet registered in OpenDOAR. A summary of all these IRs, with the number of items in each (by end of March 2018) where possible was as follows:

University-based IRs in East Africa registered in OpenDOAR by March 2018: *Kenya* – Dedan Kimathi University of Technology (dead link), Egerton University (817 items), Jomo Kenyatta University of Agriculture and Technology (dead link), Karatina University (325 items), KCA University (267 items), Kenyatta University (13,953 items), Kisii University (dead link), Maasai Mara University (5,057 items), Masindi Muliro University of Science and Technology (136 items), Moi University (847 items), Muranga University of Technology (2,846 items), Pwani University (367 items), South Eastern Kenya University (3,539 items), St. Pauls University (569 items), Strathmore University (2,163 items), Technology University of Kenya (873 items), Technology University of Mombasa (10,223 items), The Management University of Africa, USA International University – Africa (3,463 items), University of Eldoret (dead link), University of Embu (1,829 items), University of Nairobi (84,705 items). *Tanzania* – Muhimbili University of Health and Allied Sciences (1,781 items), Mzumbe University (1,686 items), Open University of Tanzania, Saint Augustine University of Tanzania, Sokoine University of Agriculture (1,788 items), The State University of Zanzibar (67 items), University of Dar es Salaam (4,512 items). *Uganda* – Makerere University (5,299 items) and Regional Universities Forum for Capacity Building in Agriculture.

University-based IRs online but not registered in OpenDOAR by March 2018: *Kenya* – Maseno University (323 items), Kirinyaga University (91 items), Machakos University (81 items), Taita Taveta University (130 items), Daystar University (1,148 items), Kenya Methodist University, Kabarak University (1,268 items), Africa International University (312 items), Mount Kenya University (5,252 items). *Tanzania* – Nelson Mandela African Institute of Science and Technology (8 items). *Uganda* – Makerere University Business School, Aga Khan University, Kampala International University (318 items), Uganda Christian University (110 items) and Uganda Martyrs University (149 items).

The extent of IR growth in East Africa, therefore, continues to grow, and a few studies have already examined their adoption and use (Dulle, 2010; Lwoga and Questier, 2014; Wanyenda, 2015). However, not much is known about how far they are enabling OA. It is against this that the study was instituted.

Literature review

As far as what repositories were meant to serve, Westell (2006, p. 221) noted that "institutional repositories were not designed to control access but to facilitate open access to their holdings," and that "the pure institutional repository provides material with no access limitations to support the widest possible dissemination of research findings" (p. 222). Shearer (2002/2003, p. 97) pointed out that "the major goal of the institutional repository, as it grew out of the open access movement was to disseminate scholarly material." Shearer (2002/2003, p. 92) also further noted that "in most cases, IRs had no barriers to their content or very low-barrier access (such as registration requirements)." Chan (2004) noted that the primary role of IRs was to facilitate open access to the traditional scholarship in institutions. To sum this up, Casey (2012) re-affirmed the purpose of IRs as partly meant to serve as open access repositories of the intellectual output of the faculty, besides showcasing the tangible results of the institution globally. Are IRs in East Africa achieving the open access goal?

Holderied (2009) noted that "institutional repositories present academic institutions with the opportunity to provide global open access to the scholarship that is created within that institution", and the developing world was bound to benefit more from the growth of the open access movement (Shearer, 2002/2003), given that it had difficulties accessing subscribed literature. This was justified by a World Health Organisation survey carried out in 2000 which established that "researchers in developing countries ranked access to subscription-based journals as one of their most pressing problems," and affirmed by Ochs *et al.* (2004) while writing about the launch of Health InterNetwork Access to Research Initiative (HINARI) and Access to Global Online Research in Agriculture (AGORA).

A number of studies have shown the achievement of open access in IRs in the developed world, with universities in Australia recording rates of non-full-text documents as low as 5 per cent or less (Xia and Sun, 2007). Not all repositories in the developed world have achieved maximum open access as such, and this depends on a number of factors, the objective of having the repository being one of them. On a world perspective, Prost and Schopfel's (2014) work established that a number of the 25 IRs that they surveyed from the Directory of Open Access Repositories were either with metadata without full-text, metadata with full-text only for authorised users and items that were under embargo or that were restricted to on-campus access. In other words, these repositories were not as open as expected by the Budapest Open Access Initiatives standards. Prost and Schopfel's study, however, did not establish why these repositories were not fully open access, other than pointing out that this would be explicitly clarified in each individual institution's open access policies. Given that IRs were viewed as a complementary option to accessing and disseminating scholarly information, and the developing world was bound to benefit more, this study sought to establish the achievements of open access IRs in universities in East Africa, the challenges affecting the provision of open access, the strategies to address these challenges and the future prospects.

Methodology

University websites in Kenya, Tanzania and Uganda were surveyed for the presence of IRs, the number of items in the repositories (by March 2018) and for the selected universities (based on the author's PhD study), how much of these items were open access (by 2014). A thorough search of the Internet and journal databases was also conducted to identify literature about open access and IRs in East Africa. This was complemented by the findings of the author's PhD study on the management and accessibility of open access IRs in selected universities in East Africa, where both qualitative and quantitative methods were used to collect data from three universities, with one IR from Kenya, Tanzania and Uganda,

purposively selected based on the highest number of items in the IR in each country by 2014. Six librarians in charge of the IRs were purposively selected and interviewed, whereas 183 researchers, selected using systematic random sampling, responded to a self-administered questionnaire. The selected universities, with their level of open access by 2014 were Kenyatta University (KU, 32 per cent OA in IR) in Kenya, Makerere University (Mak, 22 per cent OA in IR) in Uganda and Muhimbili University of Health and Allied Sciences (MUHAS, 98 per cent OA in IR) in Tanzania. To establish the level of OA of the IRs in universities, an analysis of the first 20 items of each letter of the alphabet was checked for full-text accessibility and the average number of items with full-text content determined.

Results and discussion

Achievements

Out of 145[2][3][4], 40 public and private universities in East Africa have acknowledged the role of IRs in centrally collecting, disseminating and preserving the scholarly information of the institution and invested in initiating IR projects, although some of these universities are not very old and still have to accumulate their collections for online visibility and accessibility. IRs in East Africa are growing, but at different rates – fastest in Kenya with 27, followed by Tanzania with seven and Uganda with six active online repositories in universities. Four of the six universities with repositories in Uganda participated in the Electronic Information for Libraries – Swedish Programme for ICT in Developing Regions (EIFL-SPIDER) 2016/2018 project (Open access policies in Kenya, Tanzania and Uganda) and have policies that they are promoting. The plans used to advocate for the policy help in promoting the repository, which is a strategy for growth. At Makerere University, each College Board is being sensitised about the various policy statements in the IR policy and this is building awareness of how content in the repository is expected to be generated, with responsibilities assigned to different categories of stakeholders. Westell (2006) advised that "a champion in upper administration (at the dean level) and a management structure which includes appropriate advisory committees will contribute to sustained success." This is the next stage to be followed in implementing the IR Policy at Makerere University. Harnad and McGovern (2009) emphasised the importance of mandates incorporated within policies to ensure deposits are made, ensuring the growth and open access of the IR. With reference to the author's PhD study findings illustrated in Table I, 68 per cent of the respondents were in favour of having university mandates requiring researchers to deposit research output in the IRs. This corroborated with many other studies (Abrizah, 2009; Dutta and Paul, 2014; Kennan, 2007; Kim, 2007; Sale, 2006; Singeh, *et al.*, 2013; Swan and Brown, 2004, 2005; Yang and Li, 2015) and, to move a step further, the Consortium of Uganda University Libraries (CUUL) universities that participated in the EIFL-SPIDER 2016/2018 project have integrated

	University			
	1 Makerere University	2 Kenyatta University	3 MUHAS	Total
University mandatory deposit				
1 Strongly in favour	66 (74%)	31 (54%)	27 (73%)	124 (68%)
2 Mildly in favour	13 (15%)	15 (26%)	7 (19%)	35 (19%)
3 Neither	7 (8%)	2 (4%)	3 (8%)	12 (7%)
4 Mildly against	0 (0%)	6 (11%)	0 (0%)	6 (3%)
5 Strongly against	3 (3%)	3 (5%)	0 (0%)	6 (3%)
Total	89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table I. University mandate to deposit in the IR ($N = 183$)

mandatory statements in their IR policies. Although mandates are good and highly recommended, Quinn (2010) pointed out that mandates alone would not overcome the researcher's psychological resistance to participation in self-archiving, and suggested that this should be done together with other strategies of encouraging faculty to deposit articles in repositories. At Makerere University, an attempt was done to encourage researchers to self-archive by awarding researchers with the highest number of deposits in the repository and showing the competitiveness among colleges/schools by publicising the total number of items per college/school for the administration of each college/school to push for more items uploaded in the IR.

With the growing number of IRs in East Africa, much of the grey literature, such as research reports, theses and dissertations, seminar and conference papers that were unpublished and previously only physically accessible from the library shelves (Chisenga, 2006), is now visible on the web, and increasingly being made accessible to the general public for local and international utilisation. Although the level of open access was noted to be low by 2014 at Kenyatta University (32 per cent) and Makerere University (22 per cent), universities in East Africa are prioritising open access policies to ensure that what is made visible online is actually accessible in full-text. Kenyatta University, which started its IR with abstracts from the Database of African Theses and Dissertations project had streamlined the policy issues regarding student theses and dissertations and were uploading soft copies of the work of graduating students while digitising the print theses retrospectively and making them accessible in the IR. Makerere University, which started digitising and uploading theses and dissertations in the IR prior to clearing consent issues, had these items restricted in the IR, and is now advocating for mandatory self-archiving of theses and dissertations in the IR policy. As a strategy to populate the IRs, the libraries at Kenyatta University, Makerere University and Muhimbili University of Health and Allied Sciences had embarked on in-house retrospective digitisation of theses and dissertations, with funding either directly from the library or sourced from funding agencies such as Swedish International Development Cooperation Agency at Makerere University. The IR at Makerere University started after setting up the digitisation unit in the library, with the initial content being digitised print theses and dissertations. For the other libraries, digitising the theses and dissertations was a strategy of adding full-text to the already established repository of metadata content and this has helped improve open access.

Lack of human resource (expertise) to develop, implement and manage IRs in East Africa was one of the factors that were affecting the adoption of open access as stipulated by UNESCO on the Global Open Access Portal. However, the intervention of organisations such as International Network for the Availability of Scientific Publications and EIFL, in addition to international partner universities and funding agencies, working in collaboration with library consortia in Kenya, Tanzania and Uganda (Kenya Library and Information Services Consortium – KLISC, Consortium of Tanzania Universities and Research Libraries – COTUL, CUUL) have helped build capacity for the librarians to plan, implement and manage repositories, as well as develop open access policies. Institutions that initiated repositories in the early 2000's did not start with policies and this affected the implementation of open access. With the training and guidance provided so far, the situation is improving, with universities that have open access policies hoping to yield more content in the repositories.

IR projects in East Africa have been initiated by individual universities, with libraries in collaboration with the institutional IT departments, either engaging the university administration or finding other means of funding the project. Westell (2006) noted that this was a more sustainable funding model for archiving scholarly materials and providing

access through an institution-supported platform, which would have been assessed for the projected institutional content storage and backup requirements, and centrally funded as IT utilities that benefit all members of the university community. Although getting funding for IR projects makes the adoption process faster, internal funding helps the institution to strategically plan how the project will be sustained. A number of universities in Kenya, both big and small have managed to setup and sustain repositories with internal funding, and others can emulate from them.

Researchers who have been sensitised about the benefits of self-archiving and the anticipated long-term preservation of literature are positive about open access in IRs. The majority of the respondents illustrated in Figure 1 extracted from the author's PhD study (97 per cent at Makerere University, 91 per cent at Kenyatta University and 100 per cent at MUHAS) agreed to provide open access to content in IRs or promised to share their scholarly information. However, agreeing to comply needs to be followed up for action otherwise research has shown that what they acknowledge in theory is not what they practice (Morris and Thorn, 2009). Adoption of open access among researchers has been high in some disciplines (health as evidenced from the level of open access at MUHAS) than others, probably because of the culture of publishing and the open access mandates enforced by funding agencies that are more accessible in the health sciences. Strategies of breaking the resistance to self-archiving in other disciplines need to be explored in order to expand the horizon of open access.

Challenges

As observed from the 2013/2014 EIFL-SPIDER project while setting ground for the 2016/2018 project, "the momentum to embrace open access (OA) initiatives in Kenya, Tanzania

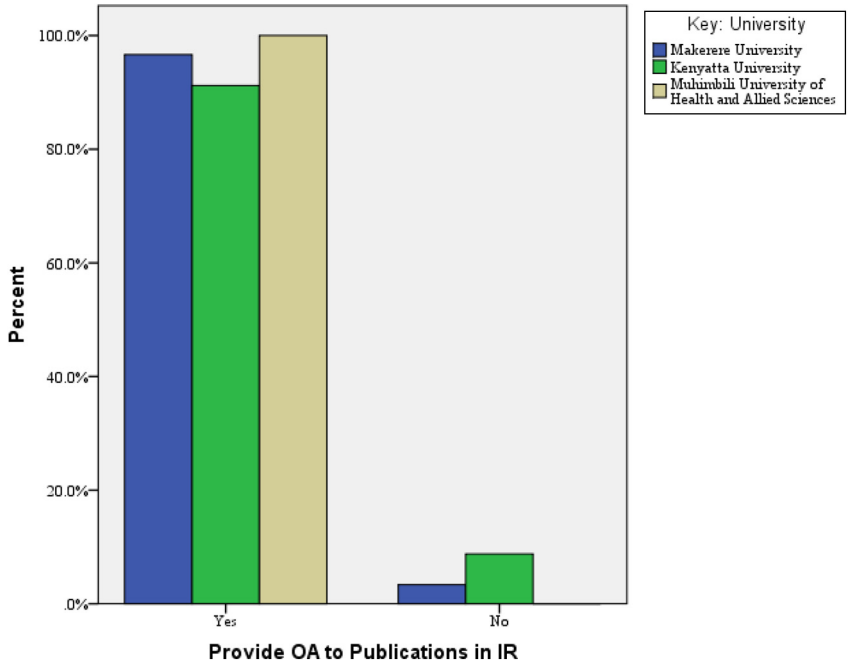

Figure 1.
Providing open access to publications in the IR

and Uganda had been building up, but the growth of digital content, accessible via the internet, was still slow" (EIFL, 2018). The total number of items per IR ranged from 0 to 85,000 items. Of the 40 actively online IRs in Kenya, Tanzania and Uganda as established from the university website survey by March 2018; 3 had more than 10,000 items; 14 had between 1,000 and 10,000 items; 19 had less than 1,000 items; and 4 had items but it was not easy to establish the total quantity from the IR website.

Some of the expressed reasons as to why there were few items in most repositories include the fact that it was sometimes difficult to get researchers to agree to share their work, especially when there were no open access policies operating within the institution. Although the EIFL-SPIDER project had succeeded in having institutions draft IR policies, some of them had stagnated because it was essential to involve all stakeholders but bureaucratic to achieve. The inability to implement the drafted policies was slowing content collection and affecting open access in the IR. The absence of government and/or funder mandates in East Africa has also affected the collection and provision of open access in IRs. Otanda *et al.* (2015) in their presentation reporting about the EIFL-SPIDER 2013/2014 project (Open access in Kenya, Tanzania and Uganda) noted that there was no open access enabling environment with the absence of open access country policies in Kenya, Tanzania and Uganda to guide institutions on how to proceed. Haas (as cited in Westell, 2006, p. 214) noted that "if all major funding agencies mandated deposition, it was likely that major repositories could be developed rapidly." Some of the policies lacked mandatory provisions to deposit content in the repository rendering the archiving process to remain voluntary. Tracking of publications from individual researchers in the institution, and from the various publishers scattered the world over was also noted as a slow and tedious process.

Lack of awareness of open access IRs among researchers and academicians was one of the hindrances to populating repositories. In practice, researchers are more aware of open access journals and social media platforms as the means of publicising their research output for easy access than using IRs. Findings from the author's PhD research established the following sequence as the ways researchers commonly use to publicise their work (number of multiple responses in brackets): Journals and Books (66); e-mail, Notice Boards, Newsletters (24); Seminars, Workshops, Conferences (23); Social Media (20); Websites, Internet (18); Repositories (14); Share hard-copy and In Library (14); Open Access (6); Google Scholar (3). As far as OA avenues are concerned, open access journals and social networking platforms such as ResearchGate and Academia.edu could be implied as the most used. Studies have shown how researchers provide full-text content on ResearchGate (Jamali and Nabavi, 2015; Martín-Martín *et al.*, 2015; Thelwall and Kousha, 2015), with Lovett *et al.* (2017), indicating that unless such authors have published in open access journals, in most cases, they violate the agreements that they sign with publishers. This was confirmed by Jamali's (2017) study. Although Lovett *et al.* (2017) cautioned librarians not to consider academic social networking platforms as a threat to open access, they tend to make researchers feel contented with the easy process of including and updating publications, and their ability to interconnect researchers in the same field, which IRs do not do directly, especially those in East Africa that have not advanced in creating researcher profiles, thus acting as a hindrance in getting researchers to self-archive in IRs. Besides, researchers seem to be more aware of the functionalities and advantages of ResearchGate than those of IRs (Borrego, 2017; Lovett *et al.*, 2017), yet IRs have been improved to offer equally the same functionalities in ResearchGate, such as statistics of usage that include coverage of users, in addition to assured long-term preservation (Francke, *et al.*, 2017; Lynch, 2003) of the publications. The unawareness of researchers of the existence, functionalities and benefits of

IRs calls for strategic marketing of IRs to improve the image and role that they play for both researchers and the institution as a whole.

The limited number of staff involved in the repository activities was also part of the reasons why there were low awareness levels and content in the IR and therefore less open access. The majority of the respondents as illustrated in Table II extracted from the author's PhD study (91 per cent at Makerere University, 98 per cent at Kenyatta University and 86 per cent at MUHAS) expressed need for awareness building about open access and IRs within the university.

Shearer (2002/2003) argued that the number of staff engaged in advocating and promoting the repository affected the visibility and growth of the repository. It was established that the staff working on the IR activities in universities in East Africa were limited to a few librarians who had been assigned the responsibilities of the IR, with minimal or no support from the reference or other librarians especially in marketing and soliciting for IR content. Giesecke (2011) pointed out that repository staffing should be composed of those with direct responsibility for the daily operation of the services and those who have new responsibilities added to their positions to support the service, such as marketing roles, contributing metadata and providing training. Librarians positioned in branch/faculty/college libraries often interface with researchers and are in a better position to promote the IR and open access within their locations. In fact, all categories of the IR stakeholders, such as the administrators, librarians, researchers and students should be involved in OA and IR advocacy for any success to be recorded in the institution. Otanda *et al.* (2015) thought it was important to incorporate students in the IR/OA advocacy strategies to reach out to research administrators, academic staff and their fellow students; however, after training them for specific events such as open access week; they do not seem to continue promoting the cause. Targeted training of trainer workshops for students in different fields could be used (as has been tried in the health discipline in Kenya – the Medical Students Association of Kenya). Efforts to sensitise the university community about the benefits of the IR and how to populate it have been made by the repository managers but the patronage from the research community has been appalling. These could be some of the reasons why some of the currently online repositories were not registered in OpenDOAR because there was not much to show the world as yet.

Awareness about IRs has also been limited because librarians have not adopted the practice of developing informational websites to guide users on how open access is being implemented in the university and how researchers can participate. Dependence on one-on-one sessions, seminars and workshops, e-mails and print marketing materials are not sufficient when trying to reach the wider university community. Websites on open access and how it applied to individual institutions could be a good and permanent source of information and easy pointer for those who might not be able to attend face-to-face workshops. Dulle (2010) recommended linking open access information sources to library

	University			
	1 Makerere University	2 Kenyatta University	3 MUHAS	Total
OA and IR Awareness need				
1 Yes	81 (91%)	56 (98%)	32 (86%)	169 (92%)
2 No	7 (8%)	1 (2%)	5 (14%)	13 (7%)
3 Not sure	1 (1%)	0 (0%)	0 (0%)	1 (1%)
Total	89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table II. The need for awareness building in the university about open access and IRs ($N = 183$)

websites for users to access. This could be an easy way of getting researchers to find information on open access from one location, which of course could still be distributed through promotional materials like leaflets and brochures. Abrizah (2009) recommended providing FAQs (frequently asked questions) covering topics such as ownership of copyright, protection of rights using creative commons licenses, plagiarism and how it is detected within the institution, preservation of materials and file security, and provide a link to the Securing a Hybrid Environment for Research Preservation and Access (SHERPA) service: SHERPA/RoMEO list of journal publishers' self-archiving policies that guide researchers on what versions to self-archive.

Westell (2006, p. 215) noted that "one of the most difficult and time consuming tasks in populating a repository is ensuring that the appropriate copyright clearances have been sought." One of the reasons why there is more metadata only content in repositories in East Africa is because the process of contacting publishers for permission to self-archive was minimally, if not done at all. Once repository managers establish that a particular publisher does not favour self-archiving of the publisher's PDF which is in most cases the only available option, they neither contact the author(s) for other versions nor contact the publisher. The end result is adding the metadata and uploading the abstract, which is already part of the metadata in the IR. This is similar to situations where institutions harvest faculty publications from other sources whenever possible, circumventing the need for author cooperation in providing copies of their manuscripts (Lovett *et al.*, 2017). An essential component of repositories is that they are dependent on permissions from others. Before content is deposited in an IR, permission should be sought from the copyright owner, and in a university setting, this may include university administration, staff, students and publishers. For journal publications, following are some of the expected procedures to follow: first, check for the publisher self-archiving requirements from either the SHERPA/RoMEO database or the publisher's website. If conditions do not favour immediate self-archiving of the publisher's PDF, then contact the publisher for permission/clarification. If other versions of the article can be self-archived, contact the author (s) for those versions. Always add publisher statements and website links to the metadata. For publishers/journals where most of the researchers in a university tend to publish, request for blanket institutional permission to self-archive in the repository.

Most universities in East Africa have adopted using the DSpace software, which is freely downloadable but not easy to install and maintain. The libraries mostly depend on the university IT department, which are often already over-burdened with other IT systems and therefore offer divided attention, slowing the whole process. Some new universities in Uganda interested in setting up IRs fail to get IT personnel to install the software and have to seek for assistance from either older universities that have repositories or the CUUL, which is still planning to form a pool of skilled DSpace IT personnel to promote IRs within the country. The inability to build IT capacity within the library to initiate and sustain IR projects is limiting the open access adoption process in East Africa.

Strategies

To address most of the challenges above, there is need to involve more stakeholders in the advocacy for self-archiving and open access in the IR. Engaging the students and researchers in sensitising their fellow colleagues and involving more librarians in the marketing of the repository could go a long way in reaching a wider community of the university. This worked quite well at the University of Kansas Libraries (Emmett *et al.*, 2011), the Grand Valley State University in Michigan (Beaubien *et al.*, 2009) and at the University of Oregon Libraries (Jenkins *et al.*, 2005).

There should be a top-down development of open access policies, beginning with government and funding agencies to smoothen the process that institutions take to develop IR policies because then, the IR stakeholders would have prior knowledge about OA policies and would easily pass and implement IR policies.

Advocacy for IR adoption in universities in East Africa should be re-enforced by engaging administrators and researchers, combined with assisted efforts to install the software for institutions that do not have the IT capacity. DSpace is the commonly used software, and IT capacity to install, maintain, trouble shoot and upgrade can be built within the library consortia, with guidance from the DSpace technical support group.

Prospects

The future of IRs and the provision of open access in East Africa is promising, with government open data initiatives already being implemented and prospects for national open science policies foreseen as institutions continue advocating for more openness in research after realising the need to re-use and/or refer to previously published papers and collected research datasets for further development.

With the growing number of universities in Kenya, Tanzania and Uganda (currently 145 universities in total), on-going research and publication activities will increase and so will the demand for online access to the research output, leading to the growth of open access IRs.

Conclusion

In the electronic information environment, library users are interested in easily accessing full-text information resources, and these should be readily available from IRs. Emphasis should therefore be placed on processes that promote open access deposits in repositories. Institutionally mandated deposits are essentially required if universities in East Africa would like to move beyond the slow and time consuming self-driven/voluntary process of collecting content and increase the visibility and accessibility of scholarly information locally produced to enhance development within the region. Staff participation in IR activities and collaboration in self-archiving or providing their scholarly information for mediated archiving are essential for open access. For student theses and dissertations, requiring deposit in the IR as a condition before one graduates would maximise content collection and growth.

Notes

1. See www.opendoar.org/countrylist.php?cContinent=Africa
2. For details of the number of public and private universities in Kenya, see www.cue.or.ke/images/docs/Accredited_Universities_in_Kenya_November_2017.pdf
3. For details of the number of public and private universities in Tanzania, see www.tcu.go.tz/images/documents/LIST_OF_UNIVERSITY_INSTITUTIONS_IN_TZ_AS_OF_30_9_2016.pdf
4. For details of the number of public and private universities in Uganda, see www.unche.or.ug/

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