An Evaluation of Academic Institutional Repositories in Ghana

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ABSTRACT

This study aims to evaluate some academic institutional repositories (IRs) in Ghana. Data were collected using observation and interview methods by examining the various websites of seven (7) selected academic institutional repositories in Ghana. The findings revealed that the University of Ghana, Legon, leads records count of the seven Institutional Repository (IRs) examined. Dspace was the prioritized software for managing and preserving the digital contents of these IRs. Theses, dissertations and research articles were the leading contents deposited on the IRs. The majority of the IRs have incorporated RSS (Rich Site Summary or Really Simple Syndication) feeds on their IRs with few using other Web 2.0 features. English was the only interface language used on all the IRs. From the interview, the findings revealed that most of the faculty members did not use the IR very often and 9(42.9) also indicated that, they have never deposited their materials on the IR. Faculty members again indicated that, inadequate ICT connectivity and infrastructure, unreliable power supply, Copyrights and intellectual rights, financial constrain, inadequate advocacy and training on the importance of IRs to faculty and users were the major challenges of academic libraries in operating IRs in Ghana.

1. Introduction

Currently, technological advances in research outputs and scholarly publications have amassed greater importance worldwide. Academic institutions were not left out from these emancipations because their research outputs began to liberate their inkling, ideas and opinions. This resulted in a new paradigm from printing houses to digital platforms. In contemporary terms, therefore published research outputs by academia have transformed over the last decade. Alemna (2016) observed that "academics all over the world place emphasis on research and publications, not only because it is presumed that research enriches both the teaching and learning process as well as contributing to the body of knowledge, but also because it is a major determinant of institutional

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prestige". With the increasing number of intellectual and scholarly outputs, academic institutions became primary repositories for these resources.

The advent of the year 2000 presented the release of EPrints software. Subsequent to this in 2002 was the release of Digital Common and DSpace software repository respectively. These experiences had laid the foundation for the IR bubble that busted across academic institutions. Institutional repositories are digital archives for collecting digital materials for long-lasting management, preservation and dissemination of research output as produced by institutions. IR was further defined by Lynch (2003) as "a university-based institutional repository is a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members." It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution.

IR is, therefore, is the storehouse for research outputs produced by institutions. These digital information resources mostly offer Open Access to intellectual capital with the objective of promoting or showcasing the research works of institutions. Many faculty members have been ballyhooed the concept of IR which includes; increased collaboration and knowledge sharing, control over the digital assets of the university, and digital preservation. IRs have increased institutions visibility in terms of ranking and ensured long term digital preservation of the intellectual outputs of institutions, promoted the institutional research outputs and prestige, it has also acted as a form of advertisement that attracts funding sources for institutions, increased dissemination of information and also created the potential for a global network with other institutions and researchers. This study intends to examine some academic libraries IRs based on the information on their websites. The study will also address faculty members' knowledge and challenges in depositing their research output on the IR.

2. Literature Review

Initially, against a historical perspective, humans were involved in managing, preserving, and storing of data, information, knowledge and artefacts. These early activities are likened to repository operations. For example, clay tablets in cuneiform scripts and writing form of archives which were produced in 2600 BC as discovered in temple rooms at Sumer. It is worth noting that, a factor in the success of ancient Egyptian Pharaohs was due to the establishment of libraries and museums as realized from temple recording on papyrus, etc. In 1988, the likes of Peter Drucker article "The Coming of the New Organisation" cited knowledge as the most important asset of any institution or organization (Johnson, 2002). He reiterated that, for an institution or organization to be competitive, this asset (knowledge collections) should be managed and preserved.

Lynch (2003) described "institutional repositories as a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members". Bruns and Inefuku (2015) believe that presently, the development of IRs are in their second decade after the launch of the three most patronized

repository platforms in 2000 (EPrints) and 2002 (Digital Common and DSpace). Nagra (2012) believes that IRs are growingly becoming a crucial component of academic institutions because it showcases the institution's intellectual and scholarly output to the wider society. Bruns and Inefuku (2015) also suggested that two important services are provided by IRs for institutions: serving as the digital archives of students work, scholarship, history, activities and the institution's value, service for researchers, and enhancing the thriving publishing time of Open Access.

Cullen and Chawner (2010) asserted that the slow embracement of the concept of IR development by academics was due to a lack of interest to use the IR to access the research outputs of others and for increasing the accessibility and visibility of their research outputs. These accounted for a low deposit rate, reflecting patterns throughout the globe. On the other hand, positive attitudes are indicated from repositories declaring their readiness to enhance the process of depositing digital archives for scholars to locate, use and cite their works to make visible the author and the institution's research output (Cullen & Chawner, 2011). According to some researchers, institutional repositories (IRs) have recently been recognized as possible solutions on leading problems for institutional administration for analyzing research output trends and also for tracking faculty members' success (Makori, Njiraine, & Talam., 2015).

The success of any IR rests on the total number of submissions and its use. Faculty members and students are the highest depositors of research output to IRs. The willingness of faculty members to use and deposit their research output in their IR is a key indicator of success for academic institutions operating an IR. Faculty members are therefore the major creators and authors for IRs while the libraries and librarians also implement, develop and manage the IRS (Onyebinama, Anunobi, & Onyebinama, 2021). According to Tapfuma (2016), these are some benefits of IRs to faculty members: enhances and increase their citation and impact factor of their research output, increase local and international exposure of their research output, enhance their reputation, help increase their promotion and tenure, make it accessible for others to use and also protect their research from plagiarism, etc. Despite these enormous benefits, many studies have shown that faculty members have a low rate of depositing their research content to IRs (Onyebinama, Anunobi, & Onyebinama, 2021).

In Africa, Okhakhu (2015) also identified some of the issues which adversely militate against the development of institutional repositories such as inadequate information and communication technology infrastructure, lack of awareness of open access institutional repositories, inadequate information and communication technology infrastructure, inadequate funding, high cost of internet bandwidth in the region and low level of awareness of open access institutional repository in Africa.

3. Methodology

The study used both qualitative and observation data collection approaches to solicit information and also to examine the various websites of seven (7) selected academic institutional repositories. Although Ghana has over sixteen (16) academic IRs, seven were selected based on the criteria of functioning IRs websites working over the period of this study, the total number of contents

as well as the information on its service page. Seven institutions that were within the top fifteen rankings of Universities in Ghana in the year 2020 (TFE TIMES, 2020) were selected as a case study for the research. They consist of two private universities and five public universities in Ghana.

The repositories which have been examined included the University of Development Studies, Kwame Nkrumah University of Science and Technology, University of Cape Coast, University of Ghana, Legon, University of Education Winneba, Ashesi University and Presbyterian University College. The website interface information was examined from the seven IRs and three (3) faculty members each of the seven universities' responses to the interview was used, thus, a sample size of twenty-one (21) interviewees took part in the second part of the study. For the sake of confidentiality and anonymity, the institution's name of the interviewees was represented with FM 1, FM2, FM3, FM4, FM5, FM6 and FM7. The qualitative data collected was analyzed thematically. Respondents also completed a consent form.

Also, additional information was obtained from the Consortium of Academic and Research Libraries in Ghana (CARLIGH) 2019 perspective on the Ghana IRs survey. Apart from the actual IR websites of the universities used for the study, their service page was also examined to determine the currency of the collection, the total number of collections on the IR, issued date of items, the diversity of materials on the IR, usage statistics, marketing and mode of promoting the research outputs of the IR, and the presence of Web 2.0 tools, etc.

4. Findings

4.1 Institutional Repository in Ghana

Firstly, the study revealed the IR developments in Ghana leapfrogged over the past ten (10) years through the support of organizations such as the Consortium of Academic and Research Libraries in Ghana (CARLIGH) and International Network for the Availability of Scientific Publication (INASP). These organizations sponsored the operations of the academic institutions through a workshop on IR and DSpace. Out of the sixteen (16), academic institutional repositories in Ghana indicated in this study. The Kwame Nkrumah University of Science and Technology (KNUST) was the first to implement its institutional repository. It must be noted that six months after the implementation of KNUST IR, it was ranked 52nd on the webometrics ranking for 100 best universities in Africa. This achievement compelled CARLIGH and INASP to assist four other academic institutions to implement repositories. The four academic institutions from Ghana that benefited from the initiative are listed below:

- Methodist University College (MUCG)
- University of Cape Coast (UCC)
- Ghana Institute of Management and Public Administration (GIMPA)
- The University of Education, Winneba (UEW)

Other academic institutions with IRs in Ghana are University of Development Studies, University of Ghana, Legon, Ashesi University, Regent University College, Central University College, Presbyterian University College, University of Mines & Technology, Regional Maritime University, Council of Scientific and Industrial Research, Wisconsin International University College and University of Health and Allied Sciences. These are public and private academic institutions in Ghana. Despite the benefits associated with IR in Ghana, the study indicated that there are many challenges at the implementation stage. Lack of institutional policy and budgetary support for the operation, bandwidth, lack of public IP addresses, software problems, lack of qualified staff, etc. were some of the challenges faced by academic institutions in the implementation of IR in Ghana. To counter these numerous challenges, some respondents in academic libraries in Ghana stated that, stakeholders should realize that the IRs are the bedrock for undertaking research outputs and that their impact on the institutions' visibility worldwide. others indicated that IRs are also good means of providing access to research findings to the communities where such research was carried out. **Table 1** shows the history of IRs in Ghana.

Table 1. History of IRs in Ghana

Academic Institutions	Date of establishment	URL Address	Number of collections	Software Type
Kwame Nkrumah University of Science and Technology (KNUST)	2008	http://ir.knust.edu.gh/	11,635	DSpace
University of Education Winneba (UEW)	2010	http://ir.uew.edu.gh/	560	DSpace
University of Ghana, Legon (UG)	2011	http://ugspace.ug.edu.gh/	18,766	DSpace
University of Cape Coast (UCC)	2012	https://erl.ucc.edu.gh/dspace/	2,090	DSpace
Presbyterian University College (PUC)	2012	http://ir.presbyuniversity.edu.gh:8080/ jspui/	1,117	DSpace
Ashesi University (AU)	2013	https://air.ashesi.edu.gh/	386	DSpace
University of Development Studies (UDS)	2014	http://udsspace.uds.edu.gh/	2264	DSpace
Total			36818	

Source: Fieldwork, 3 March 2020

The study revealed that these academic IRs were established between the years 2008 to 2014. In this study, the contents of all the seven IRs were evaluated by the contents on its browse, diversity of the materials and the number of submissions on the repository's websites. A total of 36818 collections were found on these seven (7) IRs during the period of the research. It is not yet certain in this research to determine a successful repository to how much content or collections on an IR or the diversity of its collections compared to another repository.

DSpace was the software used by these seven IRs. Li and Banach (2011), Xia and Opperman (2010) asserted that DSpace is one of the dominant and preferred IR software platforms for the management and preservation of digital archives globally. Similarly, Ukwoma and Okafor (2017),

Singh (2016) and Loan (2014) also revealed that DSpace and EPrints are the preponderance preferred software for the development of IR.

Examining the various websites of selected academic institutional repositories in Ghana revealed that a total of 36818 collections were uploaded on their various IRs (Table 1). However, the University of Ghana, Legon, constituted 18,766 (51%) of the total collections; Kwame Nkrumah University of Science and Technology constituted 11,635 (32%), University of Development Studies with 2,264 (6.1%); the University of Cape Coast constituted 2,090 (5.6%); Presbyterian University College followed with 1,117 (3.0%); the University of Education, Winneba, and Ashesi University, with 560 (1.5%) and 386 (1.0%) respectively. This finding indicates that the University of Ghana digital collection contributes more than half of the total collections for the seven (7) IRs examined. This finding is consistent with a study by Transparent Ranking: Institutional Repositories by Google Scholar (8th Edition, February 2020) which ranked the University of Ghana, Legon, IR as the Number One in Ghana with the rest of the IRs in Ghana not ranked. This finding is inconsistent with a study by CARLIGH in February 2019 with a perspective on IRs in Ghana, where Kwame Nkrumah University of Science and Technology was leading with 10900 records as compared with the University of Ghana, which had 8757 records.

The diversity of materials on an IR is measured by the different types of collections on the IR. To explore the diversities of materials on the various IR platforms, it was revealed that these academic institutions restored different types of materials for their IR. Although all IRs had their total number of collections on their homepage and the diversity of their collections, not all represented the total number of the diversity of their collections. The "//" symbol was used to represent IRs which show the diversity of their collections, but not the actual numbers they had on their websites. The symbol "0" in the table also indicates that the IR had that category of the collection, but has not uploaded any material in them. **Table 2** illustrates the different types of digital content on the seven IRs.

Out of 36818 total collections for the seven (7) IRs, 33,026 (90.0%) diversity of materials were represented with their current numbers. Therefore, for this analysis, a total of 33,026 collections were used for the study. Analyzing the diversity of the collection on the IRs homepage, all the seven (7) institutions had theses in their collections constituting 50.25% (n=16601), followed by six IRs with Researcher Articles 38.1% (n=12600), five IRs had Journals constituting 5.1% (n=1681) collections, Lectures and Speeches constituting 1.9% (n=640) on four IRs, conference proceeding constituted 1.3% (n=443) on four IRs. Heritage Materials followed with 0.9% (n=300) on the IR, University Publications constituted 0.5% (n=173) on two IRs, United Nations publications constituted 0.5% (n=157) on IR, Work in Progress, Other Specific (University of Ghana Reading, Testing, University Archives, Africa Leadership Lectures, etc.) and Collaborative Research followed with 0.2% (n=72), 0.2% (n=71), 0.2% (n=70) respectively. Book Chapters and Review had 0.2% (n=50) collections on three IRs, E-books, Newsletter sand Newspapers and Past Questions received the fewest number constituting 0.1% (n=43), 0.1% (n=18) and 0.0% (n=1) collections respectively on one IR. The findings indicate that theses and dissertations are the leading digital content on the IR, followed by Research Articles, Journals, Lecture and Speeches, Conference Proceedings, etc.

Table 2. Diversity of digital content on the IRs

Academic institutions	University of Development Studies	University of Ghana	Ashesi University	University of Cape Coast	Presbyterian University College	Kwame Nkrumah University of Science	University of Education of Winneba	Total
Theses/ Dissertations	//	5944	//	1873	//	8518	266	16601
Research Articles	//	10400	//	-	//	1996	204	12600
Reports	//	106	//	-	-	-	0	106
Journals	-	1337	//	-	-	369	-	1681
Conference Proceeding	//	91	-	-	-	344	8	443
Heritage Materials	-	300	-	-	-	-	-	300
Lectures and Speeches	//	302	-	-	-	338	0	640
Newsletters and Newspapers	-	18	-	-	-	-	-	18
Book Chapters and Reviews	//	40	-	-	-	-	10	50
E-book	-	-	-	43	-	-	-	43
Past questions	-	-	-	1	-	-	-	1
Work in Progress	-	0	-	-	-	-	72	72
United Nations	-	157	-	-	-	-	-	157
University publications	-	-	//	173	-	-	-	173
Collaborative Research	-	-	-	-	-	70	-	70
College publications	//	-	//	-	//	-	-	-
Other specific	-	71	-	-	-	-	-	71
Total collection	2264	18,766	386	2090	1117	11,635	560	33026 36818

Source: Fieldwork, 3 March 2020

These findings are consistent with Ukwoma and Okafor (2017), who ascertained that Theses and Dissertations were the most prevalent content archived in his research on IRs followed by Journal Articles and Conference Proceedings. This is also in accordance with the study by Bangani (2018) who opined that Theses and Dissertations are the major digital archives deposited to academic IRs with Journal Articles, Conference Proceeding following. These findings were also inconsistent with a study by Gul (2019) who asserted that the Journal article was the leading digital content

in IRs.

4.2 Collection home page/user interface

Introductions of social media and Web 2.0 in recent years, have improved communication between various individuals, communities, institutions and organizations (Ofori et al., 2020). Web 2.0 interactive features offer websites and applications to generate content for end-users in a more interactive way. RSS feed, Atom, Blog, Wiki, Youtube, Facebook, E-mail, Twitter, Pinterest and Reddit are some examples of Web 2.0 interactive features that IRs have incorporated to alerts and send instant messages to enhance usage on IR. Rich Site Summary or Really Simple Syndication (RSS) is a web feed that enables applications and users of a website to get updated for new content in a standardized format. For IR, the RSS feed syndicates frequently the information uploaded on the IR to the website to keep up to date with the latest addition for its users. The user also benefits from receiving new and timing updated information when subscribed to the IR website to avoid manually checking the service page for new content. The news aggregator is the software used in presenting RSS feeds built into a website to users. Table 3 shows the Web 2.0 interactive features offered on various IR websites.

Table 3. Collection home page/user interface

Homepage of IRs	University of Development Studies	University of Ghana	Ashesi University	University of Cape Coast	Presbyterian University College	Kwame Nkrumah University of Science	University of Education of Winneba
Web 2.0 tools		RSS 1.0 RSS 2.0 Atom	RSS 1.0 RSS 2.0 Atom		RSS 1.0 RSS 2.0	RSS 1.0 RSS 2.0	RSS 1.0 RSS 2.0 Atom
Link to other IRS	KNUST UG			UG KNUST UEW PUC			
Interface Language	English	English	English	English	English	English	English

Source: Fieldwork, 30 April 2020

In tune with the findings of our study, five institutions; the University of Ghana, Ashesi University, Presbyterian University College, Kwame Nkrumah University of Science and Technology and the University of Education, Winneba have incorporated RSS feeds into their IRs to share timely updates of contents with its users. This shows that the majority of the IRs had RSS feeds incorporated in them. This finding is consistent with a study by Gul, Bashir, and Ganaie (2019) in which they asserted that 77% (54 out of 70) IRs evaluated on South Asia Nations have incorporated various types of Web 2.0 tools in them. Sri Lanka, Pakistan and Bangladesh had the highest scores in incorporating Web 2.0 features in them.

Similar to RSS is Atom feed which is a lightweight XML format. It also syndicates web content.

Out of the five IRs with RSS feed, 3 which include the University of Ghana, Legon, Ashesi University and University of Education, Winneba have incorporated Atom feed which also provides a timely update of content on a web page to users. This finding is also consistent with research by Gul, Bashir, and Ganaie (2019), that the majority of repositories in Southern Asia countries are incorporated with RSS feeds followed by Atom, Facebook, Twitter, etc. It is also evident that some Web 2.0 tools such as Blog, Wiki, Youtube, Facebook, E-mail, Twitter, Pinterest and Reddit were not embedded in the seven (7) IRs studied.

The University of Cape Coast and University of Development Studies repositories were found to have links to another repository representing 29.0% (n=2 out of 7). The University of Cape Coast had links to the University of Ghana, Kwame Nkrumah University of Science and Technology, University of Education, Winneba and the Presbyterian University College repositories. On the other hand, the University of Development Studies has a link to the University of Ghana and Kwame Nkrumah University of Science and Technology. This service enables users to link to another repository without leaving the repository's page or website. It is a quick way of searching for materials on multiple repositories.

It is evident from the findings that, interface language for the seven IRs studied was English. Indeed, it is a prerogative language. Kim and Lee (2014), Loan and Sheikh (2016), Singh (2016) and Loan (2014) also found that the dominating content language usage on the majority of IRs was in English. It is also consistent with research by Ahmed (2014)that, English is the preferred content language on the IRs. Loan and Sheikh (2016) observed that few repositories interface content language that is multilingual in nature.

4.3 Total Number of Collections per the Issued date

It came to light that some IRs undertaken did not have any modern system to check the number of downloads, cited, commented, etc., per article. Usage statistics feature incorporated in repositories were not found in all these IRs in Ghana. This finding is consistent with a study by Tripathi and Jeevan (2011) they opined that alow record of the repository has incorporated the usage statistic features. Usage statistics are a tool usedin evaluating the success of material or content on a repository. Incorporating this tool helps to reflect the relevance of content, how many users are using that content and also helps there pository administrator and manager to know the information needs and wants of specific content by its users. Gul, Bashir, and Ganaie (2019) ascertained that "Usage Statistics can be an effective tool to endorse and benchmark institutional output".

It is worth noting that the digital contents on all the IRs studied were mostly published from the period of 2000 to 2020. From the chart, 92.2 % (n= 34164) contents were published from 2000 to 2020. The period 1900-1999 constituted 7.3% (n= 2719), 1800-1899 constituted 0.2% (n= 74); 170 constituted 0.2% (n= 71); 1600-1699 constituted 0.1% (n= 34); 1500-1599 constituted 0.02% (n= 7); 1400-1499 constituted 0.0% (n= 1) records. This indicates that publication and research outputs have increased in recent years. This can be attributed to the impact of research out for academic institutions and the university ranking. The Open Access concept, visibility of institutions, impact on citation have all contributed to these growths in research outputs by institutions and

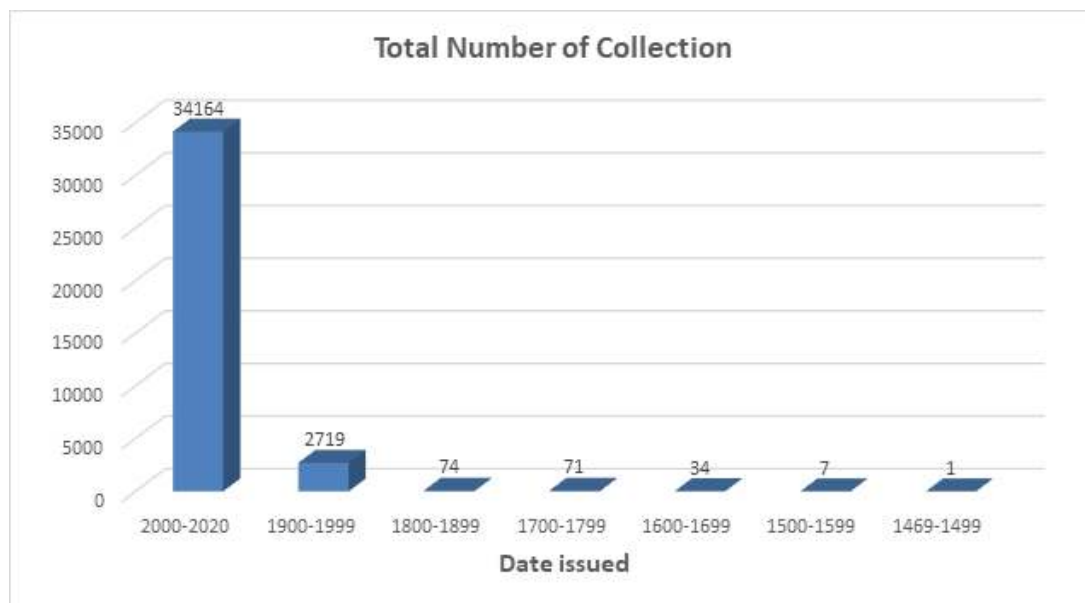showcasing their research on their IRs.

Fig. 1. Total Number of Collections per the Issued date (Source: Fieldwork, May 2020)

5. Qualitative Analysis

This part of the analysis deals with data collected from the faculty members of the seven universities. The purpose of this analysis was to provide a 'deep' understanding or insight into faculty members' knowledge about the IR. The researcher had the privilege to interview three faculty members each from the seven universities been studied.

5.1 Frequent use of IR by faculty members

Some faculty members of these institutions were asked how often they used the IR and whether it was meeting their information needs. The rationale behind this question was to ascertain the frequency of usage of the IR by faculty members and whether it was meeting their information needs. The findings revealed that most of them did not use the IR very often and they also reiterated that the IR was not meeting the information needs of its patrons and faculty members. Some reactions from the faculty members are shown below:

⋯. "I used the IR every day to check on things being done and I do not think the IR is meeting the information needs of its clients". (FM 1)
⋯. "I used the IR often and I am not very sure the IR is meeting the information needs of its patrons and faculty members". (FM 7)

⋯. "I hardly use the IR and it should meet the information needs of patrons because that is the purpose of it, but as to if it is used or not is another issue". (FM 5)

⋯ "I use it not very often and I will say yes, it is somehow meeting the information needs of faculty members and users". (FM 6)

⋯ "I have never used the IR before, never". (FM 3)

5.2 Importance of IR to academic institutions in Ghana

IRs have been touted by many authors and include increased knowledge sharing, control over the digital assets of the university, and preservation (Leuchter, 2018). Oguche (2018) also presented compelling reasons why an organization would want to establish an IR including providing an infrastructure for preservation of digital content, lowering the barrier to document distribution, creating a centralized digital showcase in which research, teaching, and scholarship can be highlighted, and facilitating wider distribution. The researcher deemed it necessary to find out some importance of IR from faculty members to their institution's research output. It was revealed in the interview that;

⋯." Apart from preservation of the institution's intellectual outputs, I think that IR can increase the institution's visibility and this will positively affect the ranking of the University". (FM 3)

⋯ "It also acts as a platform for advertisement, this will attract funding sources for the institution". (FM 5)

 ⋯. "Increasedissemination of information and also create the potential for a global network with other institutions and researchers". (FM 2)

⋯. "Promotion of institutional research outputs and prestige I think are some of the benefits of IR". (FM 1)

⋯ "to provide open access to institutional research outputs by self-archiving in an open access repository and it also to create global visibility for an institution's scholarly research outputs "(FM 6)

5.3 What encourage/ discourages faculty members from contributing to their IRs

Faculty members were also asked whether they have deposited their research output to populate the IRs of their respective institutions. Among the twenty-one interviewees, 12(57.1%) of the faculty members stated that they have deposited their research output in their IR. While 9(42.9) also indicated that, they have never deposited their materials on their IR. The following were some comments made by some faculty members on why they have deposited their materials on their IR. For instance, respondents indicated:

⋯ "to make my work easily accessible, to widen my research output readership and to promote the institutional research outputs and prestige" (FM 4)

⋯ "to enhance the accessibility of my research to other researchers and for promotion of my research". (FM 6)

··· "to increase the potential impact of my research output and it will also increase my external recognition". (FM 1)

··· "it will boost my image within and outside of my university and it will help me to make useful contacts with experts". (FM 5)

···" depositing my work in IR will protect it from plagiarism and also promote my work locally and internationally". (FM 7)

··· "for the preservation of my work digitally, in other words, it will serve as a backup in the future; in case I misplace the hard copy, I have. My grandchildren can even access my work when I am dead and gone. (FM 2)

···   "it will serve as an altruistic impetus for making my work accessible to others". (FM 3).

Increase accessibility of their research output, larger readership, long-term preservation of their work, increased usage statistics of their work and increased potential impact of their research output were some major reasons why these faculty members were depositing their work in their institutional repositories. The following were some reasons why some faculty members felt reluctant to submit their work in their IR:

···"there are no specified Copyright and Intellectual Property Rights (IPR) contents on our institutional repository". (FM 6)

···" difficult and time-consuming to deposit work in the IR and I also don't know how and what to deposit in our IR". (FM 7)

···" our repository has low prestige and our IR website is not always working". (FM 5)

···"it lacks global accessibility and therefore, prefers to make my work available only on my personal website". (FM 4)

··· "I am not aware of our institutional repository, faculty members not properly sensitized on the IR". (FM 1)

··· "others may copy my work without my permission and lack of motivation (Grant funders)". (FM 2)

··· "inadequate training for faculty members on how to deposit materials on the IR". (FM 3)

5.4 Challenges faced by institutions in operating an IR

  Faculty members were asked to mention the challenges that confronted academic libraries in Ghana in operating an IR. It was found that lack of technical and ICT staff was a major problem. It was also found that lack of knowledge and awareness on the relevant tools and practices use in measuring and promoting the research outputs were another challenge. Moreover, they also asserted that the lack of institutional policy for IR was a challenge.

  In relation with challenges associated with the academic libraries in Ghana IR, it was realized that:

  "Inadequate ICT connectivity and infrastructure and unreliable power supply is a challenge" Another faculty member of an institution mentioned that;
  "Copyright and intellectual right, and inadequate advocacy"
  Above all this, the challenges which were identified by the respondents that need to be addressed

include, inadequate ICT infrastructure and unreliable power supply, Copyright and intellectual right issues, policy issues, inadequate advocacy, inadequate funding, lack of faculty training on IR, software and technical barriers. It is expected that the resolution of these challenges will ensure efficient usage of the IRs by faculty members and users.

5.5 Strategies to enhance IRs in Ghana

The rapid growth in the implementation of IRs in academic libraries are becoming more prevalent especially in Ghana. In order for Ghanaian libraries to benefit from IR services, they will need to invest in how to increase their research contents on their IRs and also how toboost their infrastructural capacities for easy accessibility. Finally, respondents were asked to indicate the strategies to enhance IRs to meet the information needs of library usersand faculty members. This was well captured in their responses by the faculty members:

⋯ "Fund should be made available for the library to provide alternative sources or independent power supply and workable IR website"

⋯" designing a user-friendly IR interface for easy deposit of document".

⋯" specifying the Copyright and Intellectual Property Right for the IR contents".

⋯ "marketing of IR contents by librarians to the users and faculty members".

⋯ "creating more awareness on how to access and use the IR".

⋯ "there should be more sensitization for faculty members from time to time".

⋯" workshops, seminars and conferences concerning the importance of IR to faculty members should be organized regularly".

⋯" using a user-friendly IR interface by using familiar keywords and metadata".

⋯ "The libraries should use other social networking sites, such as Blogs, Facebook, Instagram, Pinterest, YouTube, Twitter, etc., to publicize the IR to increase visibility and impact".

6. Discussions and Conclusion

The development of IRs in Ghana is gradually bolstering, although the stride is slow when compared with some Africa countries like South Africa, Nigeria, etc. However, the University of Ghana (UG) repository has demonstrated a promising future, having 51% of the total collections undertaken by this study. Interestingly, the University of Ghana's IR is the only Ghanaian IR to be ranked by the Transparent Ranking: Institutional Repositories by Google Scholar (8th Edition, February 2020). The University of Ghana UGSpace places 529th in the world with 7040 records. Kwame Nkrumah University of Science and Technology, University of Development Studies, University of Cape Coast, University of Education, Winneba, Ashesi University and Presbyterian University College need to develop strategies to increase their content records and manage their access and retrieval. The low level of content on some Ghanaian repositories can be attributed to the lack of involvement of stakeholders like; library staff, students and faculty members. Creating awareness

on Open Access and self-archiving of research output on the IR is another issue that must be considered. Amidst these, for institutional management to maximize the records growth on their various IRs, students and faculty members should have their research outputs and theses and dissertations on the IR as a requirement for graduation and promotion. Sensitizing for all stakeholders on the importance of submitting their research outputs for the IRs to be populated should be a major priority for academic institutions.

Out of over 16 IRs in Ghana, only 3 institutions (Kwame Nkrumah University of Science and Technology, University of Development Studies, University of Ghana, Leghon) are represented internationally on the Registry of Open Access Repositories (ROAR) while 5 institutions (Kwame Nkrumah University of Science and Technology, University of Development Studies, University of Cape Coast, Ashesi University and the University of Ghana) were on OpenDOAR platform. ROAR and OpenDOAR are intended to facilitate and promote the development of Open Access by giving instantaneous information about the growth and status of repositories globally.

From the study, faculty members submit their research output to their IRs to enhances and increase the citation and impact factor of their research output, increase local and international exposure of their research output, enhance their reputation, help increase their promotion and tenure, make it accessible for others to use and also protect their research from plagiarism, etc.

The increasing size of diversities of contents and a high number of records on some IRs were an indication of commitment and dedication by stakeholders (library staff, IR administrators, IR managers, students, researchers, etc.) towards their IR. However, IRs with a low number of records need to revamp the IR with commitment from all stakeholders to increase their visibility, accessibility and citation of their research output on Open Access. In glorifying their IRs, building more comprehensive strategies and policy as a priority to enhance the value and vision of the IR must be developed.

The homepage or the IR interface is the homepage of IR. It has interactive features that IRs have incorporated to alerts and sends instant messages to enhance usage. They include RSS, Atom, send feedback, contact us, help, advanced search, interface language, link to other IRs, etc. Adaptation of these interactive features or tools helps in enhancing digital scholarly works on IRs. Additionally, it provides access to more users friendly and efficient communicative technologies. Since most of these interactive tools were of prominence in the IRs, Web 2.0 tools and other features were not encouraging on some IR and need to be incorporated in the set-up of these IRs. These tools will enable the IRs to have a more communicative and interactive digital learning environment.

The growths of current publication in all IRs are encouraging and indicate how IRs in Ghana have developed in terms of the currency of their publication and scholarly output. More strategies should be adopted to increase the self-archiving of both old and need material in the IRs. Heritage materials should be encouraged in the upload of digital content since only the University of Ghana had such content on its IR.

From the interview, faculty members recommended that all IR need a policy for its operation. A well-written policy will be a direct link between the institution's vision and the running of the day-to-day activities of the IRs. This will also help in the future decision-making processes about how issues that arise will be handled by the management and the staff of the library.

Also, promoting the IR services will helps to showcase, visualize and increase the use of the

repository services and resources in this digital age. The institutions should use other social networking sites, such as Blogs, Facebook, Instagram, Pinterest, YouTube, Twitter, etc., to publicize the IR to increase visibility and impact. It is very obvious that the use of social media and Web 2.0 networking tools to promote research outputs in an academic institution is important for presenting strong relevance in this digital age.

Faculty member recommended that training should be organized for faculty member and users to create awareness, expand their knowledge and educate them on the importance of IRs. This will make the cost and time of implementing the IRa worthwhile project investment. To increase the performance of the research productivity of the institution, the stakeholders in conjunction with the university must organize conferences, seminars and workshops for the faculty members and researchers on the relevant tools and practices that can help increase the research productivity of the IR.

In Africa, IR mostly faces serious financial constraints in its effort to showcase the research output of its institution. This has affected the provision of logistics to help boost the operation of the IR. The institutions should appeal to the university management to increase budgetary allocation or funding to the library. The library should also solicit funds from corporate bodies and allocate enough funding in its budget for the effective operation of the IR. Thesewill help solve other challenges, such as bandwidth challenges, power generating alternatives, funds in creating awareness and the provision of adequate ICT connectivity and infrastructural problems.

The need for IT staff to manage the IR resources is very important in IR operations. These personnels are required to support the IR's to monitor and maintain the computer systems, network system, installing, configuring, updating and solving technical and application challenges of the library software and hardware problems. All institution also needs an IR administrator and manager to help in the operation of the IR. Amidst all these, management of IRs should ensure that staff have the requisite training, education and skills to operate the IR. Although Ghanaian institutions are establishing more IRs to enhance sharing of their content scholarly and long-term preservation of content, much still need to be done.

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