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RESEARCH

An Analysis of the Factors Affecting Open Access to Research Output in Institutional Repositories in Selected Universities in East Africa

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INTRODUCTION Institutional repositories (IRs) present universities with an opportunity to provide global open access (OA) to their scholarship, however, this avenue was underutilised in two of the three universities in this study. This study aimed at proposing interventions to improve access to research output in IRs in universities in East Africa, and it adds to the depth of knowledge on IRs by pointing out the factors that limit OA in IRs, some of which include lack of government and funder support for OA and mediated content collection workflows that hardly involved seeking author permission to self-archive. **METHODS** A mixed methods approach, following a concurrent strategy was used to investigate the low level of OA in IRs. Data was collected from three purposively selected IRs in universities in East Africa, using self-administered questionnaires from 183 researchers and face-to-face interviews from six librarians. **RESULTS** The findings revealed that content was collected on a voluntary basis, with most of the research output deposited in the IR without the authors' knowledge. The respondents in this study were, however, supportive of the activities of the IR, and would participate in providing research output in the IR as OA if required to do so. **CONCLUSION** The low level of OA in IRs in universities in East Africa could be increased by improving the IR workflow, collection development, and marketing processes. Self-archiving could be improved by increasing the researchers' awareness and knowledge of OA and importance of IRs, while addressing their concerns about copyright infringement.

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IMPLICATIONS FOR PRACTICE

1. The utilization of a mixed methods research design enhanced the authors understanding of the low level of OA in IRs, and how it could be improved specifically for universities in East Africa, most of which have upcoming IRs and therefore still strategizing how to manage them appropriately in order to provide OA.
2. This study specifically provides useful pointers to the factors that limit providing OA to research output in IRs that other universities in East Africa could note as precautions as they manage their repositories.
3. To the repository managers, emphasis on having OA policies and deposit mandates, and IR marketing plans are some of the remedies that could help them achieve a higher level of OA in IRs in East Africa.

INTRODUCTION

The origins of IRs are traced as far back as 1994 when Stevan Harnad proposed the creation of ftp archives in his subversive proposal for electronic publishing, where Joshua Lederberg later in the discussions that followed, introduced the idea of having institutional rather than disciplinary archives (Okerson & O'Donnell, 1995). Literature about IRs however, started surfacing in the early 2000's, with seminal papers by Crow in 2002, who attributed the change in the structure of scholarly journal publishing to the following reasons: technological change, in the form of digital publishing technologies; significant increases in the overall volume of research; increasing dissatisfaction, especially on the part of librarians, with traditional print and electronic journal price and market models; and increasing uncertainty over who would handle the preservation archiving of digital scholarly research material (Crow, 2002, p. 5). Creaser et al. (2010) attribute the development of IRs to a combination of factors which include: "the open access movement gaining momentum at the turn of the 21st century, drastic increases in journal prices since the 1990s and increasing pressure on higher education institutions to compete for research funds through periodic research assessment" (p. 147). Most academic libraries were noted to have launched IRs purposely to archive their university's scholarly output and, where permitted, to enable access to the archived collection (Mercieca, 2008). 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." Westell (2006) noted that "institutional repositories were not designed to control access but to facilitate open access to their holdings" (p. 221). … "the pure institutional repository provides material with no access limitations to support the widest possible dissemination of research findings" (p. 222). Shearer (2003) also noted that "in most cases, IRs have no barriers to their content or very low-barrier access (such

as registration requirements)" (p. 92) Chan (2004) noted that the primary role of IRs was to facilitate OA to the traditional scholarship in institutions. To sum this up, Casey (2012) re-affirmed the purpose of IRs as partly meant to serve as OA repositories of the intellectual output of the faculty, besides showcasing the tangible results of the institution globally. However, Prost and Schopfel (2014) in their survey of 25 IRs selected from the Directory of Open Access Repositories established that a number of items in these repositories were either metadata without full-text, metadata with full-text only for authorized users, and items that were under embargo or that were restricted to on-campus access. In other words, the level of OA in these IRs was low. Based on Prost and Schopfel's (2014) study, this study established similar findings by reviewing the websites of IRs of universities in East Africa in September 2014. Access to scholarly information in IRs in universities in East Africa is limited and it should be improved in order to increase research growth and the application of knowledge for development within the region. This study aimed at proposing interventions to improve access to research output disseminated through IRs in universities in East Africa. The main research question was how could the content of IRs be made OA? The sub-questions were: (1) What factors affected the provision of OA in IRs? (2) What was the researchers' level of awareness about OA and participation in self-archiving in IRs? These led to the investigation of the causes of the limited OA in IRs in East Africa.

LITERATURE REVIEW

A number of factors contribute to an IR being OA. Babu, Kumar, Shewale and Singh (2012) while writing about the challenges of IR development in India recognised the fact that the flourishing of repositories required some government support, just like it was in the UK. According to Chan and Costa (2005), the UK House of Commons Committee on Science and Technology, on realising the need for access to scientific publications, released a report on 20th July 2004 recommending among other things, the government providing funds to all UK universities to launch OA IRs; and all authors of articles based on government-funded research to deposit copies in their IRs. Such government support is what has enabled OA in the UK to reach its maximum in almost all institutions of higher learning. On top of this, the Joint Information Systems Committee (JISC) in the UK ensured that the implementers of IRs were skilled enough before initiating repositories by providing support infrastructure under the Repositories Support Project (Pennock & Lewis, 2007). All these efforts had direct implications on the collection development processes followed for the content in IRs, and the access policies, which in most cases promoted OA.

Self-archiving mandates or policies that require researchers to deposit their published scholarly writings and/or research data in IRs have contributed a lot to the provision of OA in repositories. The first university-wide OA mandate was implemented by the Queensland University of Technology, Australia in 2004; and it registered tremendous success, with

many other institutions following thereafter. In Xia and Sun's (2007) study, which explored nine eprint repositories selected from Australia, Italy, Sweden, and the United Kingdom noted that all the four Australian IRs showed low rates of non-full-text documents, with a percentage as low as 5% or less; and this was attributed to the existence of mandate policies by Australian universities. It is also widely reported how funding body mandates have raised researcher awareness and participation in OA (Dolan, 2011), and also contributed to the provision of OA in the UK, Austria, Sweden, Canada and Australia (Swan & Hall, 2010).

Systematic content collection procedures, either with the author's consent or using established policy guidelines are essential in ensuring that IRs provide OA. Instances where metadata is entered in the IR for trial purposes may lead to having content without full-text as reported by Lee, Burnett, Vandegrift, Baeg and Morris (2015):

> As the development of DigiNole Commons was on-going, there were cases where metadata was entered to demonstrate the IR's functions and value to a department or faculty member, with the goal of submitting the full text of the articles at a later date following subsequent individual outreach.

Mediated archiving is a common practice of populating IRs. Xia and Sun (2007) who did a study on nine eprints repositories selected from Australia, Italy, Sweden and the UK noted that the majority of the documents had been deposited by either a librarian or an administrative staff, implying that mediated archiving was being used in these repositories; and the rate of full-text availability was relatively low, except for Australian repositories. There, therefore, might be a relationship between mediated archiving and OA to materials in IRs. Abrizah (2009) was of the view that when librarians collect and deposit materials into the IR without the author's knowledge, it contributes to the level of unawareness since most of them would not know that their work was deposited there. Abrizah reported that almost two-thirds of the respondents to a study that was done in a research intensive university in Malaysia were not aware that their institution had an IR; and attributed this unawareness to mediated archiving. Soliciting for the consent of the author before mediated archiving is done is therefore very important if the goal of achieving OA is to be obtained.

Researchers' awareness and support of OA are essential for the provision of full-text materials in IRs that are freely available to the public. While addressing the issue of OA to scientific publications, Bjork (2004) concluded that "general awareness of the advantages of OA publishing was naturally a prerequisite for scientists' choosing to use OA channels both for primary and secondary publishing." Just as Swan and Brown (2005) established that most of the academic authors were not familiar with the concept of IRs; Papin-Ramcharan and Dawe (2006) asserted that if authors were unaware of the existence and benefits of archives then they would not self-archive. Awareness about the IR alone was, therefore, not enough

because it had to be related to using the IR as well. Foster and Gibbons (2005) noted that although faculty at the University of Rochester were aware of the IR, one of the reasons why they were not rushing to put their work in the repository was because they had not recognized its benefits to them in their own terms.

The success of an IR may be measured according to the objectives for which it was established. Some researchers consider the number of items deposited in the repository as one of the ratings of success. Xia and Sun (2007), however, regard the rate of full-text availability in the repository as the greatest indicator of success. This is based on the fact that when users or researchers seek for information, they are interested in the full-text documents and not just the metadata. Open access to the full-text documents in IRs are therefore essential success factors.

The achievement of OA in repositories is dependent on a number of factors, some of which include an enabling policy which clearly stipulates what content should be deposited. Covey (2009, p. 224) notes that "the success of these repositories hinges on the success of efforts to convince faculty that OA is important and to persuade them to act on that conviction by doing what it takes to retain the necessary rights and to comply with publisher OA policies". Researchers are the key stakeholders who contribute content to repositories and a lot of research has been done on their self-archiving practices, especially in IRs (Allen, 2005; Davis & Connolly, 2007; Foster & Gibbons, 2005; Watson, 2007). Some of this research reveals the researchers' unawareness about how to provide OA in repositories. Covey (2009) further noted that many faculty members were either not aware of publisher policies, had a meagre understanding of copyright, or had little respect or concern for publisher policy or copyright. This greatly contributes to the low level of openness in IRs. It also contributes to why it had been a challenge to realise the full potential of IRs through content recruitment, as noted by Bamigbola (2014).

Repository activities require substantial outreach and educational efforts campus-wide (Emmett, Stratton, Peterson, Church-Duran & Haricombe, 2011) in order to achieve success in providing OA. The University of Kansas Libraries involved all categories of staff in reaching out to the researchers, soliciting for scholarly materials and involving them in alternative methods of disseminating their research, all culminating in achieving OA in the repository. Beaubien, Masselink and Tyron (2009) assert that training and involving liaison librarians in IR activities helps build a larger pool of expertise than dealing only with a few librarians. This, however, involves establishing the librarians OA knowledge gap, and training them accordingly, so that they are sure and confident of what they are supposed to impart to the researchers.

There were a few studies that had addressed the concept of OA in East Africa. Three of such studies included one in Kenya by Wanyenda (2015), who evaluated the state of IRs in

Kenya, specifically reviewing the content types, the policies and the usage of the repositories, and two in Tanzania, both of which investigated the factors affecting the adoption of OA in Tanzanian public universities (Dulle, 2010), and in Tanzanian health sciences universities (Lwoga & Questier, 2014). Although IRs were becoming a prominent feature in universities in East Africa, no study had considered the extent to which OA to the research output in these repositories was being provided. This study therefore sought to fill this gap by highlighting the low level of OA, and providing useful pointers to the factors that limit OA in IRs, so that repository managers in East Africa take precautions while managing their repositories, as they strive to provide OA.

METHODS

This study was conducted in three countries of East Africa, namely: Kenya, Tanzania, and Uganda, with repositories within university settings selected from the Directory of Open Access Repositories. The repositories in each country were selected purposefully, considering the best performing repository as one that had the highest number of items by July 2014, based on the amount of content recruited in an IR being one of the indicators of success (Bell, Foster & Gibbons, 2005; Ferreira, Rodrigues, Baptista & Saraiva, 2008; Shearer, 2003). The repositories selected for this study were from Kenyatta University (KU) in Kenya, Makerere University (Mak) in Uganda, and Muhimbili University of Health and Allied Sciences (MUHAS) in Tanzania. The IR websites of these universities were analysed to provide the basis on which the level of OA was ascertained. To establish the level of OA, an analysis of the first twenty titles of each letter of the alphabet of content on the IR website was checked for full-text accessibility and the average number of titles with full-text content determined. Makerere University had 3,015 titles in total, with an OA average level of 22%, while Kenyatta University had 8,855 titles in total, with an OA average level of 32% and Muhimbili University of Health and Allied Sciences had 1,085 titles in total, with an OA average level of 98%.

The study used a cross-sectional multiple case study design because there was a need for an in-depth understanding of how IRs had been developed, how they were managed and how participative the researchers were involved in the IR activities, in order to establish why content in the IRs was in most cases not OA. A mixed methods approach was adopted because using each of the qualitative and quantitative methods by themselves would not adequately address the study problem, thus the need to use the strength of both approaches to provide a better understanding of the problem (Creswell, 2014).

The population of the study consisted of the librarians, specifically the IR managers and the researchers from who content for the IR is collected. The study was approved by the Institutional Review Boards (IRBs) at each of the study sites with consent sought from the par-

ticipants and respondents before conducting the study. The qualitative study focused on the IR managers, and these were purposefully selected with the University Librarians' guidance in each institution, and data was collected using face-to-face interviews. Since repositories are usually managed by one to two librarians and the purpose of the qualitative inquiry was to establish how the repositories were developed and managed, based on the assumption that the low OA levels could have been caused by managerial issues, the sample size for the interviews was set at two per university to cater for the repository manager and content manager where applicable. The interviews were audio-recorded, transcribed, and analysed using themes categorized under the managerial functions of IRs (specifically on planning, budgeting, staffing, collection development, marketing and advocacy) and themes derived from literature and the research questions. This information was then summarized and reported as a narrative. The quantitative study was conducted using a self-administered questionnaire that was distributed to the researchers in their offices, with the help of research assistants. The questionnaire had both open-ended and closed-ended questions. The total population of researchers was 2,347 (761 from KU, 255 from MUHAS, & 1,331 from Mak). A sample of 330 (107 from KU, 35 from MUHAS, & 187 from Mak) was derived using a formula $[Z^2 \times (p) \times (1 - p)] / C^2$ guided by Sarantakos (2005) and Wildemuth's (2009) explanations of how to obtain sample sizes. A sampling frame was then prepared for each university, arranged according to the different schools, departments and the academic position of the researchers. Systematic random sampling was used, with a sampling fraction of 7 to select the individual researchers who responded to the questionnaire. The returned questionnaires were checked for non-response and completeness, numbered, the closed-ended questions coded and entered into the Statistical Package for Social Sciences (SPSS) for analysis. Descriptive tables and charts were then derived and used to report the findings. The open-ended questions were coded according to the emerging themes per question, and reported accordingly. The study specifically followed a concurrent strategy, with data collected in one phase, during which both quantitative and qualitative data were collected simultaneously.

RESULTS

The results are presented in two broad categories, according to the managerial factors that were affecting the provision of OA in IRs in each of the selected universities and the researchers' perspective, that is, their awareness and participation in IR activities.

The development and management of IRs in selected universities in East Africa

The interviewees in the study were asked a number of questions to capture the development and management aspects of IRs, with the responses later grouped in themes while reporting. For instance: "What did the process of setting up the IR entail?" yielded a mixed

narrative on the software, objectives of the IR, budgeting, staffing, policies, piloting, collaborations, initial content types and process of collection development, and marketing of the IRs as reported institution by institution in the sections below.

Makerere University Institutional Repository (MakIR)

The IR at Makerere University in Uganda started as a digital library project called Uganda Science Digital Library (USDL) that was meant to cover all science institutions, with the objective of making scientific literature produced in the country more accessible digitally. This project was implemented in collaboration with the University of Bergen Library, which already had a repository called Bergen Open Research Archive (BORA) operated on the DSpace software. Makerere University Library, which also adopted using the DSpace software, received practical training and experience in developing and managing a repository from the University of Bergen Library, and in 2005 piloted the USDL project at only one institution in Uganda, that is, Makerere University, and launched the project in 2006. Research output was collected voluntarily on request by the repository managers and deposited in the repository on behalf of the researchers, while the hard copy theses and dissertations that the library was mandated to collect were digitised and uploaded in the repository. Postgraduate students were required to submit a soft copy of their theses and dissertations on Compact Discs (CDs) to the Directorate of Research and Graduate Training, where they were collected by the Library for uploading in the IR. A consent form that had options for students to choose when their theses and dissertations could be made open access was drafted for use with in-coming soft copies of theses and dissertations, but it was not immediately implemented because it had to be first approved by the university administration together with the IR policy. The digitisation of theses and dissertations also started prior to the IR policy that was later drafted and was still under discussion by 2017. This content was therefore under restricted access. Makerere University Library used e-mail communication, print-marketing tools such as bookmarks, brochures and leaflets to promote the repository to the community of researchers; and also used seminars, workshops and one-on-one consultations to sensitise and train the researchers about the benefits of the repository and how to use it. The repository administrative responsibilities were handled by librarians from the digitisation section of the library, with some support from the college librarians, although their input was minimal. The repository at Makerere University received some financial support from the University of Bergen Library in the beginning, and later from the Swedish International Development Agency (SIDA).

Kenyatta University Institutional Repository

The idea of an IR at Kenyatta University was introduced by the University Librarian, who joined the library in 2011 from Strathmore University, the first institution in Kenya to go

online with a repository. The chief librarian was, therefore, aware of the value of repositories, and in 2012 utilised the support of Strathmore University Library to setup DSpace at Kenyatta University Library to initiate the repository, which was used for one year before making it public. At around the same time, the consortium of university libraries in Kenya was also actively advocating for the development of IRs. Kenyatta University started its repository project with an already existing collection of abstracts of theses and dissertations from the Database of Theses and Dissertations (DATAD) project. The objective was to make Kenyatta University research visible and accessible online, however, the DATAD content accounted for most of the items without full-text in the repository until 2013 when a policy was developed and the library embarked on retrospective digitisation of theses and dissertations to enhance the repository with full-text. In 2013, the library sensitised the university community through a one-day conference about OA and IRs, and graduate students were required to submit electronic copies of their theses and dissertations to the Graduate School, where the Library collected them for uploading into the IR. The Library solicited for publications in a number of ways: Some of the researchers/lecturers provided their publications by email. Every department had a web page on research publications and this was a source of information for the repository manager about what could be sought for inclusion in the institutional repository. Lecturers also had Google scholar accounts where they publicized their research. The library got some of the publications for the institutional repository from Google scholar. The activities of the IR were handled by the special collections section of the library, with much of the content uploaded through mediated archiving. Marketing of the IR at Kenyatta University was done through workshops and training and literacy programmes in the library, especially for lecturers and graduate students.

Muhimbili University of Health and Allied Sciences (MUHAS) Institutional Repository

MUHAS initiated its IR in 2013 after realizing it needed to harvest the local research output of its faculty members, and did it at a time when the Budapest Open Access Initiative (BOAI), in 2012 had made clear recommendations on how IRs should operate. Just like in Kenyatta University, the idea to start a repository came from the library director, who presented it to MUHAS administration for consideration. After its acceptance, MUHAS started with preparing the IR policy, which later guided the rest of the activities. The library involved the stakeholders (both the administration and the lecturers) right from advocacy, policy development to training from the very beginning of the IR project. Library staff, who worked in the ICT section of the library were assigned the responsibility of managing the repository, and were normally assisted by voluntary and temporary staff whenever available to scan, collect publications from lecturers and upload them to the repository. Much of what they uploaded in the repository was OA content, both for the student's theses and dissertations and research articles. Financially, the institutional repository was supported by SIDA collectively under the library ICT infrastructural development. Marketing of the

IR was done through workshops, seminars and training, where the researchers were taken through the process of uploading their publications. MUHAS also had an IR committee, with representatives from every school, who served as champions and ensured that the publications produced in their schools were uploaded in the repository.

Researchers' awareness and participation in OA and IRs in selected universities in East Africa

Open access as a concept was still new to some researchers in the universities in this study, and its applicability was more in relation to journals than IRs. The provision of scholarly literature on the Internet without any restrictions was the principle on which OA operated, and in IRs, researchers had to self-archive whatever they published to enable free online access to their work. To assess whether researchers in the universities in this study supported the OA principle, the respondents to this study were asked a set of Likert scale questions reported in tables 1 and 2.

As displayed in Table 1, the majority of the respondents (81.4%) in the three universities (as shown in the column for the total) were strongly in favour of the OA principle. Very few (1.1%) were strongly against OA.

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
Support OA	1 Strongly in favour	75 (84.3%)	40 (70%)	34 (92%)	149 (81.4%)
	2 Mildly in favour	10 (11.2%)	8 (14%)	2 (5%)	20 (11.9%)
	3 Neither	2 (2.3%)	5 (9%)	1 (3%)	8 (4.4%)
	4 Mildly against	1 (1.1%)	3 (5%)	0 (0%)	4 (2.2%)
	5 Strongly against	1 (1.1%)	1 (2%)	0 (0%)	2 (1.1%)
Total		89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table 1. In favour or against the open access principles (N = 183)

Most of the content deposited in the IRs at Makerere University, Kenyatta University and MUHAS was done by library staff on behalf of the researchers, and sometimes without the author's knowledge. As long as the publishers' policies allowed, a librarian would harvest and deposit the work into the repository without consulting the author or getting his/her opinion on whether they did mind providing their publications in repositories as OA. The

respondents to this study were asked whether they were aware of the IR in their university, and as illustrated in Figure 1, more than 50% of the respondents were aware of the IR in their university. Awareness of the IR was highest at MUHAS with 86%, followed by 72% at Kenyatta University, and 56% at Makerere University.

It was therefore important to find out the researcher's views on OA in repositories. The respondents to this study were asked whether they would be in favor or against providing their publications as OA through IRs, and the results are as reported in Table 2.

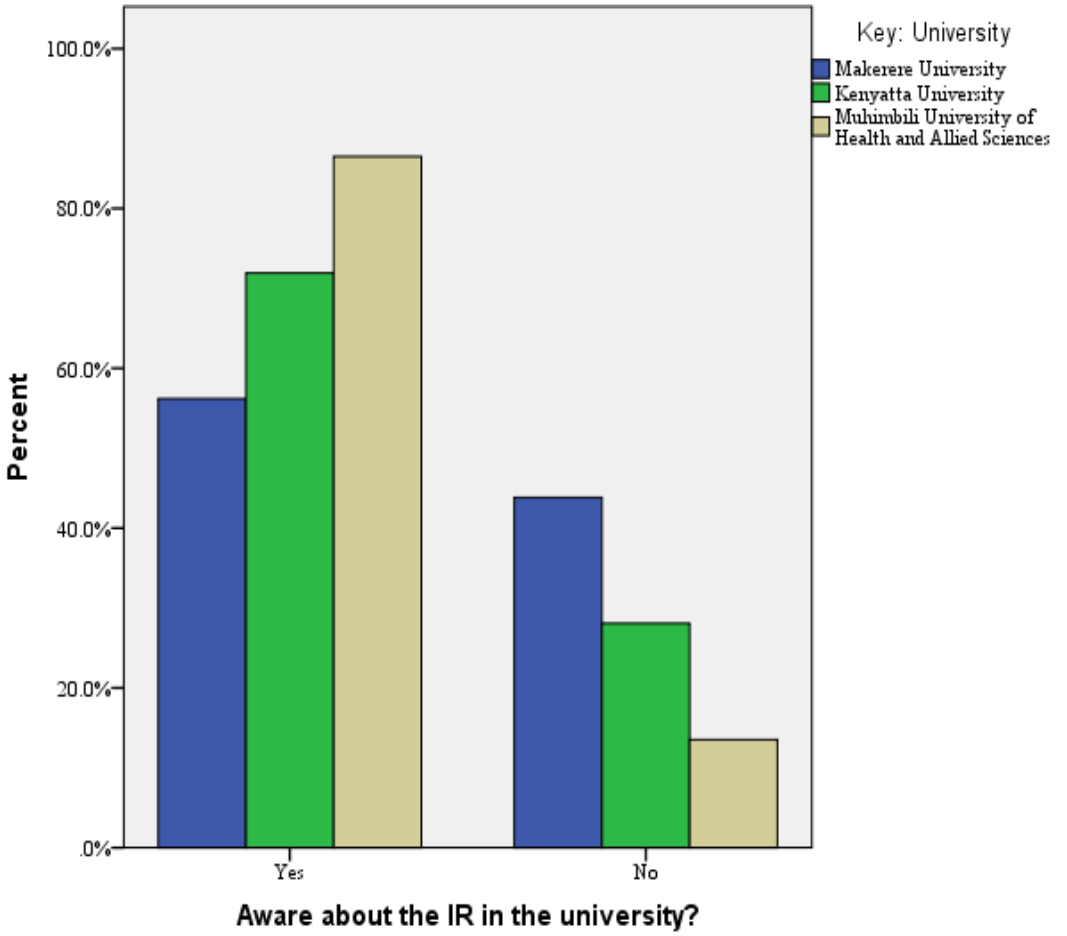

Figure 1. Awareness about the institutional repository in the university

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
Support OA in IR	1 Strongly in favour	73 (82%)	29 (51%)	32 (87%)	134 (73%)
	2 Mildly in favour	16 (18%)	18 (32%)	3 (8%)	37 (20%)
	3 Neither	0 (0%)	1 (2%)	2 (5%)	3 (2%)
	4 Mildly against	0 (0%)	3 (5%)	0 (0%)	3 (2%)
	5 Strongly against	0 (0%)	6 (10%)	0 (0%)	6 (3%)
Total		89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table 2. In favour or against open access provision in IRs (N = 183)

As shown in Table 2, the majority of the respondents (73%) were strongly in favour of providing OA to their publications in the IR, except for a few in Kenyatta University (6 respondents) who were strongly against it.

Since mediated archiving was the common practice in the three universities in this study, it was important to establish whether researchers would prefer depositing the publications in the IR themselves or they would need someone to do it on their behalf. As shown in Table 3, more than half of the respondents (54%) preferred depositing on their own provided they were guided on how to do it.

To assess why much of the content in IRs in East Africa either had no full-text or had full-text that was restricted, it was important to establish whether the researchers often had the versions required to provide OA and whether they agreed to have those versions deposited into the IR.

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
Who Deposits	1 Deposit on my own	52 (58%)	29 (51%)	17 (46%)	98 (54%)
	2 Need someone to deposit on my behalf (Mediated deposting)	37 (42%)	28 (49%)	20 (54%)	85 (46%)
Total		89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table 3. Researcher deposits or mediated depositing (N = 183)

Post-prints are the most common version of publications often recommended for self-archiving by most publishers specified on the Sherpa-Romeo site (a site that specifies the permissions that are normally given as part of each publisher's copyright transfer agreement with respect to self-archiving). The respondents were asked whether they normally kept the post-print version of their articles. As portrayed in Table 4, the majority of the respondents (75%) in all the universities often kept the post-print versions of their publications after publishing. This gave the impression that if requested for, the post-prints would be availed for inclusion into the IRs.

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
Do you keep Post-print	1 Yes	70 (79%)	36 (63%)	31 (84%)	137 (75%)
	2 No	6 (7%)	4 (7%)	4 (11%)	14 (8%)
	3 I have never published	13 (14%)	17 (30%)	2 (5%)	32 (17%)
Total		89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table 4. Keeping post-prints after publishing (N = 183)

However, researchers have different opinions about the versions of publications in IRs, with some considering versions other than the published version as different and misleading when used as references by novice researchers. To get the opinions of the respondents to this study on this issue, they were asked whether it would be acceptable to them for the post-print to be held in the IR.

Again, as displayed in Table 5 the majority of the respondents in the three universities (84% at Makerere University, 89% at Kenyatta University, and 84% at MUHAS) agreed to provide the post-print in the IR.

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
Deposit Post-print in IR	1 Yes	75 (84%)	51 (89%)	31 (84%)	157 (86%)
	2 No	13 (15%)	6 (11%)	5 (13%)	24 (13%)
	3 Not sure	1 (1%)	0 (0%)	1 (3%)	2 (1%)
Total		89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table 5. Acceptance to deposit post-print in the institutional repository (N = 183)

The provision of OA in repositories often happens with the enforcement of policies. To assess the level of agreement with the establishment of university and funder policies, the respondents in this study were asked to respond to Likert-type questions shown in Tables 6 and 7.

As shown in Table 6 and 7, the majority of the respondents, 68% for university mandates and 67.2% for funding body mandates were in favour of requiring researchers to deposit publications into the IRs in the three universities. Some few were strongly against these policies at Makerere University and Kenyatta University. None of the respondents were in disagreement with these policies at MUHAS, except for three (8%) who were undecided (on neither side).

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
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 6. University mandate to deposit in the institutional repository (N = 183)

		University			Total
		1 Makerere University	2 Kenyatta University	3 MUHAS	
Funder Mandatory Deposit	1 Strongly in favour	66 (74%)	34 (60%)	23 (62%)	123 (67.2%)
	2 Mildly in favour	13 (15%)	15 (26%)	11 (30%)	39 (21.3%)
	3 Neither	5 (6%)	0 (0%)	3 (8%)	8 (4.4%)
	4 Mildly against	3 (3%)	3 (5%)	0 (0%)	6 (3.3%)
	5 Strongly against	2 (2%)	5 (9%)	0 (0%)	7 (3.8%)
Total		89 (100%)	57 (100%)	37 (100%)	183 (100%)

Table 7. Funder mandate to deposit in the institutional repository (N = 183)

To establish the self-archiving culture of the researchers in this study, the respondents of the survey tool were asked to state the various ways they normally used to publicize their work for others to use them. One hundred and forty-nine (149) respondents answered this question, with each providing either one or more than one options where publicity of their work was done. The scores were as illustrated in Table 8.

As shown in Table 8, the biggest number of respondents (44.3%) depended on the journal or the publisher to do the publicity for them. In fact, one noted that "*we normally publish in international journals; most of them have wide circulation.*" The next group of 24 respondents (16.1%) mentioned communication through e-mail, notice boards and newsletters to their colleagues or community where they work. These communication channels were a one-time instance that was read and often forgotten, and/or sometimes deleted especially for e-mails, and therefore not very reliable if used alone. Social media, especially ResearchGate, also featured highly among the scholarly publicity options among researchers at Makerere University, Kenyatta University, and at MUHAS. Works in social media got discovered through search engines like Google and Google Scholar so they reached a wider audience, however, not all authors uploaded the actual publications and neither did they do this for all their publications. Websites (personal, departmental, institutional) and the Internet, in general, came next in the scores in Table 8.

		Responses	Percent of Cases (N = 149)
		n	
Publicizing Options[a]	Social Media	20	13.4%
	Websites & Internet	18	12.1%
	Journals & Books	66	44.3%
	Email & Notice Boards & Newsletters	24	16.1%
	Seminars & Workshops & Conferences	23	15.4%
	Repositories	14	9.4%
	Share Hard Copy & In Library	14	9.4%
	Google Scholar	3	2.0%
	Open Access	6	4.0%

[a]Note. Assessment is based on valid cases (i.e. the number of respondents).

Table 8. Distribution of respondents who provided options for publicizing one's work (N = 149)

Work on websites was however in most cases only a listing of where these works had been published, with no full-text included on the site. So, they almost only served as pointers to the actual source of information. Repositories, both institutional and subject also featured in the responses of how researchers publicized their work, although only a few respondents (9.4%) mentioned them.

On a general note, the findings of this study show that the respondents were supportive of the activities of IRs and could easily participate if prompted to.

DISCUSSION

Just as Babu, Kumar, Shewale and Singh (2012) pointed out, government support and policies play an essential role in the availability of OA in IRs. In East Africa, Kenyatta University and Makerere University started their repositories with no institutional policy guidelines, let alone the absence of government or national OA policies, ending up with the dilemma of how to encourage researchers to self-archive and provide OA to the content deposited in their repositories. Repository managers then resorted to harvesting from online sources such as Google Scholar citation pages as a collection development measure for the IR, and creating metadata with or without the full-text depending on the publisher's self-archiving policy, but without getting back to the authors for any feedback on the availability of OA versions of the articles harvested. Ideally, following the copyright licensing procedures, the consent of an author is essential for any item solicited for deposit in an IR, and this could have been spelt out in the IR policy guidelines for collection development. In the absence of these guidelines, the universities in this study also took advantage of centrally housing the print theses and dissertations and embarked on digitising and uploading them in the IR, prior to obtaining the authors' consent. With this practice, where it was not clear to the person performing mediated depositing of theses and dissertations in repositories whether to make them OA or not, the end result was to make the metadata visible and the full-text restricted or not attached at all.

Mediated archiving where the librarians collected publications either directly from the researchers or sourced for them online and deposited them in the IR on behalf of the researchers was the common practice done in the three universities in this study, yet the findings of this study indicated that more than half (54%) of the respondents preferred depositing publications in the IR on their own provided they were guided on how to do it. MUHAS however had less than half of the respondents (46%), meaning that most of them preferred mediated archiving. The results for Makerere University and Kenyatta University agree with Abrizah (2009) and Singeh, Abrizah and Karim (2013) where the respondents preferred self-archiving materials in the IR themselves. Bjork's (2004) perspective on mediated archiving, where only the restricted publisher's version that the librarians might have access

to is deposited; relates to Xia and Sun's (2007) findings. Comparing IRs to subject-based repositories (pre-print archives); Bjork noted that "it was the author of the work who voluntarily put up a copy of their scientific publication on the server, and not a third party as is the case in many IRs. Having mediated archiving in IRs was where the legal issues prominently came in especially when the mediator only had access to a copy of the publisher's restricted version." It was, therefore, good practice for the authors or researchers to archive materials in the IR themselves; however, research has shown that authors do not always practice what they say. Chan, Kwok and Yip, (2005) noted that "the real world is always very different (p. 269). Researchers may support the project in principle, but very few take action voluntarily." Although OA was not always the end result of mediated archiving, librarians may still have to practice it, adopting proactive strategies like those undertaken by the librarians at the University of Glasgow (Ashworth, 2004; Mackie, 2004) and at the Hong Kong University of Science and Technology (HKUST) (Chan, Kwok, & Yip, 2005); where follow-up was done to collect the versions that were accepted for deposit in the IR by the publishers, from the authors. Therefore, the process followed while conducting mediated archiving was very essential in content collection for IRs to ensure OA. Watson's (2007) study showed that QUEprints (the IR at Cranfield University) had over 1,600 items, with 26% of them being pre-prints or post-prints that were OA, requested from the authors and deposited in the repository by Library staff via a mediated deposit service. In Korea, the managers of the dCollection, a nation-wide repository developed by the Korea Education & Research Information Service (KERIS) received online agreement for copyright from the authors of theses before uploading them in the repository (Shin, 2010). Makerere University was in the right direction when it designed consent agreements for student dissertations and theses, and for authors of journal articles. The problem that limited using those consent agreements was that they had not yet been approved by the university administration.

Researchers' support of OA is essential for the provision of full-text materials in IRs that are freely available to the public. Although the majority of respondents in this study were in support of the OA principle and aware of the IR in their university, they had not yet put it in practice as shown by their responses to how they publicized their work for others to use it, with only 14 respondents using repositories, while six indicated using OA avenues in general. This agrees with Morris and Thorn (2009) that awareness could be at a basic level, with most of them acknowledging the OA principle in theory than in practice. Therefore, a lot still needed to be done for researchers not only to know, but also appreciate the importance of self-archiving and put it in practice (Bjork, 2004).

It is widely known that OA enables the accessibility of scholarly information by eliminating the restrictions on access. This is only achievable when efforts are made to ensure that the full-text appended to the metadata in the repositories or online archives is freely downloadable, otherwise, the mere presence of an item within an IR does not guarantee that it is ac-

cessible (Lee, Burnett, Vandegrift, Baeg, & Morris, 2015). Universities in East Africa have been mindful of having numbers (more items of records visible online) than providing OA to the content in IRs as illustrated by the low OA average levels at Makerere University and Kenyatta University. However, the majority of the respondents to this study (75%) maintained copies of the post-print versions of their articles after publishing. This meant that, if the researchers were requested to provide the post-prints for depositing in the repository, these versions would be available. Furthermore, although "authors tended to have a highly restrictive view of copyright permissions relating to pre-prints and post-prints," (Creaser, et al, 2010) the majority of the respondents to this study (86%) agreed to provide the post-print as OA in the IR (p. 157). This implied that the vigilance in collecting post-prints from researchers in universities in East Africa needed to be increased to have these materials deposited in the IRs, since over 90% of journals (Singeh, Abrizah & Karim, 2013; Swan & Brown, 2005) allowed self-archiving either the pre-print or post-print versions in IRs.

The goal of initiating the then Uganda Science Digital Library (USDL), which later became Makerere University's IR, was to make scientific literature produced in the country more accessible digitally. However, the procedures adopted to achieve this goal were not systematic enough to provide OA directly, in that most of the items in the repository had full-text but with restricted access, requiring the would-be users to seek permission for the item to be availed. Depositing theses and dissertations in the repository without author consent procedures or policies had largely contributed to the limited access to the scholarly information in Makerere University's IR. Makerere University was, however, not alone in this. At Kenyatta University, abstracts of theses and dissertations extracted from the DATAD project were uploaded in the IR at the beginning, and although retrospective scanning of the theses and dissertations was on-going, the metadata only content accounted for the limited access to the scholarly information of this repository. The challenge of having metadata only records or records with restricted full-text was not peculiar only to universities in East Africa, but noticeably in the USA and Canada as well. When the IR at Florida State University, DigiNole Commons, was being developed, metadata only items were entered in the IR for demonstration purposes and some of these items remained without full-text. Shearer (2006), while writing about the Canadian Association of Research Libraries (CARL) collaborative IR project noted that the participating institutions were not applying the same scope of collection policies, making it difficult for the harvesting process (p. 169). Some IRs were used as publishing platforms for journal issues, while "others allowed authors to restrict access to the material they deposited" or collected only metadata records without links to the full-text. This challenge was however, noted in the first surveys that CARL undertook while monitoring the collaborative IR project, and it could have been addressed later. For the case of IRs in East Africa, this problem was still persistent years after implementing these repositories.

Although numerous efforts had been put in place to ensure that the university communities at Makerere University, Kenyatta University and MUHAS were informed about OA and IRs through advocacy and training, the outreach had not been wide enough to reach all the researchers. The activities of the IRs in all the universities in this study were exclusively done by specific units in the library. Makerere University exceptionally involved the College Librarians in promoting the repository, collecting and uploading scholarly information in the repository; although a few of them actively participated in submitting research materials in MakIR. While implementing, maintaining and supporting an IR, these roles need to be approached as a team, and this team needs to be all embracing, including all stakeholders of the university than dealing only with a few librarians located at the central library of the university as was the case in the universities in this study. While developing the IR at Grand Valley State University in Michigan, USA, the project ad hoc committee thought "it was imperative that all librarians become confident in communicating with university faculty to solicit participation in the project, in particular, liaison librarians who had already successfully integrated themselves within departmental disciplines" (Beaubien, Masselink, & Tyron, 2009, p. 98). Liaison librarians in this case could be related to College or Branch librarians in the East African universities in this study. Involving many librarians on the IR project from the very beginning builds a better sustainability group that reaches out university-wide, continuously, and helps mitigate the common myths that often hinder the provision of OA. However, librarians need to continuously build their knowledge base on the changing scholarly communication arena, as they are initially guided on how to promote the IR within the university. Involving college/branch librarians who have immerse subject knowledge in the disciplines that they work with, and who interact with researchers on a daily basis facilitates the process of collecting content into the IR. Direct contact with the researchers gave the college and branch librarians the opportunity to express and explain the need to provide OA to a researchers work in the IR and therefore, their knowledge and awareness about OA needs to be enhanced. Bell, Foster and Gibbons (2005) found out that researchers were slow in depositing content in the IR because they were not aware of the benefits of doing so. Researchers only became willing content contributors in the repository after librarians had provided individualized information and direct support. This called for the active involvement of the college and branch librarians in the universities in this study.

The respondents in this study were positive about having self-archiving mandates in their universities. The majority of the respondents (68% for university mandates and 67.2% for funding body mandates) were in favour of requiring researchers to deposit research output in the IRs in all the universities in this study. This corroborated with Singeh, Abrizah, and Karim's (2013) study where "the great majority (77.8%) of the respondents were of the opinion that their university should introduce mandates to promote self-archiving"

(p. 29). A number of studies also reported that researchers would be willing to self-archive their publications in IRs if either their institutions or grant funder's required them to do so (Abrizah, 2009; Dutta & Paul, 2014; Goutam & Dibyendu, 2014; Kennan, 2007; Kim, 2007; Sale, 2006; Singeh, Abrizah & Karim, 2013; Swan & Brown, 2004; 2005; Yang & Li, 2015). Pinfield (2005) emphasized that mandates helped to quickly overcome the cultural and managerial barriers to self-archiving and that it was up to the key stakeholders and policy-makers to take up the opportunity and make OA happen in the shortest possible time. It was projected that if repositories held a large proportion of the research literature, then they would certainly create major improvements in scholarly communication. However, the success of an IR in terms of how much of its collection is research literature that is OA depends on a number of factors, some of which include: whether most of the research is funded, with the funding organisation requiring OA deposits in the IR, whether the university has an OA policy on publishing and self-archiving, the attitude of the researchers towards OA in the IR, and the vigilance of the library and other OA advocates in sensitizing, educating, guiding, promoting and helping researchers in a number of issues about OA to enable them self-archive. It is, therefore, up to the administration of the universities in East Africa to take action by advocating for OA where possible, and implement policies that are practical within their settings.

CONCLUSION

It has been argued that the low level of OA in IRs in universities in East Africa could be increased by improving the IR workflow, collection development and marketing processes. Universities in East Africa should endeavor to develop IR policies and collection development guidelines, with OA deposit mandates, if possible, so that the IR workflow process is clear to all the stakeholders for compliance. More stakeholders should join the librarians in the IR advocacy campaign. A leaf could be borrowed from MUHAS that had an IR committee composed of librarians and representatives from every school, who served as champions and ensured that the publications produced in their schools, were uploaded in the repository. The IR committee should be equipped with the OA benefits and evidence of usage statistics from the IR. Increasing the researchers' awareness and knowledge-base of OA and the importance of IRs, while addressing their concerns about copyright and plagiarism, and persuading them to do whatever it takes to retain the necessary self-archiving rights following publisher OA policies could improve the level of OA content in IRs. Efforts should also be made to inform authors about deposits in the IR made on their behalf, with requests to provide OA versions, to avoid creating only metadata records. Students could also be required to directly submit their theses and dissertations in the IR after signing a consent form that indicates whether OA would be immediate or after a specified grace period, so that restricted access in the IR is temporary and not permanent.

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