Promoting University Research Output in Ghana through Open Access Institutional Repository

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Abstract

The article focuses on awareness of institutional repository (IR), and visibility of research output through IR to enhance the visibility of university research output in higher education institutions in Ghana. One hundred and fifteen librarians were selected using a quantitative methodology. Data were collected using a questionnaire, and the results were generated using descriptive statistics. The study found out that universities in Ghana mostly relied on the "mediated-archiving" model during uploads of research output than self-archiving approach. Strategies to promote IR for its intended benefits include mandating academics and students to deposit intellectual content, linking publication metrics to academic promotions and aggressively enhancing awareness of the IR. Our paper concludes that information specialists need to be creative in sensitising researchers and the academic community regarding the visibility of their research output by using IR.

Keywords: *Dspace, Institutional Repository, Open Access, Intellectual Output, Research Output, Ghana, University Libraries, Librarians, Social Exchange Theory*

Introduction

Tertiary institutions in this age of electronic publishing, on a large scale, have come to accept that institutional repositories (IR) are key infrastructure for disseminating scholarly information (Hossain, 2010). Kutay (2014) argues that IR is a digital platform that manages and disseminates the digital materials (academic publications, electronic theses and dissertations, conference proceedings, university archival materials, and videos of important university events) of the university. The mission of university libraries is to address the information needs of faculty, students, and researchers in the university community (Bangani, 2018). Libraries capture, protect, and disseminate the university's research output, according to the Association of College and Research Libraries (2020).

Globally, Open Access (OA) promotes scholarly communication without restriction. Therefore, librarians in universities deploy the IR to engage with faculty, students, and other researchers and demonstrate the value of sharing scholarly output (Hulela, 2010). As a result, universities have placed a high value on research output, not only because it is considered that research improves teaching and learning, but also because it adds to the body of knowledge and is a vital driver of national and institutional reputation (Ntim and Fombad, 2021). The amount of research carried out in a country determines its wealth and economic advancement. In this study,

research output refers to the number of research or scientific discoveries that an academic or a student can do in a given timeframe in terms of publishing output. Journal articles, technical reports, publications, conferences, book chapters, and theses are all examples of this   (Dlamini and Snyman, 2017).

In Africa, little is known about the nature of the research or the critical role that IR plays (Dlamini and Snyman, 2017). The rise of IRs in universities across Europe, Asia, and Africa is helping to unearth grey literature such as unpublished research reports, theses, and dissertations, as well as seminars and conference papers (Kakai, 2018). IR is increasingly being used as platform for publishing original, peer-reviewed content in an open-access setting (Saini, 2018), allowing universities to collect, archive, and disseminate locally developed intellectual works. According to Ukwoma and Dicke (2017), IRs improve the use of scientific information as well as author citations and visibility.

Ukwoma and Dike (2017) have supported the continuous need to implement IR to enhance university ranking in educational institutions. To this end, "rating agencies like Times Higher Education (THE) World University Rankings, Webometrics Ranking, and Quacqarelli-Symonds (QS) Rankings, which provide trusted academic institution performance statistics, have gained wide attention from stakeholders, both national and worldwide." The IR reiterates the aim to increase institutional visibility. An IR is a way to raise an institution's visibility and status. They also stated that "IR creates an enabling environment for scholarly publication and increases the global visibility of the research publications of an institution. IR adds to the credibility of a university and plays an important role in establishing the university's identity and values". The paper focuses on promoting the visibility of university research output in Ghana through the IR.

University Landscape in Ghana

This study takes place in Ghana, a West African country near the Gulf of Guinea and the Atlantic Ocean. Ghana has a population of 24,658,823 people and a total area of 238,535 km2 (Ghana Statistical Service 2010: 1). The National Accreditation Board (NAB) defines a "university as an educational institution designed for advanced instruction and research in several branches of learning, conferring degrees in various faculties, and often embodying colleges, schools, and similar institutions" (National Accreditation Board (NAB), 2013).

In Ghana, tertiary or higher education generally begins after senior high school and is carried out at a university or college. In the last couple of years, enrolment in higher learning institutions (private and public universities), particularly tertiary education institutions have increased. In Ghana, ten (10) public universities exist, and over 150 private universities spread across the country. Accordingly, a range of qualifications is pursued including diplomas, degrees, master's, and doctoral programmes (NAB 2013). In comparison to a decade ago, the status of Ghanaian university libraries is improving and adjusting to a variety of technical and patron information needs. Owing to this, Ghanaian libraries have gradually integrated traditional library services into electronic library services, where core library functions such as collection development, cataloguing, and reference services, among others, necessitate the use of ICT-inclined staff to man the library space (Somuah, 2013).

It is inferred that at least two issues have affected university libraries in Ghana. First of all, the technological growth resulting in open access initiatives within higher learning institutions has increased the capacity for institutional research and innovation (Dlamini and Snyman, 2017). Secondly, the rapid changes in higher learning institutions in Ghana have at least prompted university libraries to promote the visibility of university research output through Institutional Repository.

The university library is central to advancing institutional research and innovations. For instance, the institutional repository was a major step in collecting, managing, sharing and archiving digital collections digitally. This was followed up with electronic databases (electronic journals, electronic books, etc), open access (institutional repositories) OA/IR and so on. In a bid to provide improved creation, management, storage and dissemination of information services to the university community, libraries have not relented on efforts to deploy institutional repositories (Thompson, Amuda and Akeriwe, 2015). Though challenges exist with the deployment of IR, the majority of university libraries

in Ghana have not yet been implemented (Dubnjakovic, 2012). This observation warrants an investigation into how IR promotes the visibility of university research output.

Literature Review

Concept of Open Access Initiative (OAI) and IR

In developing countries, readers have limited access to research output. Researchers have not been effective in engaging in research activities consequently low levels of scientific output. One of the new paradigms in scholarly communication is OAI. The open-access (OA) trend in academic/ university libraries spawned the concept of institutional open-access repositories (OAIRs) (Dlamini and Snyman, 2017). Libraries in developing countries today have more resources to promote local research and so bridge the information gap thanks to technological and interoperability requirements. Unlike in the past, when access to scholarly publications was restricted by commercial publishing companies' subscriptions, licenses, or other payments, OAI has led the charge to increase publishing alternatives (Plutchak and Moore, 2017).

The 'Budapest Open Access Initiative (BOAI) (2002)indicates that OA is; a "Worldwide electronic distribution of the peer-reviewed journal literature, completely free and unrestricted access to it by all scientists, scholars, teachers, students, and other curious minds." In a similar vein, the 'Bethesda Statement' (2003) defines; "OA, where "The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship as well as the right to make small numbers of printed copies for their personal use" (Bjork, 2017). From the aforementioned discussion, OA calls for research output to be free without any restrictions on levels of access and use (Bjork, 2017).

According to Kodua-Ntim and Fombad (2020), OAI promotes and facilitates information access without any barrier (subscription fees or access charges) whatsoever, by allowing the public to read, download, copy, share, upload, and print as long as the customer is online. To increase the global visibility of research output, several universities in Africa and beyond have established IR services by making it OA (Abrizah, Noorhidawati, and Kiran, 2010). Abrizah et al. (2010) posited that IR advances OAI by archiving university intellectual output and making it available for free, access, and use. In Ghana, OAI has had an impact on IR services by encouraging depositors to archive and share intellectual works (Moahi, 2012). One authority in the field of IR is Lynch (2003). He argued that "university IR is a collection of services that a university proffers to its members intended for the management, organisation, and diffusion of digital works produced by these members". Kamraninia and Abrizah (2010) characterised an "IR as open, interoperable, cumulative, perpetual, contributes to the process of scholarly communication in collecting, storing, and disseminating the scholarly content".

Development of IR in Ghana

In Ghana, universities are responsible for enhancing and promoting teaching, learning, and research. Libraries have collections of monographs, serials, journals, newspapers, and pamphlets to achieve this goal. CDs, microforms, and films are among the various collections.

Increasingly, institutional and subject repositories in universities in Ghana have gained wide acceptance and implementation in providing scholarly publications and information resources. These initiatives are in line with the OA. They are being developed both in private and public universities as a consequence of the availability of scholarly resources in digital formats and in response to OA policies and mandates. According to the Open Directory of Open Access Repositories (OpenDOAR), there was no IR in Ghana before 2008. The first institution to apply IR was Ghana's Kwame Nkrumah University of Science and Technology (KNUST), which was followed by the University of Ghana, Legon (UG) in 2011. Indeed, the promotion and full implementation of IR in Ghana started quite late. In 2019, all public institutions have implemented IR systems using open-source software (DSpace). Owing to the global benefits accrued in deploying IRs in other universities,

the private universities in Ghana have equally embarked on establishing IRs (Ntim and Fombad, 2021).

There is a scarcity of empirical evidence on the growth of IR in Africa. Inadequate information and communication technology infrastructure, skilled ICT personnel to set up and maintain the IR, insufficient funding, lack of knowledge of open access institutional repositories among researchers and academics, unreliable power supply, inadequate advocacy, and how to manage copyright, intellectual property rights, and how to manage it are some of the challenges that academic and research institutions face when establishing IRs (Agyen-Gyasi, Corletey, and Frempong, 2010).

The most common means to do so are to publish in open access journals and to deposit scholarly resources in institutional repositories (IRs). According to data from the Association of Commonwealth Universities, open access benefits schools by improving the visibility of their research, which can lead to higher rankings and hence a higher profile. Outside of academia, OA has a positive impact by spreading knowledge to other social and economic sectors. According to Kabugu (2014), the university library strongly advocates for OAI by engaging with faculty, students, and university management. Through effective communication channels, the libraries are strategically positioned by universities to create awareness and ensure that the university is continually informed about IR. This commitment by the university library has increased deposits from the university community (students, faculty, and other researchers) (Kabugu, 2014).

Increasing the Visibility of Scholarly Communications

Historically, the library has been recognised as the centre of the university, a vital gathering place for all academics, researchers, and students on campus (Stamatoplos, 2015). Faculty and students alike visit the library regularly to consult the collections and use the facilities. Apart from that, universities are increasingly exerting an influence within the academy by serving as a physical representation of the academic ethos and disseminating research output to the world (Martin-Yeboah, Alemna, and Adjei, 2018).

Future generations of scholars working in an online environment may be unable to appreciate this intrinsic value. When establishing evidence for libraries' contributions to research, it is important to remember that the total idea is larger than the sum of its parts and that the library's value is a key cornerstone and expression of the academy's and scholarship's values. However, there are significant changes in the patterns of these activities, which are largely – but not totally – driven by the electronic availability of resources. The library's position in the lives of researchers is shifting substantially from what it has been in the past (Schwartz, 2012).

University libraries, according to Balakrishnan (2013), are important in supporting academics in taking full advantage of the benefits and opportunities of the networked world, including advances such as open access and social media. On the other hand, libraries aren't always well-equipped to promote change, and scholars can be resistant to efforts to change their habits. Many libraries, however, have been effective in resolving such difficulties by improving their links with academics and redirecting their services to promote and utilise new methods of scholarly communication known as IR. Globally, repositories are tasked with improving the profile of scholars and increasing the exposure of the institution (Jain, 2012) It was recently announced that universities now have repositories to keep and make institutional assets such as research papers and theses public.

According to Hockx-Yu (2015), institutional repositories are a new but essential area within the educational environment. They complement scholarly communication's open-access goal by making it easier for researchers to disseminate and share their products through unrestricted internet availability.

According to SPARC (Scholar Publishing and Academic Resources Coalition), institutional repositories are becoming an increasingly significant part of the evolving structure of scholarly communication (Akintunde and Anjo, 2012). The potential benefits of institutional repositories extend beyond authors who gain visibility and users who discover information more quickly to institutions who boost their research profile and funders who see wider dissemination of research outputs. Information retrieval, according to Saini (2018), has a lot of potential for material preservation, resource sharing,

and increasing the exposure of Nigerian libraries and institutions. The research councils in the United Kingdom have recommended mandating the deposit of research financed by the Council in publicly accessible repositories, according to RCUK (2005). Funding agencies all around the world have noticed this, and there is a global trend for funding agencies to compel the dissemination of research results via repositories (Hockx-Yu, 2015).

To promote and accelerate the transition to academic communication that is truly built for the digital world, IR can play a critical role. Few journals or publishers have made scholarly communication a priority. The IR can facilitate greater access to traditional scholarly content by empowering faculty and students to effectively use the new dissemination capabilities offered by the IR to advance the movement of electronic theses and dissertations or the growth of open educational tools by empowering them to use the new dissemination capabilities offered by the IR to advance the movement of electronic theses and dissertations or the growth of open educational tools (Lynch, 2017). With the introduction of e-print and preprint servers, this is also happening on a disciplinary level, at least in some fields (Lynch, 2003).

Institutional repositories can directly feed disciplinary repositories in situations where the disciplinary practice is complete. Individual academics can use institutional repositories to help lead the way in initiating disciplinary shifts in situations where the disciplinary culture is more conservative, or where scholarly organisations or prominent publications opt to resist change (Lynch, 2017). According to Lynch (2003), institutional repositories can foster the investigation and implementation of new forms of scholarly communication that make extensive use of digital media. This, in our opinion, is the most important and exciting payoff: facilitating change not so much in the existing scholarly publishing system as it is in the beginnings of entirely new forms of scholarly communication that will need to be legitimised and nurtured with guarantees of both short- and long-term accessibility. New scholarship techniques that highlight data as a key component of the record and academic discourse can benefit from IR (Westell, 2006). They can organise and make effective attempts to capture and disseminate learning and

teaching materials, symposia and performances, and other documentation of universities' intellectual life (Abrizah, Noorhidawati and, Kiran, 2017).

The library, on behalf of the university, controls the repository most of the time, improving the exposure of the institution's outputs and raising its research profile. However, repositories are only as beneficial as the content they include, and the current emphasis is on expanding the volume of content by making it normal practice for researchers to deposit their products (Balakrishnan, 2013).

Theoretical Framework

Social Exchange Theory (SET)is one of the most prominent conceptual models in organisational behaviour. SET is a social psychological and sociological paradigm that seeks to explain societal development and stability as a process of negotiated exchanges between parties. Human relationships, according to the notion, are established through the use of subjective cost-benefit analysis and the evaluation of alternatives (McDonell, Strom-Gottfried, Burton, and Yaffe, 2006). Because this theory has been used by a few academics in prior studies, the paper links the SET to the IR initiative in Ghanaian universities.

According to SET, depositors should consider cost as well as other beneficial factors for scholarly communication such as trust, identification, and pro-sharing norms (Kling and Spector 2003; Kankanhalli, Tan, and Wei, 2005; Swan and Brown, 2005; DOAR, 2018). Kankanhalli, Tan, and Wei (2005) identified these elements as contextual factors impacting the contribution of IRs. Trust, in this context, refers to faith in the good intentions and competency of other actors, such as a university and users. Academic members' concerns regarding collective outcomes, membership, and institution commitment are reflected in identification. In the IR literature, the phrase "pre-print culture" rather than "pro-sharing norms" is used to describe the practice of researchers sharing drafts of research articles with colleagues all over the world before they have been peer-reviewed, as a factor (Samzugi, 2017).

Based on this assumption, Samzugi (2017) investigated the factors that encourage or impede participation in IR. He offered both extrinsic and intrinsic benefits of promoting research output, which

is critical to IR contribution. Extrinsic benefits in IR include publicity, accessibility, and the reliability of documents, as well as professional recognition, institutional acknowledgment, and academic incentive. Intrinsic benefits are concerned with the altruistic aim and self-interest of the IR contribution. Total costs include both copyright issues and the additional time and effort required to make the IR contribution.

As this study relates to IR promoting university research output in Ghana, Ezema, and Onyancha (2016) posit that IR can increase the readership of the university research output (increase publicity). Although few works have discussed SET and IRs, the African perspective has relatively inadequate than other developed worlds. For instance, Hulela (2010) adopted SET to examine the "perceptions of Lawrence-Kuether (2017) investigated open access and data sharing practices among Virginia Tech faculty and found that "academic authors are self-archiving their scholarly works in the Bergen open research archive" in Sweden. In Kenya, Kathewera (2016) adopted SEC to investigate "the role of an IR in the creation and use of local content by staff and students at Lilongwe University of Agriculture and Natural Resources (Luanar), Malawi". Adopting SET in this study sets to close this gap in the African perspective. Based on SET, university stakeholders including faculty and students benefit greatly by enhancing their global individual visibility, citations, and institutional visibility. It must be noted that higher learning institutions have the responsibility to demonstrate to faculty and students, the great value that is obtained in providing/contributing content. SET is applied in this study to shape the behaviour of submitters towards IR contribution.

Research Methodology

In this article, a quantitative methodology was applied. The methodology allowed the authors to collect numerical data and generalise the study findings to the sample population. The quantitative methodology was used to verify and refute prior findings in the literature and generalised to the study population to the IR. This shapes the behaviour towards IR contribution.

First of all, a global directory for academic OA repositories, called OpenDOAR was strictly used as the inclusion criteria to select the universities in Ghana running the IR platforms. OpenDOAR is the global repository of Open Access Repositories that is quality-assured. All the six university in OpenDOAR directory namely: Kwame Nkrumah University of Science and Technology (KNUSTSpace), University of Ghana (UGSpace), Aseshi University, University of Development Studies (UDSspace), University of Cape Coast Institutional Repository and the University of Education, Winneba were selected and used as the sample cases. Universities that were not registered on the OpenDOAR directory were not considered or included in this study.

After the selection of these cases, staff in the respective IR units in the six universities were sampled. In all, one hundred and fifteen (115) staff (see Table 1) were directly managing collections, and archives, and sharing research output on the IR. The participants were directly contacted by the authors via email and telephone calls. Before administering the final questionnaire, a self-administered pilot study was conducted based on 5 responses collected from library directors. Upon completing the pilot study, minor modifications were effected to improve the validity and readability of the questionnaire. The purpose of the contact was to give consent to administer the questionnaire to each respondent in the IR unit. After granting permission, the face-to-face approach was used in meeting with the staff. Data was then gathered from the study sample. The participants included the repository administrator, repository librarian, technical support team and general repository support staff. In total, questionnaires were distributed to 115 staff from six universities. See table 1 for details of the sample distribution.

Table 1: Sample distribution

	Name of university	Name of IR (URL)	Sample
1	Kwame Nkrumah University of Science and Technology	KNUSTSpace (http://dspace.knust.edu.gh/)	30
2	University of Ghana	UGSpace (http://ugspace.ug.edu.gh/)	16
3	Ashesi University	AseshiInstitutioanl Repository (https://air.ashesi.edu.gh/)	10
4	University of Development Studies	UDSspace (http://www.udsspace.uds.edu.gh/)	17
5	University of Cape Coast	UCC Institutional Repository (http://ir.ucc.edu.gh/dspace/)	16
6	University of Education, Winneba	UEW Institutional Repository (http://ir.uew.edu.gh)	17
Total			**115**

For data analysis, the Statistical Package for Social Science (SPSS) software was employed. Items on the questionnaire were primarily collected from two studies: Ukachi (2018) and Markey, Rieh, St. Jean, Kim, and Yakel (2007).

Analysis and Discussion of Findings

Demographic Biographical information was gathered in order to understand the respondents' viewpoints on the role of university libraries in encouraging research output and the general objectives of the study.

Table 1: Demographic Information

Gender of respondents		
Responses	**Frequency**	**Percent**
Male	60	52.2
Female	55	47.8
Age of respondents		
Responses	**Frequency**	**Percent**
18-29 years	65	56.5
30 – 39 years	25	21.7
40 – 49 years	15	13.0
50 – 59 years	**10**	**8.7**
Total	**115**	**100.0**

Source: Field data, May 2019.

Male library staff in IR units comprised 52.2% of the study's population, while females comprised 47.8%. Furthermore, the majority of respondents (56.5%) were between the ages of 18 and 29, with only a few (8.7%) falling between the ages of 50 and 59. 73.9% of the total population.

Table 2: Purpose of IR

Study Variables	N	Mean	Std. Deviation
Archive research output	115	3.8905	1.22333
Promotes research output	115	3.8876	0.78767
To boost the particular scholar's prestige	115	3.3678	0.71234
To boost your institution's prestige	115	3.7905	0.7334
"Provide open access to their intellectual output"	115	4.5876	0.4007
"To place the burden of preservation on the IR instead of on individual faculty members"	115	4.312	.01204

Source: Field data, May 2019.

Table 2 shows the means, standard deviations, and reliabilities of all variables based on responses. A mean ranking of the purpose of IR in universities revealed that most respondents largely agreed that IR in universities "Provide open access to their intellectual output" (m=4.5876) and "carries the burden of preservation on the IR rather than on individual faculty members" (m=4.312). Other reasons for establishing IR included archiving research output (M=3.89, S.D= 1.223), promoting research output (M=3.58, S.D=.787), (M=3.36, S.D=.712), and boosting your institution's prestige (M=3.7905, S.D=.546), in that order.

The purpose of the repositories, according to Islam and Akter (2013), is to "provide open access to their intellectual output" of the institutions.

According to Islam and Akter (2013), IR "resolves the problem of developing-country scholars by providing unlimited access to intellectuals' work without economic barriers." They went on to say that "the most significant barrier for developing-country research scholars is limited access to scholarly works." IR solves this problem by removing economic barriers to accessing intellectuals' work.

In developing countries like Ghana, the cost which involves technical staff, training, cost of software, etc. is one of the challenges for libraries maximising IR in their universities (Ibinaiye, Esew, Atukwase, Carte and Lamptey, 2015). The section compares how libraries used open-source software versus proprietary software to establish IR in the university.

Table 3: Software of IR in Ghana

Software used	Frequency	Percent
DSpace	92	80
Eprint	1	0.9
Digital Commons	22	19.1
Islandora	–	–
Hydra	–	–
Total	**115**	**100**

Source: Field data, May 2021.

The table above summarises the various types of open or proprietary IR software used in Ghanaian universities. DSpace was identified as the open-source software used by the vast majority of respondents (80%). Other software repositories were Digital Commons, scoring 19.1%. Only one respondent confirmed Eprint as the IR software used for building the repository. None of the repositories used Islandora and Hydra software for IR development in Ghana.

A study by Thompson, Akeriwe and Aikins (2016) found that "using proprietary software is more expensive; hence, many academic libraries in the developing countries do not select that option". Thompson et al. (2016) confirmed the study's findings that most universities, including the University of Development Studies in Ghana, preferred open-source software over proprietary software because it is less expensive. It was suggested that the "UDS Library had the technical expertise for customising the open-source software and for the creation of the metadata". Respondents evaluated the types of content of the IR in the universities (Table 4).

Table 4: Type of content in IR

Content types	Mean	S.D	Decision	Rank
Heritage (rare) materials	2.51	0.21	Neutral	7
Journals	4.20	0.15	agree	3
Lectures, Speeches, Reports	3.71	0.10	agree	5
Research Articles	4.72	0.45	Strongly agree	1
Conference Proceedings	4.11	0.32	agree	4
Theses	4.50	0.05	agree	2
Others (past questions)	2.22	1.02	Disagree	6

Note: Strongly agree (5), agree (4), Neutral (3), Disagree (2), Strongly disagree (1).

The responses to the digital repository's content are shown in the table above. There was a high agreement for research articles (X=4.72, SD=0.45) and Theses (X=4.50, SD=0.05) as contents for the IR. On the other hand, a few respondents agreed with heritage materials (X=2.51, SD=0.21) and others (past questions) (X=2.22, SD=1.02). The results explained that respondents in the university libraries noted huge contents of research articles and theses in the digital repository but observed that past questions and heritage collections were rarely deposited in the IR.

Ezema and Onyancha (2016) have echoed that, IRs archive and promote research produced by the institutions. Previous studies including Martin-Yeboah, Alemna, and Adjei (2018); Safdar and Rehman, (2015) and Sani (2018) assessed the digital contents of IRs in their respective institutions. Safdar and Rehman (2015) confirmed the results in the present paper indicating that "various types of content such as research papers/articles, thesis, working papers, proceedings, past examination questions" are available in the IR. Preprints; working papers; theses and dissertations; research and technical reports; conference proceedings; departmental and research centre newsletters and bulletins; papers in support of grant applications; status reports to funding agencies; committee reports and memoranda; statistical reports; technical documentation; and surveys (Agyen-Gyasi, Corletey and Frempong, 2010).

Submission Criteria

Table 5: Submission criteria in IR

	Frequency	Percent
Only self-archive	13	11.3
Strictly mediated archive	69	60.0
Both Mediated and self-archive	33	28.7
Total	**115**	**100**

Source: Field data, May 2021.

The results revealed that most (60.0%) of the library staff in the IR unit alluded that electronic materials are often mediated archived (11.3%) other than self-archived. It can be said that among all the six universities, library staff receives the electronic copies on Compact Discs or emails and then submit them to the IR.

There are two types of archiving, according to Bamigbola (2014): self-archiving and mediated archiving. In self-archiving, the author submits the digital item by himself, whereas someone else archives the author's work in the mediated archiving method. Armstrong (2012) adopted mediated archiving at Boise State University in the United States, where library staff was entrusted with uploading documents to the institutional repository. If instructors know they won't have to spend time self-archiving, they may be more inclined to contribute their work.

Promoting Research Output

Respondents were asked to use a 5-point Likert scale based on Strongly Disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4), and Strongly Agree (5) to assess the functions of IR in universities (5). Table 6 displays the means and standard deviations.

Table 6: IR and promoting research output

	Mean	S.D	Decision	Rank
The IR collects the research/intellectual output of the university	4.31	0.23	4	1
The IR preserves the research/intellectual output of the university	4.09	0.11	4	3
IR improves citation rates of research output	4.19	1.32	4	2
The IR enhances student research for the global audience	3.84	0.25	4	5
The IR provides opportunities for research collaboration from other institutions	4.03	0.39	4	4

Source: Field data, May 2021.

The results revealed high scores for all five items. Specifically, respondents rated "IR collects research/intellectual output of the university"(X=4.31, SD=0.23) as the highest reason for promoting the intellectual output of the university. This was followed by "IR improves citation rates of research output" (X=4.09, SD=0.11) and IR provides opportunities for research collaboration from other institutions (X=4.03, SD=0.39). The understanding here is that, the IR's ability to capture the intellectual capital of the institution, enable long-term preservation of digital assets, and expose staff research to a wider international audience have all contributed to its relevance as a tool for scholarly communication. The findings of the study are consistent with those of Ukachi (2018), who discovered that IR collects university research/intellectual output and that many of these resources have become essential tools for scholars conducting research, building scholarly networks, and disseminating their ideas and work.

Table 7: Motivations for depositing scholarly works

Motivations for depositing scholarly works	Frequency	Percent
Depositing scholarly work on IR increases the likelihood of communicating research findings with others and peers.	17	14.8
Provides researchers with credible publication sources.	5	4.4
Depositing research work on IR will increase my visibility within the discipline to which I belong.	15	13
Depositing work increases the number of people who read the materials.	19	16.5
The potential impact of research will be increased by depositing scholarly work.	15	13
Scholarly work on IR will be cited more frequently.	10	8.7
Posting research output on IR improves one's chances of advancement.	3	2.6
Posting scholarly works on IR allow other scholars to have access to the materials they could not otherwise access	16	14
Posting research on IR will increase the chances of attaining grants for research	15	13
Total	**115**	**100**

Source: Field data, May 2021.

The results shed light on some of the motivations for depositing scholarly works in a university. Respondents generally agreed that depositing university research in the IR increases the readership of the research output (16.5%). Second, 14.8% of respondents stated that depositing scholarly work on IR increases the possibility of communicating research findings with other people and peers. In general, librarians revealed several reasons why faculty and researchers deposit research output into IR.

Hulela (2010) concurred with the study's findings. According to Table 7, academic authors want to share their scholarly work with others because they have benefited from other people's research. This suggests that the altruism factor influenced their decision to engage in an IR. Other important motivators included the preservation of scholarly work in an IR, the maintenance of rights to their scholarly work, and increased exposure within their university and departments. The notion that contributing to IR might boost prospects of promotion did not appear to be a big issue for the respondents; it had little impact

on them. There is no link between IR contributions and the promotion of academic authors. It also shows that IR did not affect the respondents' financial incentives. Respondents to the study addressed the challenges that hampered the optimisation of IR in Ghanaian universities (see Table 8).

Table 8: Barriers to promoting research output

Questionnaire item	Mean	Standard Deviation	Rank
Difficulties getting internet access/slow internet	3.2609	1.07676	5
Inadequate ownership/intellectual rights	4.3261	1.17175	2
Inadequate collaboration among academics, researchers, and libraries	3.7826	1.10646	3
Librarians lack the requisite promotional competence	3.5217	.88206	4
Not conducive environmental /platforms for sharing research output	2.5217	1.17986	7
Academic members and students are unaware of the potential of open access resources.	3.0217	.97646	6
Policy absence mandating academics and students to submit research output	4.8913	1.05710	1

Source: Field data, May 2021.

According to the mean value generated, 'policy absence mandating academic and student submission of research output' received the highest mean of 4.8913 per respondent. This was followed up by "Inadequate ownership/intellectual rights" with (X =4.3, SD=1.17)On the contrary, with a mean score of 2.522, 'non-conducive environmental /platforms for sharing research output' was rated the lowest. Given this, the university administration must establish a policy requiring faculty or academics and students to submit research output.

Table 9: Increasing the visibility of university research

Questionnaire item	Mean	Standard. Deviation	Rank
Build a solid commitment to promoting research output.	4.2304	.95073	1
Increase the accessibility of research output.	4.1404	.85349	2
Encourage academics, students, and the library to work together effectively.	4.1364	1.08030	3
Increase graduate students', professors', and researchers' awareness of open access resources.	4.0870	1.48422	4
Librarians should be periodically trained in ICT skills.	4.0720	1.66429	5
Find and create credible publications for researchers.	4.0570	1.86429	6
Make research findings more visible.	4.0230	1.93250	7
Strategy for University-Wide Research Development.	4.0000	1.98230	8

Source: Field data, May 2021.

According to the mean values generated, 'developing a strong commitment towards promoting research output' obtained the highest mean of (4.23), indicating that it is the best method for promoting research output according to the respondents. This was followed by increasing research output accessibility (4.14), promoting appropriate collaboration among academic members, students, and the library (4.13), raising awareness of open access resources (4.08), regularly training librarians on ICT competencies (4.07), identifying and creating credible publication sources for researchers (4.05), and increasing research output visibility (4.05). (4.06). (4.02). Despite this, the 'university-wide research development strategy' obtained the lowest grade, with a mean score of 1.98. This suggests that respondents were not enthusiastic about the University of Ghana implementing a university-wide research development strategy as an effective strategy for tackling the challenges connected with promoting research output.

Conclusion and Recommendations

The paper discusses how IR is used to promote the visibility of university research output in Ghana. In structuring and redefining the mandate of university libraries, OAI and IR have become innovative platforms that enhance scholarly communications. This paper revealed that IR is key to promoting scholarly communication within higher learning institutions in Ghana. Our paper established the following conclusions:

- The submission of digital content into the university IR was largely mediated archiving other than self-archiving.

- IR collects, preserves, shares, and promotes the research/intellectual output of universities in Ghana.

- Unlike academics, students were mandated to deposit into the IR. No policy supported faculty submissions on the IR.

- Strong commitment from library and university management towards OAI can greatly promote the visibility of university research output through IR.

- The authors expect, among other factors, to contribute research output for individual and institutional visibility.

The main recommendation of this paper is that concrete strategies should be taken by library and university administrations, as well as other interested stakeholders, in increasing the visibility of research output in Ghana by promoting the IR platform. This is because, despite advances in OA, academics remain largely unaware of the concerns, justifications, and benefits. OA aids academia by promoting published works while also allowing academics to be known by others. This ability to bridge the information gap between industrialised and developing countries is increasingly vital for educational, cultural, and scientific advancement. Promoting IR in universities in Ghana might thereby encourage information and knowledge sharing among the academic communities. Based on the study's findings, the university library can create guidelines to orient submitters on archiving techniques (self-archiving and mediated) in the IR. The library instructions should minimise technological difficulties/barriers, as well as the time and effort required to deposit materials. In terms of strategic priorities, the universities in Ghana must identify OA as a strategy for boosting research and improving institution visibility. Surely, management must identify and prioritise IR by mandating academics and students to deposit content into the IR. The degree of emphasis by university management through an IR policy plays a more important role in committing the user community to mandatorily contribute to IR. By so doing, institutional and individual visibility of the intellectual output of the university. It is also recommended that connect publication metrics to academic promotions. The university should link relevant publishing metrics to promotions to foster academic research in Ghana. By depositing research findings in the IR, academics or researchers might be encouraged to advance in promoting research findings within their disciplines. There should be collaborations between stakeholders and the library through aggressive publicity to create more awareness of the IR. A few publicity strategies include providing google analytics reporting, one-on-one engagements, flyers, posters, email systems, and internal memos.

In Ghana, workshops to enhance interactions between the stakeholders and the university library will be an advantage.

Implications for Future Research

Even though the success of IR is dependent on academics and students depositing research output, universities in Ghana are experiencing problems attracting digital content. Academics and other researchers in the academic community are not yet particularly interested in IR. From the study, librarians and IR teams need to be creative in sensitising researchers and the academic community regarding the visibility of their research output by using IR.

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