



**CONSORTIUM OF ACADEMIC
AND RESEARCH LIBRARIES IN GHANA**

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HELD AT

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GHANA**

THEME:

**MANAGING RESEARCH OUTPUT FOR NATIONAL DEVELOPMENT: TRENDS
AND ISSUES**

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**CONSORTIUM OF ACADEMIC AND RESEARCH LIBRARIES IN GHANA
(CARLIGH)**

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**WELCOME MESSAGE BY THE CHAIRPERSON OF THE LOCAL ORGANIZING
COMMITTEE**

DR. MAC-ANTHONY COBBLAH

On behalf of the Organizing Committee of the 3rd CARLIGH/AAU International Conference, I am honoured and delighted to welcome you to the 3rd International Conference with the theme “Managing Research Output for National Development: Trends and Issues” at the Association of Africa Universities(AAU) headquarters, Accra, Ghana.

This year’s conference has assembled over hundred (100) participants across the world and promise to be very exciting, innovative and eventful. We have invited well accomplished scholars/experts as keynote speakers to set the tone for our presentations and discussions.

As the Chair of the Local Organizing Committee, I assure you on behalf of my team that, we will do everything possible to ensure a successful, learning and memorable conference. We have an exciting programme at this conference that will allow participants to reflect upon and celebrate accomplishments, establish new friendships, extend networks and jointly explore current and future research directions.

We are grateful to all who have worked so hard in various ways to support this year’s conference. We are also grateful to the keynote speakers, presenters, participants and sponsors for the interest shown in the Conference. We are particularly grateful to the Association of African Universities, (AAU) for collaborating with CARLIGH to organize this conference.

We hope that you will have a productive and fun filled time at this very special conference.

With Gratitude.



Dr. Mac-Anthony Cobblah
Chair, Planning & Organizing Committee

THE RESEARCHER AND DATA

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Abstract

Generation, dissemination, use and reuse of scientific knowledge are critical for the maintenance and enhancement of quality of life of humans and for national development. The focus of the presentation at CARLIGN Conference 2018 was to discuss best practices in research data collection, management of research data, sharing of data, storage and preservation of data and effective dissemination of research data. Most of the information discussed was obtained from internet sources. This paper is an overview of tools and approaches currently available to researchers for enhancement of research work, data management, storage, and reuse.

Keywords: Cloud computing, data collection, data repositories, management of research data, research data

Introduction

Research is the process of collecting factual and relevant information or data, analyzing them, drawing conclusions and deciding further courses of action. It is an investigation focused on discovering some facts through careful study i.e. systematic enquiry. Data refers to facts and statistics collected for reference and analysis e.g. information on ideas, objects etc. in a raw and unorganized form. Thus, research data refers to evidence used to support research findings e.g. numbers/spreadsheets, videos, images, artifacts, diaries and experimental data. Research data generated depends on the type of research. This paper is an overview of tools and approaches currently available to researchers for enhancement of research work, data management, storage and reuse.

Types of Research

Two main types of research are quantitative and qualitative research.

Quantitative Research

Quantitative research is a process used to quantify a problem or address the "what" or "how many" aspects of a research question. It involves generating numerical data or data that can be transformed into usable statistics with software such as SPSS, Epi Info.

The four (4) main types of quantitative research are shown in the figure 1.

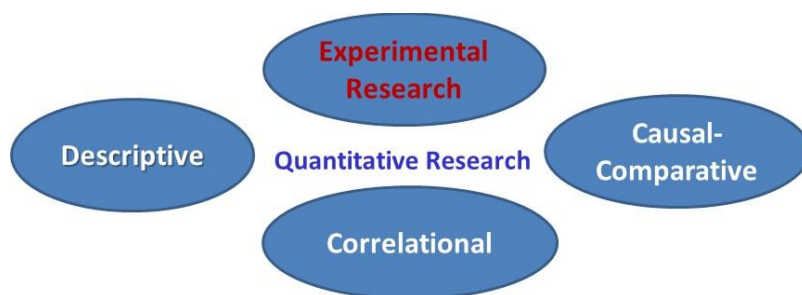


Figure 1. Types of Quantitative Research

Qualitative Research

This type of research involves collecting and working with non-numerical data and searching for interpretation from these in order to understand social life via the study of targeted populations. Qualitative research is necessary for identifying relationships between variables, e.g. relationship between wealth and cardiovascular diseases. Some common approaches used include focus groups discussions, interviews (individual) and surveys. Figure 2 shows the main types qualitative research.



Figure 2. Types of Qualitative Research

Data Collection Approaches

There are primary and secondary methods of collecting data.

Primary Data

This is first-hand data collected during research (field research). Advantages and disadvantages of primary data collection approach are as shown by Table 1.

Table 1. Advantages and Disadvantages of Primary Data Approach

Advantages	Disadvantages
<ol style="list-style-type: none"> 1. There is high degree of accuracy - Reliable 2. The data is specific and relevant 3. The approach is unbiased 4. More detailed information is obtained during primary data collection 5. Secondary data is not always available in some cases 	<ol style="list-style-type: none"> 1. It is time consuming to collect field data 2. This approach is more costly than that of secondary data 3. It is more costly than secondary data approach

Secondary Data

This approach involves the re-use of data collected by another person(s). Table 2 shows the advantages and disadvantages of the secondary data collection approach.

Advantages	Disadvantages
1. This data could easily be obtained from journals, books, websites, newspapers	1. Accuracy of the data is usually a challenge
2. The approach is convenient, saves time and finances	2. It is difficult to find data particularly relevant for a specific study
3. It is useful especially when primary data is unavailable	3. Extra caution is required for use of secondary data
	4. It is not always possible to employ this approach

Example of workflow for primary data collection (Figure 3):

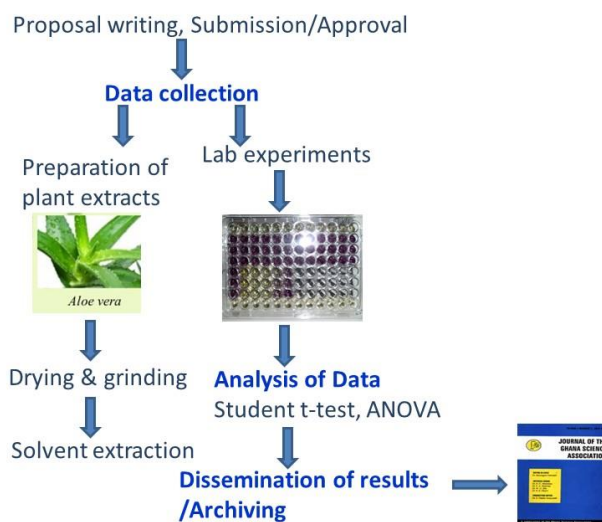


Figure 3. Example of Primary Data Collection Approach - Anti-leukemia Activity of Medicinal Plants

Figure 4 shows an example of workflow for secondary data collection.

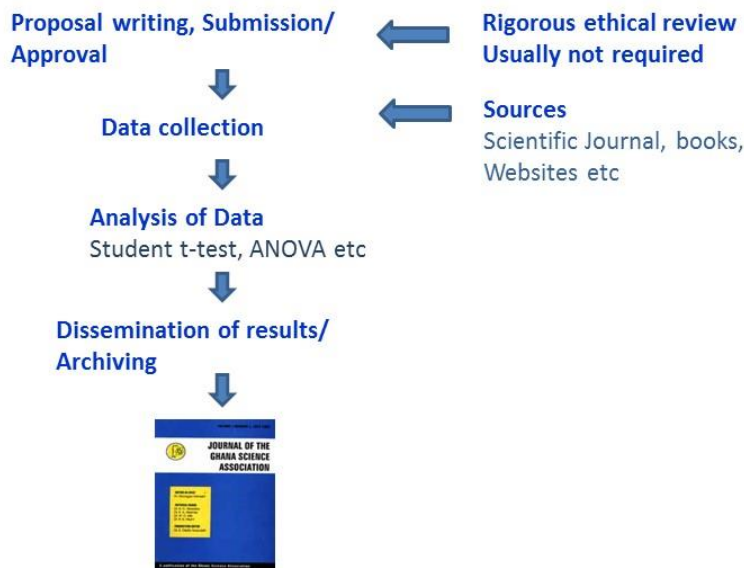


Figure 4. Example of Secondary Data Collection Approach

Management of Research Data

Research data management involves organization of data, from beginning of research cycle through to dissemination and archiving of results. This data is crucial as it is evidence -based for research findings. Therefore, robust and suitable data storage facilities are needed to reduce loss of data through accidents or negligence.

Data safety concerns protection of data against loss through storage (including backups) and archiving, and by good organization and documentation. On the other hand, data security involves protection of data against unwanted alterations. This can be achieved by controlling access to the data. The systematic data arrangement to protect it from loss is referred to as data organization.

Good research data management guarantees that files and data are organized for access and analysis without difficulty, hence increasing research efficiency. In addition, tracking of progress is easily done, and there is reduced risk of any group member exiting with valuable knowledge on research.

It is necessary that researchers ensure compliance with both funders and institutional research data policies and expectations. Most funding agencies have regulatory requirements, and funders around the world are taking more interest in outputs of research. Most funders now

require the production of a data management plan. Data management is critical for improvement of research integrity and validation for results of research.

Cloud Computing

Cloud computing is an Internet Technology (IT) paradigm that uses a network of remote servers hosted on the Internet to process, manage, store and provide access to data, rather than a local server or a personal computer (Sun Microsystems, 2009). Cloud computing may also refer to deployments within institution's firewalls (private cloud) or combination of intra institutional systems with external networked computing systems that share connectivity over internet protocols (hybrid cloud). Cloud computing is employed on daily basis by researchers when using email (e.g., Yahoo, Gmail, Hotmail), social media e.g. Facebook etc (<https://www.zdnet.com/>). Although research is a collaborative effort sharing of data, software and work plan with others in the research group around the world is usually challenging. Moreover, data generated by the researchers is currently increasing in size e.g. large DNA sequencing data (Big data). In the age of Bigdata, data management is becoming an increasingly important component of analysis. In this era of cloud computing, there are significant increases in data sizes. The expression "Rain clouds" implies cooperation between single clouds to provide accessible resources during an emergency. When managing a variety of data with large volumes, challenges may arise with data size, variety security and other factors that may require the use of "Rain clouds".

Three models of cloud computing available are (1) Infrastructure-as-a-Service (IaaS) which refers to the basic building blocks of computing that can be rented i.e. physical or virtual servers, storage and networking (2) Platform-as-a-Service (PaaS) which comprises of underlying storage, networking, and virtual servers as well as tools and software needed by developers to build the applications and (3) Software-as-a-Service (SaaS) which is the delivery of applications-as-a-service (Kumar and Goudar,2012). This is a version of cloud computing that is used by most people. Giant cloud providers include Amazon Web Services (AWS), Microsoft, Google, IBM, and Alibaba.

Advantages and Disadvantages of Using Cloud Services

Using cloud services implies that departments or institutions do not have to purchase or maintain their own computing infrastructure. In addition, there is no need to purchase servers,

update applications/operating systems or decommission and dispose of outdated hardware or software since these are done by suppliers. Also, cloud computing allows users to work faster on research projects and test out concepts without focusing on pre-payments since payment is only done for used resources. However, cloud computing is not cheaper than other forms of computing. Furthermore, some institutions may be hesitant to host sensitive data in a common service with rivals. The applications are only accessible with the availability of internet connection.

Research Data Repositories

Data repositories are database service or infrastructure that archive and manage long-term storage and preserve digital resources, provide catalogues of discoveries, access and reuse of data. Digital research data is best preserved and published using a research data repository. Most data repositories may be used without charges for the purpose of depositing research data; however, users are required to register before using them i.e. open access allowed. Some journal publishers prefer to specify the repositories where data, code and supplementary materials may be deposited. Preference for a repository depends on the type of data. For example, raw data on gene sequencing of human cytochrome P450 drug metabolizing enzymes might best be deposited in ArrayExpress. However, the results of a cloning of cytochrome P450 enzymes could be stored in a generalist repository.

Data articles in these repositories are citable peer-reviewed publications. Authors are expected to pay publication costs i.e. article processing charges, since data journals are “Open Access”. Generally, organizations provide external repositories for the purpose of archiving datasets. Repositories are usually run by legal entities, e.g. universities and libraries. An example of such repositories is re3data, a joint project of the Berlin School of Library and Information Science, the GFZ German Research Centre for Geosciences and the Library of the Karlsruhe Institute of Technology, which collaborate with other Open Science repositories like Databib, OpenAIRE, DataCite and BioSharing. The re3data repository offers detailed information on over 2,000 research data repositories and appears to be the most globally comprehensive source of reference for research data (<http://www.re3data.org>).

Useful Hints for Identification of Scientific Trusted Data Repositories

Most of the trusted data repositories are well recognized within the scientific community and supported as well. They have infrastructure for long-term preservation of published datasets

and provide expert curation. These repositories also possess the necessary community certified reporting requirements. Public access to data in these repositories is allowed without unnecessary restrictions. It is worth noting that the above criteria may not be met by all trusted journals.

Open Data Access

Open Access refers making data/publications freely available online to all at no cost and with limited restrictions with regards to reuse. The unlimited distribution of research is very essential for authors (for visibility), readers (for usability) and funders (wider impact). There are two main routes to making research outputs openly accessible: One involves publishing articles or books through the open access route on a publisher's platform (gold open access) and the other route involves archiving a version of manuscript in an Open Access repository (green open access)

Manuscripts published through the Gold Open Access route are accessible immediately on publication. Authors retained copyright and most permission barriers are eliminated. On the other hand, manuscripts published via the Green Open Access route are usually made accessible after self-archiving period has elapsed and these may be deposited in a repository. Dissemination and re-use of open access content depends on the terms of the license under which it was made available.

Why share data? Scientific research is generally geared towards finding solutions to challenges in life and development. Thus, it is imperative that the outcomes of research are shared for the benefit of the public. Indeed, some research is also funded by the public purse and so it is fair to promptly share the outcome with all funders. Adequate dissemination of research data for use and reuse presumes that data are findable, accessible, interoperable and reusable (Wilkinson et al., 2016). This is also known as the FAIR Principle for research data.

Conclusion

Relevant research data is needed for national development and prosperity, therefore, more effort must be made to ensure that the necessary infrastructure and other resources are put in place to support researchers. All academic institutions must develop policies on RDM and Open Research Data Access. These policies must focus on providing guidance to the academic

community on RDM and ensuring that academics adhere to good data management practices. Researchers must encourage people in their disciplines to use selected repositories. They must also endeavor to describe data sufficiently so that it could be easily traced. Ultimately, research data generated must be findable, accessible, interoperable and reusable.

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ACCESS TO AND USE OF AGRICULTURAL INFORMATION IN THE SVOSVE FARMING AREA OF ZIMBABWE

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Abstract

Agricultural information is critical for increasing household income and food security yet the major challenge is access to quality information and subsequent on-farm utilization. In 2017, a study was conducted in the Svosve communal area of Zimbabwe aimed at identifying farmer's information needs, factors influencing access to and utilisation of the information. A survey covering 6 villages in the area was conducted in Svosve to collect both primary and secondary data using a semi-structured questionnaire. Convenience sampling technique was employed purposively to select 88 farmers and 4 extension workers. Data was analysed using SPSS and content analysis. Qualitative data was used to complement the quantitative data. Farmers in the area had different information needs according to their different farming thrust, gender, problems and expectations. Under the current production systems about 15% of the farmers indicated the importance of fertilizer application knowledge followed by 7-8 % who preferred information on tobacco and or maize production, land preparation and marketing. However, pesticide and herbicide knowledge was the most needed information (15 %) for farmers to advance their production. The key informant for livestock production indicated that generally farmers in the area needed more training in livestock production. There was general access to information within the Svosve area but utilisation was affected by source disseminating information, costs to get information, dependency on indigenous knowledge and extension workers not being forthcoming. The majority (26 %) of the farmers accessed their information from government extension workers while 24 % accessed it from field days and 22 % depended on other farmers. About 29 % of the adopted aspects were from extension workers, while 25 % of the adopted aspects came from field days. Farmers indicated high cost to implement and unreliable information as major challenge to utilisation. The researcher recommended that information must be packaged to fit the rural community so as to enhance food security and income generation.

Keywords: Agriculture, information needs, information access, use

Introduction

Agriculture plays a pivotal role in Zimbabwe's socio-economic development as well as food security. Over 70% of the population living in rural areas draw their livelihoods from agriculture (FAO, 2015). The rural population rely on agriculture as subsistence producers or agriculture workers for food security and income generation (FAO, 2006). However, both producers and workers require agricultural information for their livelihoods. Thus, smallholder farmers require proper agricultural information in order to plan for their activities, making choice of the inputs, diffusing and adopting technologies and eventually on when and where to sell their products (Babu et al., 2011).

Farmers require proper information in order for them to make decisions related to planning of agricultural activities, choice of enterprise, production and marketing for the season or long term. Generally, farmers need a wide variety of information such as availability of agricultural support services, government regulations, climate change, crop production and managements, disease outbreaks, adaptation of technologies by other farmers, wages rates and so on. This suggests that therefore, there is a direct relationship between availability of information and agricultural development (Babu et al., 2011). However, the content of the information services needs to reflect their diverse circumstances and livelihoods. From this, one can see that information indeed is important in any development activity and should be made available and accessible to farmers but in reality such information is not available to most farmers.

Farmers differ in their access to, and use of agricultural information depending on the different sources they have access to. According to Meitei and Devi (2009), rural farmers are not getting the right information at the right time, leading to slow development of agricultural activities. The researchers were triggered to undertake this research after observing that farmers had access to various sources of information within their community, but even, with all efforts made, the information was not being effectively used by the farmers and in turn it was evident in their low yield, quality and profits at the end of a season. Access to reliable, timely and relevant agricultural information helps to reduce farmers' risk and uncertainty, thereby empowering them to make good decisions. A previous study has shown that wide availability and multiple sources of information have not significantly changed farmers' behaviour towards new technologies and information which is often attributed to a lack of knowledge or understanding of farmers' perspectives and needs on the part of information providers (Mittal and Mehar, 2013).

It is generally known that limited access and utilization of agricultural information on agricultural technologies and recommended agricultural practice are among the factors that contribute to low agricultural production in the study area. Farmers have different information needs and as long as these needs are not met, clearly no matter how much information may be at their disposal, if it does not meet the need, there will be limited use. Lwoga et al. (2011) reveal that despite the large body of knowledge that exists in research institutions, universities, public offices and libraries, it is only a small amount of agricultural information which is eventually accessed by rural farmers.

Statement of the problem

According to Adedoyin (2012), a steady flow of accurate, understandable and factual information links the scientists to the farmers and for any agricultural progress, farmers must know, understand and act in accordance with information. Some farmers in Svosve have access to information and some do not, this was highlighted in a study done by Matsika (2012) which noted that some farmers especially women had challenges in agricultural productivity because they were not involved in extension services. Preliminary interviews with a few farmers in Svosve area indicated they are getting uncoordinated, fragmented, duplicated and overlapping information which also then triggered full research study for clarification of such opinion. There is the need for farmers to get information that ensures effective use which in turn gives a positive change in their yields. It is important to understand the actual needs of the rural farmers before one can go further to understand and assess, access and use the information. Thus, the research was guided by the following objectives:

- i. To ascertain information needs of farmers;
- ii. To identify sources of information farmers had access to; and
- iii. Assess the challenges they face in using the information

Methodology

The study was carried out in Svosve-Wenimbi communal areas of Mashonaland, East Province of Zimbabwe, approximately 40 km from Marondera, the provincial town. Almost all smallholder farmers in Svosve-Wenimbi area are into tobacco, maize and tomato production. Few farmers grew crops like potatoes, onions and carrots. Many households rear cattle as the dominant livestock and most of them use cattle for draught power and selling to them raise school fees for their children. The study used both qualitative and quantitative methods and it

was in the form of a survey. A pragmatic approach was taken as it sought to understand farmers' experiences and their perspectives as farmers themselves and capture all important aspects by virtue of using the qualitative as well as the quantitative designs. According to Sewell (2008), there is need for a researcher to gather both quantitative and qualitative data for authentication. Qualitative methods were used to understand the information needs of farmers. It brought out attitudes and seeking behaviour practices. Quantitative methods were used to answer questions and the relationships between variables.

The survey covered 6 villages, namely *Masikana*, *Masomera*, *Dhirihori*, *Muchakata*, *Nhowe* and *Mayor* and all these villages have extension workers within them to assist farmers, Zimstats (2016). Convenience sampling technique was employed to purposively select 88 farmers and 4 extension workers. The reason for using the convenience sampling technique that the data collection coincided with the time most farmers were planting so it was at the convenience of those who were free and willing to participate. Purposive sampling was used for the 4 extension workers who stood as key informants due to their role in disseminating information. Questionnaires and semi structured face-to-face interviews were used as the data collection tools. Questionnaires in the study encouraged respondents to give accurate and confidential information making it suitable for gathering exact information needs and issues surrounding access to, and use of information which are the main themes. Interviews allowed for in depth information to be noted, and deeper insight was gained on the status quo regarding sources of information available and needs of farmers in the Svosve area. The data for the questionnaires was collected in 5 days while the interviews were carried out within 3 days. Validity was ensured by using triangulation as the study obtained complementary quantitative as well as qualitative data. Data collected was manipulated through assessment of frequency of responses to questions from the questionnaire. The data was analysed by generating descriptive statistics of interviewees while logistic regression analysis for factors influencing farmer access and use of information. Data was analysed using SPSS which presented percentages and frequencies in the form of tables, graphs and charts. Content analysis was used for the responses from the semi structured interviews and grouped responses with similar messages together. Qualitative data was used to complement quantitative data.

Results and discussion

General farmers' information

The majority of the farmers who participated in this study were between 41-50 years, while less farmers were in their 20s (< 10) and above 61 years (< 10). This may indicate that most of the productive workforce might have migrated into urban areas while most of the elder people have remained in the farming area. About 55% of the household head attained secondary education followed by 27 % farmers who reached the primary education level (Table 1). Only 5 % of the household heads had some form of adult education while 14 % had no education. The same trend was noticeable for the spouse's education with > 40 percentage attaining secondary education. However, a different scenario was with other members of the family with some even attaining college education while 80 % went up to secondary education (Table 1). The level of education of the whole family has a strong bearing on how information or knowledge is adopted by the household. However, the final decision of what is to be utilized by the household is solely dependent on the household head unless another member of the family has some influence which could be monetary. These results pointed out that the level of literacy contributed to a farmer's ability to access information, and this made it easier for the accessed information to be interpreted during usage.

Table 1. Family Education Indicators

Education level attained	Percentages		
	Household Head	Spouse	Family Member
No formal	14 %	13 %	0
Adult	5 %	6 %	0
Primary	27 %	38 %	5 %
Secondary	55 %	44 %	80 %
College	0	0	15 %

Farmers Information Needs

Current farming ways and situation farmers require fertilizer application knowledge the most (15 %) which is followed by those aspects with 8 % then 7 % such as tobacco and maize production aspects, land preparation and marketing. Keeping records, weather forecast, animal husbandry were amongst the least needed information and knowledge. It has been noted that farmers have different information needs and the level of demand is dependent on a particular farmer and their immediate or future needs to improve their yields. Similar observations were

noted by Oदिनी (2014) where he pointed out that identifying an information need is the first step towards satisfying information needs and that the information seeking process involves a number of steps before identifying information sources and needed information. Pesticide and herbicide knowledge is the most needed information (15 %) for farmers to advance their production followed by the need for disease control (12 %) and general agronomic (10 %), practice which might include soil improvement aspect (8 %) (Table 2). As such, it is critical then to understand how these needs will be delivered to the farmers and then ascertain its utilization and adoption.

Table 2. Current and future farmers needs: farmer’s perception or view

Farmer’s needs			
Current production needs	Frequency of need (%)	Future production needs	Frequency of need (%)
Fertilizer application	15	Pesticide and herbicide	15
Seed variety utilization	8	Disease control	12
Disease control	8	Soil Science	10
Pesticide and herbicide	8	Fertilizer application	8
Tobacco production	7	Soil fertility management	8
Maize production	7	Horticulture production	7
Land preparation	7	Animal husbandry	7
Markets and marketing	7	Pasture management	7
Horticulture production	5	Machinery and implements	5
Soyabean production	3	Economics and Finance	5
Soil fertility management	3	Post-harvest	5
Time of planting	3	Weather forecast	3
Machinery and implements	3	Dairy Science	3
Bean production	3	Agricultural engineering	3
Crop rotation	2		
Irrigation system	2		
Animal husbandry	2		
Matching soils with crops	2		
Weather forecast	2		
Keeping records	2		

Farmers in the area are mostly into crop production as indicated by the high (>10 %) preference of finance, weather date, production aspects, marketing, value addition and planning (Figure 1). Findings by Tadesse (2008) also highlights that people may have different objectives, interests, perceptions, beliefs and access to information and resources. This might also indicate that farmers lack animal production aspects, which would encourage them to venture into animal husbandry. Given that farmers who own cattle are few and also goat production is not prominent in the area which can explain lack of animal husbandry aspects. From the interviews done and further information obtained from farmers, it was noted that the reason for less interest in animal production was because there were fewer extension workers who specialized in animal production. Also evident was the fact that in Svosve area there was just one veterinary officer and over five crop extension workers. The few farmers who are into animal production are likely to be male farmers and got knowledge from school or from indigenous source. Overall, the farmers in the area might be losing out from benefiting financially from one of the leading abattoir in Zimbabwe (Surrey) which is only ~60 km away.

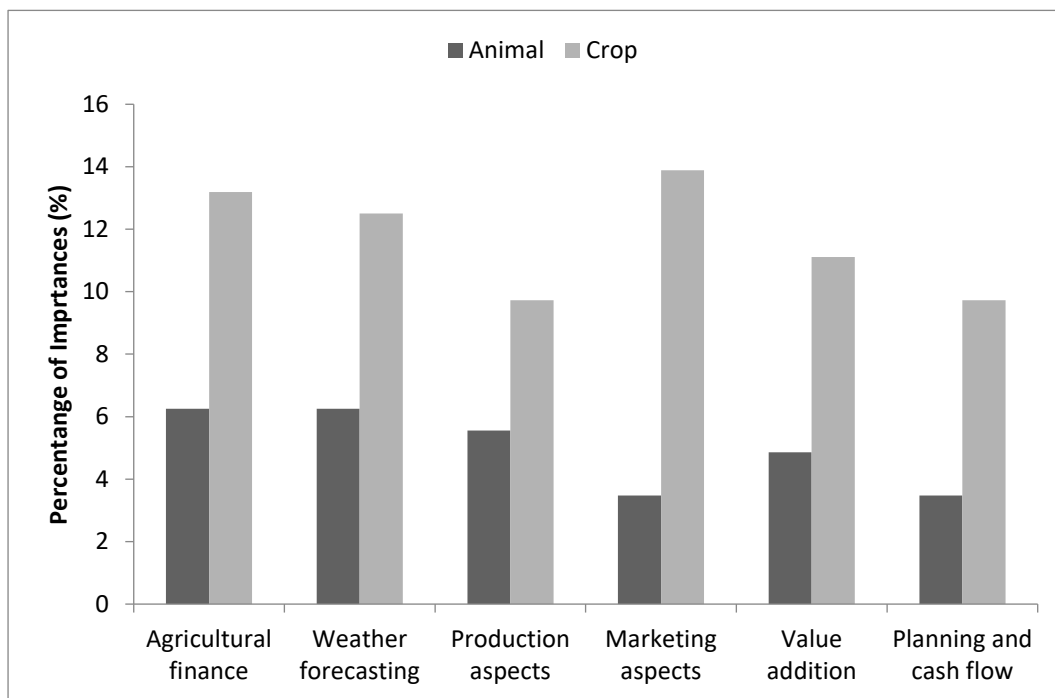


Figure 1. Importance of information needed by farmers

Accessing and Utilization of Information

Most of the farmers in the area acknowledge having an idea on various production aspects (both animal and crop) and indicated that such knowledge was attributed to indigenous knowledge, other farmers, government extension workers and formal education. Twenty-six percent of the farmers access their information from government extension workers while 24 % accessed it from field days, and 22 % depended on other farmers (Figure 2). Key informants also confirmed that government extension workers were the most accessible source (22 %) followed by demonstration (15 %) and farmer trainings (14%). Very few farmers attributed their knowledge or ideas to the radio and other source of information. Both demonstration and mobile phones provided information to 11-12 % while only 5 % of the farmers indicated that they received information from NGO extension (Figure 3) similar to the various sources identified by Daudu (2009). Results indicated that there was no link between proactive asking about the information and adopting the production aspect on their field. Adoption of an aspect for any source will have to fit in with the farmers' resources. Sometime a farmer might want improve ways of farming, but the cost of implementing could be a hindrance to progress. Literature consulted earlier highlighted issues of cost as a major constraint for farmers especially those in rural areas as not everyone could afford, yet all acknowledged the different sources available for access.

Despite farmers indicating that they mostly got their information from extension workers, further analysis indicated that the frequency of access was very low, ranging from once/ month to twice/ month, with other outstanding farmers contacting extension workers thrice in a month. One key informant indicated that distance was a major problem for farmers to reach extension workers to access information. Another farmer indicated that as much as extension workers were available, over the years things had changed since extension workers were no longer forthcoming as the previous ones. Unless one looked for them, they barely made the effort to meet with their farmers and discuss issues of concern.

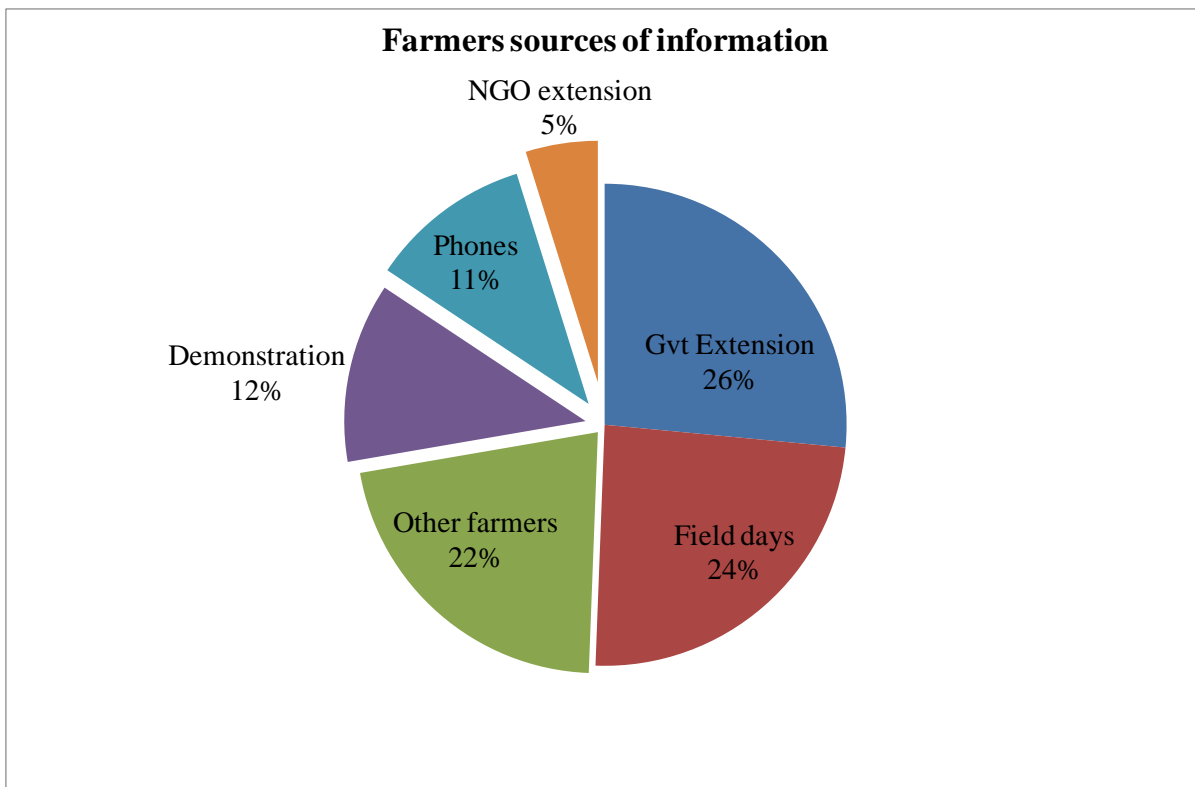


Figure 2. Access to information from farmers

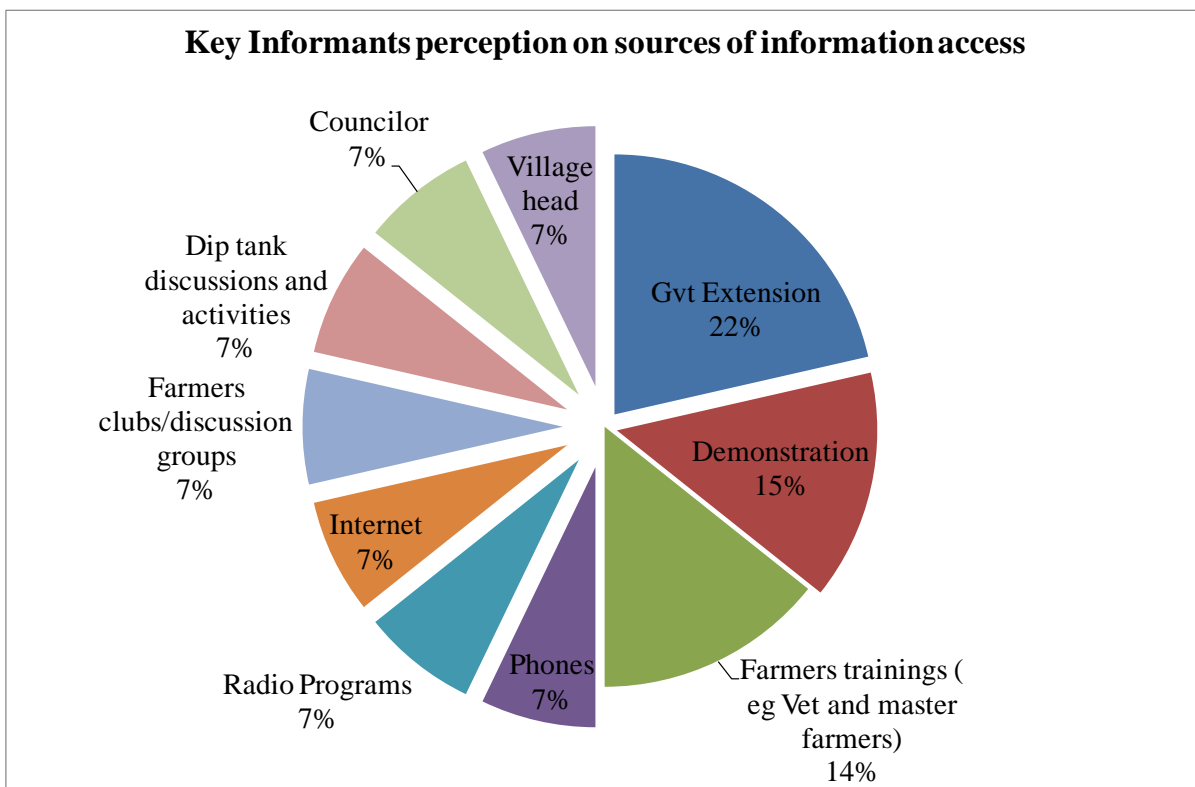


Figure 3. Access to information from key informants

The change in social behavior and attitude with extension workers could explain the deviation from the extension way of conducting their duties. The study also indicated that farmers depended mostly on what they see from other farmers who were farming better than them which made them more (34 %) interested in learning (Table 3). Likewise, for information to be accessed there was the need for self-initiative rather than source initiative. Farmers who want to produce and improve their source of livelihood were the ones who sought information about the aspects in question (Table 3).

Table 3. How Information is Provided by Source

Information access	Self-initiative to visit (%)	Source visited by Household Head (%)	Source call or visited (%)
Government Extension	16	8	11
Field days	7	2	5
Other farmers	34	2	
Demonstration	2	2	2
Phones	2		2
NGO extension	5	2	

Accessed and Utilized Information

There was a strong and positive correlation between adoption of various aspects and the source of access. Farmers would adopt technologies with clear information and the cost incurred during the adoption process should be within their incomes. Farmers are accessing information from all the various sources in the form of verbal, text and demonstrations. But, for verbal information to be understood, it must be well articulated in a simple and straightforward manner. The farmers indicated that most of the information whether verbal or written and most of them were in Shona (80 %), English (10 %) and Shona or English (10 %). However, language barrier of using English when training farmers or providing text affected the utilization of the provided information, especially for the elderly and uneducated farmers. In most, cases farmers understood more when there was visual aid, and this was mainly during field days or those who were fortunate enough to own television sets. The veterinary worker indicated that for some aspects where it was just verbal communication, farmers would act as if they understood, but in reality, what they do at their homestead was completely different.

Twenty-nine percent of the adopted aspects were from extension workers, while 25% of the adopted aspects came from field days (Figure 4). The farmers adopted technologies from the extension workers but sometimes, they complained that the information was not reliable. However, information from demonstration and field days was considered more reliable since they experienced hands on training up to harvesting. In most cases, the farmers who failed to adopt the technologies attributed their failures to the huge investment cost. An example has been the use of high yielding varieties such as SC729, or the use of a tractor for land preparation. Another example is the use of improved livestock breed which would be most welcome, but the issue of cost greatly affected the farmers. As such, there was the need to find cheaper innovations which the farmers could access and utilize. The study also showed that 19 % of the adopted aspects were due to farmer interaction leading to sharing of information amongst themselves. Similarly, (FAO, 1997) revealed that fellow farmers, neighbours and farmers' cooperative society were used as preference sources of information. The issues of self-initiative to learn what others were doing accounted for such high utilization. There was trust amongst farmers that information from the next farmer was viable and visible (adoptable).

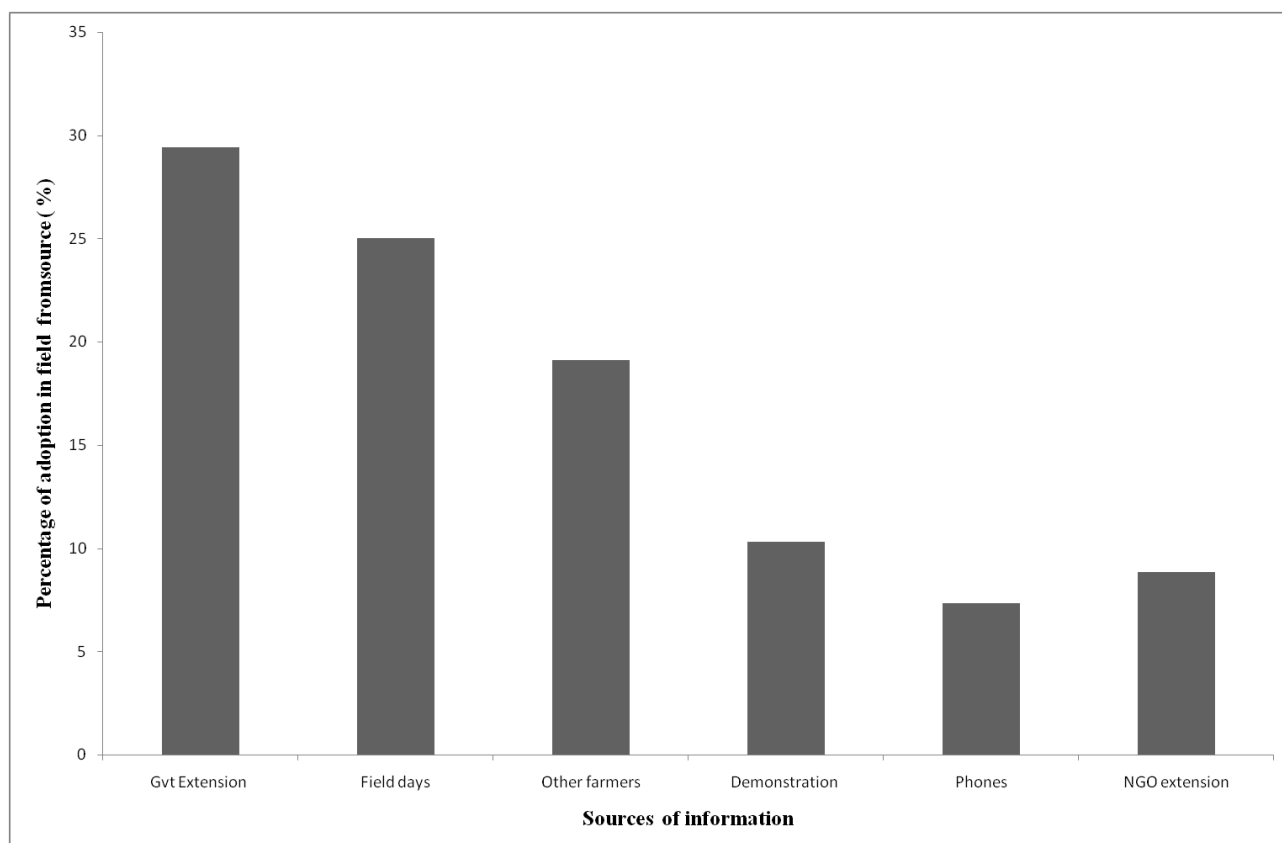


Figure 4. Utilization of Accessed Information from Different Sources

Conclusions and Recommendations

The study showed that farmers had different needs and thus different preferences driving their initiative which affected their choices of the types of information they accessed. That self-initiative in turn motivated the farmers to seek assistance from extension workers and other farmers. Thus, when field days and demonstrations were held, the farmers were more attentive and adopted those technologies. It was also evident that access to information and other agriculture related factors were crucial factors to enhance best agricultural productivity. Despite the accessibility of information, communication gap, poor communication services, low literacy levels, costs, poor infrastructure and inadequate extension services were some of the causes of poor access to, and use of information. Extension services influenced access and utilization of agricultural information and had a positive relation with access and utilization of agricultural information. In as much as various information was available and accessible, reasons for non-use and no eagerness by the farmers was because some farmers especially the elderly prioritise indigenous knowledge over current trends. It can be concluded that access to information has huge impact to agricultural productivity.

Based on the findings, the following recommendations were made to ensure access and use of information by farmers in Svosve:

Information needs assessment. It is important to have frequent rural information needs assessment before providing information services to farmers. This can further be a basis for setting up information systems that cater for the different needs of farmers around Svosve.

Access to research output. Output from agricultural research stations and other similar institutions should be repackaged to ensure that it is not too technical to be unusable by the ordinary farmer. Moreover, for improving information usage, providers should repackage information in appropriate forms suitable for rural communities and in the preferred language which in this case would be Shona.

Increasing number of extension workers. Government has to take initiatives to appoint more Agritex service officers, agriculture instructors, field officers etc. and proper monitoring their works is also important as this has proven to have a positive effect to the usage of the information which they disseminate.

Face to face interactions. Agricultural information providers should devise a means of strengthening face-to-face meetings such as demonstrations, study tours, home visits, and public meetings, among others in the rural set up as the farmers understand interpersonal communication better above all else.

Improved communication. Interpersonal sources should be employed because they have been found to be more effective. They allow far much interaction with the information users.

Timely delivery of information. If radio and television must be used, efforts must be made to ensure that broadcast times are appropriate and the area coverage is as wide as possible thereby allowing farmers in all parts to be able to receive the same information in a timely manner.

Inclusion of indigenous knowledge. Indigenous knowledge among farmers should be captured by researchers and be included in the different sources of information disseminated nowadays since this allows for the combination of current technologies with typical protocol known by farmers.

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RESEARCH DATA MANAGEMENT (RDM) AT THE UNIVERSITY OF GHANA: MYTH OR REALITY?

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Abstract

This study explores Research Data Management (RDM) at the University of Ghana (UG) with emphasis on how the University has responded to this emerging strategic interest in research- focused Higher Educational Institutions (HEIs). Using a qualitative case study approach, data for the study was gathered through interviews and document analysis. Seven participants comprising faculty members and senior members from the University Library, the University of Ghana Computing Services and the Research Office were purposively selected for the interviews. The results show that despite the lack of a formal institutional framework, RDM remains a critical research integrity concern for the University. The findings also reveal that existing infrastructure and capabilities are inadequate. The study recommends that the University should start engaging with the local community towards a more formalized and institutional uptake. It also calls on the University Management to commit to supporting capacity building efforts for RDM development. The Library is also encouraged to be proactive in this space and participate in the development of RDM at UG.

Keywords: Research Data Management, RDM Development, University of Ghana

Introduction

One of the issues of strategic importance to many higher educational institutions (HEIs) in recent times has been the effective management of research data (Cox & Pinfield, 2014). The growth of data-intensive and collaborative science in nearly all knowledge domains, and the value and prospect of research data management (RDM) for advancing scientific research means that, research data is not only viewed as a strategic institutional asset for HEIs but also its effective management and sharing is gaining traction among governments, funding bodies, and researchers.

South Africa remains the most significant case in Africa. The National Research Foundation (NRF) recognises open sharing of data and mandates researchers to preserve their data in its “Statement on Open Access to Research Publications”. There are also national level initiatives including the development of cyber-infrastructure to support data-intensive and collaborative research. In response, many HEIs are beginning to develop RDM policies and programmes (Kahn et al., 2014:296). However, the extant literature on RDM development, especially at HEIs, is dominated by discussions and experiences from developed nations. There is also little mention of RDM in the literature on Ghana. This study was conducted, therefore, to fill this gap by exploring institutional response to RDM at the University of Ghana (UG).

UG is the premier and the largest public university in Ghana; reputed as a centre for academic and research excellence. Its vision is to become a world-class research-intensive university by the year 2024 (UG, 2014:9), to which end it aspires *inter alia* to increase its research funding streams by at least 150%, quadruple the quantity of faculty publications in high-impact journals and connect to global research networks (UG, 2014:12). These aspirations are consistent with some of the opportunities that institutional RDM programmes provide (Hiom et al., 2015:491). van Deventer and Pienaar (2015:43) also intimated that contributions to the RDM literature from developing countries can provide valuable insight even for pacesetters from developed regions. The study therefore sought to achieve the following objectives:

1. To assess the RDM awareness and practices, including how it is understood within the UG Research community
2. To assess institutional response to RDM at UG
3. To explore the Library’s capacity and readiness to support RDM at UG

Literature Review

According to Jones, Guy and Pickton (2013:5), RDM is “the active management and appraisal of data over the lifecycle of scholarly and scientific interest”. This involves more than just storing or archiving data. It involves a number of processes comprising of the collection, stewardship, ownership, protection, retention, analysis, sharing and reporting of research data (Pienaar, 2011:8-9). However, some misconstrue the concept as synonymous with data storage (Conrad et al., 2017:69; Darlington et al., 2012:8), especially in environments where the concept is fairly new or where experiences with RDM are very limited. Renwick, Winter and Gill (2017) thus suggest that data literacy be incorporated into information literacy trainings for researchers. Indeed, how the concept is understood and perceived within a research community is likely to shape how they will respond to its development and uptake (Higman & Pinfield, 2015:372).

The importance of RDM cannot be over emphasised. Gathering data for research can be an arduous task, it requires time and financial resources which are limited, and the data may have potential for reuse or repurposing beyond the original research that produced it (Van den Eynden et al., 2011:3). In the case of observational data, it may be practically impossible to recreate. Therefore, when research data is properly managed and openly shared, institutions are spared from expending extra funds to gather or create new data (Harris-Pierce & Liu, 2012:599), and it also saves valuable time for researchers. What is more, effective research data management is key in managing research risks since every research is prone to a variety of data-related risks including data loss or corruption, and privacy or copyright breaches which can have significant, potentially catastrophic implications (Harris-Pierce & Liu, 2012:599). Furthermore, effectively managing research data can help curtail any potential reputational damage to an institution (Whyte & Tedds, 2011:2) especially because good RDM practices ensure adherence to high and ethical research standards. Within well-established institutional frameworks, potential risks can be picked up early in the research process (CGIAR, 2017).

For many HEIs, data mandates from government and funding organisations have provided the impetus for launching RDM programmes (Henderson & Knott, 2015:48). Institutional approaches to RDM, however, are quite diverse but valuable lessons exist for late adopters. It is well established in the literature that developing a comprehensive and mature RDM infrastructure must encapsulate three broad aspects: a clear policy framework; an integrated technical infrastructure; and appropriate skills and services to fully support the data needs of researchers (Searle et al., 2015). The policy framework usually includes issues of strategy, guidelines and standard procedures but sometimes institutions may fall on just the guidelines

rather than an explicit policy to articulate their RDM aspirations as in the case of Griffith University in Australia (Searle et al., 2015). This is also usually where institutions tend to respond to RDM first. In terms of technical infrastructure to support RDM, a growing practice has been to develop in-house systems often with the support of campus technology services. These systems range from High Performance Computing (HPC) infrastructure, institutional/data repositories and other centrally managed in-house RDM platforms (e.g. OMERO and BRISKit) (Jones, Pryor & Whyte, 2013:14). Conversely, institutions have also adopted external infrastructure options and solutions including national data service infrastructure, Cloud services and other external data centres (Jones, Pryor & Whyte, 2013). RDM support spans the provision of storage, data analysis and visualization support, support for collaborative research, and advisory, guidance and training services among others.

Developing RDM services is one area that has usually fallen under the purview of the library, but they have mostly done so in collaboration with other services units such as IT Department and Research Office. According to Cox and Verbaan (2016:319), there is a growing shift in the role of academic libraries towards more embeddedness and engagement in the research lifecycle, and RDM is one of the means towards such deeper engagement. The mainstreaming of RDM in the field of Library and Information Science as evidenced by the growing body of RDM literature on libraries, the increasing number of data initiatives as well as the creation of RDM portfolios in libraries shows that RDM is increasingly becoming a strategic focus for academic libraries, and studies by Searle et al. (2015), Cox and Pinfield (2014) and Corral, Kennan and Afzal (2013) among others have sought to demonstrate this.

There is no gainsaying that RDM is a natural extension of the mandate of academic libraries who have always been the custodians and managers of scholarly outputs of which research data is inclusive (Lewis, 2010:2; Henty, 2008:2). Lewis (2010), Corral (2012) and Lyon (2012) are popular for propounding RDM functions that resonate with Librarians' current expertise and services. But while Lewis and Corral(2012) present a hierarchical outlook of RDM roles ranging from broader issues of national-level advocacy and curriculum development to institutional-level local support, Lyon (2012) situates librarians' role within a research lifecycle model - The Research360 Institutional Research Lifecycle (Cox & Pinfield, 2014:302), giving legitimacy and making a stronger case for librarians. However, a recent study by Faniel and Connaway (2018) found that librarians' ability to successfully deliver RDM services and programmes hinges on the availability and adequacy of technical and human resources, the perceptions of researchers about the library, leadership support, and communication and collaboration with other stakeholders.

A 2017 international survey by Cox and his colleagues points to a growing leadership role for librarians in RDM in most HIEs especially in the area of advocacy and policy development (Cox et al., 2017). Cox et al.(2017) also found that the scope of services are heavily tilted towards advisory and consultancy such as training on data literacy and supporting data management planning rather than on more technical support like curation. While efforts are afoot to bridge the skills gap particularly in data curation skills, issues of resource adequacy, opportunities for collaboration with other service units as well as gaining legitimacy in the eyes of researchers and support from leadership remain pressing challenges for academic librarians. Both studies by Faniel and Connaway(2018), and Cox et al. help to contextualize the space within which academic libraries must strive to demonstrate value and prove their worth in this data landscape. But, Renwick, Winter and Gill (2017:59) admonish librarians to engage with researchers to inform them about how they can support their data management needs. To do this, they need professional development opportunities to build capacity (Conrad et al., 2017), and they must collaborate with other services units such as IT and Research Office on campus to deliver specialised support services for researchers (Wiorogórska, Leśniewski & Rozkosz, 2017:207; Renwick, Winter & Gill, 2017:59; Cox & Verbaan, 2016:319) because RDM is a multi-stakeholder enterprise (Jones, Pryor & Whyte, 2013:2-3). Henderson and Knott (2015:56) also advise librarians to start with the low hanging fruits.

Methods

The study used the case study method. Data was collected using semi-structured interviews and document analysis, and analyzed using thematic analysis method. The following institutional documents were analyzed: “UG Strategic Plan 2014-204”, “UG Research Policy”, “UG Research Policy Guideline on Good Practices: Record Keeping and Data Management”, “UG Institutional Repository Policy”, “UG Research Ethics Policy”, “UG Intellectual Property Policy” and “UG Library System Draft Strategic Plan 2014-2019”. Seven respondents from the Research Office (one), Library (two), IT department (two) and two senior researchers were selected purposively to provide information on awareness and understating of RDM, policies, infrastructure, practices and expectations on RDM. Respondents from the three service units were considered for selection if they were senior members (a management/administrative level rank) and had worked in that capacity for at least three years. This was considered enough time for respondents to possess rich information about the policies and programmes of the University in their respective units. For the two senior researchers, the Office of Research,

Innovation and Development (ORID) of UG provided the researchers with a list of all senior researchers in the institution who have extensive research experience with at least ten published scholarly works to their credit, and who have received funding for research. These senior researchers provided information on their practices and expectations and perceptions. Ethical clearance was given both from the University of Ghana and the University of Pretoria for this research.

Results and Discussions

Understanding, Awareness and Practices of RDM

The results of the study show that the concept of RDM is quite new at UG and is evolving in terms of its development. The analysis of the data revealed that most of the respondents have a vague understanding of what RDM constitutes, and often referred to it in terms of research data storage or preservation.

I think really that's where the University should go, having a platform...where datasets for research can be stored [R4].

This is very important because the level of understanding or perception about RDM and its importance can influence the response of stakeholders towards its development (Higman & Pinfield, 2015:372). In fact, one of the respondents emphatically admitted to the tenuous understanding of RDM among librarians.

I don't think we've understood it...there's some confusion...maybe there is a slight understanding but I don't think we have understood it totally... We'll need to know what data management is in the first place and we need to also understand why data management? [R3].

This revelation, nevertheless, is not unusual. According to Darlington et al. (2012:8), researchers at the Department of Mechanical Engineering at the University of Bath, UK demonstrated similar limited comprehension of RDM during the implementation of a project aimed at developing an RDM system for the Department. Like UG, many of them treated RDM as data storage. This tenuous grasp of the concept among participants shows that RDM is quite new in Ghana as is the case for many developing nations (Chigwada, Chiparausha & Kasiroori, 2017; Renwick, Winter & Gill, 2017). There is, therefore, the need to educate and increase awareness about it within the University's research community, a responsibility that the library should be seen taking leadership on or playing an active role in.

The data further shows a general appreciation and awareness of the need for RDM and the implications for such critical concerns as security, integrity, continuity and institutional reputation. Even more promising is the recognition of such implications by the University as captured in the “UG Research Policy Guideline on Good Practices: Record Keeping and Data Management”:

“The primary role of data management is to ensure the highest possible degree of integrity, reliability, and continuity in research. It also affords some level of institutional memory”.

Particularly is the general acknowledgement and awareness of poor data management as a risk. Interestingly, the researcher-participants did not seem to be sure or aware of any internal mechanisms to assist them in averting the identified risks.

...currently, I have no knowledge of any kind of systems like that to help curtail such risk [R7].

For the researcher-participants, the risk of losing their data which is a “trade secret” to them was real and substantial. The task of collecting data can be expensive, difficult and time-consuming (Van den Eynden et al., 2011) and in some scenarios it is not practically possible to regenerate the data. It is natural therefore that data loss emerged strongly among the risks identified by respondents. Other risks that were mentioned by the respondents include: reputational risks to the institution where data cannot be made available for audit and verification, project failure and financial loss.

When you lose your data it means the time, money, energy spent is gone, and the purpose of research is to try to solve a problem, so you have not solved or resolve an issue if the data is lost. If anything, you have caused financial loss [R6].

“If the data are not properly protected, the investment, whether public or private, could become worthless. The responsible handling of data begins with proper storage and protection from accidental damage, loss, or theft”.

So now everything seems ok, but one day suppose somebody comes and say this nice data you generated let's see your data repository and it's not there and we say it's [Mr 'A'] who's keeping it on his computer and he is nowhere to be found, or what is the evidence that he is not even doctoring them [the data] now and then? I think there may be issues, so maybe the earlier we look at it the better. And people have doctored information, not from here, abroad, so it can happen [R7].

All these concerns are consistent with the literature. Poor data management can lead to data loss (Harris-Pierce & Liu, 2012:599), which can cost individual researchers and their institutions time and money (Van den Eynden et al., 2011:3) and catastrophic reputational damage (Whyte & Tedds, 2011:2). These recognitions are useful for making a case for RDM as they can serve as internal drivers for RDM development at UG. It also implies that the lack of a formal institutional infrastructure or system for proper RDM at UG can have potential risks for the institution and thus requires the University to take a proactive stance on RDM.

Generally, attitudes towards RDM at UG have been positive. The document analysis shows that adherence to good data management practices is a major policy principle in the “UG Research Policy”, and the “UG Research Policy Guideline on Good Practices: Record Keeping and Data Management” which outlines several of these best practices. Many of the respondents in their responses corroborated some of the provisions in the policy and guideline. On research data sharing, it was evident based on the data that UG has keen interest in an RDM culture, particularly, in safeguarding institutional data and the sharing of data among researchers within its local community.

...as far as sharing of data and management of data is concerned, the University is fully interested [R5].

The credibility of research findings depend on record keeping and good data management. In order to achieve this, the University will create a meta-database of research materials/ data repositories.

A running theme among the service providers was their view of policy as a key instrument for building an RDM culture within the UG research community. They believe that a definite policy that mandates researchers to share or deposit their research data is a sure way to compel researchers to do so. While this is logical, the literature advocates that RDM policies should not be used as cohesive tools. Instead, incentives for depositing and sharing research data could be explored or internal systems could be developed to align with the current practices of researchers (Procter, Halfpenny & Voss, 2012:139-140). This can be achieved through broad-based consultations and engagements with the research community during the policy formulation stages.

However, the researchers' approach and attitude to research data and institutional RDM were somewhat influenced by their disciplinary backgrounds (i.e. Botany and Pharmacy). On a common front, both researchers value their data extremely and are keen on its security. They are, however, concerned with publishing research papers from the data rather than data management or sharing per se. Understandably, researcher's career progression and rewards

are often tied to the research they conduct and their impact rather than on what they do with the data itself.

On sharing and publishing their data as well as using institutional RMD infrastructure, one of the researchers from Botany was reluctant particularly when it involves active research data but the second researcher from Pharmacy was amenable to the idea adding that it is necessary for the University to have some control over the data generated by the researches it underwrites. This second researcher however admitted that his position may have been influenced by his previous experience as an administrator in the University.

So even depositing your DNA things there, it's not that you are very happy about it...but the raw data that I used in writing the paper that one I won't give it to anybody...Yes, what I want to share I will share but when I want to share, I have to determine that... I prefer I am able to store the thing myself until if someone needs it and if I think I can give it fine, but just to leave it so that somebody else decides who can have access to it, it's problematic [R6].

Furthermore, trust was an underlying factor to the researchers' willingness to share and publish data or use central RDM infrastructure. The results also show that researchers will consider using internal and central infrastructure for managing their research data if they are confident of its effectiveness and guarantees for the safety of their data and if they retain greater control over decisions and choices of who to share it with.

But I suspect maybe part of the problem may be lack of trust, people may think if they probably [store it themselves] nobody can go into my database... [R7].

No, because I don't trust human beings... [R6].

This finding is consistent with the literature. In a 2009 study to “improve understanding of information use in the life sciences”, life science researchers were found to be averse to the idea of data sharing and publishing and may only share active data (“experimental data”) if they are allowed sufficient time to publish their research from the data they generated and be given control in terms of personally publishing the data or making sharing choices rather than someone else doing it on their behalf (Williams et al., 2009:38-39).

The data also shows that writing a data management plan is currently not a requirement for internal funding at UG, neither is there an indication that the University was planning to incorporate data management planning into the research process at UG.

So far I haven't seen that [requirement for a data management plan] in the internal funds that we give researchers... international donor I believe will require for data management plans but as far as our internal grants are

concerned I have not seen that on our forms yet, but like I said that could be the next level [R5].

Largely, researchers manage their own data. This is clearly espoused in the UG Research Policy and corroborated by the researcher-participants. This is consistent with the situation in other developing countries as reported by Chigwada, Chiparausha and Kasiroori (2017).

“Most of the specific tasks of data management fall to the PI and Research Director”

...so you analyse and keep it on your computer, if it is hard copy you save them in files and then you publish....so everybody keeps their data and unfortunately if they die that is the end of the data and the University as far as I am aware cannot get to it [R7].

However, in special cases the University has provided some level of support in terms of infrastructure, training and guidance.

Institutional Response to RDM

Institutional Policies and Guidelines

The University's response to the subject of RDM at this time is captured under section 5.6 of the “UG Research Policy” as a key policy statement and re-echoed in the “UG Research Policy Guideline on Good Practices: Record Keeping and Data Management”, officially acknowledging RDM as part of good research practices. However, there is no explicit RDM policy at UG. According to Pryor (2014:16-17) and Rans and Jones (2013:1), RDM policies typically state the key principles, expectations and roles for specific data management activities and are essential for effective RDM adoption. Searle et al. (2015:444) add that though guidelines may be included in the policy framework for RDM, they are often fluid and non-obligatory in nature.

The analysis also shows that the UG Research Policy captures very few aspects of RDM compared to the Guideline on Data Management, which outlines extensively best practices for guidance in the management of research data. Other aspects of RDM are also addressed loosely in the “UG Institutional Repository Policy”, “UG Research Ethics Policy” and “UG Intellectual Property Policy”. The guidelines, however, as the data confirms are not necessarily binding.

...but a guideline is just to guide you, a policy reinforces or is binding, a guideline is not binding [R5].

These findings are consistent with the findings of Searle et al. (2015) and Higman and Pinfield (2015). The study by Searle et al. (2015) at Griffith University found that rather than an explicit

policy, RDM was treated as one of the research integrity concerns in the “Griffith University Code for the Responsible Conduct of Research”. Like UG, the “Best practice guidelines for researchers: managing research data and primary materials” provided a more comprehensive guidance to RDM. Also, Higman and Pinfield’s 2015 study on RDM policy development among UK HEIs found that most institutional policies were not detailed and failed to capture certain key aspects of RDM. They add that while this is typical for institutions at the early stages of the RDM policy development, it also limits the extent to which these policies can influence local practices within new and emerging RDM systems (Higman & Pinfield, 2015). These policies and guidelines are publicised mainly through the ORID website, institutional emailing list and as booklets which are circulated across the University. This notwithstanding, the researcher-participants denied knowledge of any specific RDM policy or guideline admitting that it may exist, but they were unaware. Similar sentiments were generally expressed among the service providers.

I have no idea about institutional policy on RDM but I know a research policy exist and then there is ethics policy. I am not particularly aware of any RDM guideline... [R7].

I don't know about a policy, but I have heard you can deposit your paper into a repository. I don't know whether it exist, it might exist but I don't know [R6].

The data indeed confirmed no specific RDM policy but the unawareness about existing RDM guidelines was conspicuous and revealing. It is an important signal for the University to rethink its communication and awareness efforts within the local research community on the issue of RDM.

Finally, there is no clear framework for monitoring compliance with these policies and guidelines provisions on RDM. Though current review processes for internal funding applications may pass for an audit framework, compliance with local and funder data mandates are not explicitly embedded in this process, especially since writing a Data Management Plan (DMP) is currently not part of the requirements for research funding application at UG.

I have not had the need to write an RDM plan [R6].

Now there is a consciousness because international donors want systems in place, so they require those things, so international donors I believe will require for data management plans but as far as our internal grants are concerned I have not seen that on our forms yet...[R5].

It is, however, imperative for institutions that wish to develop RDM to establish audit frameworks that can facilitate effective and systematic response to compliance breaches and research risks (ANDS, 2013:5).

Technical Infrastructure and Support Services

Despite the lack of a clear institutional strategy and an established framework for RDM at UG, the data revealed a few capabilities that represent potentials for further exploration. Existing infrastructure such as an HPC facility, a private cloud facility (HP Cloud Matrix), an institutional repository (UGSpace) developed with DSpace software, and data analysis applications (SPSS and NVivo) can be harnessed and extended to support RDM, even though they are not necessarily provisioned for that.

The data also shows institutional support for collaborative research such as developing an HPC and providing huge storage facilities for such enterprise. There is also the provision of specific tools and support for data analysis mainly through the Library and IT department. The Research Office also provides guidance on RDM (specifically on funding applications and best practices in RDM). There is also support in the area of intellectual property and ethics but these are yet to be streamlined with RDM.

There was recently some Italian...collaboration they did with the department of Physics and Computer Science and we had to go in to provide...what we call High Performance Computing infrastructure (HPC). We didn't have that infrastructure; we had to build some...infrastructure to support the kind of lab they wanted to run that project. Currently, we are also collaborating with Prof. Awandare and his team at Biochemistry department, they have had the need to build specialised [...] HPC to run genome, I mean to run the kind of multiple algorithms to support the kind of chemical related or biomedical related research they are doing. And that we have collaborated with them and IBM to provide such infrastructure. Even though we have an HPC, it's not so much unique for the rest of the community, so we are trying to build another one that could be leveraged by all other departments... like I said, it had to be done within [the] shortest possible time, maybe two or three months because the VC then and incoming VC were all interested and we were able to work with procurement to get some few servers, put together heavy processor-base and memory-base to be able to enable them [to] run that thing [R1].

...In terms of providing research grants to researchers to conduct research, ORID plays a vital role...We provide research advisory role, we send information to faculty members regarding funding opportunities through a platform we call 'research alert' just so faculty will know the information as far as research grant is concerned [R5].

Apart from the resources that we have, we also have this package for data analysis; the NVivo, for example, is for qualitative data analysis [R2].

The data also points to management interest in RDM despite the lack of institutional systems for RDM. It also suggests that the failure to develop these systems may be indicative of institutional priorities and exigencies as well as human resource limitations. The high level interest and recognition by management can be leveraged to promote RDM at UG.

Unlike RDM, the Research Office has developed systems to facilitate, promote, develop and enforce other key principles in the UG Research Policies. Such systems also help to promote good research practices within the University. For instance, the Technology and Development Transfer Centre (TDTC) facilitates issues of intellectual property and technology transfer. Committees for Ethical Clearance supervise and regulate ethical research conduct involving human subjects across the University. They have also developed policies and standard operating procedures for these units. It is hoped that RDM will see similar developments in the near future.

Setting up a research office is a gradual process; you have to look at certain systems that you will need immediately and then you build on that, so we have identified ethics, intellectual property and other systems which we've managed to put in place in this short period and it's working, so hopefully, maybe the next port of call will be to set up what the policy has said. I think the whole issue is one of prioritization; you can't do everything looking at the limited resources in terms of human resources [R5].

It is safe to assert therefore that, UG recognises RDM as a research integrity issue and has taken steps to promote it. Yet, it is limited in capacity to fully participate in the global RDM agenda.

The Library and RDM

The data suggests that the University Library is yet to take a strategic stance on RDM. Though current roles in managing the institutional repository, providing data analysis packages and information literacy instruction resonate with data management functions, it is clear that there

is inadequate capacity in terms of expertise and curation skills to fully participate in this emerging area of LIS work. There is a need to build capacity for the librarians to take up this new role particularly in the areas of consultancy, training and curation.

Unfortunately, that has not come up, we are looking more at the output – the eventual published articles...rather than the raw data that has been collected and I don't think the library has really thought of how that [research data] could be managed as a library...I think we need to retool. Because in the first place, when we look at the library school from which many of us are trained we don't even talk about those things [RDM] at all, so we really don't have what it takes, [but] I think we can learn. We don't have the right skills [and tools] now, but we are capable of doing it so long as we are retooled, I think there is so much out there that we can read, and learn, and maybe visit people who are doing it and be exposed to what is being done, we can come and replicate it here [R3].

What is more, since RDM is a multi-stakeholder enterprise, it is imperative for the Library to collaborate with other relevant stakeholder of the university such as the Research Office, IT Department, Archives and so on, to deliver RDM support for the university community. The deficiency also creates new opportunities for curricula development. The School of Information Studies, UG must consider updating its graduate curriculum to reflect this emerging role of librarians as data scientists and data curators in this era of “the fourth paradigm”.

Conclusion

The main purpose of this study was to explore RDM at UG, emphasising on how the University has responded to this emerging strategic interest for HEIs. The study found that despite the lack of a formal institutional framework, RDM remains a critical research integrity concern for the University. The University's main response has been the development of a comprehensive guideline and recognition of RDM as a key policy statement in its research policy. There was also a tenuous understanding about RDM among the participants and there was a general lack of awareness about existing guidelines on RDM. Existing infrastructure can also be harnessed for future and further development, but this will not be enough and requires commitment from the University's management to support capacity building efforts for RDM development.

The study has practical implications for RDM strategy development and institutional planning at UG. It reveals critical pressure points for stakeholders to focus on. It also contributes to the literature on institutional RDM development from a developing nation's perspective, revealing how an institution has responded to RDM even in the absence of a formal national data mandate. The study also provides a useful background for further and future RDM studies at UG and Ghana at large.

Recommendations

Going forward, the University should begin to engage with the local community towards a more formalized and institutional uptake. A more interpersonal approach should be adopted to drive awareness about the University's position on RDM and the existing RDM guidelines and compliance with the existing guidelines should be heartily encouraged.

Given the tenuous understanding about RDM, the University Library should consider educating the local research community on RDM and its importance. They should start investigating current RDM practices as well as taking stock of institutional research data within specific research teams across the University. Understanding the practices of the local research community is very necessary for developing solutions that are fit for purpose for effective uptake (Procter, Halfpenny & Voss, 2012:139-140). The outcomes of such investigation can also be used to make a case for service development. They should also capitalize on the institutional recognition of RDM as a research integrity imperative to play an active role in the future development of RDM. They can start with RDM advocacy and promoting current support and capabilities within UG. To be successful, however, the librarians must build their own capacity to take up these new and additional roles.

It is further recommended for academic and research libraries in Ghana to be proactive in this space and not relegate themselves to the background. They should build capacity – through conference attendance, researching and studying research reports on RDM; seek collaborative opportunities and providing innovative support even in the absence of an official mandate.

Finally, further research is recommended on RDM development at UG. Investigations into institutional research data assets stock, researchers' practices and preferences as well as service requirements should be carried out. Future studies should include other critical stakeholders beyond the ones in this study such as the University Management, Legal Department, archives, Government and so on. More participants should also be engaged (larger sample size) in order to gain a more realistic and comprehensive picture across the institution. Further studies can

also explore opportunities at the national level that can be harnessed for institutional RDM development and collaborative research at UG and other HEIs in Ghana.

Limitation

The scale of this study and the number of participants engaged may not necessarily paint a true and fair picture in some of the findings. The triangulation of data sources was adopted as a strategy to mitigate this challenge by corroborating some of the findings from the primary data with secondary sources which were mainly institutional documents. This in no way diminishes the veracity of the findings which are still instructive providing some useful pointers worth considering.

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BRIDGING THE GAP BETWEEN CREATION AND ACCESS TO RESEARCH OUTPUT: THE UDS INSTITUTIONAL REPOSITORY IN PERSPECTIVE

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Abstract

Researchers are usually engage in the cyclical process of generating or building upon knowledge, however, output ends up either on the authors' computers or shut away in expensive subscription-based journals. This then makes access expensive and difficult, if not altogether impossible. Finding a common platform that will serve as a bridge to link creation and access of research outputs to users is necessary hence the introduction of the Institutional Repository at the University for Development Studies (UDS). This paper studies how the UDS Institutional Repository (UDSSpace) manages research output of the University community to bridge the gap between creation and access. The study was undertaken from the perspective of the Repository team, and was aimed at identifying strategies for the collection and depositing of research outputs, the organization of these items, preservation mechanisms in place, modes to access and retrieve as well as the challenges faced in their management. The study used the qualitative research method and made use of interviews in the collection of primary data. Existing literature was reviewed and a qualitative data analysis approach was employed. The findings revealed that effective strategies for content recruitment was predominantly dependent on strong coordination with faculties. Items in the repository were organized into communities and collections. Accessibility of content was without barriers or restrictions and items could be retrieved through any search engine. Contents in the repository were backed up on an in-house local server and on a virtual private server (VPS) for long term preservation. The challenges faced included financial constraints, inadequate cooperation from faculty resulting in low participation among others. In conclusion, existing relationship between UDSSpace and the University community should be enhanced to achieve a holistic goal of bridging the gap between creation and access to research output.

Keywords: Institutional Repository, Content Acquisition, Information Management, Information Access, Information Retrieval

1.0 Introduction

Researchers, faculty and students continuously go through a painstaking scientific processes of conducting research on diverse topical issues that creates new knowledge or build upon existing ones in order to advance society and solve problems facing the human race. Advances in technology in the 21st century, provides many avenues for which such research can be conducted rapidly and with ease, thereby increasing the pace at which such results are generated. The next most important activity after conducting research and generating results, is to be able to communicate these findings to other researchers, faculty or students in that field of study or otherwise. The results and findings from most of the research conducted end up either on the authors' computers, shelves or are shut away in expensive subscription-based journals. This becomes a challenge and defeats the researcher's intention of conducting research, which is, to make findings available for replication, testing and validation in other environments and by other researchers. Access to these research results then becomes expensive and virtually impossible to procure when the need arises.

The situation is even more critical for developing countries especially in Africa, where subscription costs are high, internet connectivity is unstable and there exist erratic power supply. Duplication of research efforts then becomes inevitable in most academic and research institutions.

As a matter of urgency, academic libraries have realized the need to find a common platform that will serve as a bridge to link the creation of research output to the necessary users, and facilitate access hence, the introduction of open access institutional repositories. Through these open access institutional repositories different users of research outputs (funding agencies, academics, students, policy makers, etc.) are able to easily access pre-existing data serving as basis for decision making. This paper sought to investigate the role UDS Institutional Repository plays in serving its core mandate of managing the intellectual outputs of the University in terms of collection, dissemination and preservation of the created knowledge.

2.0 Literature Review

2.1 Concept of Institutional Repository

In an attempt by most academic institutions to retain the scholarly output of their institutions, Institutional Repositories (IRs) are established. Institutional Repositories (IRS) have been

defined diversely by various authors. However, the 2006 Association of Research Libraries defined Institutional Repositories as permanent, institution-wide repository of diverse, locally produced digital works that are available for public use and support metadata harvesting. Dora and Kumar (2015, cited in Nyirenda, 2017) opined that IRs serves as preservative platforms for intellectual outputs of a university or academic institution. This is to say that, IRs are institutionally based and host all scholarly output of the community members of the institution and makes it freely available for use by other researchers within or outside the institution. IRs generally host preprints and post prints of scholarly research journal articles, data sets, theses and dissertations, learning objects, technical reports, speeches, newspaper clippings, working papers, digital images, presentations, lecture notes among others. Institutional Repositories basically provide the service of collection, preservation, and persistent accessibility to a variety of scholarly materials (Palmer, Tefteau and Newton, 2008).

2.2 Content Acquisition Strategies

The challenge is not in establishing an institutional repository, but in sustaining it. Mainly, sustainability issues concerning repositories have to do with content recruitment (Mark & Shearer, 2006). A repository that does not grow will soon die off. It is therefore, essential to the survival of every repository, for academic libraries and librarians to devise effective and efficient strategies of recruiting content for their IR collections. Usually, the content of institutional repositories is built through self-archiving and mediated archiving. Self-archiving is the process where the authors or contributors submit or deposit their own items into the repository by themselves whereas mediated archiving is done by IR staff where items are collected from authors and deposited by the staff. Mediated archiving is labour-intensive and requires higher staff numbers to achieve desired results. Ideally, all institutional repositories' ultimately aim at self-archiving, but this is increasingly challenging because getting depositors to commit to regular self-archiving is problematic. It therefore rests on the library to develop marketing and communication strategies that will engage faculty and promote self-archiving since there are limited resources to support full-fledged mediated archiving.

The Confederation of Open Access Repositories (COAR) in 2012 introduced a project which focused on ways in which organizations can improve deposit rates or increase the content in their repositories on a permanent basis. It was discovered that there is no single path to follow or for which to learn about IR content development options. Griffith Research Online (GRO)

which was one of the study cases by COAR, elicited some strategies that are considered critical factors for successful population of their Repository. These included “harvesting” that is finding content published by Griffith members, upload published research output on behalf of Griffith authors, assign a staff member to contact publishers' for permission to allow the use of published PDF version, undertake all copyright checking, provide easy access to a range of statistics relating to each publication by a given author, demonstrate how searching in Google Scholar returns an entry in GRO, utilise both marketing and support strategies which are tailored to meet the needs of different “cultures” (COAR, 2012).

According to Jenkins *et al.* (2005), IR managers need to undertake advocacy and promotion as they are essential for the development of repositories. Making IRs attractive to members of an institution and content recruitment are one of the core mandates of librarians (Bell *et al.*, 2005)

2.3 Access and Retrieval

With the massive advancements in technology and the increasing usage of information and communication technologies (ICTs) across all disciplines, the focus of libraries worldwide is shifting from just content acquisition to providing access. Librarians and information providers have realized that the 21st century patron is not just looking for a storehouse of information, but rather more convenient and reliable avenues for tapping and accessing such information. This has become evident in the new and better ways by which libraries and information specialists meet the information needs of patrons. The introduction of the online public access catalogues (OPACs), has revolutionized the library’s interaction with patrons. Chat services, emails, list serves, selective dissemination of information, among others have also made access to the library and its resources relatively easier.

Institutional repositories are no exception when it comes to the importance of access and retrieval of information. IRs have been described as having four key attributes: (1) institutionally defined; (2) scholarly; (3) cumulative and perpetual; and (4) open and interoperable (Johnson, 2002). IRs operate on an open access platform and as such access to its collection is readily available with little or no restrictions which pertains to the fourth attribute stipulated by Johnson (2002). As reiterated by Oguz and Davis (2011), without open access, IRs would have failed in achieving their main goal of institutional visibility through demonstrated academic quality. Thus, making the content available through easily accessed search engines is critical. Also, IRs need to support commonly accepted open standards such

as the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) and Search and Retrieve URL (SRU) to enhance interoperability. This facilitates searching within IR collections by crawlers of most, if not all, major search engines.

2.4 Preservation

Flecker (2003) notes that “digital materials are surprisingly fragile, keeping digital resources usable by future generations requires conscious effort and continual investment”. The cumulative and perpetual attribute of institutional repositories (Johnson, 2002) indicates that preservation is an important indicator of the seriousness with which an institution holds its IR. A key rationale right from the beginning of the development of DSpace was to test the ability to archive digital material for the long term (Westell, 2006). Without an underlying strategy for digital preservation, the institutional repository and its contents lack sustainability. Preservation guarantees the long term availability and accessibility of the digital item for continuous scholarly communication and as such, ensures sustainability of the IR.

3.0 Research Methodology

3.1 Study Area Information

University for Development Studies (UDS) is a multi-campus University located in the three regions of Northern Ghana with five campuses. The Tamale Dungu, Nyankpala and Tamale Choggu campuses are located in the Northern Region, Navrongo Campus in the Upper East and Wa Campus in the Upper West Region. Since the emphasis is on development studies, all the courses taught at the University have a trace of development studies, ranging from mathematical sciences, medicine, nutrition, nursing, education, business studies, community development, accounting and so on. Each campus has a well-furnished library headed by a Campus Librarian who attends to all the issues at the campus level but reports to the University Librarian at the Central Library at the Nyankpala Campus.

The Budapest Open Access initiative was launched to find solutions to the access challenges facing researchers, faculty and students, not only in Africa but the rest of the world. They proposed an adoption of the Open Access Movement which allows research findings to be made freely available and accessible on the internet without restrictions to access. IRs were introduced as one of the major drivers of open access to facilitate circulation of research output.

Richard Johnson's definition of institutional repositories in his 2002 article best fits the purposes of this paper and it is defined as:

A digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end-users both within and outside of the institution with few, if any, barriers to access.

Institutional Repositories operate on an Open Access Platform, which helps in averting these challenges and increases access to research output. Hence the establishment of UDS Institutional Repository in May, 2014. It started with two staff but currently has 4 permanent staff and 2 supporting staff. The history on the establishment of UDS IR has been extensively described by Thompson *et al.* (2016) where the details of the IR implementation, marketing and advocacy, initial content recruitment strategies as well as communicating the value of an IR to faculty were laid out. UDS happens to be the 4th public university in Ghana with an IR (Thompson *et al.*, 2016). The Repository's main task was to be responsible for making the scholarly and academic output of the University community (staff and students) available online to improve visibility and access. It currently has about 1,650 items as compared to 408 in 2016 (Thompson *et al.*, 2016), of which the most populated communities are research articles and theses. Digitizing was done in order to capture retrospective thesis on the shelves, whilst e-copies of current thesis were collected for deposit into the repository. Within the University community, the Institutional Repository is meant to showcase and retain the intellectual output of academics and students to the outside world. Table 1 below shows the contributions of the individual collections to the general communities in the UDS Institutional Repository.

Table 1: Collections contribution to the Repository

Community	Collection	No. of Items Contributed	% Contribution
RESEARCH ARTICLES	Administration	15	2.1
	Faculty of Agribusiness and Communication Sciences	26	3.6
	Faculty of Agriculture	193	26.5
	Faculty of Applied Sciences	34	4.7
	Faculty of Education	19	2.6
	Faculty of Integrated Development Studies	118	16.2
	Faculty of Mathematical Science	56	7.7
	Faculty of Natural Resource and Environment	58	8.0
	Faculty of Planning and Land Management	51	7.0
	ICT Directorate	24	3.3
	PEPU	0	0.0
	RPU	0	0.0
	SAHS	24	3.3
	SBL	31	4.3
	School of Engineering	5	0.7
	SMHS	61	8.4
	Library	13	1.8
THESES	Faculty of Agribusiness and Communication Sciences	50	8.7
	Faculty of Agriculture	66	11.4
	Faculty of Applied Sciences	6	1.0
	Faculty of Education	60	10.4
	Faculty of Integrated Development Studies	110	19.0

	Faculty of Mathematical Science	45	7.8
	Faculty of Natural Resources and Environment	2	0.3
	Faculty of Planning and Land Management	115	19.9
	School of Allied Health Sciences	75	13.0
	School of Business and Law	11	1.9
	School of Engineering	1	0.2
	School of Medicine	20	3.5
	Library	3	0.5
	Institute of Inter-disciplinary Research and Consultancy services (IRaCs)	14	2.4
CONFERENCE PROCEEDINGS AND MAGAZINES	Conference Proceedings	23	85.2
	Harmattan School	0	0.0
	Magazine Articles	4	14.8
	Workshops/Seminars	0	0.0
AFRICAN LEADERSHIP LECTURE	Print	0	0.0
	Videos	4	100.0
LECTURE NOTES AND TEACHING RESOURCES	Navrongo Campus	0	0.0
	Nyankpala Campus	1	100.0
	Wa Campus	0	0.0
	Tamale Campus	0	0.0
SPECIAL COLLECTION	J. A. Braimah	15	31.9
	R. B. Bening	32	68.1
UDS JOURNALS	Development Spectrum	6	2.3
	Ghana Journal of Development Studies	184	71.9

	Ghana Journal of Science, Technology and Development	22	8.6
	International Journal of Irrigation and Agricultural Development	0	0.0
	Journal of Medical and Biomedical Sciences	0	0.0
	Studies in Gender and Development in Africa	0	0.0
	UDS International Journal of Development	44	17.2
LECTURE NOTES AND TEACHING RESOURCES	Navrongo Campus	0	0.0
	Nyankpala Campus	1	100.0
	Wa Campus	0	0.0
	Tamale Campus	0	0.0
CENTER FOR DISTANCE AND CONTINUING EDUCATION	Professional Education Practice Unit	0	0.0
	Research and Projects Unit	0	0.0
REPORTS AND BOOKS	Books and Book Chapters	6	85.7
	Reports	1	14.3
	Third Trimester Field Practical Training Programme (TTFPP)	0	0.0

Source: UDS Institutional Repository, 2018

From the Table 1 above, there are ten (10) communities and fifty-nine (59) collections currently available on the UDS IR. The communities and collections are structured in accordance with the existing academic structure of the University (campuses, faculties, departments, units etc.). Research articles community has the highest number of items followed by the theses and the UDS Journals communities. The contributions of the other collections are minimal.

3.2 Research Design and Data Collection

This study made use of a qualitative approach to the process of enquiry. Qualitative approach to research deals with situations where the researcher wants to reveal underlying reasons, opinions, experiences, motivations and challenges that individuals directly affected by the research problem, uniquely face. A qualitative approach was used because the study sought to identify the role the UDS IR play in serving as a medium linking creation of research output to access by the necessary users.

A case study design was adopted since the main focus of the research was to study the role of the UDS IR and the interested respondents in their natural setting without causing any external influence that would distort the findings. The respondents were selected for the study by use of a purposive sampling technique. The researchers targeted those that they felt possessed the necessary information they required for their study. Therefore, respondents included the staff of the Institutional Repository, since they were directly involved in the day to day management and administration of the IR, and the University Librarian because of his managerial role as the head of the Library and is responsible for key decision- making as well as the active role he played in the establishment and maintenance of the Unit.

The data collected from the respondents was by use of a semi-structured interview. This was necessary because the researchers had some predetermined questions that they wished to gather information on, and also offered the opportunity to address new and follow-up questions that came up as the interviews progressed. The use of semi-structured interviews allowed respondents the freedom to express themselves thoroughly on any issue that was of concern to the research study.

The study employed qualitative data analysis methods to analyze the data gathered from the respondents. Content analysis allowed the researchers to identify patterns and generate codes out of the responses obtained. These were further coded under broad standard categories and the emerging themes informed the discussion of findings.

4.0 Results and Discussion

4.1 Strategies for the Collection and Depositing of Research Output in the IR

Lagzian, Abrizah and Wee (2013) considered the content of institutional repositories as a critical factor to a successful as well as affected repository implementations. Dorner and Revell (2012) also assert that for IRs to be successful, librarians must not only ensure active and

continuous content recruitment, but also that IRs are effectively promoted to library users as valuable information resources for research.

A number of strategies have been employed by the University for Development Studies (UDS) Institutional Repository Unit in actively collecting and depositing items into its collections. The study results revealed that staff- assisted depositing (mediated archiving) was the major approach used by the Unit. This entailed the members of the IR Unit, collecting items from faculty and depositing into the repository on behalf of the said faculty member. These items are usually received either on data drives, via email or through the online submission form on the UDSSpace homepage. The Unit also had a couple of promotional activities ongoing which included the distribution of flyers and brochures to staff and students on all campuses as well as displaying of posters on notice boards. Sending periodic information and reminders about developments in the Institutional Repository through the staff mailing lists to members of the University Community had gone a long way to increase awareness and solicit for research outputs to be included in the Repository's collections.

Periodic workshops and seminars for staff and graduate students of the University Faculty has been ongoing. These serve as a sensitization platform and an avenue for the IR team to assist faculty to obtain a registered account so as to enable and encourage self-archiving. The IR's ultimate aim is to achieve total self-archiving by contributors.

The IR unit, with the assistance of the University Librarian has been able to include a compulsory submission of e-copies of student thesis as part of the requirements for graduation. Hence, all graduate students are required to submit e-copies of their thesis to the IR before clearance for graduation. This has sometimes been a challenge, they indicated, since uptake by the various departments and faculties are relatively slow. However, the adoption of this strategy is being complimented by the digitization of retrospective theses into the repository. The digitization is done on campus basis and this has remarkably improved the theses collection.

Since the Institutional Repository Unit is centralized within a multi-campus university, the IR team members took it upon themselves to identify staff at the various Campus Libraries to serve as representatives on their campuses. These IR representatives were tasked with sensitization, soliciting for items from faculty and generally serving as the first point of call on

issues relating to the Institutional Repository at the Campus level. This helped to decentralize the operations of the IR and further involve all campuses, faculties and departments of the University considering its multi-campus nature, in the development of the Repository. This is in line with Jenkins' *et al.* (2005) assertion that advocacy and promotional activities are vital for librarians in the development of any IR.

The IR team also harvested publications and other scholarly materials authored by staff from other open access platforms and archived them on their behalf into the repository. A workflow has been created where one staff is designated to do content harvesting to feed the other staff in the workflow. The copyright status of all submitted files are equally checked on behalf of contributors as a way of encouraging deposits. The IR had the SHERPA/ROMEEO service embedded in its system to augment the manual checking of copyright status of almost every item deposited in its collections. This strategy has really contributed significantly in increasing the items in the repository.

4.2 Organization of Items on the Repository

Bothma et al. (2014) underline the importance of a proper organization of information be it on an individual's personal computer or in the cloud. They stress the need for a good organizing structure to facilitate retrieval with as little effort as possible. Institutional repositories collect vast amount of items and as such, need a structure to organize these items and enhance retrieval in ways that will be efficient and effective by the users of the IR system. Items in the repository were structured around individual faculties in the University and were organized into communities and collections. There were ten (10) communities comprising fifty-nine (59) collections. All newly submitted items produced and submitted by an author could be viewed at a glance using the Really Simple Syndication (RSS) feed on the homepage. Contributing authors' names were showcased with the corresponding number of their scholarly output deposited in the repository. These names were ranked in ascending order, that is, based on the author with the highest number of items in the repository

4.3 Preservation Mechanisms

The mechanism in place for a long term storage of contents in UDS IR was a backup on an in-house local server and on a virtual private server (VPS) to enable retrieval and interpretation of the information for all periods. Portable Document Format (PDF) is the acceptable format

for depositing items into the repository as it is able to transcend longer periods of time, independent of instruments and systems used for creating, storing and interpreting them. It is also opted for as the technical specifications are made available in the public domain. It allows for easy exchange of electronic information with other users as it is supported by a wide range of software.

4.4 The Modes for Retrieval /Access to Items in UDS IR

End users of institutional repositories, both within and outside, should be able to access them without any barrier or few, if any (Crow, 2002). Access to the items could be by a search either on the repository's homepage or through any search engine such as Google, Yahoo, MSN, Bing, etc. This was possible because the Repository has been registered with OAI-PMH which allows all search engines to search through its collections. Searches could be by keywords, author, date and title. Browsing through the repository could be through the basic search engine or through the communities or collections. Authors have the right to request for restrictions on accessibility to their deposited files. Embargos or restrictions are enabled on contents that are commercially sensitive, or are in breach of some copyright agreements among others. UDS Institutional Repository applies the standards and protocols of metadata, thus, aiding easy retrieval of items in the collection.

4.5 The Challenges Faced in the Management of Research Output

Mark and Shearer (2006) expressed surprise and disappointment that institutional repository collections have generally grown more slowly than proponents had anticipated given the vision and the potential it possesses. The UDS Institutional Repository, from the results of the study, faces a number of challenges in the management of research output of the members of the University community. Some of the identified challenges are outlined in this paper.

Financial constraint was one of the major challenges facing the management of intellectual property of UDS. Funding needed for both the establishment and operation of UDS Institutional Repository was solely sourced from the University's internally generated funds. Njuguna and Itegi (2013, cited in Nyirenda, 2017) asserted that financial constraints – especially in Africa 'impact virtually all aspects of research including its mission, processes, participants' integrity, as well as dissemination of findings'. The University Library receives a quota of the University's budget for the fiscal year to finance its operations and activities. The

Library is constrained financially in supporting the activities of the IR when necessary, since the funds have to be distributed among all units and campuses. The IR Unit is thus, limited in the organization of training programmes, developing training materials and guides, undertaking marketing and promotional activities, among others.

The current practice of the University regarding theses/dissertations is for students to submit e-copies of their works to their departments to be forwarded to the IR Unit or the Library for archiving into the Repository. However, this has not been as smooth as expected since there is hardly any cooperation from the departments. E-copies of students' theses are not submitted to the IR Unit, and the Unit ends up by digitizing the hard-bound copies before these works can be captured and then added to the collection. This slows down the rate of populating the repository and leads to waste of resources such as time, money and effort.

The UDS IR also lacks a well-structured written marketing plan/strategy to guide its activities. A marketing plan lays down the details of activities, resource allocations, time frames and responsibilities that govern the marketing or promotional activities of an organization. Since content recruitment is a major issue facing IRs worldwide, it is important that a strategic marketing plan be developed for implementation in order to gain effective results.

Disasters are inevitable, be it natural or man-made. It is therefore imperative that measures are adequately put in place to minimize natural disasters and prevent man-made ones. These disasters could be floods, earthquakes, fire outbreaks, cyberattacks among others. At the time of the study there was no disaster preparedness plan in place for the IR per-adventure a disaster occurs. This is dangerous because the IR stands a higher risk of losing valuable content without any possibility of recovery.

There is low participation by faculty in archiving their research output in the repository. Most members of the University faculty are not convinced about the personal benefits that will accrue to them upon depositing their research output in the Repository. They thus, feel reluctant where voluntary participation is needed. This then posed great challenge to IR team in soliciting for items to be included in repository.

4.6 Key Indicators of IR

The researchers tried to determine if the IR team had ways by which they could identify if the IR was actually bridging the access gap to scholarly output of the University. The images below show the statistics of the IR for three years;

2015

2016

2017

Source: www.udsspace.uds.edu.gh, 2018

The ^{statistics} shows that, the number of searches performed on the UDS IR had grown from

Action	Number of times
Searches Performed	10,653
browse	7,415
browse_by_item	7,256
Item Views	814
Bitstream Views	586
browse_mini	315
Collection Views	314
browse_by_value	309
Community Views	140
display_statistics	127
Item Updated	49
Workspace Item Views	30
Community List Views	19

Action	Number of times
Searches Performed	53,820
browse	27,228
browse_by_item	24,762
Bitstream Views	6,646
Item Views	3,904
browse_by_value	2,992
Collection Views	1,052
browse_mini	964
display_statistics	893
Item Updated	559
Community Views	438
Workspace Item Views	389
Invalid ID Requests	295
Bitstream Updates	108

Action	Number of times
Searches Performed	2,466,939
browse	1,309,764
browse_by_item	1,159,866
Bitstream Views	310,005
browse_by_value	178,733
Item Views	166,756
browse_mini	64,244
Collection Views	62,952
display_statistics	54,499
Community Views	27,276
Item Updated	12,408
Workspace Item Views	6,888
Community List Views	5,817
Invalid ID Requests	4,297
Workflow Item Updates	2,393
User Home Page Views	2,317
authenticate	2,221

10,653 in 2015 to about 2,466,939

in 2017 representing 23,057.22% increase over a three-year period. The number of times the Repository had been browsed was 7, 415 in 2015, 27, 228 in 2016 and 1,309, 764 in 2017. Item viewed had . Items viewed improved significantly to 166, 756 in 2017 from 3, 904 in 2016 and 814 in 2015. Community views recorded 140 in 2015, 438 in 2016 and 27, 276 in 2017 whilst the Collection views were 314, 1,052 and 62, 952 in 2015, 2016 and 2017 respectively.

It can be inferred then, that the usage of the repository has increased considerably over the period. Thus, it can be said that since usage is increasing, the repository has not faulted in serving as the needed platform to project and access the University's scholarly output by users within or outside the institution.

Table 2: UDS Web Ranking

YEA R	COUNTR Y RANKIN G	WORLD RANKIN G	PRESENC E RANKIN G	IMPACT RANKIN G	OPENNE SS RANKIN G	EXCELLEN CE RANKING
2018	4TH	4101	5458	11300	3400	3622
2017	4TH	4217	4729	11613	3454	3625
2016	4TH	3373	5922	6004	3224	4060
2015	3RD	4197	5788	3979	11924	4318
2014	7TH	10081	14825	12188	7019	3996
2013	8TH	9780	11990	13346	6526	3147

Source: www.webometrics.info

Table 2 shows the web ranking of the University for Development Studies based on the webometrics ranking. This ranking is a major supporter of the Open Access initiatives and is aimed at promoting openness, academic web presence and significantly increasing the global dissemination of scientific, academic and cultural output produced by universities (www.webometrics.info). The ranking is based on four key indicators; presence, visibility, transparency and excellence. Presence relates to the size (number of webpages) of the university's main web domain including all the subdomains that share the same central web domain as well as the file types such as pdf documents. Visibility focuses on the number of external networks (subnets) which originates backlinks to the university's webpages, transparency or openness here deals with the number of citations from top authors whereas the university's excellence is ranked based on the number of papers amongst the top 10% most cited in 26 disciplines.

From Table 2, it can be seen that prior to the establishment of the UDS IR (2013), the UDS ranked 8th in Ghana, 9780 in the world, had a web presence of 11990, an impact of 13346, an openness of 6526 and an excellence of 3147. However, the establishment of the UDS Institutional Repository in 2014, saw the figures shooting up in 2015 when the UDS ranked 3rd in the country, 4197 in the world, 5788 based on web presence, 3979 of impact, 11924 openness and 4318 excellence ranking. This was a major achievement since all the figure rankings

dropped by almost half or more. Currently, the University for Development Studies ranks 4th among other higher education institutions (HEIs) in Ghana, 4101 in the world, 5458 in terms of presence, 11300 on web impact, 3400 ranked on openness and 3622 in excellence according to the Webometrics web ranking of universities for 2018.

5.0 Conclusion

The current strategies being used for the development of the UDS Institutional Repository are encouraging as they have contributed significantly to the increase in content and have improved access to local content enormously. The UDS Institutional Repository Unit has put in substantial efforts in managing the research output of the university community. However, the success in planning and managing the UDS IR is highly dependent on coordination by the IR Manager and the existing relationships with faculties. The IR Unit needs to maintain and strengthen relationships with faculty members so as to promote the active participation by faculty. It is essential, therefore, that the IR Unit further tries to discover whether the efforts of the IR in bridging the gap from creation to access of scholarly output, as indicated by the available statistics, is indeed felt by the stakeholders involved (University management, faculty, students and researchers). The UDS Library and the institutional repository team need to constantly research and implement strategies that can advance the role the IR is playing in managing intellectual output so as to demonstrate its relevance to the University community as well as to enhance service provision and satisfy user needs.

5.1 Recommendations

Documentation and training materials should be made readily available for users of the repository. The IR can make available training materials to users in the form of booklets, short videos, brochures and flyers that will contain easy guides to critical issues concerning the Repository. These should include guides on self-archiving or using other submission channels, browsing, searching, e-user registration among others.

The IR needs to develop a disaster plan which will spell out the mitigation measures, actions to be taken in case of a disaster and its reorganization after a disaster. To prevent chaos after a disaster, a plan must be developed in order to effectively bring sanity after the occurrence. The disaster plan must contain backup mechanisms for the IR content as well as procedures for re-establishment after a disaster.

The IR can make available usage statistics reports of items held, to the University Community. These statistics gives the researchers an idea of the views and downloads to their items. This could show number of downloads, views and reads of an article and can include country and city specifications. This could help in increasing deposits into the repository as authors can practically feel the impact of the repository on their research.

Imbedding altmetric tools onto the repository platform in order to generate a pictorial view of the impact the item is making will go a long way to motivate authors to deposit more items into the repository. The conventional Impact Factor (IF) for articles is flawed not only because of the time lag but it excludes counts of usage of data, software, figures or presentations. Altmetric tools count the number of shares, mentions, tags and other activities on blogs, wikis, twitter, Facebook and other social network platforms associated with any research paper. This shows the immediate impact the research paper is making in the community. Altmetrics serve as a motivation to researchers to deposit more into the repository since the data gotten tells the researcher the type of attention the article is getting (either negative or positive). Altmetric tools are viewed as alternative ways of making research efforts felt and can be measured at the individual, the group, the departmental and the university level.

Managers of the various institutional repositories in Ghana need to build repository manager-level lateral solidarity to share experience, exchange various creative ideas, add improvements and disseminate ideas, thereby highly developing their respective IRs.

There should be an improved management support for the Institutional Repository by way of instituting policies that will oblige faculty and students to deposit their research output into the repository. For instance, it could be stated as a requirement for completion of an academic programme, that students have to submit e-copies of their theses/dissertations to the IR. Also, publications of faculty can be submitted to the repository as a requirement for promotional interviews. This management support will improve faculty and students' appreciation of the efforts of the IR at bridging the gap from creation of research output to access.

UDS IR needs a marketing strategy that would ensure consistency, efficiency and effectiveness in creating awareness, advocacy and promotion. Rapid population of UDS repository has been very challenging and remains as such, in view of this, there should be a continuous multi-faceted strategy to actively to recruit content.

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MANAGEMENT OF ELECTRONIC THESES AND DISSERTATIONS IN SELECTED NIGERIAN UNIVERSITY INSTITUTIONAL REPOSITORIES

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Abstract

Theses and dissertations in electronic format are one of the research output managed in institutional repositories in recent times. The management of these research output has, however, not been without challenges which has affected the visibility and accessibility of electronic theses and dissertations (ETDs) from Africa. Purposive sampling was used to select nine federal institutions with functional repositories with a view to accessing how these research outputs are managed. Findings from the study revealed that the libraries in these institutions manage the ETDs. However, they do not have strong sustainable measures in place for these research output. Recommendations of the study include a proposed ETD policy framework which libraries can adopt. Libraries should come up with business models to help fund the repositories. Cloud computing solutions should also be adopted to handle some technical aspects of managing repositories in order for library staff to focus on other administrative and management aspects.

Keywords- Electronic Theses and Dissertations, Management, Institutional Repositories, Policy Framework

1.0 Introduction

In order to achieve the cardinal roles entrusted on universities, research which is one and the most important of them should be encompassing and conform to international standards in terms of conduct, management, dissemination and preservation. This is not surprising as research is a pivot that links teaching and learning and in the opinion of Oyedum *et. al.* (2015), is also an assessment criterion to indicate the level of understanding of the teaching and learning exercises. It is within this context that various researches are carried out in our institutions of learning on yearly basis. The outputs of these researches which include theses and dissertations are managed and preserved and can be assessed in the university libraries whose key roles include is the collection, dissemination and preservation of the various research outputs in support of the attainment of the research objectives of their parent institutions. Interestingly, of all the research outputs achieved from the institutions, theses and dissertations form the bulk of which universities own and attach much interest.

Theses and dissertations are documents of Masters and Doctor of Philosophy (PhD) students that present research investigations and findings which form part of the graduation requirements recognised by many universities worldwide. Not only do these 'intellectual core' of universities represent the significant research and scholarship of the universities they represent, they are also a valuable historical record of the research and teaching community (Middleton, Dean and Gilbertson, 2015).

With the upsurge of repositories, Electronic Theses and Dissertations (ETDs) are recently uploaded or published in institutional repositories all over the world including Africa. This is with a view to increase visibility and accessibility of these "cherished academic genre", according to Yiotis (2008), whose local empirical data are not readily available in international literature. institutional repositories because of their wide and instant access and dissemination, are good tools for the bibliographic control of researches at postgraduate level. Aside this, the basic assumption that research outputs at postgraduate levels can be viewed online can help reduce the endless circle of duplicated researches in Africa. Furthermore, the initiative was envisaged to greatly solve the inaccessibility gap of scientific and research information between developing and the developed world by facilitating the free availability and distribution of scholarly research output. In order for this to be achieved, there is the need for the proper channeling of issues related to visibility and accessibility.

Development of policy documents for electronic theses and dissertations in institutional repositories is therefore pertinent in the digital age. Controversies have trailed publishing electronic theses and dissertations in institutional repositories especially when students wish to

publish parts or all of the contents of their dissertations using other independent publishers. Ownership of publishing rights, copyrights, access levels, to mention but a few, are some of the issues that should be explicitly discussed in policy documents before electronic theses and dissertations are uploaded so that all parties involved; students, postgraduate offices and librarians are aware of the level they can go when it comes to publishing these electronic research outputs. It is usually assumed that the policies that work for print theses and dissertations would work for the electronic forms also. Often overlooked, however, is the issue of increased visibility and accessibility which cuts borders of institutions and even countries. This means almost instant visibility and access which hitherto were only available within the four walls of individual institution's library, with stringent access rules in most cases. As such, the rules must change and not just change but be clearly stated for all to see and be guided. It is against this backdrop that this research assessed the management of electronic theses and dissertations in Federal University Institutional Repositories in Nigeria.

2.0 Management of Electronic Theses and Dissertations (ETDs) in Nigerian Institutional Repositories.

Digitisation of theses and dissertations in Nigeria can be traced back to 1980 and 1985 respectively in University of Jos and Obafemi Awolowo University, Ile-Ife (Baro *et. al*, 2014.). However, Okoye and Ejikeme (2011) mentioned that, an international workshop held at Ahmadu Bello University (ABU) Zaria, Nigeria, in 2008 on open access repositories heralded the open access initiative in Nigeria. UNESCO's sponsorship of six University Librarians to a Workshop on the Use of the Greenstone Open Source Software, also increased the zeal to set up digitisation and repositories in Nigeria. Finally, the initial digitisation of theses and dissertations at the University Libraries of Jos and Obafemi Awolowo Ile-ife, under the AAU-DATAD programme, provided a model for ABU Library to start digitising its post-graduate theses and dissertations (Eke, 2011).

Baro, Oyeniran and Ateboh (2013) stated, in their study of twelve repositories in Nigeria, that theses and dissertations formed the bulk of library resources digitized, and Eke (2011) mentioned that the University of Nigeria, Nsukka had deployed staff and technical infrastructure to aid the digitisation project in the Library. Similarly, Anunobi and Onyebinama (2011) and Ibinaiye (2012) both reported the digitisation of theses and dissertations in Federal University of Technology, Owerri (FUTO) and Ahmadu Bello University, Zaria respectively.

FUTO digitisation process was initiated under the Database of Theses and Dissertations in Africa (DATAD), initiative while that of Ahmadu Bello University was initiated by the library management according to Ibinaiye (2012) when they acquired both hard and software to begin the digitisation of resources which included theses and dissertations and seminar presentations.

3.0 Statement of the Problem

The accessibility and visibility of theses and dissertations from Africa especially Nigeria has been low despite the huge number of these research outputs generated from our universities yearly. The inability to manage them even in the electronic format has caused an inaccessibility gap and thus a repetitive cycle of researches conducted in our ivory towers. Even more worrisome is the fact that universities have repositories which are start-up facilities for their management and dissemination but yet the gap still remains. It is thus pertinent to investigate how the electronic formats of these research outputs are managed by Nigerian universities. To achieve this, the following research questions were posed:

1. How are ETDs in the selected Nigerian Institutional Repositories managed?
2. What are the practical ways ETDs repositories in Nigeria can be sustained?

4.0 Literature Review

A meeting between University Microfilms International (UMI) dissertation publishing, VirginiaTech, ArborText, SoftQuad and University of Michigan in 1987 heralded the initial planning for electronic theses and dissertations (ETDs). The first ETD conference was held in 1998 and the Networked Digital Library of Theses and Dissertations (NDLTD) was initiated. According to Sengupta (2014), the Networked Digital Library of Theses & Dissertations (NDLTD) which is an international organization promotes the adoption, creation, use, dissemination and preservation of electronic theses and dissertations in various subjects and languages accessible through its union catalogue.

Today ETDs and its repositories have spread across all the continents of the world. The Digital Library and Archives of VirginiaTech defined ETD as the electronic versions of theses and dissertations submitted in support of candidature for a doctorate or master's degree, respectively, which presents the author's research and findings. The "Online Dictionary for Library and Information Science" (ODLIS) defines Electronic Theses and Dissertation (ETD) as Master's theses and Doctor of Philosophy (Ph.D.) dissertations submitted in digital form

rather than in print or paper, as opposed to those submitted in hard copies and subsequently converted to machine-readable format.

The benefits of ETDs include but not limited to the following:

- i. Worldwide accessibility to research the work of the Graduate School;
- ii. Streamlining presentation of research output with hyperlinks and multimedia files;
- iii. Reducing storage space for libraries.

The ETD program planning, according to Wang (2014) typically should consist of the setting up of a planning committee. The committee should be responsible for advocacy, policy formulation, proposing an implementation plan to mention but a few. The ETD creation, submission and ingestion consist of a number of workflows ETDs go through from production to final archiving. Access, archiving and preservation and evaluation are also important stages in the ETD lifecycle. The development of repositories should be backed up with policies for their management, content recruitment and system operation. Although Eke (2011), Ezeani and Ezema (2011), Musa, Musa and Abdulkadir (2014) and Akintunde and Anjo (2012) all reported the institutional repository initiatives in their different institutions, nothing about the policy statement of its establishment or content recruitment was reported. The recommendation of Uzuegbu (2012) that an African-wide policy on institutional repository creation by concerned institutions be adopted also gives an insight into the dearth of policies backing the establishment of institutional repositories (IR) in Nigerian Universities. Little wonder, the inconsistent path the repositories have taken so far.

Establishing and developing repositories does not necessarily mean that the contents are automatically in there. Contents are important part of the repositories and so are the policies and practices adopted for managing the content in them (Gul.*et. al.*, 2015). Dubinsky (2014) also stated that one measure of the success of any IR is the volume and scope of its contents. However, content recruitment and management seem to be a challenge of IR administrators. In the opinion of Li and Billings (2011), content recruitment has been one of the major issues faced by libraries and IR administrators as many IRs have experienced difficulties in content recruitment after their establishment. Nigerian institutional repositories are no exception. Li and Billings (2011) also assessed scholarwork@Umass, the institutional repository of University of Massachusetts, USA to find out the content recruitment strategies that were used for its successful development. The aim was to come up with a model that can be used for other institutions. The strategies used and discussed included but not limited to building partnership

with relevant stakeholders of particular interest, creating a workflow for the Graduate School and then evaluating the usage statistics. Another notable strategy employed was harvesting from existing repositories and databases.

Schopfel (2013) investigated what can be done to improve the quality of content and service provision in an open environment. The Schopfel's (2013) research was based on a review of communications of thirteen conferences on electronic theses and grey literature. He outlined five ways institutions can add value to the deposit and dissemination of ETDs. They include interoperability, format, metadata and services. Schopfel's (2013) article reiterated the roles recent IR developments like data and current research information systems (CRIS) can play in adding values to ETD. The awareness of open access repositories has no doubt increased over the years with academic staff and institutions directly or indirectly keying and benefiting from open access resources. However, awareness in many cases does not necessarily mean active participation. For example, many institutions that were the early adopters of electronic theses and dissertations repositories have along the line reduced or outrightly stopped the recruitment of contents to these repositories. This corroborates Dubinsky (2014) observation, that the mean monthly growth rate of newer IRs was over three times that of the established IRs. This should not be the case for e-theses and dissertations because they are owned by the institutions and so should be an advantage to help increase the content and web visibility of repositories.

5.0 Methodology

Using a survey research method, data was collected using observation and an online questionnaire from nine Federal Universities that have deployed functional Institutional Repositories and offer postgraduate programs. The Universities were purposively selected based on functionality and access to contents of the repositories for a period of three months (November, 2017-January, 2018). The respondents for the study were Institutional Administrators of repositories as indicated below:

Table 1: Universities with functional Institutional Repositories

1.	Ahmadu Bello University, Zaria	http://kubanni.abu.edu.ng:8080/jspui
2.	Federal University of Technology, Minna	http://dspace.futminna.edu.ng/
3.	Federal University of Technology, Owerri	http://library.futo.edu.ng/index.php/2014-10-22-23-19-25/2015-05-08-10-14-02
4.	University of Ibadan	http://ir.library.ui.edu.ng/
5.	University of Ilorin	http://uilspace.unilorin.edu.ng:8080/jspui/
6.	University of Lagos	http://repository.unilag.edu.ng/
7.	University of Nigeria, Nsukka	http://repository.unn.edu.ng:8080/xmlui/
8.	Federal University Oye-Ekiti	
9.	Federal University Dutsen-ma	

6.0 Results and Discussion of Findings

Research Question One

How are ETDs in the Selected Nigerian IR Managed?

Repository administrators were requested to indicate which unit in the University manages the repository currently. They were also requested to indicate who uploads contents to the repository and the sustainable measures in place for these repositories.

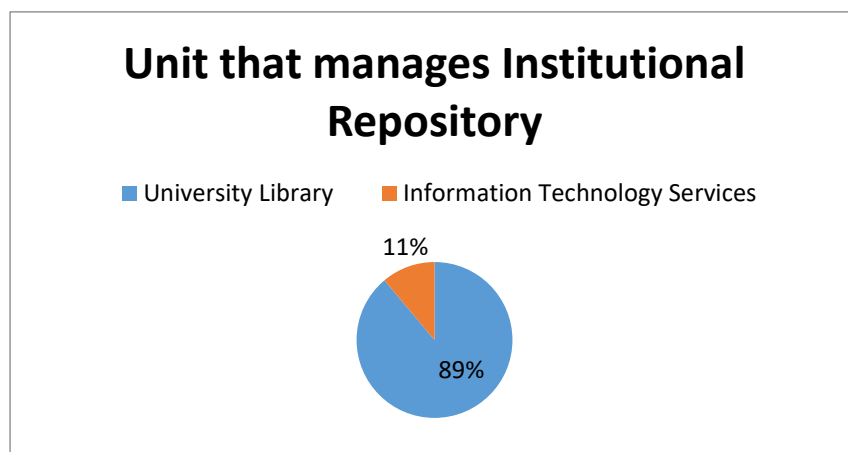


Figure 1: Unit that Manages IR

The university libraries in majority of the libraries are the managers of the contents of the institutional repositories (electronic theses and dissertations included) as shown in Figure 1 above. This can be said to be the situation across board because repositories are tools that librarians use to manage information resources albeit in electronic form. The findings

corroborate that of Wyk and Mostert (2014) who reported the implementation and management of the University of Zulu institutional repository was by the University Library. Stark, Alemneh and Eisenhauer (2013) also opined that it was the responsibility of academic libraries to meet the challenges of managing ETDs throughout their life cycle (storage in repositories included). However, as indicated in the result shown above, the information and communication unit of some universities still manage their repositories. This could be as a result of the technical nature of repositories, but then the management of its contents is best handled by librarians since it goes with the workflow of libraries-acquisition, processing, storage and access. The implication of this situation is that librarians must be more skilled in these technical aspects of managing repositories because even in universities where librarians manage the repositories inadequate technical skills have also been reported in the literature (Wyk & Mostert, 2014; Akintude, 2009)

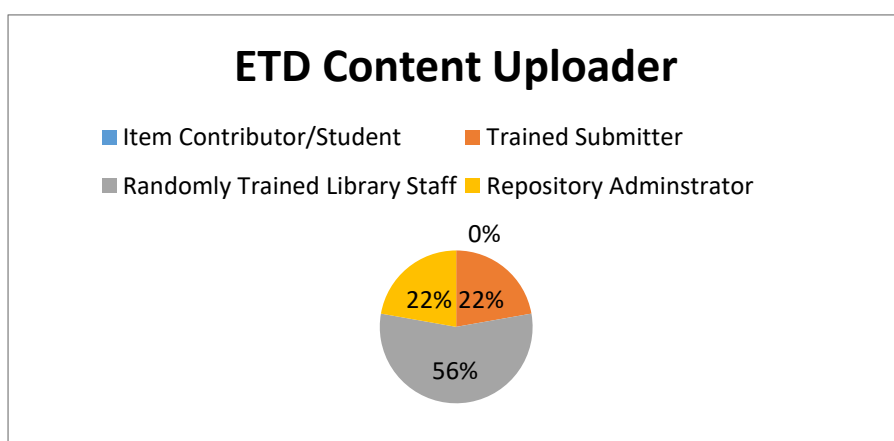


Figure 2: ETD Content Uploader

The data visualised in Figure 2 showed that majority of the libraries used randomly trained staff to upload contents to their repositories. This explains the low contents in some of these repositories. It is quite unrealistic and not sustainable for library staff to take up the responsibility of content population of ETDs. For other contents like journal articles and conference papers in repositories, self-archiving is practiced. In other situations, content recruitment or harvesting from other open access repositories is sometimes used. The situation for ETDs, however, is slightly different because of its unpublished nature. In developed countries, however, the case is different. For example, the Texas Digital Library has a content submission platform where students upload their theses and dissertations to before onward uploading to the library's repository.

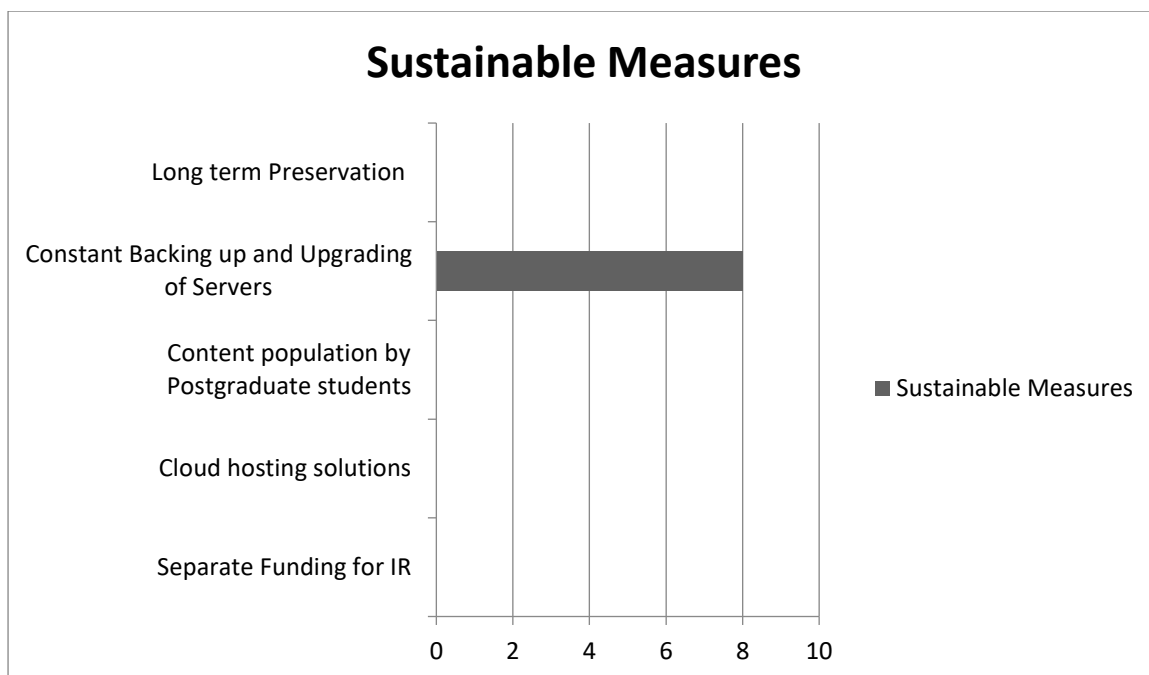


Figure 3: Sustainable Measures

Data visualised on Figure 3 above revealed that constant backup and upgrading of servers was the only sustainable measure in place in the selected IRs. The other sustainable measures were not in place. However, the only sustainable measure indicated above has not been sustainable. The researchers observed loss of data while upgrading servers from few of the repositories which led to the shutdown of the repositories online. Corroborating this observation, Gbaje and Mohammed (2017) noted an assumption among institutional repository administrators that digital contents would be preserved for long-term use simply because they have been ingested into the IR. This assumption has led to some repositories losing data whenever there is a need for software upgrade.

Research Question Two

What Practical Ways Can ETD Repositories in Nigeria be sustained

The respondents offered the following ways to sustain ETD repositories in Nigeria

1. The university libraries should adopt a common content populating workflow for electronic theses and dissertations with postgraduate students and the cataloguing/digital library staff embedded in the workflow.
2. The adoption of a business model for the published theses and dissertations would go a long way to ensure the sustainability of the repositories in addition to developing, creating and sustaining value for these research outputs. From the data collected, it can be inferred that libraries do not have a well spelt out plan for sustaining their

repositories, hence the many challenges they are facing. Thus, a business model (BM) approach using the Business Model Canvass is recommended. Rasuli, Alipour-Hafezi, Solaimani (2015) stated that BM aims at defining the structure of an enterprise or organization in such a way that it (expectedly) creates and captures value.

3. Cloud computing solutions would go a long way to take care of technical issues giving librarians time to focus on the management of these research outputs.
4. The adoption of a common ETD policy framework proposed in this study.

7.0 Summary of Findings

The following are the major findings of the study

1. ETDs in Nigerian university repositories are managed mainly by the university libraries, although the management varies for some universities.
2. Randomly trained library staff usually upload the ETDs into the repositories, which explains the reason behind the low contents.
3. There are no sustainable measures in place except for regular back-ups.

8.0 Conclusion

The management of ETDs in Nigerian university repositories is poor. There are several management practices that are still not in place which explain the poor management of these research outputs. Another assumption observed while carrying out this study was that what works for journal and conference papers would naturally work out for theses and dissertations. However, this cannot be the case because of the uniqueness of ETDs. There is no doubt that the world is moving to a knowledge- based global economy, driven by the creation of ideas and their translation into commercial value. Given the rapid dwindling funds, it is important that universities tap into this reservoir of ideas in the form of theses and dissertations to contribute to growing the economies of their countries.

9.0 Recommendations

Based on the findings of the study, the following recommendations are proffered:

1. The content populating workflow should be adopted to solve the challenge of populating the theses and dissertations in the repositories by the postgraduate

students. The workflow can be designed as a separate tool to be integrated with repositories

2. Dedicated cloud computing solutions should be embraced for repositories. This would go a long way in easing the technical burden of maintaining the repositories. Thus, library staff would be able to concentrate on content population and other aspects of managing ETDs.
3. Research communication and commercialisation of the best ten research findings from ETDs of each university should be adopted. Universities must use the various forms of media to communicate these activities and lobby policy makers. There must be a synergy between our ivory towers and policy makers, industries and private organizations in order for any funding model to work.
4. Libraries should create research/scholarly communication units to handle issues related to research output management.

Proposed Electronic Theses and Dissertation Management Policy Framework

	Key Indicators	Contents
1.	Acquisition/Content Population	Graduating Postgraduate students should be mandated to deposit the e-copies of their theses and dissertations.
2.	Content Availability	Institutions and authors can decide which ETD should be available to the public in full-text, bibliographic information, datasets etc. and for how long. Institutions may decide modalities for providing data to service providers on the OAI-PMH platform and for how long.
3.	Content Accessibility	Institutions can decide which format the ETD deposited should be made accessible.
4.	Quality Assurance	Only completed and approved electronic formats of theses and dissertation must be uploaded to the repositories. The postgraduate school, library and research office should synergise to ensure a smooth quality assurance process from acquisition to dissemination and storage.
5.	Preservation (long and short term)	Modalities should be in place to decide which ETDs should be preserved for short or long terms; and put in modalities to ensure which preservation technique would work best at a particular

		time. The option of using open source preservation software can be looked into. Preservation could also be leased out to a third party depending on the funds involved. Alternatively, an ETD preservation consortium can be formed.
6.	Intellectual Copyright	Institutions should decide level of intellectual property right students and the institutions own and for how long. How much royalties should be paid in cases of patents and innovations. Information about rights held over the document, typically describing the conditions which it may be distributed and how these conditions may change over time.
7.	Funding	Funding models should be adopted for the repositories. The models should include both long and short terms. Funding models may include but not limited to consortia membership model, philanthropy/corporate sponsorship, research funded models (Kitchin, Collins and Frost, 2015) and the business model.
8.	Technical Support	In-house and cloud computing solutions are the options available. Institutions may decide to adopt one of both depending on individual differences. The pros and cons of both should be studied and decided for how long they can be sustained.

Source: Authors Original Proposed ETD Policy Framework, 2018

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CONTEMPORARY ROLES OF LIBRARIANS IN NAVIGATING AND ADDRESSING ACADEMIC RESEARCH ETHICAL DILEMMAS: THE TECHNICAL UNIVERSITIES IN PERSPECTIVE

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Abstract

The polytechnics in Ghana are currently been upgraded to Technical University status. In view of this, academic research and, for that matter, compliance to research ethics has become imperative in these institutions notwithstanding concerns on ranking, funding, open scholarship, virtual research, and reputation building have also come into play. Academic writing is guided by laid down rules, standards and codes of conduct in order to uphold intellectual integrity and honesty. As such, behavioural attitudes, the ‘‘duty-based theory which complements the need for compliance to academic research policies, rules and codes of conducts has been espoused. The researchers explored the librarians’ role in support of the Technical University new road map. This is an exploratory study that adopted the quantitative method. Senior Polytechnic Librarians whose institutions had undergone the transition became the resultant respondents. A questionnaire was the instrument used for the data collection. Twenty-six responses were analysed using SPSS to ascertain the results Findings revealed a number of roles deemed traditional and contemporary. Although the librarians play crucial roles by instilling academic discipline, emerging roles and use of Information Communication Technology (ICT) applications were minimal. The study revealed plagiarism, fabrication, poor record keeping, honorary authorship, conflict of interest, duplication particularly of dissertations as some of the dilemmas of scholarly communication. Other delinquencies were data insecurity, social network abuse and issues on e-waste. It was discovered that integration of ICT has impacted on academic research and for that matter on ethics. The benefits of adhering to ethical standards promote integrity in research, impact on institution’s reputation, ranking, funding, transparency amongst others. Innovative applications, interactive and collaborative approaches, policy and compliance, sensitisation and education amongst others were recommended as remedies to manage and curtail the menace of violations of research ethics. The study ascertained the degree of awareness of these dilemmas among the librarians. It postulated vigorous ethical scrutiny and research enquiry to ensure that research findings improve human conditions both present and future. As Librarians our traditional roles are currently embedded with the new and challenging tasks.

Keywords: *Research Ethics, Ethical Dilemmas, Technical Universities, Intellectual Honesty*

Introduction

The awareness and consideration for academic research ethics among scholars have become imperative as a result of open scholarship, big data, institutional ranking, academic integrity, funding and reputation building. Academic ethics encompass human conducts, attitudes and responsibility of compliance to lay down policies, rules and codes of ethics. The study explored contemporary roles of librarians in navigating and addressing issues of academic research ethics by Senior Technical Universities' Librarians in Ghana.

Tertiary institutions have three main pillars which are teaching, research and extension services (Exner, Horsman and Reed (2017:2). Faculty, students and scholars lives are organised based on these core values and credos which are evaluated thereof. That notwithstanding, in this age of information overload, dynamics and demands, it is critical to assist academic scholars to distinguish quality information, be it in print format or electronic, especially for scholarly research purpose. Contemporary developments and free academic environments such as “open access, repositories, collaborative research, big data and social networks platforms have subjected knowledge, teaching, speaking and publishing to the norms and standards of scholarly inquiry. Honesty, objectivity, trust, legality, integrity, accountability and responsibility in conducting academic research have become the cornerstone of many academic enterprises” which include the Polytechnics, now Technical Universities (European University Institute, 2013:7).

Academic research, whether funded or unfunded, requires clearance from an ethics and integrity committee. This is especially so in the case of funded research. Publications are subject to ethical clearance and audit conditions to ensure integrity according to Weng'ua1, Rotich and Kogos, (2017:23). This is because academic researchers are indebted to the public, sponsors, community and colleagues. Non-compliance to ethical standards is considered as serious academic misconduct and violation of laid down rules in the entire academic scope (European University Institute, 2013:7). In pursuance to this, most academic and publication institutions have instituted Research Ethics Policies and Committees to provide advice and guidance on academic research ethics. Such committees also act as liaisons to external partners on ethical issues. A number of universities currently boast of ethics committees; however, some polytechnics in Ghana are yet to establish such an important committee.

Ethics has been explained to connote the moral standard that guides one's action. They are rules which distinguish between right and wrong. Bothma, Cosijn, Fourie and Penzhorn (2014, 137) define ethics as “a branch of philosophy that deals with human conduct and character in distinguishing right from wrong.” The paradigm shift in research has necessitated the need to

educate researchers on ethical standards. Undertaking academic research has become mandatory among scholars in Ghana and this includes the Technical Universities. Considering Ghana's education policy of accrediting the award of degrees to them, there is the need to revisit and be alerted on some ethical implications in academic research.

The study adopted the Duty-based Theory (Fallies, 2007:28). This theory hypothesises that human behaviour is regulated by laid down rules. This framework considers ethical action as one perpetuated from duty, that is, "it is done precisely because it is our obligation to perform the action". (The application of this framework makes it obligatory for scholars to abide by academic research ethics (Brown University, 2015: 7). "Thus it is not only right to do it, but that it is wrong not to do it irrespective of the environment." This is the basis for academic research policies, rules, code of conducts, ethics committees, informed consent of parties involved in research, respect for confidentiality and anonymity, amongst others

Road Map of Technical Universities' Education in Ghana

Polytechnics are found in each of the ten administrative regions of Ghana. They operate under the guide of an Act of Parliament, Act 745, to provide tertiary education in Ghana (Nyako, 2011). The Polytechnics are mandated to train middle level managers in the areas of Applied Science, Engineering Technology, Applied Business and Art to serve manpower needs of the country according to Kutsanedzie, Achio & Mensah (2013). Further, the upgrading of the Polytechnics to autonomous degree-awarding institutions have brought about a paradigm shift in the curriculum and research focus, hence the call for conformity to research ethics (Agyefi-Mensah & Edu-Buandoh, 2014). The review of the curriculum and current research focus have created gaps in research, thus leading to ethical scepticism and enquiry.

The new roadmap was enshrined in the 2013 "State of the Nation Address" to convert Polytechnics into Technical Universities. It is expected that students in the Technical Universities will be trained to acquire high level practical and technical skills to drive the country's economic and national development agenda. The Technical Universities, according to the Ministry of Education (2014:1), have the mandate to:

- i. Contribute to raising the quality and competitiveness of the Ghanaian workforce by providing opportunities for working employees to upgrade their skills and acquire new skills.
- ii. Reduce the admission pressures on the traditional universities,
- iii. Provide progression avenues for technical and vocational students.

iv. Advance in research to inform policies

The Technical Universities are mandated to produce publications that meet both local and international standards; hence, there is the need for librarians to create the needed awareness to faculty and students on academic ethics. Developments such as inventions and innovation, which fall within their domain are subject to some level of ethical compliance called intellectual property and patent rights.

Objectives of the Study

This study explored academic research ethical dilemmas, assessed the impact of ethical compliance on research, identified the various tools and applications and the extent to which librarians have integrated such tools to control the menace of ethical violations. Again, it assessed the awareness and preparedness of senior polytechnic librarians in support of the new paradigm. The findings of the study are expected to help librarians understand the various ethical dilemmas and ways to control or eliminate them. It will serve as a policy guide to decision makers in making appropriate decisions, policies and codes concerning ethical compliance.

Statement of Problem

Academic research ethics has become a contemporary issue of concern in tertiary institutions worldwide. This is because of its implications on ranking, funding, visibility, reputation and integrity of research in these institutions. Research has revealed the rise in ethical misconduct among scholars. Such misconduct, according to Totolo (2015), includes plagiarism, conflict of interest, duplication, fabrication amongst others. With regard to the conversion of the polytechnics in Ghana to Technical Universities, it is envisaged to trigger research gaps. Inversely, limited attention has been given to addressing ethical issues in research, intellectual property protection and awareness.

Radical changes in Information and Communication Technology (ICT) as an enabling tool within the academic sphere, coupled with such phenomena as Big data, data mining, open access, mobile application, repositories, open education and electronic document production as well as current paradigm in academics and research such as joint or collaborative research, virtual and community engagement pose significant diverse challenges and ethical implications to researchers (Cherinet, 2018; Roger and Duranti 2017). These include social network abuse,

data insecurity, cybercrime and plagiarism that are experienced among tertiary establishments (Dadzie, 2011).

The challenge of funding academic research currently experienced by the institutions has been corroborated by Weng'ua1Rotich and Kogos (2017:26) and Resnik (2015:2). Research proposals have declined due to lack of credibility and academic integrity in satisfying funding partners. With regards to the conversion of the polytechnics in Ghana to Technical Universities, it is envisaged to trigger research gaps. Inversely, limited attention has been given to addressing ethical issues, intellectual property and awareness. The mandate to create the needed advocacy on academic research ethics to faculty and students falls within the scope of the librarians and this study seeks to investigate their preparedness in navigating and addressing such issues.

Research Questions

The following were the research questions this study attempted to answer.

- i. What are the roles of the Technical University librarians in research?
- ii. What are the importance of academic research ethics compliance in the Technical Universities?
- iii. Are Senior Librarians across the Technical Universities aware of ethical responsibilities towards scholarship?
- iv. What are some of the components of ethical misconduct in the Technical Universities?
- v. Are there measures in place to detect, control and eliminate the menace of violation of research ethics in the Technical Universities?

Literature Review

Importance of Ethics to Academic Scholarship

A number of tertiary institutions worldwide value deduced ethical norms to constrain the impact on academic research abuse and negligence. Therefore, the Polytechnics which have been upgraded to the status of Technical Universities ought to be mindful of ethical standards which are the cornerstone of any academic institution. The benefit of ethical compliance among other things address as the challenge of funding research that confronts tertiary institutions which include Polytechnics in Ghana. Researchers are obligated to the community thus ‘‘public responsibility’’ in addition to the research output in addressing societal needs. The society reciprocally supports and funds academic research as a part of social responsibility

mandate, provided the research conforms to ethical standards and codes of conduct (Resnik, 2015:2).

Again, reputation and ranking of institutions are subjected to research ethical compliance. Non-compliance to academic ethics can tarnish the reputation and this may affect the ranking of the academic institution (Asia Pacific International College, 2017:2). The transition of the Polytechnics to degree awarding entities is open to competition which entails being ranked among others academic and research institutions. Among the checklist for the ranking adherence to research ethics and compliance, openness in research, originality, objectivity and integrity.

Ethics compliance fosters justice, dignity and worth of the human person in scholarship (Capurro, 2008:1162). There is the assurance of authenticity of the publication produced. There is always reliability and validity in the publications produced (Macfarlane, 2009:1). On the other hand, individuals with varying characters might have certain limitations considering the current changes in technology and intelligence. It promotes accountability, being held accountable for the authenticity of the work produced, be it errors or goodwill, amongst others. The sources of the research are usually disclosed and accounted for. Authors are held answerable and responsible for their actions.

Contemporary Roles of Librarians in Academic Research

Librarians, as part of their traditional roles increase access to information, deliver information literacy, digitise resources, render Author Aid Services, market and promote resources, establish and manage institutional repository and also collaborate with partners. Librarians play diverse roles in the research life cycle process. According to Pienaar and Van Deventer (2009:3), librarians promote collaborations among research teams, facilitate data collection, create knowledge and disseminate it among scholars.

However, the dynamics and demands in academic research have triggered emergent, blended roles and developments by librarians according to Cherinet, (2018:93). These roles include establishment of Virtual Research Environment (VRE), Alert and Tagging Services, Research Data Management, Data visualization services, Literature gap analysis, promotion of Personal Information Management (PIM) practices, discovery and measurement of research impact (Brydges and Clarke: 2015) and financial management among others. These evolving and variegated roles have not gained the needed recognition and attention in Africa as indicated by Hart and Kleinveldt (2011:37) and corroborated by Mchombu and Maggy (2015:115) as a result of low penetration of ICT applications and skills. Therefore, an analysis and synergy of

the competencies, passion and professionalism of librarians are required to address the changing desires of researchers.

Budgeting and prioritizing has also become key components of the librarian's role. According to Shun (2016:682) libraries continually experience reduction of budgetary allocation necessitating them to prioritise. A study by Gabbay and Shoham (2017:3) revealed a claim by faculty members that librarians disproportionately divide budget to support teaching more than research. The effect of this results in faculty members distancing themselves from the use of the library during research. It is within this context, that the study explores the current roles of librarians support for academic research, their cognizance on academic research ethics, and ways to address them.

Research Methodology

This is an exploratory study which adopted the case study approach using Polytechnic Librarians whose institutions had undergone the transition to Technical University status. Preliminary investigations carried out by the researchers revealed that though there were research departments where research ethics need to be practiced by researchers, the onus of training and empowering researchers on ethics sit well with librarians. A questionnaire was the instrument used for the data collection. The questions were emailed to some respondents, affording them the opportunity to access them remotely and at convenient times. The researchers personally distributed those of Accra and Koforidua Technical Universities thereby providing the researchers a direct engagement with respondents.

Research Population

Seven (7) out of the ten (10) Polytechnics have been upgraded to Technical University status (National Council for Tertiary Education 2016; Ghana News Agency (2016). Twenty- six (26) librarians became the resultant population due to non-availability of some respondents at the time of the study. Majority of the libraries had at least three Master's degree holders for the position of professional librarian (Table 1)

Table 1: Respondents Across the Regions

Respondents	Total Number of Library Staff (Professionals and Para-Professionals)	Total Professionals
Accra Polytechnic	11	5
Kumasi Polytechnic	11	5
Tamale Polytechnic	12	3
Sunyani Polytechnic	20	3
Takoradi Polytechnic	25	5
Ho Polytechnic	9	3
Koforidua Polytechnic	10	5
Total	98	29

Source: Field Survey(2017)

Results

Librarians' Role in Academic Research

Librarians possess the credo, the techniques, knowledge and skills in providing information that supports research activities in higher education institutions. Library professionals were discovered to play crucial roles that support research in diverse ways. The study revealed the traditional roles performed by the Librarians as follows: Eighty-nine (89%) of librarians increase access to information, 81.4% support marketing and publicity of scholarly materials, 74% institutional repository (IR), 70.3% indulge in networking and collaboration, 67% focus on information literacy, 59.2% are concerned with digital curation and preservation, 55.5% Authod Aid services amongst others.

Majority of the respondents attested to the above roles. On the contrary, 51.8% were concerned with Research Data Management (RDM). Fewer Librarians(44.4%) were concerned with academic identity management, 37% reviewed literature and identified gaps, far fewer number (33.3%) supported Virtual Research Environment (VRE), while 33.3% were involved in Alert /tagging services. Data Visualisation and Personal Information Management (PIM) services recorded minimal endorsement among respondents with a rating of 22.2%. The former roles directly support teaching activities, while the latter roles address research needs and control of ethical dilemmas by ensuring that researchers access and utilise authentic information.

Table 2: Roles of Academic Research

Roles played by librarians to support academic research	Rating %				
	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly disagree</i>
Increased access to information	89%	11%			
Marketing of library resources and services	81.4%	14.8%	3.7%		
Institutional repository (IR) managers	74%	22.2%	3.7%		
Networking and collaboration	70.3%	26%		3.7%	
Promote Information Literacy	67%	26%	3.7%	3.7%	
Digital Curation and preservation managers	59.2%	22%	18.5%		
Author Aid Services	55.5%	22%	18.5%	3.7%	
Research Data Management (RDM) managers	51.8%	26%	22.2%		
Academic identity management	44.4%	37%	14.8%	3.7%	
Literature gap analysis	37%	14.8%	44.4%	3.7%	
Virtual Research Environment (VRE) Managers	33.3%	37.3%	22%	7.4%	
Alert /tagging Services (articles and grants)	33.3%	14.8%	51.8%		
Data visualisation	22.2%	22.2%	44.4%	7.4%	
Promote Personal Information Management (PIM) practices	22.2%	3.7%	74%		
Other (specify)					

Source: Field Survey (2017)

Importance of Academic Research Ethics and Its Impact on Scholarship

Researchers of today are obliged to include a variety of metrics in their application for grants, funding and promotion hence ethical compliance plays a crucial role. Researchers have the obligation to respect the trust placed in them by their colleagues, the public and themselves. Ethics, according to Mikesell, Bromley and Khodyakov (2013:1), protects researchers and

scholars from certain obligations that promote quality research. It also controls abuse of usage of scholarship. Issues of accountability, ownership and originality are considered as some of the impact on research (Kamat, 2006:10).

The findings of the study revealed the following as some of the impact of ethics on scholarship: Elimination of plagiarism was strongly endorsed by 81.4% of the respondents; Enhances Accountability (70.3%), Ensures integrity(66.6%); Promotes transparency (62.9%); Promotes standardization (62.9%), Openness in research (55.5%), Rights to anonymity (51.8%), Source of funding support (48.1%), Enhances institution’s reputation (44.4%) and Promotes continuity in research (40.7%). The study revealed minimal awareness about the importance of ethical compliance with respect to funding, reputation and ranking and continuity of research which explicitly point out about the methodology involved in carrying out research.

Components of Ethical Misconducts /Dilemmas

The researchers explored some of the ethical dilemmas known by the respondents. The Table 4 below gives the rating. Plagiarism recorded the highest form of academic misconduct, this was strongly agreed by (88.8%) of the librarians. Studies have revealed conducts that are considered as breaches to academic research. Mikesell, Bromley and Khodyakov (2013) in exploring the ethical concerns associated with ‘Community-Based Participatory Research (CBPR) with regard to ethical compliance define ethics as norms for conduct that distinguish between acceptable and unacceptable behaviour, which plays a vital role in research.

Academic dishonesty rated (66.6%), data manipulation (59.2%), fabrication (51.8%), examination/assignment malpractice (48.1%), conflict of interest (40.7%), poor record keeping (33.3%), author inflation /honorary authorship (33.3%), Salami publications (29.6%), and ghost authorship (29.6%).

Table 4: Ethical dilemmas

Misconduct/Dilemmas	Rating%				
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Plagiarism	88.8%	7.4%			3.7%
Academic Dishonesty	66.6%	22.2%	7.4%		3.7%
Data manipulation	59.2%	25.9%	11.1%	3.7%	

Fabrication	51.8%	29.6%	11.1%	3.7%	3.7%
Examination Malpractice	48.1%	29.6%	11.1%	11.1%	
Conflict of interest	40.7%	40.7%	11.1%	3.7%	3.7%
Poor record keeping	33.3%	44.4%	11.1%	7.4%	3.7%
Author Inflation / honorary authorship	33.3%	22%	37.3%	7.4%	
Salami Publication	29.6%	48.1%	22.2%		3.7%
Ghost Authorship	29.6%	25.9%	33.3%	7.4%	
Other (specify)					

Source: *Field Survey (2017)*

Control of Ethical Dilemmas by Librarians

This section presents the responses on measures to control and curb ethical menace. Majority of the respondents (84.2%) indicated the use of plagiarism detectors such as TurnItIn, Plagscan, Viper and Copy leaks. Information literacy was proposed by (81.4%), compliance to fair use and copy right recorded (77.7% whiles the establishment of Academic Ethics Committees recorded (62.9%). In addition to these were the use of referencing managers such as Mendeley, Zotero, Endnote and Refworks which assist in compiling references used with a rating of (59.2%). The establishment of academic writing centres was minimally endorsed by (48.1%) with Promotion on Personal Information Management (PIM) recording (33.3%).

Discussion of Findings

It was discovered that the traditional roles were being performed by majority of the librarians to support research but those roles do not fully track and address diverse dilemmas which have emerged resulting from advancement in technology and the research landscape (Bell,2016). Majority of the librarians (67%) endorsed information literacy, but this was debunked by Cordell (2013:178) pointing out that digital literacy instead of information literacy served as preventive strategy by impacting on behavioural change in this technological era. Librarians, advancing on this emerging role will address issues which pertain to data security, social network abuse, e-waste among others.

Literature Gap Analysis is one of the roles performed by librarians in the advanced world to assess the library's collection in relation to research instead of solely reading and weeding the

shelves. Findings from the study revealed that majority of the librarians were not aware of this phenomenon. Citing Turcios, Agawal and Watkins (2014:475) and Grant, (2009:96) identifying gaps in literature enables librarians and researchers to know “how much literature exists, the subject coverage and to identify trends particularly on electronic resources”. It also promotes article evaluation, ethical sourcing in research, proper citation network analysis and systematic literature review according to Kim, Colicchia and Menachof (2016:1). However (37%) of the librarians attested to this role of managing research data or Research Data Management (RDM) was alluded to by Chad and Enright (2014:150). It is an emergent role where librarians play critical roles in the research cycle consisting of a number of different activities in the data life cycle. According to Cox and Pinfield (2013:1) it involves the “design and creation of research data, storage, security, preservation, retrieval, sharing, and reuse, as well as the technical capabilities, ethical considerations, legal issues and governance frameworks”. The ethical consideration implies integrated measures established to control and detect plagiarism, establish informed consent, referencing and mitigate the challenge of keeping data among others. Considering its enormous benefits, practicing and integrating RDM enables researchers and librarians “monitor publication activity, expenditure on publication, monitor compliance with funders’ requirement which includes ethical standards (Chad & Enright 2014:150). In spite of its impact on research, minimal awareness (51.8%) was recorded among the Technical University Librarians. This is a holistic and innovative approach which ought to be adopted by Technical University Librarians in the research landscape.

Technical University Librarians as, part of their mandate, are to establish strategies and suitable ambience for learning, research and studies. JISC (2016) therefore recognises Virtual Research Environment (VRE) to encompass research tools, interoperable frameworks and strategies which enable researchers to customise research. These environments are mostly managed by librarians to support research collaboration and standards among scholars and publications. Unfortunately, the scenario in the Technical Universities in Ghana is different. Only about thirty-three (33.3%) of respondents strongly agreed to this. A study by Pienaar and Smith (2008:8) corroborated among others things that the University of Pretoria Library was one of the few libraries which has advanced and integrated it. The benefit of this cannot be underestimated since it promotes transparency and addresses the menace of fabrication. Alerts and tagging services (journals, articles and grants) facilitate in securing current literature needed for one’s research. It provides updates on trends, emerging and up -to -date publications, for example, the table of content of books and journals. Researchers and librarians

of the University of Melbourne (2017) receive current feeds which include “citations, conference alerts, table of contents alert, bookmarks and RSS feeds”. Despite its importance of notifying researchers about the sources of information and current topics relevant to one’s interest, it facilitates citation and compilation of bibliographies used, alleviate plagiarism, duplication, and use of predatory journals and other ethical dilemmas. Unfortunately, this study recorded minimal awareness (33.3%) among respondents. This was corroborated by Baro, Idiodi and Godfrey (2013:170) among librarians in University Libraries in Nigeria.

Lately, data visualization has become one of the embedded roles performed by librarians to support research. It facilitates data communication, outlines relationships and promotes the use and reuse of data. Data visualisation enables one to identify patterns within larger data (Enago Academy 2017). It has become a key research component as a result of innovative ways of delivering research output and blended ways of learning. Citing Czuhajewski (2015) librarians at the University of Michigan Library system undertake this activity in order to present research findings in an analytical manner which controls conflict of interest. It facilitates understanding, evaluation and interpretation of data. According to Voliva (2015), the phenomenon of big data with its associated ethical dilemmas has propelled the integration of visualization in order to make meaning from data easily. In spite of its benefits, the study revealed negligible awareness among the respondents with (22.2%) strongly agreeing to this. Burton and Lyon’s (2017:33) research findings confirm this. Some of the data visualisation tools discovered include infographics and open knowledge map.

Additionally, promoting Personal Information Management (PIM) among researchers through advocacy and training is laudable to facilitate the use and reuse of scholarship. Practicing PIM, according to Fourie (2012:187), supports cognitive processes such as ‘‘thinking, problem-solving, idea generation, categorization, representation, vocabulary exploration, and visualisation’ ’It also serves as avenue for researchers to provide security, and to personally protect data. However, a marginal number (22.2%) of the respondents strongly agreed to this role. Otopah and Dadzie’s (2013:142) study findings affirm this by indicating that inadequate skills is a major setback on the part of students in Ghana.

Academic identity management is considered as one of the modern perspectives that aims to promote scholarly communication, collaboration and reputation building of creators. The large amount of literature on the web makes it difficult to track creators and authors. Therefore, creating and maintaining the profile of authors has become necessary. Dilemmas such as author

inflation /honorary authorship, Salami publication and ghost authorship could be tracked. The Technical University of Munich Library (2017: 2) identified “Researcher ID, Google Scholar Citations, Scopus, Web of Science, Bepress ” as platforms that are used to assign unique identifiers to researchers for easy tracking of works. The platforms aim to increase visibility of authors, facilitate the transfer of bibliographic record, import and export of records. This study revealed far fewer, thirty–seven percent (37%) of the librarians strongly agreed to this. The findings supported that of Li, Thelwall and Giustin (2012:1) that majority of researchers and librarians were not aware of this role.

It was discovered that establishment of an Institutional Repository (IR) which showcases the research output of the institutions such as dissertations, journals, artifacts, monograph amongst others produced by the organization recorded seventy- four percent (74%) of the librarians strongly agreeing to this. However, before information in the repository is disseminated, it needs to be scrutinised ethically. Librarians, as part of their roles, are to acquire and operationalise the use of plagiarism detectors and referencing tools such as TurnItIn, Mendeley, Plagiarism Checker, Plagscan and Refworks. Some of these applications are available openly and for use.

ADDRESSING ACADEMIC RESEARCH ETHICAL DILEMMAS

The under listed recommendations and suggestions are provided as remedies to prevent and manage the menace of research misconduct. These have been categorised under: “use of innovative applications, interactive and collaborative approach, policy and compliance, intensified advocacy and education on academic research ethics, behavioural change” amongst others.

The use of innovative applications such as plagiarism detectors is recommended. These are tools used to detect the plagiarism count in publications before submission. They enable one to work on plagiarized contents before submission. Furthermore, the use of referencing tools which facilitate referencing on numerous formats and styles is recommended. Also, learning and content management applications such as integrated library system and learning management system provide one platform which enables one to carry out integrated research thereby controlling the abuse of information.

Interactive and collaborative approach encompasses research support, best practices and additional roles assumed by librarians to curb the menace of ethical violation. Studies have

revealed that one of the ways for librarians to accelerate this transformation is through collaborative action (Shun, 2016:688). Creation of Virtual Research Environments (VRE) ensures that requisite resources and facilities are available to support collaborative research. Since Librarians are recognized as stakeholders and partners in research data management, they should collaborate with virtual researchers by integrating applications such as: telephone, Web 2.0, email, instant messaging, forums, wikis, blogs, meeting tools, project management tools, video conferencing, data-based conferencing, Access, Grid, project calendars and task assignments computers for effective and collaborative research.

Furthermore, since the integration of Research Data Management by specifically adhering to the research life cycle is endorsed, librarians should be able to facilitate the various stages of the research lifecycle by creating data, processing data, analysing data, preserving data, disseminating data and ensuring the re-use of data for effective research.

Practicing Personal Information Management (PIM) enables one to “create, organize, retrieve, use and distribute information to fulfil various responsibilities”. By that one will be able to use and reuse information thereby enabling the possibility to have the right information in the right place and in the right format. Additionally, tagging and alert services, Selective Dissemination Information and mentoring students are recommended.

Policy and compliance - On the issue of policies and compliance, Academic Research and Ethics Committees should be established to advocate, enforce, sanction and penalize offenders. Again, establishment of ethical standards and policies that will promote conformity and compliance on the type of consent needed to carry out research is recommended. The policy should also outline the areas of focus as well as the dos and don'ts in research.

Improvement in accreditation standards is also recommended. The accreditation entities ought to produce checklist which encompass ethical compliance.

As part of the recommendation, the Research and Ethics Committee should develop checklists that will explore integrity. The checklist may guide researchers on relevant areas to review literature, select a design and adopt sound methodologies.

Intensified advocacy and education on academic research ethics -Teaching of Information Ethics, as part of the curriculum in Library and Information Science (LIS) schools, is recommended to enable librarians obtain the knowledge on ethical issues on research. Also, the establishment of academic writing centres where research papers and works are proo read

and edited to ensure that academic writing meets the required standards and pedestal are recommended. An example is the Carnegie Writing Centre at the University of Ghana, Legon, Ghana.

There is the need to educate researchers and students on the preventive measures such as effective referencing and citation other than the use of plagiarism detectors which will incur additional cost.

Behavioural change- Ethical obligations, according to the deontology theory, entail rules of behaviour for scholars to abide by. Thus it is not only right to do it, but that it is wrong not to do it irrespective of the environment. Henceforth, the use of sanctions and punitive measures such as rejection, retraction, demotion amongst others could be introduced to promote the desired behavioural change.

Conclusion

The study was conducted prior to the conversion of Polytechnics in Ghana to Technical Universities. With the transition of the Polytechnics to Technical Universities, reputation building and ranking, research funding, the exponential growth of information as well as changes in technological trends have impacted on the tasks and expectations from librarians. Their traditional roles are currently embedded with new and challenging task in order to meet the demand and desires of faculty, students and researchers. However, the study discovered that much emphasis is placed on the traditional functions performed by majority of the librarians. This does not fully address the diverse ethical research dilemmas currently experienced. Managing research output for national development requires vigorous ethical scrutiny and research enquiry in order to justify funding support and research sustainability.

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POLICIES, LEGAL AND ETHICAL ISSUES OF RESEARCH OUTPUT, USE AND MANAGEMENT IN ACADEMIC LIBRARIES

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Abstract

There have been rigorous concerns on the management and use of research output in all parts of the world. As a result, international policies and local standards of ethics have been developed to govern the dissemination, access and use of research output. One main strategy used in maintaining ethical consideration in the use of research results is through applying pressure on academic institutions such as universities to ensure effective control of copyrighted works. In Ghana, academic libraries also have a responsibility of managing and adhering to ethical concerns in access and use of research output. This study presents lessons drawn from empirical investigations of the policies, legal and ethical issues/concerns of research output, use and management in Ghana. The study design is qualitative; making use of desk review and primary data. Guided by past studies, the empirical evidence was drawn from an interview conducted for librarians and assistant librarians who were selected from the public universities in Ghana. Besides, extensive review of the policies of various libraries in different universities across the world was done. The results indicate that academic libraries are duly bound to acquire, preserve and disseminate research output for public use within the confine of some ethical considerations. The obligation to adhere to ethical consideration is partly the responsibility of research in general. While libraries have developed internal policies with strategic plans on adherence to legal provisions, application of these are weak. Individual researchers often fail to comply with copyright, intellectual property and licensing issues. It was discovered that research scholars lack detail knowledge on compliance with the policies, legal and ethical issues/concerns of research output, use and management in Ghana. With the advent of information technology, academic libraries in Ghana have the potential of designing and implementing data management projects. However, they face some challenges in the management of research output in different areas including funding, incentives, personnel and infrastructure. The results revealed a gap between the actual and potential capacity in the management of research output among academic libraries in Ghana. It is recommended that management of academic libraries in Ghana should collaborate in the management of research output. Appropriate intervention should include collaborative learning and use of information technology in libraries.

Keywords: University Libraries, Research Ethics, Research Data Management, Plagiarism, Fair Use

1.0 Introduction

Libraries are vital for disseminating information to a wide audience, and developments in information and communication technologies (ICTs) are transforming how this information is processed and accessed (Ferguson *et al.*, 2016). Faculty and students come to the library for information related to other areas, and the library is the place to go in order to explore new areas of knowledge (Albiz, 2013). The relationship between the library and the user is one of confidentiality, and librarians and other information workers have to take appropriate measures to ensure that user data is not shared beyond the original transaction (Ferguson *et al.*, 2016). As a result, academic libraries are becoming increasingly involved in copyright issues, such as through work with course reserves, licensed library resources, and assisting faculty authors with negotiating copyright agreements with publishers (Charbonneau & Priehs, 2014). One of the most common priority areas for a majority of libraries is supporting copyright policies and initiatives, including helping faculties to understand and manage their own copyright (Saunders, 2015).

Data and software are critical components and intellectual properties of most disciplines. Therefore, the ease to which these intellectual properties can be discovered, repurposed and shared is creating concern among educators (Darch & Knox, 2017; Rodriguez *et al.*, 2014). Hence this complicated and ever-changing panorama of academic and digital information calls for some minimal knowledge about copyright; thus the corresponding legislation and alternative options such as copyleft (Muriel-Torrado & Fernandez-Molina, 2015). Despite the fact that university libraries have evolved at a fast pace in recent years, academic libraries are facing enormous pressures of which copyright related problems are not left out and these require them to respond and adapt in order to remain relevant (Saunders, 2015). As the internet keeps on developing, copyright protection has become more important (Sunders, 2014). For instance, incorporating new services to adapt to the changing needs of their users, digital developments have myriad implications for copyright, giving rise to challenging issues that had not been faced in the past (Fernández-Molina *et al.*, 2017).

Notably, plagiarism prevention and detection are part of the library instruction program or library instruction syllabi. Librarians could be contributing more strongly to an academic culture that discourages plagiarism on ethical grounds; it should be discussed in a meaningful and productive way, based on deontological reasoning (Stepchyshyn & Nelson, 2007). Despite the fact that university libraries have evolved at a fast pace in recent years, academic libraries

are facing enormous pressures of which copyright related problems are not left out, and that requires them to respond and adapt in order to remain relevant (Saunders, 2015). For example, a good number of the services presently provided by university libraries entail some risk of infringement of copyright laws.

The process by which a researcher selects, adapts, rejects and improve ethical rules to guide their choice are worthy of study (Darch & Knot, 2017). According to Albrtz (2013), copyright law is central to all, that we do in higher education. We rely on it to protect our unique research and publications from theft. We invoke it when we use others' content in our own teaching and research. Ethical dilemmas are taken to be situations in which there are conflicting ethical obligations, and doing one right thing has the potential to cause harm in another way (Ferguson et al., 2016). According to them, ethical conflicts and ethical dilemmas appear wherever information is generated, organized, stored, distributed and consumed. Scientific data repositories, journal data deposition policies and the development of persistence linking between scholarly publication and data sets have made data more accessible. However, deposition and sharing practices still vary among researchers, journal publishers, data repositories, information providers and universities (MacMillan, 2014). Today's technology has made it possible for students to create, use, and share media rich in creative content in both their personal and academic lives (Rodriguez et al., 2014). Additionally, as the internet keeps developing, copyright protection has become more and more important (Zhu *et al.*, 2013).

In Ghana, higher institutions, especially in the various universities, have set up academic libraries to grant large users including faculty members, students and other corporate researchers' access to large volumes of academic information. However, it is uncertain whether policies, legal and ethical issues/concerns of research output, use and management in academic libraries are enforced with effective compliance. While plagiarism is very common among researchers in general, other copyright laws are often believed to be violated by users of academic libraries. It is therefore, uncertain how academic libraries in Ghana manage access and use of research output within the limits of ethical concerns.

2.0 Objectives of the Study

The main objective of the study is to assess the policies, legal and ethical issues/ concerns of research output, use and management in academic libraries in Ghana. Specifically, the study sought to:

1. examine the data management policies in academic libraries;
2. examine how academic libraries manage access and use of research out;
3. identify the ethical issues regarding the use of research output;
4. analyse the challenges associated with the management of research output;

3.0 Literature Review

On a global perspective, Shachaf (2005) conducted a study among 28 countries involving comparative content analysis of the English versions of codes of ethics proposed by professional associations. He shows that the most frequently identified principles were professional development, integrity, confidentiality or privacy, and free and equal access to information. In the case of access to information, librarians have, either intentionally or by default, become major houses for individuals, organization as well as students to have access to information (data and software), hence the need for them to protect this information from theft. On the other hand, confidentiality and privacy and equal access to information appears in all existing library and information ethics. That is to say that the principles that appear in library association code of ethics are common over the world.

As always, when dealing with the production and dissemination of information, in print or electronically, one must be careful of works copyrighted by a third party, aside from bearing in mind that creations resulting from such activities will have a copyright of their own (Fernández-Molina et al., 2017). Citing an example, Ferguson *et al.* (2016) indicated that Culture and Sport Glasgow (CSG) refused to disclose an information to a requester on the grounds that it was personal information, and that disclosure would be a breach of data protection principles. As such, libraries have the authority for copyright related instruction on campus and can provide both the point of need instruction and expertise to ensure that all students are informed about this issue (Rodriguez *et al.*, 2014).

Most information resources contained in the collections of academic libraries are copyrighted, meaning that a good proportion of the everyday activities they undertake comes into conflict with copyright laws. The examples are numerous and varied. If one copies, photocopies, scans

or digitizes a work, the right of reproduction becomes an issue. If a work is made available to the public, whether on the internet or on an intranet, what comes into play is the right of communication to the public (Fernández-Molina et al., 2017). The rights affected and the precautions to be taken coincide with those of the above process. Some conflicts can be dealt with reasonably under current legislation. Copyright legislation directly affects the habitual work of university students, who are both users and creators of copyright works (Muriel-Torrado & Fernández-Molina, 2015).

Although ethics have long been held to shape researchers' behavior in general, the role of ethical perspectives on promoting or inhibiting data and software sharing has received little attention to date (Darch & Knox, 2017). For instance, intellectual property issues have dominated the study of Albitz (2013) and three key areas in particular that have been prominent among his discussions are “plagiarism, technology transfer, and illegal music downloading”. On the plagiarism scope, it involves directly copying without using quotation marks and attribution according to professional definitions. Plagiarism occurs when one author copies someone else’s writing or ideas without sufficient acknowledgment (Chambliss *et al.* ,2010). Plagiarism, as an intentional or unintentional breach of attribution, is at its core an issue of scientific misconduct, along with falsification and fabrication, as Hauptman (2008) put it.

There are multiple harms perpetrated in and through plagiarism, as Snapper (2004) has pointed out: plagiarism harms not only the author, but the reading public, as well as “scholarly effort itself”. For these reasons, plagiarism is a core information ethics issue. Electronic texts contribute to the problem. With the right tools, individual words, phrases, paragraphs, and even whole pages of text can be readily copied and pasted from a pdf file to a word processing file. If authors model a study after one done by someone else, the originating author should be given credit. If the rationale for a study was suggested in the discussion section of someone else’s article, that person should be given credit. Librarians are frequently or occasionally consulted on plagiarism offenses, but few have codified their positions in library policy statements, mission statements or outcomes assessment plans (Stepchyshyn & Nelson, 2007). Most rely on their institutional policies on plagiarism.

On the part of copyright related instructions, more incentives are needed to build awareness of copyright policies among those working in academic libraries (Charbonneau & Priehs, 2014). This is because researchers such as Yoona and Kim (2017) are of the view that data reuse

intention are directly influenced by the subjective norms of data reuse, attitude towards data reuse and perceived effort involved in data reuse. Explaining further, they indicated that social scientists consider reusing other data because they perceive that doing so will increase their research performance and productivity. However, they were quick to add that, their hesitance to reuse others' data when they think that doing so could potentially cause problems, such as misrepresentation of data, copyright infringement, and fewer publication opportunities. Owing to this, Charbonneau and Priehs (2014) stressed that there is the need for improved communication about relevant library and university policy regarding copyright. That is to say, that librarians need to develop skills that bridge traditional liaison work with the increasingly data driven demands of research, so that they can support researchers with their data management needs and help users discover data across myriad collection and resources (MacMillan, 2014).

Librarians need to understand the barriers to data sharing present in the cultural norms of disciplines and often overwhelming cognitive overhead required to navigate time consuming, complex processes (MacMillan, 2014). Interestingly, Rodriguez and Shipman (2014) analyse copyright instruction for college students in the digital age and discovered that the library sporadically has offered outreach to faculty by conducting workshops about copyright, fair-use and author's right, occasionally in conjunction with campus faculty development office, the center for excellence in teaching and learning. However, most of these measures address only the teaching and research needs of faculty omitting those of diverse students' population.

With particular reference to the impact of new technologies, sources used to assist ethical decision-making, and the contribution case studies can make to ethical understanding and decision-making, Ferguson *et al.* (2016) investigated how library and information science (LIS) professionals experience ethical dilemmas. They suggest that new technologies do not appear to change ethical principles but, when experienced in the workplace, substantially change the factors the professional has to evaluate (Ferguson *et al.*, 2016; Fernández-Molina *et al.* 2017). As a result, academic libraries can support data reuse by providing data search and management services, consulting on copyright and ethical issues in data reuse and educating researchers about data reuse practices (Yoona & Kim, 2017). In the universities, Charbonneau and Priehs (2014) revealed that identifying a copyright person may be helpful in alleviating any frustration and confusion, because evidence suggests that most of the librarians who work in academic libraries feel they have the subject knowledge necessary to help their constituent

with research data services (Tenopir *et al.*, 2014). Therefore, identifying this designated copyright persons may be instrumental in helping to educate the rest of the library staff responsible for furnishing current updates to copyright cases (Charbonneau & Priehs, 2014). Albitz (2013) further states that as the importance of copyright education grows, it is critical to ensure that “the people assigned this responsibility have the resources and support to perform their responsibilities in the most effective and efficient way possible”. He stressed that components of the job description for a copyright officer would consist of: consulting with members of the educational community on copyright-related issues; educating the community through programming of various types; creating and implementing policy related to copyright; and advocating for the application of copyright law that supports teaching, learning and research. Key stakeholders are also equally trying to make data more discoverable through bi-directional links, and metadata across the globe (MacMillan, 2014). Additionally, a comprehensive training covering a range of copyright laws is also warranted to assist in the development of staff in providing copyright related information to library users (Charbonneau & Priehs, 2014). In support, Fernández-Molina *et al.* (2017) indicated in their study on academic libraries and copyright, that staff training embraces all activities that the library develops in order to develop and update the formation of personnel.

In exploring the role of attitudinal belief, attitudinal norms and data repositories among social scientists, Yoona and Kim (2017) show that; social scientists develop positive attitudes towards data reuse if they believe that their communities or disciplines have strong norms of data reuse. According to MacMillan (2014), as data types, sets, repositories and findings aids are all multiplying, there is an urgent requirement to maintain current knowledge of available resources in the disciplines, a call in his view that may be answered by librarians as well as researchers.

As indicated by Rodriguez *et al.* (2014), understanding the ethical use or possible abuse of information and creative content is competency need that even goes beyond the classroom and into the lives and future workplace demand of students. As a result, in this digital age copyright education on college campuses is often decentralized and handled by multiple units. It is clear that some academic research libraries are offering a verity of research data management and more plans to do so within the next two years (Tenopir *et al.*, 2014). Most commonly these services are extension of traditional informational or consultative services, such as helping faculty and students locate datasets or repositories. This is in line with Ferguson’s *et al.* (2016)

study that relevant codes of ethics are satisfactory on traditional library issues of access and confidentiality but do not address the ethical challenges of current and potential digital environments. However, like many small to medium size universities, like Oakland University (OU), have neither a copyright office nor a designated academic unit that handles copyright education (Rodriguez et al., 2014). This is confirmed by Muriel-Torrado and Fernández-Molina's (2015) findings that knowledge of copyright is far below the minimal requirements. Muriel-Torrado and Fernández-Molina's (2015) further explained that the most basic aspects of copyright are unknown or misunderstood, for instance, how long copyright lasts or the meaning of public domain. Equally, despite the suggestion of Ferguson *et al.* (2016) that relevant codes of ethics are satisfactory on traditional library issues of access and confidentiality, they were, however, quick to add that it does not address the ethical challenges of current and potential digital environments. These insufficiencies reflect a deeper dilemma, because without such knowledge, not only university students but researchers will not be able to make adequate use of the work created by others, and run a high risk of committing infractions of copyright. Also, considering that universities are reported not having a designated copyright center or expert, this may result in confusion and has implications for copyright management and the coordination of services and support across campus (Charbonneau & Priehs, 2014).

4.0 Methodology

4.1 Research design

This study used an exploratory design to investigate the policies, legal and ethical issues of research output, use and management in academic libraries. Neuman (2014) explains that exploratory research rarely yields definitive answers and hence requires the researcher to be creative, open minded, and flexible; adopt an investigative stance; and explore all sources of information. Most exploratory research uses qualitative data, allows room for judgments and multiple perspectives (Cohen, Manion & Morrison, 2007). This study therefore, is a qualitative research which is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2014).

4.2 Study Population and Sampling

The study population consisted of academic libraries of public universities in Ghana. The respondents were professional librarians including assistant librarians in the public universities in Ghana. Professional librarians are responsible for managing library resources including;

ensuring adherence to the ethical issues regarding the use of research outputs. Their exclusive knowledge and involvement in library resource management made them the primary respondents for this study.

The public universities in Ghana, excluding the technical universities, are the following: University of Ghana, University of Cape Coast, Kwame Nkrumah University of Science and Technology, University for Development Studies, University of Education, Winneba, University of Energy and Natural Resources, University of Health and Allied Sciences and University of Mines and Technology. Non-probability sampling technique was used to select the respondents for the study. Specifically, purposive sampling was used to select Librarians, Deputy Librarians, Senior Assistant Librarians, Assistant Librarians, Junior Assistant Librarians from the University of Ghana, University for Development Studies and Kwame Nkrumah University for Science and Technology respectively. The primary consideration in purposive sampling is the researcher's judgment as to who can provide the best information to achieve the objectives of your study (Kumar, 2011).

4.3 Data and Method of Analysis

Only primary data were gathered and used for this study. The primary data were gathered from an in-depth interview of three respondents each from the selected universities. The main issues discussed during the interview included data management policies in academic libraries, access and use of research output in libraries, ethical issues regarding use of research output, and the challenges associated with the management of research output in libraries. The data were analysed using qualitative methods. This specifically, involved quotations of interviewees' responses and interpreting them within the context of the study.

5.0 Results and Discussion

This section presents the results and discussion of the study. Various issues have been discussed with much focus on the objective of the study. They include data management policies in academic libraries, access and use of research output in academic libraries, ethical issues regarding the use of research output in academic libraries, and the challenges associated with the management of research output in academic libraries.

5.1 Data Management Policies

Data management policies are considered as integral aspects of academic libraries. This study provides mixed findings on the evidence of data management policies in academic libraries in Ghana. While some respondents have not been able to cite examples of data management policies, others in an interview identified policies in broad areas including institutional repository, records management and archives policies. A respondent shared the following remark regarding how the University for Development Studies implements data management policies in an interview:

There are guidelines in the institutional repository policy on copyright. Besides, there are other standards being put in place such as data backup on local and remote external servers, ensuring data integrity and security with a contingency plan for restoring lost data, and the use of metadata to record details of research output [Respondent 1; Junior Assistant Librarian].

Another respondent shared similar views regarding how the University of Ghana applies data management standards in an interview:

The University has assigned various roles to some key administrators. Such administrators have been given a general responsibility for ensuring that appropriate policies and procedures are in place to ensure compliance with best practices such as record keeping standards and legislative requirements under the Public Records and Archives Administration Act, 1997 (Act 535) [Respondent 2; Senior Assistant Librarian].

The caption above has revealed some standards of good practice of some academic libraries in Ghana. The results imply that there are guidelines for the protection of intellectual property rights regarding the use of research output in the library. Besides, there are internal practices that aid professional librarians to protect collections in their libraries. This effort does not only ensure the availability of reference materials, but also provide security for different research output in the Library. The adoption of technology in the management of research output such as the use of metadata represents an effective method of managing research output in academic libraries.

However, one respondent in an interview maintained that there is no data management policy in the Library and hence was not able to mention any policy in relation to data management in the Library. This suggests that the respondent has no knowledge regarding the existing data management policies in the Library. The finding implies that even if data management policies exist that govern the use of the Library resources, they are not effective and not widely known by some staff of the Library. Hence application of data management policies in some academic libraries in Ghana may be weak.

5.2 Access and Use of Research Output

Academic libraries pay attention to ethical issues regarding user access to research output. Copyright policies are thus ensured. One main area of application of this is effective monitoring of the activities of users regarding adherence to the policies and ethical concerns of the use of library resources. A respondent made a comment on this in an interview:

Policies on access and use of library materials are regularly monitored and reviewed to ensure that they remain relevant to the University business aims, requirement and applicable laws. Staff compliance with the policies and associated procedures are monitored on an on-going basis through self-assessment by Heads of Department, University Librarian and Archivist/Records Manager. These policies are reviewed in every five years [Respondent 2; Senior Assistant Librarian].

The results imply that there has been a periodic assessment of the policies governing the use of research materials in academic libraries.

To create user awareness on the use of the library resources, capacity building programmes are being organized by academic libraries to offer orientation to researchers. This is considered useful and effective among the sampled libraries. A respondent from Balme Library (University Ghana Library) shared his experience regarding training of users on the library resources:

Management of the University Library regularly organizes workshops to train staff and researchers on how to access relevant data in their fields of study. These are usually done in collaboration with Elsevier Publications who provides experts to facilitate the training [Respondent 2; Senior Assistant Librarian].

This finding implies that the Balme Library (University of Ghana) considers human resource development in the use of Library resources very important. Besides, the collaboration with external institutions such as Elsevier Publications will strengthen the quality of the training to facilitate users' access to large volumes of research output.

Similar findings were revealed from other respondents from University for Development Studies and Kwame Nkrumah University of Science and Technology. It was discovered that both institutions have also considered training staff and other researchers in the use of the library resources as an essential aspect of facilitating access to the resources. Two respondents shared their views as follows:

There is an avenue for training – through University Summer School and Research Management Seminar as well as E-Resources Training [Respondent 3; Senior Assistant Librarian].

There are training programmes through workshops, seminars, and Academic Board meetings. Workshops and seminars are also organized periodically to sensitize researchers on available tools and new research materials that are essential to academic studies [Respondent 1; Junior Assistant Librarian].

The findings suggest that management of some academic libraries carry out regular training of users on the use of the library resources. Besides, other platforms such as Academic Board meetings and seminar presentations at the University are used to disseminate information on the availability and use of library resources. Hence effective management of research output is being supported by interventions such as training programmes to influence wider access.

Sustainable access to research data is one of the critical issues that has been considered by some academic libraries in Ghana. The results of this study point out that some academic libraries have adopted technological innovations in the management of research data. This is in the form of protecting the existing library resources for sustainable access. A Senior Assistant Librarian from the University of Ghana shared his experience regarding how the Balme Library protects research data for sustainable access as follows:

The servers and content of the repository are conserved (backed up, maintained) according to current best practice by the Library's Information Technology personnel in collaboration with the staff of University of Ghana Computing Systems (UGCS).

Master copies of all archived items are stored on the archival cloud server in TIFF format [Respondent 2; Assistant Librarian].

The use of information technology in libraries is one of the recent innovation contribute effectively to data management in libraries. Besides, the introduction of information technology in libraries will not only ensure data availability but can increase user access through the electronic resources section of libraries. This means that researchers can have access to library resources from different parts of the world.

From the perspective of respondents from the University for Development Studies Library, the use of information technology is also facilitating effective collaboration with other libraries and research institutions in sharing research data for wider access. Accordingly, a respondent had this to say:

The University for Development Studies has collaborated with other organizations to increase user access to academic information. Making research data/output available on the Library's website, and hence creating awareness of users about the resources at both local and international conference/seminars/workshops and inter-institutional gatherings. [Respondent 1; Junior Assistant Librarian].

Their views support the conclusion that collaboration among academic libraries will make the resources available to many users because of the open access resources. Besides, participants' organizations will also contribute towards protecting data loss while ensuring user adherence to ethical issues in the use of library resources.

5.3 Ethical Issues Regarding the Use of Research Output

The findings of the study include an analysis of some ethical issues regarding the use of research output in academic libraries. While some researchers happen to be aware of the ethical considerations on the use of research output, adherence to all of them is sometimes compromised. It was discovered that plagiarism is one of the major ethical issues that is common among researchers. A respondent from the University of Ghana shared his experience on this and how their institution is responding to it as follows:

Plagiarism has been a problem with the use of research data among our users. The Library has, however, acquired plagiarism check software (TurnItIn) that helps to

ensure that research data are properly and appropriately used [Respondent 2; Senior Assistant Librarian].

Another respondent shared the response below with the researcher in an interview:

There has been an unlawful use of research data (illegal photocopying), creating awareness on fair-use of research data. The University has also acquired anti-plagiarism software to check unlawful copying [Respondent 1; Junior Assistant Librarian].

While plagiarism is a known serious ethical issue that some researchers and students often commit, issues on illegal photocopying of research output has been observed among some researchers and students. From the experience of a respondent from the University for Development Studies Library, some users photocopy library resources. While it is possible, to check plagiarism with software, illegal photocopying may be difficult to detect thus leading to a greater abuse of research results in academic libraries.

5.4 Challenges Associated with the Management of Research Output

Despite the various policies, ethical standards and the use of technology in the management of research output in academic libraries, there are challenges associated with these efforts as discovered by the findings of the study.

The main challenges facing academic libraries in the management of research data include weak or nonexistence of explicit legal policy for management of research data, limited knowledge of existing staff on the ethical issues in library resource use, copyright protection of access to data and limited financial resources to access restricted resources. A respondent from the University for Development Studies shared his experience on this with the researcher as follows:

The non-existence of explicit legal layout or policy for management of research data makes it difficult in enforcing ethics and legalities in management and use of research output. Besides, most library staff are not aware of legal and ethical issues with respect to the use of research output [Respondent 1; Junior Assistant Librarian].

The caption above suggests that not only do some users of academic libraries fail to adhere to the ethical issues of research data use but some staff of academic libraries are unaware of the ethical issues and policies regarding research data management and use. This means that enforcement of some of the policies and legal issues on research data use and management will be weak.

It was also discovered that access to some databases by academic libraries is restricted and often required some financial resources to procure such resources. This means one of the critical challenges facing academic libraries, as pointed out by a respondent from the University of Ghana's Library (Balme Library), is as follows:

Accesses to some research findings are restricted with copyright protection. Besides, financial resources are limited and this has challenged wider access to research data/output [Respondent 2; Senior Assistant Librarian].

The findings indicate that some copyright protection restrict academic libraries from accessing some relevant research results that could be of importance to researchers. Besides, the only way to overcome such barriers is to have the right of use through procurement of the resources. However, the financial requirement involved is sometimes high for the academic libraries. This suggests that the University Libraries have financial challenges regarding accessing academic information.

6.0 Conclusion

Some academic libraries in Ghana are making the necessary efforts through policies and technology to strengthen data management, facilitate access, and ensure user adherence to ethical concerns in research and publications. However, there has not been effective collaboration with some institutions thus leading to restriction of some essential research output. The results revealed a gap between the actual and potential capacity in the management of research output among academic libraries in Ghana.

Recommendations

It is recommended that:

Management of academic libraries in Ghana should collaborate in the management of research output;

Appropriate intervention should include collaborative learning and use of information technology in libraries; and

Measures should be put in place to identify people who flaunt the policies so as to re-orient them to use data and publications within the limits of the copyright law.

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INFORMATION SYSTEM (IS) ISSUES IN MANAGING INSTITUTIONAL REPOSITORIES (IR) IN ACADEMIC LIBRARIES

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Abstract

In order for academic libraries to perform their role of acquiring and disseminating information for academic and research activities effectively in the digital age, academic libraries have resorted to the use of digital tools of which information system (IS) is a major component. From about the 1950s, academic libraries have engaged in the use of different types of information systems and these systems vary along the needs of libraries and their users. The need for academic libraries to manage scholarly material which is institutionally defined, called for libraries to use a specific information system; Digital Asset Management System (DAMS) such as Dspace, Eprints, FEDORA and Greenstone in addition to other information systems which are used for other functions in academic libraries such as Integrated Library System (ILS) and Electronic Resource Management System (ERMS).

In this 21st century these systems have been merged to what is termed Library Service platforms (examples are Alma, Quali OLE and Sierra) that provide features for print and electronic resource management helping to streamline workflow through built-in knowledge bases with web feature.

This paper therefore aims at exploring the literature to determine the features of library service platforms and how they can be used to manage institutional repositories in academic libraries.

Keywords: Academic libraries, Information systems, Institutional Repositories (IR), Library service platforms

Introduction

Academic libraries are regarded as the heart of any academic institution. Throughout history, academic libraries have performed their role of providing content that meet the needs of academic institutions. Makori (2013) stated that academic libraries provide information resources and services that support teaching, learning, research and community services in

universities. They are therefore posited as warehouse of information and knowledge which serves as strategic resources for the development of curriculum.

The relevance of academic libraries is still evident in the digital age as they have embraced information and communication technology to collect, organize, store and disseminate information for the advancement of knowledge. One of such great initiatives is the establishment of Institutional Repositories in most academic libraries across the globe. Lynch, (2003) recognized the role academic libraries are playing in the setting up of institutional repositories in academic institutions. Lynch therefore intimated that it is possible for IR to be established by different units at different universities but for an IR to be effective, Lynch recommended collaboration among librarians, information technologists, archives and records managers, faculty, university administrators and policymakers. It is worth noting that in most universities, the libraries have taken the initiative to establish IR thereby performing their traditional role with current technology.

Academic libraries collect, manage and disseminate information materials of all kinds including traditional (physical) materials, subscribed and open source electronic databases and IR among others. Libraries first adopted integrated library system (ILS) also known as Library Management system (LMS) to help manage their predominantly print collections. These systems have been defined by Reitz (2004) as an integrated set of applications designed to perform the business and technical functions of a library, such as acquisitions, cataloging, and the provision of public access.

The availability of technology has introduced electronic resources which are being acquired by libraries. The traditional LMS are not able to manage the electronic acquisition of libraries (Fu and Fitzgerald 2013). This led to the introduction of other IS like Electronic Resource Management System (ERMS), Digital Asset Management System (DAMS) of which Institutional Repository (IR) systems are part, to aid in new library workflows. The development of an institutional repository for instance was noted by (Breeding, 2015) when he stated that, libraries also maintain repository platforms which store, describe and manage documents and content objects on behalf of their institutions. Digital asset management systems are used to manage such collections and “Digital preservation platforms provide additional layers of functionality to a digital asset management environment to ensure the long-term viability of digital materials.”

Information systems in Academic libraries

According to Breeding, (2015), all the information systems that are used by libraries to manage their collections are regarded as resource management system. Resource management systems used in libraries currently include library services platforms, integrated library systems, electronic resource management systems, and digital collections management systems and other products that may be used for other categories of specialized materials.

Makori and Osebe, (2016) provided the list of IS that have been introduced in 2016 in libraries as enterprise resource planning system, cloud enterprise resource planning, integrated information management and automated digital information systems that are used to manage and support access and use of information from common databases and remote sites. This meant that, libraries had to acquire different information systems in order to manage the different types of collection they have.

Though the introduction of information systems such as Electronic Resource Management (ERM), Digital Asset Management (DAM), and Institutional Repository (IR) are enabling libraries manage collections in electronic format in addition to the Library management system (LMS), evidence from available literature proves that this is not a best practice. Fu and Fitzgerald (2013), for instance intimated that it would be more efficient to manage print and electronic resources using a single, unified workflow and interface in this era of global financial crises to help reduce multiple licensing and maintenance cost. Green (2014) also does not agree to the use of other IS in addition to ILS and proposed the development of an entirely new system in libraries that will enable libraries perform all functions with one system. Pace (2009) also called for integration of all other IS into ILMS to aid work flow. This has brought about current IS in libraries which are being referred to as library service platforms.

Library services platform is a term coined by Marshall Breeding in 2011 to describe a type of library resource management system with characteristics that differ substantially from integrated library system. He proposed the term for three main reasons as has been noted from his writings. The first reason is to help differentiate a new set of products that were being introduced onto the library market from the existing integrated library systems which were being deemed as inadequate. The second reason for the introduction of the term by Breeding is to help rebrand library resource management systems as the existing ones at the time

(integrated library systems) were connoted with a number of inadequacies. The third reason is to

“provide a vendor-neutral product category. As each of these products was being introduced, each vendor posited its own name for its approach. Ex Libris used Unified Resource Management, and OCLC used Web-Scale Management Service. Vendors tend not to use each other’s product categories for new products, so providing a neutral term was needed. The term has since been adopted in both the library and vendor communities”

Breeding admits “the introduction of the term has also introduced some confusion; especially since many products fit some of its characteristics and not others... the lines of distinction remain blurry”.

Examples of library service platforms as noted by Breeding, (2015) are OCLC WorldShare Management Services, Ex Libris Alma, Sierra from Innovative Interfaces, ProQuest Intota, Kuali OLE, SirsiDynix BLUEcloud Suite, Spydus 9 from Civica (Breeding, 2015). The presence of such systems, he noted, is heavily felt in North America.

It is however worthy to note that, the emergence of library service platforms is not a new phenomenon to the library environment. Libraries have constantly experienced a number of changes in the software environment ranging from use of single modules in managing different aspect of library operation, the use of integrated library management system and next generation library system. Breeding, (2015) noted this development as “constant theme” in library automation systems where systems are consolidated into integrated or unified platforms;

The emergence of library service platforms brings another round of consolidation of functionality that brings together several categories of functionality that had been handled in separate products. The library services platform in general will replace multiple incumbent products, including the integrated library system, any formal or informal products or processes to managing electronic resources, and knowledge bases of e-content resources. These platforms can also address link resolution, though this functionality spans a gray area between resource management and discovery (Breeding, 2015).

Library service platforms and Institutional repositories in academic libraries

Information systems issues are major ones in managing an IR, especially in academic libraries burdened with the responsibility of managing other resources alongside an IR. As posited by Lynch, (2003) , information systems and other IT technologies are major tools in the management of an institutional repository. Therefore, any change in IS and its associated technology should be managed properly to aid the migration of digital content from one set of technologies to the next. Ferreira, Baptista, Rodrigues, & Saraiva, (2008) also intimated that IR implementation is not only about software implementation and populating the database. It is also about having available mechanisms in place to ensure that the IR is actually being used by the general public. It therefore means that the software should be user friendly to encourage use from the general public. One other way will be to get the content of the IR or at least its bibliographic records integrated in the wider library system. This can be done through discovery services or Library service platforms.

With the current consolidation of major IS in the library industry into a common one, one question remains for libraries that manage IR such as academic libraries, and that is; will library service platforms help manage IR? The answer to this question is crucial for libraries since in the opinion of Ferreira et al., (2008) the selection of software is the first process to be undertaken when initiating an IR implementation project.

To help the dilemma of academic libraries, six major functional characteristics of library service platforms have been analyzed to help determine their benefits in managing IR in order to help academic libraries avoid managing multiple IS.

Characteristics of library service platforms

- **Management of Electronic and Print Formats of Materials**

Library service platforms according to (Breeding, 2015) consolidates the management of print and electronic materials into a single platform which makes use of a common data store, work - flows, and other points of efficiency. They have features for managing archival materials, institutional records, and large-scale digital assets. Though libraries currently use other Digital asset management systems, the management of IR may eventually be subsumed within library services platforms. Cho (2011) also presented the features of the library service platforms as having functions to manage acquired digital licensed data (ERMS), digital content created and managed by the library (IR), archiving system, LMS, and organic interoperation with academic

management system and other knowledge databases across the internet. Library service platforms also provide additional functions among which are library portal, meta-search and link resolver.

- **Extensive Metadata Management**

Library services platform supports multiple metadata standard which therefore enables it to be used to manage multiple data formats. Metadata standards such as MARC, Dublin Core and other XML standards are supported. This feature serves the needs of libraries best as they are confronted with the situation of managing multiple formats of collection materials which demands other metadata standards apart from MARC which is widely used in library management systems. This is done through a normalized internal set of data structures or through a mechanism that natively stores different types of records (Breeding, 2015).

- **Knowledge Bases**

In outlining the features of the library service platforms, Breeding, (2015) again posits that they serve as a tool of knowledge bases and bibliographic service from which local collections are drawn or defined. The use of this feature for an IR gives the library the opportunity for its locally digitized collection to become part of the globalized information world. This affords the opportunity to libraries using the knowledge base access to information resources beyond and above their local collection as well as to create digital contents which can be accessed anywhere in the world (Omekwu and Echezona, 2009). Rafiq and Ameen, (2013) also noted that libraries embark on digitizing their collections with the aim of providing increased access and to preserve the materials. Therefore, the use of knowledge base feature helps to meet this aim as the materials can be accessed by a number of libraries subscribing to the knowledge base.

- **Built-in Collection Analytics**

This feature according to Breeding, (2015) enables the software to use a multi-tenant platform to perform analysis on the collection held using the wider knowledge base. It therefore allows a library to analyze its collection in the wider context of other libraries on the platform.

- **Discovery**

Library services platforms are developed to integrate with a discovery service which searches the entire collection of a library unlike the traditional online catalogue which is limited to only

the catalogue entries of a library (Breeding, 2015). This feature will be very helpful as the current practice in most libraries is to conduct a sole search in the IR.

- **Cloud base**

Library service platforms come with a feature of being hosted in the clouds. This releases libraries from the burden of technically managing hardware and software. The vendor is responsible for managing the software (Breeding, 2015). This enables libraries not to hire additional technical staff or worry over how to get the software running which is a major challenge to most libraries, especially in developing countries.

Challenges of Library service platforms

Two major scholars in library software development Breeding and Chad have identified peculiar challenges with library service platforms as they are being delivered by vendors currently. Breeding, (2015) noted that though library services platform may replace the integrated library system, the electronic resource management system, and a link resolver and its knowledge base, library services platforms generally do not necessarily serve as publishing platforms to replace institutional repository or large-scale digital asset management systems. A number of library service platforms have capabilities of supporting IR but this feature is not at the advanced stage yet. Breeding (2015) therefore thinks that “Library services platforms should not be considered monolithic self-contained systems that become the only technology product a library will need” Chad, (2016) also indicated that Library services platforms lack interoperability; developers develop the software in such a way that it cannot take on additional software from any other developer. Chad acknowledges the fact that library services platforms have integrated print and electronic resource management but this system has not yet made enough provision for University libraries that may manage Institutional repositories, archives and special collections, research data management and publishing. Chad (2016) therefore thinks that interoperability in the library software use is more of myth than a reality.

Recommendations

Based on the features identified from the literature of library services platforms, the following recommendations are made;

- The developers of the library service platforms should enhance the Digital asset management and publishing features of their products. This will help serve the major

need of not having to acquire additional software in libraries such as academic libraries that are into digitization.

- Library service platforms should be developed with features of interoperability. This will enable libraries to add on any other system that will help meet specific needs which may not be present in the library service platforms.
- Open access initiative organizations should embrace this idea to develop a number of such platforms for the library industry. This will help the less endowed libraries in developing countries especially to make use of such systems to manage their multi format collections.
- Library professionals should take the initiative to study the use of library service platforms to make themselves ready for the adoption of such systems.

Conclusion

Academic libraries and libraries in general have for many years battled the issue of software selection and use to manage their collections and provide enhanced services. Software vendors along the historical lines have provided some level of solution from ILM/LMS, second generation library system, and currently library service platform.

Library professionals have for all these years looked forward to interoperability in the systems that they use. The introduction of the library services platform which aims at providing single software that can help a library perform its functions of managing different forms of collection from print to electronic is a great achievement for the library industry. This system will help serve as a one-stop-shop for a library's collection management software need in the near future. It will therefore be prudent for software developers and vendors to enhance the features of library service platforms that will support huge Institutional Repository and publishing initiatives so that libraries that can afford and will want to use such systems will be able to gain the maximum benefits from their use.

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**STORAGE MEDIA USE AND CHALLENGES: THE CASE OF DIGITIZATION
UNIT OF KASHIM IBRAHIM LIBRARY, AHMADU BELLO UNIVERSITY, ZARIA,
NIGERIA**

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Abstract

This paper investigates the storage media used for preserving digital information resources and its challenges in the Digitization Unit of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria. In order to achieve the objective of the study, three research questions were raised for the purpose of the study. A qualitative research method was used with a purposive sampling technique adopted for the study; the instruments used to collect data were structured interview and observation. The responses from the respondents who were the staff of the Digitization Unit were analyzed descriptively using tables. The results of the study revealed that external hard drive, CD/DVD, Internal server were some of the storage media used in the Digitization Unit of the Library. It was also discovered that storing uploaded digitized local contents formed part of the reasons for using storage media. Finally, damaged CD/DVD and corrupt files were said to be some of the challenges faced while using the storage media. The paper recommends the use of mirror server, refreshment, migration and destruction of passwords to ensure perpetuity in the use of storage media in the Digitization Unit of Kashim Ibrahim Library.

Keywords: Storage Media, Library Digitization, ICT Digital Information Resources

Introduction

The emergence of Information and Communication Technology (ICT) has changed the way information resources are preserved in libraries, archives and information centres. Through the use of ICT, institutions are not only able to store a large amount of information but can also have quick access to it for present use, future use and long term-reuse. The rate at which digital information resources are created keeps increasing daily and their management becomes a challenge, therefore there is the need to choose the right storage media to be used for storing the digital information resources. Information resources in libraries include e-textbooks, these

and dissertations, question papers, conference proceedings, seminar papers, technical report, undergraduate project, papers, maps, online databases, pictures, music, etc. Digital information resources are information such as text, graphics, images and sounds in the non-print format which can be accessed through the use of a computer. Nwabueze and Oghenetega (2015) stated that digital information resources are information in soft copy and are accessible through computer machines and other corresponding ICT tools.

Digitization in the library is the process of converting information resources such as local contents, sound recordings and pictures from analogue to digital form. The aim of digitization is to increase access, preserve resources and improved library services.

Storage media is a computing hardware that is used for storing, porting and extracting information; for temporary or permanent use. The digital storage medium includes optic and magnetic technology. The optical technology includes the DVD and CD-ROM, while the magnetic technology includes floppy disk hard drives and removable drives.

Without an effective storage media of digital information resources in libraries, access via digital storage devices becomes difficult and produces little or no access to resources that can be used for teaching, learning and research.

Statement of the Problem

The aim of a university library is to acquire, process, store, preserve and disseminate information resources in print and non-print format to support, teaching, learning and research for present and future generation. It was observed by Gbaje (2011) that digital information resources will cease to be available without proper management intervention. Gbaje (2011) posits that as a result of changes in technology hardware and software and these serve as a threat to digital storage because the media are designed in such a way that it must be compatible with one another.

It is as a result of this that the research wants to determine if the Digitization Unit of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria is faced with such a challenge and whether or not it is bracing up to face the challenge.

The Objectives of the Study

The following were the objectives of the study.

1. To identify the types of storage media used in the Digitization Unit of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria.
2. To determine the purpose of the storage media use in the Digitization Unit of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria.
3. To determine the challenges faced in using storage media in the Digitization Unit of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria.

Literature Review

Gbaje (2011) stated that the continuous changes in computer hardware and software can cause technological obsolescence and this can pose a threat to storage media because it leads to the loss of the means of accessing information in digital form, and to tackle this problem, information resource needs to be migrated from one platform or format to another due to the constant changes in hardware and software so as to meet up with the current changes and upgrades. Gbaje (2011) and also Kol and Oltmans (2005) asserted that the purpose of migration is to preserve the integrity of digital objects and to retain the ability of clients to retrieve, display, and otherwise, use them in the face of constantly changing technology. With migration, file formats will be converted into new formats as soon as the original formats run the risk of becoming obsolete.

The two primary technologies used for digital storage are magnetic and optical storage media. The magnetic media come in a number of formats; the floppy disk, tape systems, removable disks and hard drives. They all rely on magnetic particles in the recording of the substrate that changes direction in the presence of a magnetic field while optical technology includes CD-ROM, CD-R/W, DVD-ROM, DVD-R/W and DVD+R/W are read using a laser beam which reflects the light from the surface of the disc in areas of differential reflectivity (Gbaje, 2011). Another serious challenge facing digital preservation is technological obsolescence which is caused by continuous upgrade of operating systems, programming language applications and storage media due to commercial interest the devices, software and formats used to store information are often designed for obsolescence. In other words, corporations that design these hardware and software design them with a shelf-life in order to ensure the sale of latest upgrades and models (Reyes, 2013). Moghaddam (2012) stated that emulator should be used to recreate the functionality of obsolete technical environments on modern computer platforms

Mageto (2009) provided general advice on issues that should be considered by the creators and managers of digital information resources when selecting physical storage media for long-term preservation. Mageto (2009) points out that server-based hard disk storage is the most effective and secure storage regime for digital resources, provided it is well managed and includes an effective backup strategy. Mageto (2009) further states that any physical storage medium is, by definition, completely dependent upon very specific combinations of hardware and software for access and the accessibility of information stored on such media is therefore highly vulnerable in today's rapidly evolving technological environment. The need to periodically refresh digital resources onto new media is inescapable for the near future. Nevertheless, careful selection of appropriate media can maximize the periods between refreshment cycles and simplify the refreshment process, in addition to providing the securest storage environment possible.

Media deterioration is also a problem of obsolescence in retrieval and playback technologies. Innovation in the computer hardware, storage and software industries continues at a rapid pace, usually yielding greater storage and processing capacities at lower cost. Devices, processes and software for recording and storing information are being replaced with new products and methods on a regular three to five years cycle. Records created in digital form, in the first instance, and those converted retrospectively from paper to microfilm to digital form are equally vulnerable to technological obsolescence.

Ekoja and Gbaje (2012) asserted that digitization and archiving of digital materials have also brought upon libraries the responsibility to preserve them for future use and reuse. Preservation is aimed at ensuring that the digital materials remain accessible and useable as long as it is required, notwithstanding technological (hardware and software) change.

Methodology

The qualitative research design was adopted for the purpose of this study. The population of the study covered the staff of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria which consisted of 560 staff. The subject of the study were the staff of the Digitization Unit who were purposively selected. Their total number was eight (8) and they automatically formed the sample size for the study.

Interview and observation were the instruments used to collect data for the study and triangulation was used to determine the validity of the data collected. The data collected was organized, tabulated and discussed descriptively.

Results and Discussions

The response rate indicated that only 6 (75%) out of the (8) staff were interviewed because two of the staff were absent at the time of the interview.

Table 1: Storage Media used in the Digitization Unit of Kashim Ibrahim Library

Flash Drive	X	
CD-ROM/Hard Disk		√
Computer Hard Disk		√
External Network Drive		√
Memory Card	X	
Microfilm	X	
Memory Sticks	X	
Floppy Disk	X	
Mirror Server	X	
Internal Server		√
Software		√

Key: X= Not Available √=Available

Table 1 above revealed that during the interview and observation, it was discovered that the CD Rom/DVD, computer hard disk, external network drive, software and server were said to be storage media used in Kashim Ibrahim Library to store Digital Information Resources (DIRs) such as theses, dissertations, seminar and conference proceedings etc. Other forms of storage media like flash, memory card, microfilm, memory sticks, floppy disk and mirror servers were not put to use as storage media. This implies that the Library is meeting up with expectation only that there are better options if used, could be more effective and reliable.

Table 2: Use of Storage Media in the Digitization Unit of Kashim Ibrahim Library

Storing individual Information Resources		√
Storing Repository Work		√
Storing Uploaded Information		√

Storing Departmental Assignment	X	
Storing Past Exam Question Papers	X	
Storing Continuous Assessments Scores	X	
Storing Thesis and Dissertations		√
Storing Undergraduate project	X	

Key: X= Not Available √=Available

Table 2 above revealed, at the time of the interview, that the storage media was used in Kashim Ibrahim Library to preserve information about the results of the research output carried out by members of the University community, information about resources that have been uploaded, information about the repository work, and information about individual personal research work such as conferences, seminars and theses. It was discovered that some of the information on the storage media in the Digitization Unit served as a backup in case of failure or any type of threat. This implies that the information resources stored on the storage media were mainly preserved for easy access and retrieval.

Table 3: Challenges Faced in the use of Storage Media in the Digitization Unit of Kashim Ibrahim Library

Passworded storage devices	√
Damaged storage devices	√
Empty storage devices	√
Corrupted storage devices	√

Key: X= Not Available √=Available

Table 3 above revealed that password storage devices, damaged storage devices, empty storage devices and corrupted storage devices were said to be some of the challenges faced in the use of storage media in the Digitization Unit. This implies that information on the research output of the University community will become difficult to access, upload and retrieve if the challenges were not addressed as and when due.

Conclusion

Storage media is vital to the preservation of digital information resources. External hard drive, internal server and CD Rom were identified as the storage media used in the Digitization Unit of Kashim Ibrahim Library, Ahmadu Bello University, Zaria, Nigeria. The study confirmed that storage media were used to keep information about individual information resources,

repository work and the information uploaded about the research output of the University community.

Finally, corrupted CD-ROM, damaged CD-ROM, passworded information, empty CD-ROM were some of the challenges identified.

Recommendations

The following recommendations are made based on the findings of the study;

1. Mirror server should be used as a backup in case of technological failure.
2. Constant refreshing, replication, emulation and migration of storage media should be adopted in the Digitization Unit of Kashim Ibrahim Library in order to ensure continuous access and easy retrieval of the information on the storage media.
3. The digital information stored on the storage media should not be provided with passwords, and the ones with password should be destroyed.

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DATA ANALYSIS SOFTWARE USAGE AMONG UNIVERSITY OF CAPE COAST LECTURERS: IMPLICATIONS FOR CAPACITY BUILDING PROGRAMMES

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Abstract

This study aimed to explore the extent of data analysis software usage among lecturers in the University of Cape Coast in order to identify areas of deficiencies to inform the design of capacity building programmes. Core among the issues investigated included: lecturers' perceived level of proficiency, training readiness, the need for the establishment of a data analysis support centre, as well as preferred type of capacity building programmes. The study employed a descriptive census design, and a structured questionnaire was used for data collection. A total number of 319 lecturers in the University of Cape Coast responded to the questionnaire. The generated data was analyzed using frequencies, descriptive statistics and inferential statistics. Among the key findings were that lecturers frequently used more quantitative than qualitative data analysis software. The most used quantitative data analysis softwares were SPSS, Excel and STATA. Lecturers rated themselves moderately proficient in the use of their preferred data analysis software, and also preferred the establishment of a data analysis support centre to facilitate the analysis of their work. Lecturers preferred training methods for capacity building programmes were live lecture/demonstration, small group discussion, one-on-one instruction or a combination of all these approaches. It was recommended that capacity building programmes in the use of data analysis software must be tailored to suit the preferred training methods of lecturers. Also, a data analysis support centre must be established by University of Cape Coast to provide support for lecturers in the analysis of their research data.

Keywords: *Statistical Analysis Software, Qualitative Analysis Software, Proficiency, Capacity Building, Training Programmes*

Introduction

According to UNESCO (2013), universities are among our most generally accepted twenty-first century institutions. For that matter, as institutions of higher learning, they play a pivotal role in the development of nations through high quality research and teaching activities. Established links between higher education, higher income earnings and national development (Ashenfelter, Harmon, & Oosterbeek, 1999; Harmon, Oosterbeek, & Walker, 2003, OECD, 2003; Blumdell, Dearden & Sianesi 2005) have heightened the need for universities to build their capacity to provide leadership in the development agenda of nations through cutting edge research and innovation. Such high expectations from institutions of higher learning mean that universities in Ghana, especially, the University of Cape Coast, whose mandate it is to train human resources for all levels of education in the country must constantly work at building their capacities to meet their own development agenda and also match up with international standards in order to improve their visibility. For such pertinent aims to be attained, it is imperative that the University attracts and retains well trained and competent faculty members.

Lecturers, the world over, and for that matter, the University of Cape Coast, are required to guide both postgraduate and undergraduate students to carry out research. This places a demand on them to be astute in the processes of scientific enquiry in order to effectively do their job. As opined by Akinlagbe and Baiyeri (2011), in future, the role of lecturers will still result in improved student learning, but will also require them to have broader capabilities than content knowledge and pedagogy skills. This is probably because we live in an era where lecturers are required to measure up to international standards and make higher impact as academics in their institutions. Proficiency in the use of the relevant technological tools, especially, data analysis software (DAS), or at least, the availability of a well-resourced data analysis support centre to facilitate the work of lecturers is therefore very important.

The concept of data analysis has been defined differently, depending on the biases of researchers or institutions. For instance, the OECD (2013) considers data analysis as the process of transforming raw data into usable information, often presented in the form of a published analytical article, in order to add value to the statistical output. It is quite clear from this definition that the bias is obviously towards quantitative analysis of data. However, it is worthy to note that data analysis is not restricted to only statistical analysis. This is because research does not always generate quantitative data. Data can be qualitative, in which case data

analysis then becomes the classification and interpretation of linguistic (or visual) material to make statements about implicit and explicit dimensions and structures of meaning-making in the material and what is represented in it (Flick, 2013). Thus, from the foregoing discussion, it is clear that data analysis in research can be quantitatively or qualitatively done, and in this day and age of technological advancement, there are many computer software packages that aid the process. For instance, some noted quantitative analysis software packages are: SPSS, Stata, SAS, R., MATLAB, Excel, etc., and among the popular qualitative data analysis software are: NVivo, Atlas.ti, MAXQDA, QDA Miner, etc.

Usually, it appears to be taken for granted that once faculty members have the requisite qualifications in their fields, they automatically possess all the relevant competencies in carrying out their duties, including the use of the relevant DAS in analyzing their research data. This may however, not always be the case because even if such faculty members were exposed to such software during their masters and doctoral programmes, new versions of these software, as well as more improved software are being churned out from time to time by software developers to facilitate academic work. It would therefore be necessary for lecturers to be constantly updated through training or better still, be given the needed support by their institution whenever the need arises for them to analyze data for their research work.

Even though the use of ICT and other DAS in analyzing research data is expected to facilitate academic work, some studies have reported infrequent usage of such software. For instance, Zare-ee's (2011) study reported infrequent use of ICTs for research and instruction among Iranian teachers. In addition to this, other research findings indicate that many variables can limit university lecturers in their use of ICTs for research and instruction. Some of these factors are socio-cultural limitations in the context of the use of ICTs, different perceptions of their (dis)advantages, and obstacles encountered in their application in higher education (Zare-ee, 2011). Previous research has shown that many obstacles can prevent teachers from using ICTs such as problems in infrastructures (Mehlinger & Powers, 2002; Pelgrum, 2001), lack of training (Jacobson & Weller, 1988; Schrum, 1999; Willis, Thompson & Sadera, 1999), weak technical support (Schrum, 1995), and logistical factors such as the lack of time, software, hardware, knowledge of available information technology resources, etc. The presence of these limitations to the use of ICT among lecturers could have a telling effect on work output. As pointed out by Rahim et al. (2008), research data often remain unanalyzed and unpublished due to incompetency in statistical software usage. It is therefore crucial for the University of

Cape Coast to institute a capacity building programme to enable lecturers develop and constantly update their skill in the use of the relevant software for their analysis to boost the quality of their research.

Research literature is replete with information about the most frequently used data analysis software among lectures in other jurisdictions, yet the researchers struggled to come across data on lecturers in the Ghanaian context, particularly in the University of Cape Coast. In the case of Nigeria where ICT tools appear to be used often by faculty members, a training needs analysis of lecturers for information and communication technology (ICT) skills enhancement conducted by Akinagbe and Baiyeri (2011) found out that, the highest demand for ICT training need by the lecturers in their study was data analysis using computer software like SPSS, GENSTAT, Excel, E-view. Another study by Abatan and Olayemi (2014), revealed that the most frequently used DAS among university lecturers was SPSS, followed by STATA, SAS, MiniTab , Ms-Excel, MATLAB, R , Epi-info, and PSPP in that order. These last two findings imply that SPSS appears to be a preferred DAS among lecturers.

In another development, a study conducted by Ibezim (2015), focusing more on computer software data analysis skills required for capacity building of university lecturers for effective educational research, revealed computer, communication and math competency skill needs of the lecturers for effective data analysis in educational research using computer software. This implies that the lecturers were largely not ready for DAS training yet. This finding was corroborated by Omotunde's (2017) study which aimed to find out Information Communication Technology Training Needs of Academic Staff in Universities in Ekiti State, Nigeria. This study came out with the finding that majority of respondents had limited computer skills, could not use technical computer programmes to complement their work and were not formally trained in the use of ICT. Such lecturers may be considered not ready for further training in DAS usage because it would be difficult to teach them new software skills if they lacked skills in the use of the computer itself.

With respect to the preferred methods for training lecturers in the use of DAS, the American Library Association (2005) suggested classroom presentations, online tutorials or computer assisted instructions (CAI), information instructions and printed guide as some training methods for instructing users in using electronic information resources. Georgina and Olson (2007) did a study which was aimed at examining how faculty technology literacy and

technology training impact their pedagogy. The study revealed that faculty technology training may be maximized for the integration of pedagogy by using the training strategy of small group faculty forums with a trainer. In a study conducted by Akinnagbe and Baiyeri (2011), findings seemed to suggest age did not play any key role in lecturer's need for training in the use of DAS, however, no inferential statistics was used in their case. Ghamsari (1999) investigated ICT use among faculty members of the Iranian Institute of Industrial and Scientific Research and found that email was the most frequently used form of ICT and that university degree and field of study were positively correlated with the amount of use.

In the light of all these research findings, it is necessary to assess DAS usage among lecturers in the University of Cape Coast, Ghana in order to identify the implications for capacity building programmes, and also to find out lecturers' perspectives about the establishment of a data analysis centre to support research work.

Objectives of the Study

The following objectives were formulated to guide the study:

1. To find out the most frequently used DAS among lecturers in the University of Cape Coast.
2. To determine University of Cape Coast lecturers' perceived level of proficiency in the use of their preferred DAS
3. To assess the training readiness of lecturers in the University of Cape Coast in the use of DAS.
4. To determine the extent of University of Cape Coast lecturers' preferred training methods for developing their competence in the use of their preferred DAS.
5. To determine University of Cape Coast lecturers' perception about the establishment of a data analysis assistance centre
6. To establish the difference between age of University of Cape Coast lecturers and their levels of perceived proficiency in the use of DAS
7. To establish the difference between academic rank and University of Cape Coast lecturers' perceived level of proficiency in the use of DAS

Methodology

A descriptive census design was adopted for the study. The essence of using this approach was to obtain a total head count of lecturers in terms of certain key biographical details (Welman, Krauger & Mitchell, 2012) as well as to describe their perspectives on DAS usage. The population for the study was therefore, all lecturers in the University of Cape Coast. However, 319 out of the total number of 777 lecturers who were at post at the time of the study responded to the instrument, giving a return rate of approximately 41%. Because a total head count could not be obtained, it was realized during the data analysis that lecturers of the professorial rank did not respond to the questionnaire. However, a sample size of 319, provided adequate biographical details to furnish the researchers with the requisite information for the study

. A questionnaire was designed and used for data collection because of the high literacy level of the study population. The questionnaire was first pilot-tested among 40 randomly selected lecturers from the University of Education, Winneba, to check for its reliability. An overall Cronbach's alpha of 0.77 was obtained as a measure of reliability, which according to Cortina (1993), is acceptable. Copies of a questionnaire were distributed electronically and follow ups were made with hard copies to increase the return rate. Data generated was analyzed with frequencies and percentages; means and standard deviation; and ANOVA. Data generated from the open-ended item was analyzed thematically.

Results

Research Objective 1: To Determine the Most Frequently Used DAS among Lecturers in the University of Cape Coast

Research objective one sought to find out the most frequently used DAS among lecturers in the University of Cape Coast. The DAS listed were for both qualitative and quantitative analysis. Figure 1 presents a bar chart of the various DAS frequently used by lecturers.

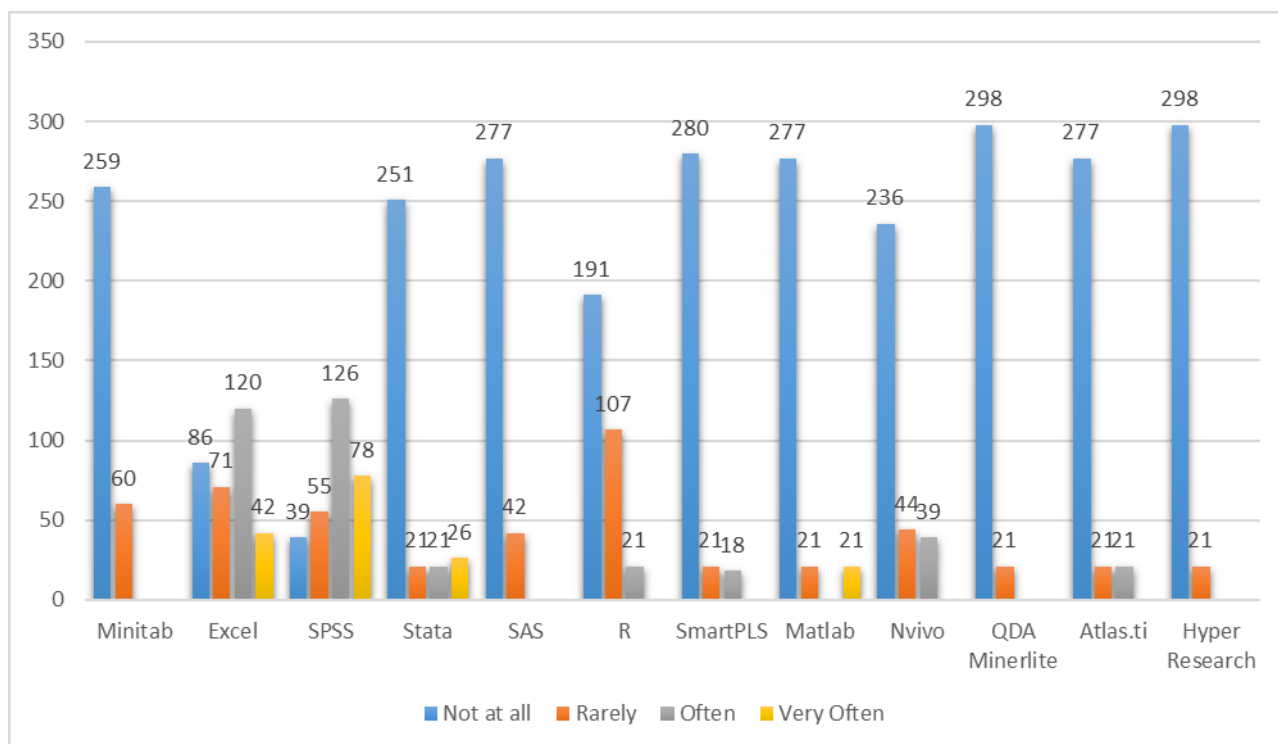


Figure 1: Bar Chart Showing the Frequency of Usage of DAS

Source: Field Data (2018)

From Figure 1, it can be observed that, the frequently used DAS in order of usage was SPSS [Often (39.5%); Very Often (2.5%)], this is followed by Excel [Often (37.6%); Very Often (13.2%)] and Stata [Often (6.6); Very Often (8.2)]. It is important to note that, these are predominantly quantitative DAS. It can be observed again that, all the twelve DAS listed recorded high values of non-usage with QDA Miner Lite and Hyper Research recording the highest value of 298 (93.4%). It is imperative to note that these are strictly qualitative DAS. Nvivo and Atlas.ti, which are both qualitative data analysis software, were rarely used as well.

Research Objective 2: To determine University of Cape Coast Lecturers' Perceived Level of Proficiency in the Use of their Preferred DAS

The focus of research objective two was to determine the perceived level of proficiency of academic staff in relation to the use of their preferred DAS. The level of proficiency was measured on a 5-point Likert scale from being *completely proficient* to *not proficient*. Table 1 presents the Means (M) and Standard Deviations (S.Dv.) of the various responses from the lecturers.

Table 1: Levels of Proficiency in the Use of DAS

S/N	Statement	M	S.Dv.	Interpretation
1	Coding/preparing data for entry into DAS	2.97	1.68	<i>Moderately Proficient</i>
2	Entering data into DAS	3.60	1.49	<i>Very Proficient</i>
3	Preliminary Analysis with Qualitative Software	2.53	1.28	<i>Slightly Proficient</i>
4	Preliminary Analysis with Quantitative Software	4.17	1.35	<i>Very Proficient</i>
5	Checking Assumptions	4.29	1.27	<i>Very Proficient</i>
6	Selection of appropriate analytical tool	3.14	1.26	<i>Moderately Proficient</i>
7	Ability to carry out data analysis	4.05	1.51	<i>Very Proficient</i>
8	Data output interpretation	3.93	1.39	<i>Very Proficient</i>
9	Presentation of info-graphics	2.91	1.49	<i>Moderately Proficient</i>
10	Proficient in use of DAS	3.54	1.28	<i>Moderately Proficient</i>

Source: Fieldwork, 2018

Source: field data (2018)

Mean ranges: 0.0 – 1.5 (*Not Proficient*); 1.6 – 2.5 (*Slightly Proficient*); 2.6 – 3.5 (*Moderately Proficient*); 3.6 – 4.5 (*Very Proficient*); 4.6 – 5.0 (*Completely Proficient*)

Average Mean: 3.51

Average Standard Deviation: 1.4

From Table 1, it can be inferred that lecturers indicated various levels of proficiency in the use of their preferred DAS. The responses ranged from moderately proficient to very proficient. On the average, it can be stated that, the academic staff who participated in the study could be considered as ***Moderately Proficient*** (M = 3.51, S.Dv. = 1.4) in the use of their preferred DAS.

Research Objective 3: To Assess the Training Readiness of University of Cape Coast Lecturers in the Use of DAS.

The researchers sought to determine the training readiness of lecturers in the use of DAS. The level of readiness was measured on a 5-point Likert scale where lecturers were to indicate the extent to which certain statements were true concerning their levels of readiness for training. The items sought to assess their willingness as well as their background knowledge in the use of other software that gives them the needed competencies for further training. Table 2 presents the Means (M) and Standard Deviations (S.Dv.) of the various responses from lecturers.

Table 2: Training Readiness in the Use of DAS

S/N	Statement	M	S.Dv	Interpretation
1	Training in the use of DAS will boost my confidence on the job	4.23	1.14	<i>Very true of me</i>
2	Make time to participate in training on DAS usage	3.79	1.48	<i>Very true of me</i>
3	Adequate background knowledge in the use of other computer software	4.08	1.49	<i>Very true of me</i>
4	Willingness to participate in DAS training	3.18	1.10	<i>Moderately true of me</i>
5	Participation in DAS training will contribute to professional development	4.13	1.36	<i>Very true of me</i>
6	Readiness to pay for cost of training	3.81	1.26	<i>Very true of me</i>
7	Willingness to purchase DAS	4.13	1.20	<i>Very true of me</i>

Source: Fieldwork, 2018

Source: field data (2018)

Mean ranges: 0.0 – 1.5 (*Not true of me*); 1.6 – 2.5 (*Slightly true of me*); 2.6 – 3.5 (*Moderately true of me*); 3.6 – 4.5 (*Very true of me*); 4.6 – 5.0 (*Completely true of me*)

Average Mean: 3.91

Average Standard Deviation: 1.29

From Table 2, it can be inferred that lecturers indicated various levels of readiness in the training on DAS. For instance, lectures agreed to the fact that DAS training would boost their confidence on the job (M = 4.23, SD = 1.14) and that they possessed the requisite background knowledge in computer software usage to enable them learn how to use new DAS (M = 4.08, SD = 1.49). On the average, it can be stated that the lecturers who participated in the study could be considered as **Very Ready** (M = 3.91, S.Dv. = 1.29) for training on DAS usage.

Research Objective 4: To Determine University of Cape Coast Lecturers’ Preferred Training Methods for Developing their Competence in the Use of their Preferred DAS

Research objective four sought to elicit from lecturers their preferred training methods for capacity building in the use of their preferred DAS. The results obtained have been presented in Figure 2.

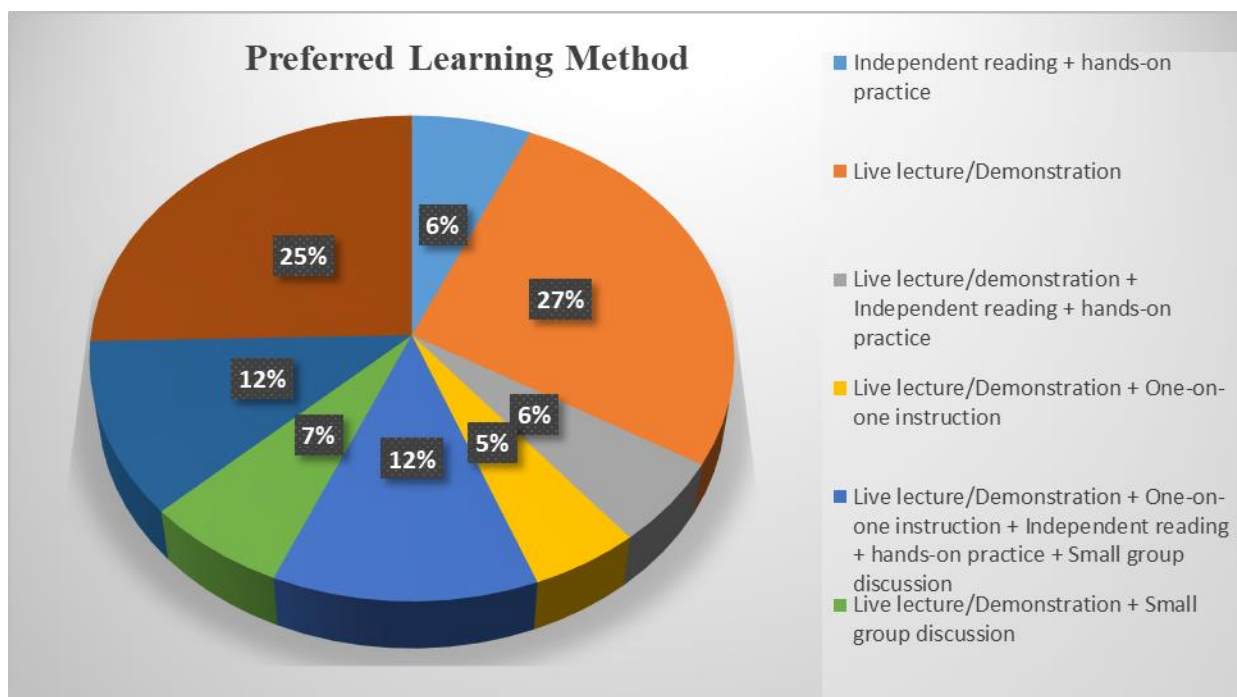


Figure 2: Pie Chart on Preferred Learning Methods of Lecturers for Data Analysis Training
 Source: Field Data (2018)

It is evident from Figure 2 that, 27% of the respondents indicated that their preferred training method is live lecture/demonstration. This is followed by 25% who indicated that they would like to have small group discussion for any training programme on DAS. Again, 12% mentioned that they would prefer to have a one-on-one instruction during any training programme on DAS, however, 12% also indicated their preferred choice for the combination of live lecture/demonstration, one-on-one instruction, independent reading, hands-on practice and small group discussion.

Research Objective 5 To Determine Lecturers’ Perception about the Establishment of a Data Analysis Support Centre in the University of Cape Coast

Research objective five focused on the perception of lecturers on the establishment of a data analysis support centre in the University of Cape Coast. The results are presented in Figure 3.

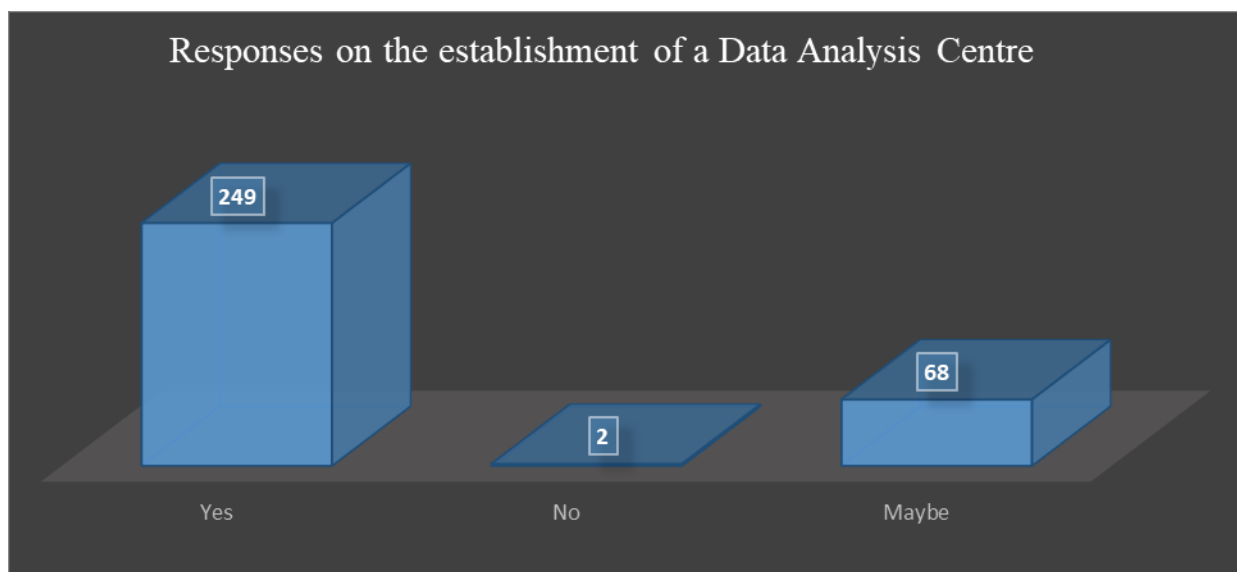


Figure 3: Bar Graph Showing Responses on the Establishment of a Data Analysis Centre

Source: Field Data (2018)

From Figure 3, out of the total number of lecturers who participated in the study, only 2(0.6) indicated they did not want a data analysis centre to be established. It is evident that, majority of the respondents, 249 (78.1%) responded in the affirmative of a possible establishment of a data analysis centre in the University to provide assistance to lecturers with data analysis. The key reasons surmised from lecturers' responses on why it is important to establish a data analysis centre have been summarized as follows:

- **Increased research output**

A good number of the lecturers believed that the establishment of a data analysis centre would help increase research output among lecturers.

- **To improve the turnaround time for data analysis**

Some lecturers support the establishment of a data analysis centre because it would help them speed up their research write-up, make it fast for them to analyze data and enable them meet timelines for research projects.

- **Provide avenue for lecturers to learn new software**

Lecturers supported the establishment of a data analysis centre because they were convinced it would help them to learn new qualitative and quantitative DAS. Some also believed it would help them to improve their skills in the use of the DAS they have been using.

- **Provide guidance on data analysis**

Lecturers believed that the establishment of a data analysis centre would provide an avenue for them to obtain assistance in analyzing their data. Some noted that a centre like that would help them in the selection of the appropriated qualitative and quantitative analysis to use for their research. This they hope would help them meet the standards required by high impact journals and also make their work more acceptable to academia.

Research Objective 6: To Establish a Difference between Age of University of Cape Coast Lecturers and their Levels of Perceived Proficiency in the Use of DAS

In order to establish the difference between age of lecturers and their levels of proficiency in DAS usage, the following null hypothesis was tested:

H₀: There is no statistically significant difference between the age of lecturers and their levels of proficiency in DAS usage.

H₁: There is a statistically significant difference between the age of lecturers and their levels of proficiency in DAS usage.

A one-way ANOVA test was carried out and the test result has been presented in Table 3.

Table 3: One-way ANOVA Output on the Age of University Lecturers and their Levels of Perceived Proficiency in the Use of DAS

	Sum	of	df	Mean	F	Sig.
Squares				Square		
Between Groups	5.532		3	2.766	6.803	.001
Within Groups	192.306		316	.407		
Total	197.838		319			

*significant at $p < .05$

Source: field data (2018)

The results from Table 3 yielded a statistically significant difference between the age of lecturers and their perceived level of proficiency in the use of their preferred DAS [F (3, 316) = 6.803, $p = 0.001$]. A post-hoc analysis; Tukey's Honestly Significant Difference (HSD); was further conducted to identify where the difference lies amongst the various age groups.

Table 4: Tukey’s HSD Analysis Showing the Mean Differences between Age and Perceived Proficiency in the Use of DAS

(I) Age Group	(J) Age Group	Mean Difference (I-J)	Std. Error	Sig.
24 – 38	39 – 53	.152*	.049	.005
	54+	.140	.108	.394
39 – 53	24 – 38	.214*	.062	.002
	54+	-.109	.138	.711
54+	24 – 38	.329*	.059	.000
	39 – 53	-.082	.132	.808

*significant at $p < .05$

Source: Field Data (2018)

Tukey’s HSD result indicated that, there was a statistical significant difference in the perceived proficiency in the use of preferred DAS between lecturers of age groups (24 – 38) and (39 – 53) at p-value .05. Thus, lecturers aged between 24 – 38 years seemed to be more proficient in the use of their preferred DAS as compared to those who were between 39 – 53 years. Again, there was a statistically significant difference between 24 – 38 year group of lecturers and 54+ year group of lecturers in terms of proficiency in the use of their preferred DAS with the former doing better than the latter.

Research Objective 7: To Establish the Difference between Rank and University of Cape Coast Lecturers’ Perceived Level of Proficiency in the Use of DAS

In establishing the difference between rank of University of Cape Coast lecturers and their perceived proficiency in the use of DAS, the following hypothesis was tested:

H₀: There is no statistically significant difference between the rank of lecturers and their levels of proficiency in DAS usage.

H₁: There is a statistically significant difference between the rank of lecturers and their levels of proficiency in DAS usage.

A one- way ANOVA test was conducted and the result has been presented in Table 5.

The results from Table 5 indicate a statistically significant difference between the rank of lecturers and their perceived level of proficiency in the use of their preferred DAS [F (3, 316) = 9.335, $p = 0.000$].

Table 5: One-way ANOVA Output on the Academic Rank of University Lecturers and their Levels of Perceived Proficiency in DAS Usage

	Sum	of	df	Mean	F	Sig.
Squares				Square		
Between Groups	9.832	3		2.766	9.335	.000
Within Groups	172.099	316		.407		
Total	181.931	319				

*significant at $p < .05$

A post-hoc analysis; Tukey’s Honestly Significant Difference (HSD); was further conducted to identify where the difference lies amongst the various ranks. The results have been presented in Table 6 below.

Multiple comparison

Table 6: Tukey’s HSD Analysis Showing the Mean Differences between Age and Perceived Proficiency in the Use of Data Analysis Software

(I) Rank	(J) Rank	Mean Difference (I-J)	Std. Error	Sig.
Asst. Lecturer	Lecturer	2.596*	.533	.000
	Snr. Lecturer	6.923	2.896	.081
Lecturer	Asst. Lecturer	2.596*	.645	.000
	Snr. Lecturer	4.739	2.906	.363
Snr. Lecturer	Asst. Lecturer	6.923	2.896	.081
	Lecturer	4.739	2.906	.363

*significant at $p < .05$

Tukey’s HSD result indicates that, there was a statistical significant difference in the perceived proficiency in the use of DAS between assistant lecturers and lecturers at p -value .005. Thus, assistant lecturers perceived themselves to be more proficient in the use of their preferred DAS as compared to lecturers. Again, there was no statistically significant difference between assistant lecturers and senior lecturers as well as lecturers and senior lecturers.

Discussion of Findings and Implications for Capacity Building Programmes

Most Frequently Used DAS among Lecturers in the University of Cape Coast

From the results of the study, it is very clear that the most frequently used DAS among lecturers in the University of Cape Coast are SPSS, Excel and Stata in that order. And the least or rarely used software are QDA Miner Lite and Hyper Research. This finding corroborates the findings of Akinagbe and Baiyeri (2011) as well as Abatan and Olayemi (2014), that the DAS which lecturers require more training in or tend to use more often are SPSS, STATA and Ms-Excel. The interesting thing about this finding is that all the DAS used frequently by lecturers are quantitative DAS. What could be the reason for this scenario? A cursory look at the project work and theses produced yearly in the University of Cape Coast clearly suggests that quite a good number of qualitative research is carried out in the University. The question then is; “how do people analyze their qualitative data?” Could students and faculty members still be resorting to the tedious manual process of analyzing their qualitative data? What probable impact could such approach of analyzing data have on the extent of data generation and quality of their analysis? Some reasons that have been cited in literature to be a major obstacle to technology use in education is lack of training (Jacobson & Weller, 1988; Schrum, 1999; Willis, Thompson & Sadera, 1999) as well as weak technical support (Schrum, 1995). Although people might be familiar with these qualitative DAS, lack of training and difficulty in accessing these software might discourage them from using them. Again, it is also probable that most the studies carried out by students and lecturers are quantitative bias.

The implication of this finding is that capacity building programmes in DAS usage should focus more on training in the use of qualitative DAS usage. Probably, once lecturers develop competence in the use of such software, they may be motivated to employ the qualitative approach in their research in addition to the quantitative approach.

Lecturers Perceived Levels of Proficiency in the Use of their Preferred DAS

University of Cape Coast lecturers, on the average, considered themselves to be moderately proficient in the use of their preferred DAS. This is a very healthy development because it implies that the lecturers had an appreciable level of confidence in their own ability to use their preferred DAS. However, considering the kind of academic rigour involved in research work, it would have been best if lecturers had indicated utmost confidence in their levels of proficiency in the use of these software. Once institutions of higher learning are required to produce cutting edge research, it is imperative that faculty members are up to date and very

proficient in the use of the relevant DAS in their various fields. Thus, although a self-rating of moderately proficient may be considered good enough for lecturers, there is still more room for improvement. The implication of this finding to capacity building programme development is that, it should not be taken for granted that once lecturers largely use quantitative DAS, they possess all the required skills in their usage. More training programmes should be organized to enable lecturers build their capacities in the usage of the DAS known to them.

Training Readiness in the Use of DAS

If the skill set of lecturers is inadequate for the kind of work they do, then the logical thing to do is to provide them with the necessary training. The question then is how ready are lecturers to participate in capacity building programmes on DAS usage? The findings of the study revealed that lecturers possessed the requisite background knowledge to enable them learn new DAS. It was also revealed that lecturers were confident in the fact that training in the use of DAS would boost their confidence on the job. Overall, the lecturers could be considered as very ready for further training in DAS usage. This finding contradicts the findings of Ibezim (2015) and Omotunde (2017) whose studies found that academic staff lacked the basic computer skills for further training in DAS usage. This finding is quite refreshing and implies that capacity building programmes in DAS usage for lecturers would likely enjoy favourable patronage from them. More especially, as lecturers were even willing to purchase their own DAS. In addition, their levels of readiness implied that lecturers had the required aptitude for further training, thus capacity building programmes could just as well focus on DAS training proper other than just the development of computer skills. This is because lecturers already considered themselves proficient in computer software usage.

Lecturers Preferred Training Methods for Developing their Competencies in the Use of their Preferred DAS.

The methods lecturers favoured most for developing their capacity in the preferred DAS were live lecture/demonstration, small group discussion, one-on-one instruction, and a combination of live lecture/demonstration, one-on-one instruction, independent reading, hands-on practice and small group discussion, in that order. This implies that though lecturers needs vary, some common training methods would best suit quite a good number of them, while a few of them may require special attention. The preference for small group discussions corroborate Georgina and Olson (2007) findings whereas the need for online tutorials or computer assisted instructions as stipulated by the American Library Association (2005) were not opted for.

The implication of this finding for capacity building programme in DAS usage is that the use of the traditional methods of live lecture and demonstration is still favoured by lecturers and must still be considered in providing training for lecturers. However, it is important to note that opportunity must also be given for small group discussions and one-on-one instructions. One-on-one instructions must be considered, especially for lecturers who require extra assistance in the use of DAS.

Lecturers' Perception about the Establishment of a Data Analysis Support Centre

The study revealed that an overwhelming majority of lecturers who participated in the study advocated for the establishment of a data analysis support centre in the University of Cape Coast to help faculty members with the analysis of their research data. They believed such a centre would help increase research output, improve the turn-around time for data analysis for research projects, provide avenue for lecturers to learn new software and also provide guidance to lecturers on data analysis as well as DAS usage. The implication of this for capacity building is that a data analysis centre would most likely enjoy favourable patronage among lecturers in their bid to develop their skills in DAS usage.

Difference between Age of Lecturers and their Perceived Levels of Proficiency in DAS Usage

The ANOVA result indicated a statistically significant difference between age of lecturers and their perceived levels of proficiency in the use of DAS. The post hoc analysis indicated that younger lecturers perceived themselves to be more proficient in the use of DAS as compared to older lecturers. This finding supports the view that people of age 25 – 34 (Millennial generation) are considered to be active experimental learners, proficient in multi-tasking, and dependent on communication technologies for accessing information and for interacting with others (Oblinger & Oblinger, 2005; Prensky, 2001). However, it contradicts the findings of Akinagbe and Baiyeri (2011) whose findings seemed to suggest age did not play any key role in lecturer's need for training in the use of DAS. Though their finding was about the need for training, the difference in perceived proficiency between the young and the old suggests that the older lecturers might require more training as compared to the younger lecturers. This difference may probably be because younger lecturers appear to be more technology savvy as compared to older lecturers. The implication of this finding for capacity building programmes

is that training programmes must be age sensitive. Older lecturers should be given more special attention during training programmes in DAS usage.

Difference between Rank and University Lecturers' Perceived Level of Proficiency in DAS Usage

The ANOVA test revealed a statistically significant difference between the academic rank of lecturers and their perceived proficiency in the use of their preferred DAS. The post-hoc test indicated that the difference was only between assistant lecturers and lecturers, but not between assistant lecturers and senior lecturers, as well as lecturers and senior lecturers. Assistant lecturers perceived themselves to be more proficient than lecturers probably because they were mostly fresh from the postgraduate programmes where they might have been exposed to DAS usage as part of their training, as compared to lecturers who may not have used such software for some time after their postgraduate studies. The implication of this is that consistent training in the use of DAS would go a long way to keep lecturers up to date and also boost their proficiency. That is, there should be variations in the DAS training organized for university lecturers such that, the lower rank lecturers who are proficient in DAS are given a different training as compared to the higher rank lecturers who are less proficient in DAS.

Conclusion

Based on the findings of the study, the following conclusion can be reached:

1. Lecturers in the University of Cape Coast frequently use more quantitative than qualitative DAS. The most used quantitative DAS are SPSS, Excel and STATA.
2. Lecturers in the University of Cape Coast largely consider themselves to be moderately proficient in the use of their preferred DAS.
3. Lecturers in the University of Cape Coast possess the requisite aptitude and readiness for further training in the use of DAS
4. Lecturers in the University of Cape Coast would prefer live lecture/demonstration, small group discussion, one-on-one instruction, and a combination of live lecture/demonstration, one-on-one instruction, independent reading, hands-on practice as well as small group discussion methods for learning about DAS
5. Lecturers in the University of Cape Coast advocate for the establishment of a data analysis centre to provide assistance to lecturers in the use of DAS. Such a centre would likely enjoy massive patronage among lecturers

6. Younger lecturers in the University of Cape Coast perceive themselves to be more proficient in the use of DAS as compared with older lecturers
7. Lecturers perceived proficiency in the use of DAS is rank sensitive in the University of Cape Coast. Assistant lecturers perceive themselves to be more proficient than lecturers.

Recommendations

Based on the findings of the study, we have come out with the following recommendations:

1. The University of Cape Coast, through the Directorate of ICT should establish a Data Analysis Support Centre to provide assistance to both lecturers and students in the analysis of their research data and also help build the capacity of lecturers in the use of DAS.
2. Special training programmes must be organized by the Directorate of Human Resource of the University of Cape Coast, Training and Development Section, in conjunction with the teacher support unit to build the capacity of lecturers in DAS usage, especially, in qualitative DAS
3. The Training and Development Section of the University of Cape Coast must pay special attention to older lecturers and lecturers at the higher ranks during capacity building programmes in DAS usage as they are more likely to consider themselves less proficient compared with younger lecturers and assistant lecturers.
4. A variety of training methods must be employed by the Training and Development Section of the University of Cape Coast during capacity building programmes to cater for the needs of individual lecturers. The most favoured training methods to be considered include: live lecture/demonstration, small group discussion, one-on-one instruction, and a combination of live lecture/demonstration, one-on-one instruction, independent reading, hands-on practice and small group discussion

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BUILDING CAPACITY IN RESEARCH DATA AND OUTPUT MANAGEMENT

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Abstract

The paper discusses the basic concepts in research data management (RDM) and examines the infrastructural ecosystem for data storage. It looks at the conceptual issues relating to capacity building and the associated skill gaps. It further goes on to discuss the principles underlying capacity building for RDM. Finally, the paper looks at the approaches and strategies that can be adopted to build capacity and concludes by asserting that capacity building is inherently an institutional phenomenon that comes out of a complex inter-play of attitudes, assets, resources, strategies and skills that may be tangible or intangible.

Keywords: *Human Capacity Building; Research Data Management; Infrastructure Ecosystem; Data Storage; Building Partnerships*

Introduction:

Research is usually conducted to generate new knowledge or to modify existing knowledge to serve as a catalyst for the development of society since the practical applications of the knowledge can provide solutions to the problems that perpetuate poverty and under-development. In the universities and research institutions the researches undertaken are key to the vitality of the innovation ecosystem which positions them to compete in the global research and development (R&D) activities. As we are all aware, the conventional pathways for communicating research outputs have always been through publications in journals and face-to-face events like conferences. These have been enriched by the new digital formats such as the social media which include online communities of practice. For example, web-based collaboration allows for geographically separated laboratories to work together in real time and share knowledge.

Over the years librarians in academic and research institutions have been supporting the research process and some have even become active participants in the institutional research lifecycles. In some of these institutions, librarians have liaised with faculty members and researchers to offer such assistance as building profile, data management and dissemination

support services, training in database search skills as well as citation management and consultations.

According to Corrigan (2018), as the trove of information continues to expand, it becomes increasingly difficult to organize, secure and distribute the data across the entire enterprise. Certainly, service excellence is not achieved using traditional quality assurance processes, but that it is more likely to be attained through strategic planning processes aligned with key performance indicators that provide accountability (Holmes and Parsons, 2016). Even though by their training librarians have the expertise not only to capture the knowledge that is generated, but also to manage and record it for dissemination, the era where they were seen as repositories of information, the place to go and access facts, figures and carry out research is over. According to Tenopir, Birch and Allard (2012), services related to supporting researchers in their data management both short- and long-term have been found to be lacking in many cases. Thus, to address these challenges librarians should think of re-positioning themselves more as active partners in the creative endeavor which involves the production of scholarship. For example, it should include data curation which offers opportunities for finding new ways to communicate the value of the skills librarians already possess and in developing new roles that were not previously associated with them (Gore, 2010).

The fact is, research is increasingly becoming data-driven and there seems to be an unfortunate gap in competencies and skill sets that are needed to fully integrate librarians into research data management. In the opinion of Tenopir et al. (2012), lack of formal data management processes, insufficient or non-existent training and tools, and inadequate funding all play into the loss or misuse of research data. Consequently, for librarians to effectively lead the application of research data management solutions in their institutions there will be the need to equip them with the requisite skills by building their capacity. Fortunately, over the past decade and half, Elsevier, through its Library Connect Programme has been sharing some of these best practices. Through its community-driven model, it has been building skills and competencies to enable librarians to keep pace with the rapidly evolving scholarly ecosystem, including the research data lifecycle.

Basic Concepts in Research Data Management

What is Data?

According to the “Merriam-Webster Dictionary” (2005), data is defined as “any factual information such as measurements or statistics used as a basis for reasoning, discussion or calculation”, and in the opinion of Weinberger (2012), it forms the base of the knowledge pyramid (i.e. data precedes information, which precedes knowledge, which precedes understanding and wisdom). Mariyika, et al. (2011), opine that there are two primary ways in which data can be generated. In the first instance, data can be captured directly, through some form of measurement (eg. observation, survey laboratory work, field experiment, etc.). Secondly, exhaust data are inherently produced by a device or system, but are by-products of the main function rather than the primary output. Data, therefore, have strong utility and high value because they provide the key inputs to the various modes of analyses that individuals, institutions, businesses and scientists employ in order to understand and explain the world that we live in. Furthermore, they are used to create innovations, products, policies and knowledge that shape how people live their lives.

Characteristically, there are three types of data and these are the structured, semi-structured and the unstructured. Structured data are those that can easily be stored and transferred in a defined data model such as numbers, while the semi-structured data have no pre-defined data model and thus cannot be held in a relational database. The unstructured data do not have a defined data model or common identifiable structures.

What is Research Data?

One of the definitions adopted from defining research data by University of Oregon Libraries is “the recorded factual material commonly accepted in the scientific community as necessary to validate research findings”. Research data can be described as “the material underpinning a research assertion” (University of Sheffield), and these include; documents, laboratory notebooks, questionnaires, audio-types, etc. Whereas some types of data may be shareable, others are not due to either the nature of the records themselves or to ethical and privacy concerns (e.g. drafts of scientific papers, preliminary analyses, etc.). Interestingly, research data does not include trade secrets, commercial information and materials held to be confidential by the researcher until they are published. Furthermore, personal and medical

information disclosure which constitutes invasion of personal privacy does not qualify to be classified as research data that can be shared.

The advent of “Big Data” in scholarship has provoked debate about the paradigm changes as a result of inconveniences in the size and number of datasets available for research (Plantin, Lagoze and Edwards, 2018). Big Data is conceptualized not as large quantities of data but as inter-related assemblage that requires careful “packaging” before it can be used. As a scholarly output, research data has contributed significantly to the advent of data storage, sharing and management platforms.

What is Research Data Management?

Research Data Management (RDM) consists of different activities and processes associated with the data lifecycle and these involve the design and creation of data, storage, security, preservation, retrieval, sharing and re-use. All these, according to Cox and Pinfield (2014), take into account technical capabilities, ethical considerations, legal issues and governance framework. Thus, responsible data management is important in all phases of a project from planning and data collection to data analysis and dissemination. It is therefore incumbent on every member of a research team to be conversant with the role that he or she plays in data management. This obviously calls for the establishment of a clear communication plan that will ensure that all the research team members are aware of the project status, time line changes, and the problems encountered.

Data management is one of the essential areas of responsible conduct of research and it includes general concepts which need to be understood. According to the Guidelines for Responsible Data Management put together by the Clinical Tools Incorporated, the key concepts are:

- **Data Collection:** The methodology varies with projects. A successful data collection involves the provision of the necessary information for the development and justification of the research project. Even though data collection in any research endeavor may prove to be tedious, whatever data that is eventually collected is used to prove or disprove a hypothesis and justify or counter a body of research. Thorough data collection does not only allow the researchers to analyze and assess their work more accurately, but it also allows independent researchers to replicate the process and evaluate the results. Furthermore, it provides justification to sponsors for expenditures and project decisions. In this respect, thorough data collection should incorporate a

system that will ensure that the data is vigorously evaluated to assuage any deficiency as far as the project protocol is concerned.

- **Data Ownership:** This usually refers to the one who has the legal right to the data, and who has the right to retain the data after the completion of the research. This is a very complex issue involving the project team, the sponsoring institution and the funding agency.
- **Data Protection:** This is very necessary because project data should be protected from physical damage. According to Kramer et al. (2004), data protection should be part of every project plan for data storage. The best form of data protection, whether in written or electronic format, is limiting access to it through the use of unique user IDs and passwords that cannot be easily guessed. It is also better to change it more often or provide access to data files through a centralized process. Thus, as far as protecting the system is concerned it is important to use a firewall and intrusion detective software to monitor access.
- **Data Retention:** This relates to the length of time that the data should be kept. This usually depends on the sponsoring institution and the funding agency. More often than not, they have their own requirements as to how long the data should be retained.
- **Data Storage:** This is also very crucial since it safeguards the investment in the research. Storage allows future access to the data in order to re-create the findings or establish a precedent. It is important to store enough data so that a project and its findings can be re-constructed with ease. The best way to protect data is to limit access to it whether it is in written or electronic format. According to Straub (2004), the key issues associated with electronic data storage are thorough documentation to allow for the data to be used appropriately in the future.
- **Data Analysis:** Usually, this refers to how the raw data can be evaluated and interpreted into meaningful and significant conclusions for other researchers and the general public to understand and use it.
- **Data Sharing:** This relates to how the results of the research are disseminated. Of late, researchers are required to share the data they produce, and this is usually part of the conditions that have to be met from funding agencies. The motivation for sharing the data, according to Borgman (2013) is to; facilitate reproducibility of research, make publicly-funded assets available to the public, leverage investments in research data, and advance research and innovation.

- **Data Reporting:** This usually relates to the publication of conclusive findings.

Obviously, good RDM does not only enhance the efficiency of the research process, but also the safety (i.e. protecting valuable data) and quality of the data. Furthermore, good RDM enhances research visibility and ensures compliance with ethical codes, data protection laws as well as journal requirements and funder policies.

From the foregoing, a data management and sharing plan will help researchers to consider when research is designed and planned, and how the data generated could be managed during the research process and shared afterwards with the wider research community. According to Corti (2014), some of the key issues that enhance RDM include the policy landscape that covers the assessment of existing and new data to ensure good quality assurance, documenting and contextualizing the data, being up-to-date with the legal, ethical and other obligations towards researchers, funding agencies and institutions.

Infrastructure Ecosystem for Data Storage

The advent of the commercial Internet and the World Wide Web in the early 1990s introduced both technologies and cultures that challenged the traditional scholarly infrastructure. According to Plantin, Lagoze and Edwards (2018), two recent transformations in scholarly communication infrastructure have led to the development of data-sharing platforms. First, these are increasing interest in data as a scholarly output which challenges the scholarly infrastructure to fulfil their multiple functions in the areas of data output validation, certification and dissemination. Secondly, the online environment has spawned a series of web-based entities such as e-print and institutional repositories. Therefore, with the emergence of the web-based content management platforms such as Dspace and Fedora there has been a plethora of enhanced services in metadata aggregation. In the opinion of David and Bunn (1988), and Ribes and Finholt (2009), most of today's data repositories, portals and curation systems were initially developed in isolation and these have resulted in the creation of path dependence or incompatibilities that have made the eventual task of integration very difficult.

In recent times, several data storage, sharing and management platforms have been developed, and a typical example is what Dr. Mark Hahnel created in the year 2011. This is FIGSHARE which is both a website and technology. On one hand, it invites researchers to self-archive their outputs (e.g. datasets, graphics, presentations slides, etc.) on figshare.com. On the other hand, it is marketed to university libraries or scientific publishers as middleware services since it

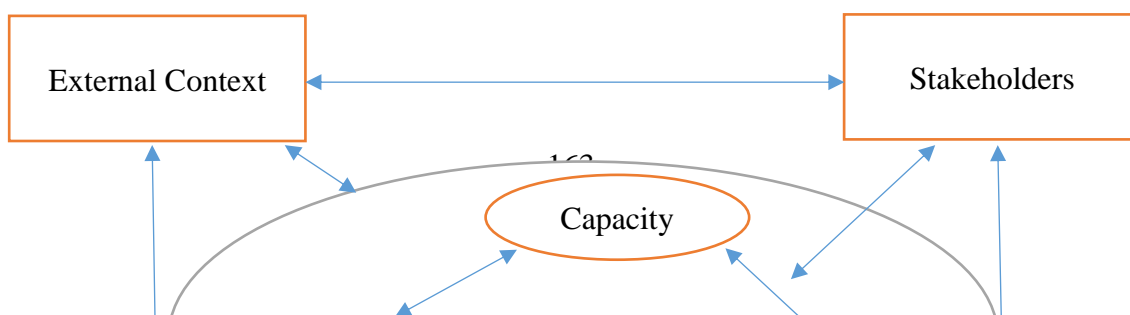
provides a suite of features like web portals, data management tools and persistent identifiers which are usually installed “on top of” existing infrastructural components. With the introduction of computers in data storage, it is important that institutions protect the data against theft and hacking. Quite recently, the development of data protection protocols has been taken very seriously. Thus, whereas electronic data storage offers many benefits, it also requires additional safeguards to prevent individuals from gaining unauthorized access to the computer system to steal or corrupt the data. It is therefore important that members of the research team are educated about social engineering and the importance of keeping passwords.

According to Borgman (2006), maintaining large scale databases, data archiving, and data sharing facilities within an institutional library requires well-trained data scientists with sound understanding of scientific principles and processes. The data scientists are expected to lead the data management teams, guide data management activities from data capture through processing to data analyses and publication, including the development of data structures and the application of data management software packages.

Conceptual Issues Relating to Capacity Building:

As a dynamic process, capacity building is often viewed as part of a change process. According to a DFID(2010) practice paper, even though several researches have been carried out in an attempt to establish a conceptual framework for capacity building, there has not been any conclusive evidence to establish any single model or framework or approaches that can guarantee success in building capacity and improving performance. It is therefore, still work in progress. However, in a work done by the European Centre for Development Policy Management (ECDPM, 2008), the Centre examined the factors that encourage capacity building, how it differs from one another, and why efforts to develop capacity have been more successful in some context than in others. As far as their proposed analytical framework is concerned, the main thrust has to do with the interconnected dynamics of capacity, endogenous change and adaptation, and performance and these are shaped by four other factors, which are the external context, stakeholders, internal features and resources, and external interventions.

Fig: Key Elements of Capacity Building



ECDPM, 2008

Source: ECDPM

As work in progress, the framework is a reductionist approach whereby one looks at aspects such as capacity or performance or internal features and extrapolate conclusions that are seen as valid for the whole. The key assumptions are that:

- Capacity issues need to be seen in relationship to the socio-political dynamics of the context within which they take place;
- Capacity changes and performance are inter-related in complex ways; and
- External interventions are important but they are only one contribution to the capacity development process (ECDPM, 2008).

In effect, capacity is about empowerment and identity that allows an individual, organization or a group to be aware of itself to grow, diversify, survive and become more complex. Inherently, it is a systems' phenomenon that comes out of a complex interplay of attitudes, assets, resources, strategies and skills which may be tangible or intangible. Performance, on the other hand, is about the execution and implementation or results of the application and use of capacity.

Skills Gap Analysis:

According to Shipman et al. (2018), embarking on the quest to learn what training needs exist and to identify possible gaps that are available to librarians will benefit many throughout the world. As far as effective RDM is concerned, some excellent technical skills are very crucial. Primarily, it is very important that anyone who is charged with the responsibility for RDM in an institution is knowledgeable of the data lifecycle as well as subject-specific knowledge and

communication, networking, reference metadata as well as being equipped with software and computer skills to help with data management.

In the opinion of Auckland (2012), examining the competencies and training required for RDM include; data management and curation, metadata advice and use, preservation of project records, metadata schema development, sources of research funding, complying with various funders' mandates, data manipulation tools, data mining, metadata advice and use. Equally important are such technical skills like knowledge of interoperability standards and protocol, metadata statistics and repository software as well as soft skills like project management and leadership. In this respect, for librarians to effectively lead the application of research data management solutions in their institutions there will be the need to equip them with the requisite skills by building their capacity.

It requires effort and skills to make research open, re-usable and discoverable by others. According to Lyon and Brenner (2015), some of the associated skills required for open research include; data analysts, data archivists, data engineers, data librarians, data curators, etc., and even though this whole concept of community capabilities is very important, skills development and acquisition should not just depend on the availability of education and courses, but also on the ability to hone skills and acquire new ones through interaction with peers (Ashley, 2016). In their opinion, researchers at University of Cambridge have observed that the current skill gap has two effects. First, the data they find is often not as re-usable as it might be, and second, they themselves lack the skills to make their research data and software re-usable in turn.

In this respect, support for the development of appropriate data skills should be the responsibility of all stakeholders since this requires the efforts and skills to make research open, re-usable and discoverable by others, and this calls for discipline-specific training in data management and open research to address the problem. Some of these skill gaps could be addressed through formal education (eg. organized courses in the Library Schools to train data scientists, data managers, etc.) and also later in the career as part of continuous professional development activity (eg. short courses, workshops, conferences, etc).

Capacity Building:

The goal of capacity building is to facilitate individual and organizational learning with a view to building social capital and trust towards the development of knowledge and appropriate skills-set that engenders attitudinal change to create a successful organizational culture and a set of capabilities to achieve results. In the opinion of Morgan (2008), “capacity building is a very risky, messy business with unpredictable and unquantifiable outcomes, uncertain methodologies, contested objectives, many unintended consequences, little credit to its champions and long-time lags”. It is a complex notion that involves individual and original learning, and is defined as “enhancing the abilities of individuals, organizations and systems to undertake and disseminate high quality research efficiently and effectively” (DFID, 2010). In effect, this is an endogenous process by which people, organizations and society as a whole strengthen, create, adapt and maintain capacity over time and process.

Conventional wisdom tells us that successful capacity building depends on the level of commitment, ownership and motivation that the actors bring on board. Usually, participants who are determined to develop their capacity overcome all sorts of constraints and obstacles, while those with less resolve make little progress. Again, anecdotal evidence of the rapidly increasing complexity of the research environment is persuasive enough, and the experience of information technology applications in library operations is quite instructive for management of our libraries to show genuine interest in, and commitment to building capacity in their various institutions.

The fact is, building capacity in an institution depends to some extent on the ability of the establishment to attract resources in the form of funding and equipment. In this regard, institutions should have operating budgets not only to support training activities, but also to buy new equipment.

Principles Underlying Capacity Building in Research Data Management

Some of the guiding principles underlying capacity building as far as RDM is concerned include networking through effective collaboration and communication to facilitate the sharing of experiences. For, it is important that all the researchers, data managers and beneficiaries involved understand the local context so that they can accurately evaluate the existing capacity to ensure local ownership as well as to secure the necessary support. Furthermore, there is the

need to establish a robust research governance system and an appropriate support structure to help promote effective leadership that will plan for long-term continuity across the broader institutional community and within the library.

Capacity building, according to Baser and Morgan (2008), has become an overt and intrinsic part of designing and carrying out research and communication activities, and that some of the generic principles that underpin such successful efforts are that, as a process:

- Effective capacity building is the result of an inter-play between individual, organizational, network and institutional factors, and even though it is difficult to plan in advance, its development can be pursued and facilitated by a process of action learning and continuous interventions that need to be systemic.
- Strengthening existing processes that involve building on existing strengths and assets to enhance the local ability to solve problems.
- Ensuring full local ownership of externally-driven interventions by rigorously focusing on the quality of the research.
- Defining the role of external expertise to ensure that the overall responsibility for the process and control over the resources is under the organization. Meanwhile, some room can be made for external expertise to catalyze and support the internal change agents and the management.
- Ensuring that some skills and resources are readily available. Generally, it is important to identify the gaps and shortfalls at an early stage for speedy redress.
- Putting in place an effective monitoring and evaluation plan right from the beginning to enhance the supervisory process.

Approaches to Capacity Building:

Many practitioners see capacity building as a human resource issue that has to do with skills development and individual training. However, what has to be borne in mind is that changes in human cognition and understanding play a key role in capacity development, and these entail absorbing and mastering new ways of thinking and then turning the new knowledge acquired into capabilities for action and improved performances. In the academic and research institutions, the critical concerns have to do with the existence, effectiveness and inter-relationships of collective capabilities that commit and engage, carry out tasks or functions,

relate and attract resources and support, adapt and self-renew, and finally, balance coherence and diversity (Baser and Morgan, 2008).

There are several approaches to capacity building, and according to Baser and Morgan (2008), these may be categorized into top-down and/or bottom-up, technical and/or organizational, individual and/or organizational. The other approaches that can be considered are the planned, incremental and the emergent. Usually, the planned approach is based on planning, control and intentionality, or put another way, the techniques of scheduled and engineered interventions or “planned change”. As far as this approach is concerned, the basic assumption is that planning and “design” could be used to generate shifts in capacity building in an organization. For, it lends itself to targeting, crafting and achievement of clear objectives scheduling of activities and the application of results-based management. In the opinion of James and Wrigley (2006), this approach works best where there are:

- Shared consensus about policy and direction;
- Resources to pay for the support system;
- More tangible objectives especially technical and functional; possibilities of control from senior managers; and
- Opportunities to quantify means and ends.

There is also the incrementalism approach that is based on the principles of adaptiveness and flexibility in implementation. Essentially, it is about the capability to make changes within a structured process of capacity development. This approach, in the opinion of Baser and Morgan (2008), works best in situations where the context is unstable and the choice of strategy is difficult to explain. These include situations where the likely beneficiaries are uncertain about making predictions in respect of their capacity and performance needs. Therefore, using adjustment and small interventions the staff can avail themselves of the opportunities available.

As far as the emergent approach is concerned, this is another approach to change and capacity development in a complex adaptive system whose behavior cannot be managed in any conventional sense. It focuses on nurturing relationships and waiting for results and capabilities to emerge. The tendency has been that many organizations tend to rely on a single approach when it comes to capacity development even though no single approach has the power and the traction to shift a complex system. Thus, for capacity building to be effective, the organizations would have to combine several approaches.

Dynamics and Strategies of Capacity Building:

Based on the Kolb Learning Cycle, the capacity building process could be approached by following some key strategies. One of such strategies is the process-oriented which stresses the importance of human and organizational qualities such as resourcefulness, identity, resilience, innovation, collaboration, adaptiveness, courage, imagination and aspirations (ECDPM, 2008). As far as this particular strategy is concerned, it is important that capacity needs assessment is conducted to enable the Human Resources Department to see which areas that they will require additional staff training and how these can be incorporated into the institutional development strategies. Such an exercise will help identify the strengths and weaknesses of the research and institutional framework at the individual, organizational and institutional levels. Furthermore, it will help with the planning of the detailed activities as far as the cost and time-scales for the capacity building exercise are concerned since investments would have to be made in creating opportunities for continued learning and development of professional skills. To succeed in such an endeavor, it will be necessary to engage all the stakeholders so that they can own the process since this will allow for more effective decision-making.

Efforts to strengthen capacity in the short term could be done through a carefully organized one-to-two weeks training workshops to address specific and general deficiencies in some research areas as data collection, management and analysis, and there are scholarly and inter-related actors like the universities, research institutions, academic publishers, etc. which are readily available to carry out these activities. Currently, with the availability of e-Learning and other social media platforms, capacity building using these media has been greatly enhanced. For example, Scholarly Collaboration Networks (SCN) like Mendeley, Academia.edu and ResearchGate are some of the interesting blend of social and professional platforms with elements of see and be seen as well as tools for managing research (DeLory, 2017). Thus, with increase in SCNs, librarians need to understand the role of these networks in the research lifecycle as well as the key issues involved, and how to incorporate them in scholarly communication models.

As part of efforts to build the capacity of information professionals in the country, the Department of Information Studies of University of Ghana, could consider introducing RDM track as part of the Masters' degree programme. Indeed, developing such a specialist

programme as an elective course could produce a core of data scientists who can lead data management teams to guide data management activities from data capture through processing to analyses and publication. Such training could position them to closely interact with scientists throughout the various phases of their research project.

Building Partnerships:

As information professionals, the nature of our job enjoins us to build bridges to knowledge from its generation to dissemination. Thus, building partnerships is very crucial for both academic and research librarians to meet the needs of their clients as well as to help promote the R&D activities of the institutions concerned. The fact is, the whole collaborative process will allow for wider and deeper inputs from people with a variety of perspectives, expertise and experience to bear on the capacity building activities. According to Atkinson (2018), this can be particularly effective where there are clear links to key institutional strategies and drivers. Furthermore, it provides the opportunity to deal with areas of activity that are too large for any stakeholder to deal with individually.

In this respect, individuals, teams and managers involved in such activities will have to possess the right attitude and the willingness to share knowledge, information and skills. They should be willing to challenge conventional thinking, and be able to bring to bear fresh perspectives, and to re-think traditional library services. Certainly, there are bound to be challenges that will have to be resolved. For example, collaboration with other university staff and students may be problematic at times since staff priorities will primarily relate to their normal areas of responsibility while the priorities of the students will always be towards their chosen programmes of study.

Conclusion

It is quite clear that capacity building is inherently an institutional phenomenon that comes out of a complex inter-play of attitudes, assets, resources, strategies and skills that may be tangible or intangible. It is all about empowerment and identity that allows the institution or the staff to be aware of the activities that will enable them grow, diversify, survive and become more complex. The key idea underlying the concept of capacity building is for the institution or individual to do something in a certain way at a certain time and on a certain scale. Usually, the technocratic toolkits associated with capacity building are; programme goals, result matrices, change strategies, milestones and performance indicators. Therefore, it is very

important that the capacity of the institutions and the research teams are strengthened to package and disseminate the research data outputs to policy makers.

While some institutional libraries are developing the necessary training programmes to address these shortcomings, most professional librarians are learning on the job through self-study or in-house training. In other jurisdictions, the thinking is to incorporate the programme into professional development courses as a way of developing the much needed skills. Finally, continuing education occurs through conferences, seminars webinars, classes, workshops, e-mail groups, self-study and peer instructions. Ultimately, it is the convergence of data-intensive R&D activities, technological advances, and the expertise of information professionals that provide academic and research libraries with the opportunity to create new profiles in the institutions as partners in knowledge creation, and by so doing help to expand the traditional library roles. This new environment, according to Tenopir, Birch and Allard (2012), allows libraries to take more active and visible roles in the knowledge creation process by placing information professionals at the stage of research planning process to provide the necessary expertise to develop RDM plans as well as to identify appropriate data descriptions and create preservation strategies.

Capacity building is therefore about the dynamics of change and it involves the transitioning from one pattern of behavior to another at individual, organizational and institutional levels. Much of the focus of capacity building interventions remain at the overt, formal and recognizable levels, however, many of the factors that shape the process such as the relationships, structures, patterns of authority, and the resources are hidden and informal. Meanwhile, it is the nature of interplay between the overt and the hidden, the formal and informal that happens to be the major determinant of the effectiveness of any effort to develop capacity.

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**BUILDING LIBRARIANS' SKILL IN RESEARCH DATA AND OUTPUT
MANAGEMENT: CASE STUDY OF LIBRARIANS AT SAM JONAH LIBRARY
(UNIVERSITY OF CAPE COAST) AND OSAGYEFO LIBRARY (WINNEBA
CAMPUS)**

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Abstract

The paper examines the role of Sam Jonah Library in supporting researchers to manage data in the University of Cape Coast as well as the readiness of the librarians within the Library in taking up additional roles in response to research data and output management within the University. It also attempts to identify the capacity needs of the librarians with respect to research data and output management in the University of Cape Coast. The study adopted the case study research design and the population included management and staff of the Sam Jonah library. Questionnaires were the main tools for data collection, which were analysed using version 22 of SPSS. Tables were used to document and help with interpretation of the data. Although majority of respondents had an idea of the constituents of research data and its management, the study confirmed the need for librarians to acquire the requisite skills for data management. Much of the training and competence development could be performed in-house, by different university functions and specialist in the profession through training workshops, seminars, short courses, conferences and also through educational institutions that train professionals.

Keywords: Research data, Data Management, Capacity Building, Academic Librarians.

Introduction

Academic libraries have been striving to remain relevant as well as demonstrate their value in this technological age to their parent institutions. Though the value of libraries in academic environments has long been a topic of research and argument among librarians, it can be argued that within the context of academic libraries, the relevance and value of the library can strictly

be linked to the parent institution's mission statements, values and its working strategic plan. (Brown, Wolski & Richardson, 2015)

Most academic institutions are geared towards training graduates and researchers who can produce quality research output that can foster national development. Quality research output improves an institution's visibility, both locally and globally as well as giving the individual researchers within the institution the opportunity to serve on external committees, or publish in peer-reviewed journals. It can therefore be concluded that, an academic library's ability to provide the needed assistance, accurate, reliable and complete information resources in a timely manner to researchers will amount to its relevance and value, towards the goals of both individual researchers and the university community at large.

Research data are the main asset of scientific, economic and social research. They are the root for any research and also the definite product of research. The importance of a quality research data and its source is therefore necessary, particularly when data sharing and re-use is becoming increasingly important within and across academic disciplines. (Brown, Wolski & Richardson, 2015).

As mentioned earlier, the research process in universities is becoming more and more competitive and demanding, as such, it is now possible to gather a significant amount of data within a short space of time. These data enable many problems to be investigated for solutions. The question that needs to be addressed however is, what becomes of these data after the research? Undeniably, a significant amount of the data is even lost before the research process is completed due to lack of proper management.

Institutions can track grant applications of their researchers, collaborations being built with other researchers, conferences presentations and their areas of expertise. All these are research data that can enhance an institution's research package. Academic institutions can also use these to track the research output and performance of graduates and faculty members, and also showcase what is being done to attract funding and collaborations. But these can only be achieved if these data are well managed within the institution.

Often, libraries and librarian's strategic and personal relationship with the universities research centers, senior management, faculty and individual researchers, ensure proper management of

their research outputs and repositories. Since librarians cannot be side-lined when it comes to showcasing their institutions' research expertise and experts, promoting and supporting the sharing of open data, managing repositories and curating research data, their professional development towards these needs has to be addressed accordingly to equip them for their roles.

Problem Statement

Globally, there has been an extensive dialogue on the vital roles academic libraries can play towards their research community in recent years. Academic libraries in Ghana are therefore developing and implementing new roles and service models, especially in the area of research output. A closer look at roles towards the management of data that give “birth” to these rich outputs would be an advantage to the library and the institutions at large.

Although the libraries under study have taken some initiatives to meet the emerging role of librarians in supporting the new area of research output management, there is still much to be done to include managing research data within their parent institutions.

Managing research data is an essential part of the research process, but many individual researchers have challenges in ensuring that their data can be stored in a secured manner while remaining accessible and not obstructing their research activities. These challenges can be confirmed by their inability to perform simple activities like naming files for easy and quick identification, keeping track of different versions of files, and deleting those not needed, backing up valuable data and controlling who has access to their data among others.

Despite the benefits of managing data in institutions, earlier studies like (Gary, 2013; Lewis, 2010) also identified some factors that constrain individual researchers to perform data management activities. According to these studies, “some researchers do not have the technical skills to do the metadata work, which is mostly technical in nature”, and there are no consistent storage infrastructures, coupled with time constraints to organise the data. Bruhn (2014).

Some scholars are of the view that, academic libraries and librarians should provide a leading role in research data management support on behalf of the researchers, as this will help to minimise the challenges that researchers face in fulfilling the directives from some funding agencies and research counsels and also ensure long term storage, preservation and re-use of data (Cox & Pinfield, 2013).

Though there are scholars who argue that most of the research data support services could be seen as an expected extension of the existing library work and it is just a matter of renaming the services that the library offers. Any academic library that seeks to manage data needs to build capacity of individual librarians who will be responsible for these activities and also build the needed infrastructure for consistency. This paper therefore focuses on how to build capacity to identify ideas for useful tools, practices and services towards managing research data and output, particularly data in Sam Jonah and Osagyefo libraries respectively.

Academic libraries have long been providing some sort of research support to researchers, and have been involved in managing, preserving, and providing access to information. It is important that research data is well managed to make it discoverable, accessible and connectible to enable innovative re-use. Research data management by the library can therefore be beneficial for the library as well as the students, other researchers, the institution and can improve external collaboration and building partnership while ensuring copyright protection, (Ingram, 2016).

Objectives of the study

The study seeks to;

- examine the roles of Sam Jonah and Osagyefo libraries in supporting researchers to manage data in the University of Cape Coast and University of Education, Winniba.
- examine the readiness of Sam Jonah and Osagyefo libraries and librarians in taking up their additional role in response to research data and output management in their institutions; and
- identify the capacity needs of the librarians with respect to research data and output management in the University of Cape Coast and University of Education, Winniba

Literature Review.

The Concept of Research Data

Research data, in this context, refers to the information that is generated or collected to be used as primary sources in the production of original research results and would be required to validate or replicate research findings. According to Burnham (2012), research data can be classified according to the processes used to gather or generate them, and these are:

- Experimental data: generated by lab equipment (e.g. gene sequences or chromatograms)

- Computational/Simulation data: generated from calculation models – the actual model (and metadata about the model) may be more important than the output data (e.g. climate models, economic prediction models etc.)
- Observational data: recordings of specific phenomena at a specific time or location (e.g. seismic data, medical imaging, opinion polls, climate data etc.)
- Derived data, produced via the processing or combining of other data (e.g. data mining, compiled databases etc.)
- Canonical data: data extracted from reference datasets (e.g. GenBank, HILDA etc.)

Research Data Management

Research data management is seen as all the activities involved in the planning, organisation and preservation of research data. It includes all activities that ensure that data is safely stored, is findable and can be used to reproduce findings. Any good data management will begin with a plan that will help to support data reuse beyond the life of the project that generated it. It can also show how data will be protected. (Imperial College, London, 2016)

Reasons for Managing Research Data

Research data is an important element of the research procedure, and some data would be impossible or difficult to retrieve if lost; for example recordings of a specific seismic event. Some data may also serve additional purposes for other researchers and students; for example the geographical map of a region or town collected by a geographer. Good management practices will therefore ensure that researchers are able to meet any obligation related to data retention by guarding against the misfortune of data loss. The effective management of research data will also inform research integrity by enabling the tracking of data from collection to results. This will increase the repeatability of the research should it ever be necessary to defend a knowledge claim.

From the above, it is clear that researchers have a responsibility to manage research data effectively, but do they have the requisite skills for it? Though the responsibility for data management lies primarily with researchers, the library can provide a supporting framework of guidance and training, tool infrastructure and support staff that can help with many aspects of data management.

Role of the Library in Research Data Management

Globally, academic and research libraries are implementing Research Data Management (RDM) services in support of university research activities. In Africa, some academic libraries

are providing frameworks for these services with some degree of success as policies, infrastructure set up, library staff training, as well as awareness and advocacy campaigns held with academic staff and researchers (Chiwari & Mathe, 2016). They also mentioned Cape Peninsula University of Technology (CPUT) Library as an academic library that has taken a leading role in creating platforms, systems and processes for the management of research data for their institution. The development of Research Data Management services should therefore be part of an academic library's own strategic plan which is closely linked to the institutional goal of producing quality research output.

The Library's role in Research Data Management may include the planning, curation, dissemination and promotion of the research outputs in terms of articles and theses, the curation of research data through research data management systems and data repositories, or a cloud-based service for academic and research staff, at no cost to use their institutional email address to sign up, or add it to an existing account. They can also train highly skilled staff, develop research infrastructure and build collaborations with other research stakeholders within the institution to train and equip researchers to manage data personally, as well as advocate for the need for data sharing and re-use and ensure copyright protection. (Chiwari & Mathe, 2016).

All these activities should, however, begin with a proper data management plan.

A data management plan is a formal document that outlines what the library and researchers will do with the data during and after research processes. It describes the data that will be created, the standards used to describe the data (metadata), the ownership of the data, who can access the data, how long the data will be preserved (and/or made accessible), and what facilities and equipment will be necessary to disseminate, share, and/or preserve the data. (Craigin et al, 2007).

Building Capacity for Research Data Management in the Library

Undeniably, Research Data Management plan and policies alone cannot be adequate for managing data effectively in the library. The library needs to build and improve RDM capacity of employees. Developing Research Data Management service must start with identifying existing competences within the library and analyzing new needs for competences and skills development. A report by Johnsson and Åhlfeldt (2015) for Lund University suggested that, there should be an established formal section "Research data management and co-ordination" in university libraries to co-ordinate and promote the activities in RDM towards faculties,

university management, and other university research support functions. Staff at different sections of the university library, such as digitization services, digital collections, scholarly communication, may also play important roles in the Research Data Management process, by acting as experts in their specific domains if they have the requisite skills.

Data management staff can be trained to build capacity on: basic data management, data management planning, data life cycle, archiving, subject classification of research data, (i.e. Data Documentation Initiative) metadata standards, copyright and licenses, (i.e. legal prerequisites and research ethics in managing research data), data collection methods, preparation for sharing, de-identification of personal data , data identifiers such as URI, methods for text encoding such as XML and other formats among others (Johnsson & Åhlfeldt ,2015).

Methodology

The study adopted both qualitative and quantitative methodology with the use of semi-structured interviews and questionnaires. The mixed methodology helped to get answers from a number of perspectives. It also ensured that there are no ‘gaps’ in the information/data collected. It also eliminated some pre-existing assumptions from the researcher. (Stange, K . et al., 2006).

Population

The population for this study is the professional staff of Sam Jonah library and Osagyefo library and this comprise the senior members who form the management body of these libraries. They are; the Librarians, Deputy Librarians and the Assistant Librarians as well as the Principal Library Assistants with post graduate qualification in information studies.

Sampling and Selection of Subjects

Available statistics from the libraries show a total of 11 senior members, and 13 Principal library assistants with post graduates degree in information related studies from the Sam Jonah Library and 16 professionals with post graduate degee in information studies from Osagyefo library. The study used all 40 staff as the sample size. There was therefore no sampling in this study since all the professional staff were included in the study considering the population size. (Murray & Warm, 2003)

Instrumentation

The study adopted a questionnaire and interview guide as the main data collection instrument. The questions and interview guide were informed by the research objectives. The questionnaires consisted of open-ended questions. The open-ended questions allowed the respondents to express their opinion on the topic under study

Results and Discussions.

Background of Respondents

The background information sought from respondents included their level or rank and number of years of service in the field of librarianship. This was to enable the study ascertain whether the rank of librarians and the years of service has any link with staff knowledge of what research data and its management is.

Table 1: Staff Categories of Respondents

Table 1: Staff Categories of Respondents		
	Frequency	Percentage
Principal staff	22	78.6
Senior members	6	21.4
Total	28	100.0

Source: field data, 2018

Out of the 28 respondents representing 70% of the total sample size, 22 (78.6%) are Principal Library Assistants and 6 (21.4%) are Senior Members. 3 (10.7%) of the respondents have served in the profession for 1-5 years and above 20years respectively. 13 (46.4 %) respondents have been in the profession for between 6-10 years, 5 (17.8%) have been in the profession between 11-15 years whiles 7(25.0%) of the respondents have been in the profession between 16-20 years.

The Concept of Research Data Management

Table 2: Definition of Research Data Management

Statement	Yes	No
The effective handling of information that is created in the cause of research	21(75.0%)	7(25.0%)

The planning, organization and preservation of the evidence that underpins all research conclusions **23(82.1%) 5(17.9%)**

Practices that ensure that data is safely stored, findable and usable to produce results **25(89.3%) 3(10.7%)**

Research activities aimed at increasing data availability **22(78.6%) 6(21.4%)**

The study sought to find respondents' understanding on the concept of research data management. From the result, most librarians have an idea as to what constitute research data and its management processes. This knowledge however cannot be said to have fully solved the challenges of managing research data in these academic institutions. From an informal conversation between one of the researchers and a faculty member, the latter disclosed that "I just save my data on my pen drive or computer, sometimes I lose it when the drive is lost, but that's the best I can do". It can be argued that there are a lot of individual researchers even among the librarians whose research has generated some useful data that no one else know or would know of or reuse unless such are managed and made available ((Wong, 2009).

Role of the Library in Research Data Management

Undoubtedly, research data challenges have responsibilities for academic libraries, as they are traditional custodians of knowledge. These roles start from mainly acquiring published literature to managing literature and collaborating with researchers who develop and use research data (Goldenberg-Hart, 2004). Academic libraries are seen as preservation institutions with resource management infrastructure, and librarians as information professionals with resource/research management expertise who are believed to have capabilities to deal with all data challenges (Borgman, 2010; Jones, 2008).

This study sought from respondents the role(s) the Libraries are currently playing towards research data management in their institutions. Though all the respondents{28 (100%)} indicated that they believe that the respective libraries have data management responsibility towards the universities, most believed that the library is already performing these roles through the management of their institutional repositories, and the Database of African Thesis

and Dissertation (DATAD), is a typical example. This indicates that most librarians classify research output as research data, and therefore, believe that since the library runs an institutional repository that manages the research output of the university, and also provides some sort of research assistant to graduate students, the library is already managing research data for the university.

Research output can be classified as data of some sort to other researchers (It can be the root for other research though it is a definite product of research), but the classification of research data as indicated by Burnham (2012), makes research output just a component of research data. Currently, Sam Jonah library manages the institutional repository (IRs) for the research output that is being utilized to actively support research lifecycle of the University of Cape Coast. However, personal observation has shown that, the library can do more to help manage the data that produces these outputs as well. An interview response from a respondent specified that “even the research output repository managed by the library have few challenges like inadequate visibility, and much needs to be done to improve it.” It will be important for the librarians to understand how to manage the useful data that generate the output as well. Academic libraries have long been institutions that preserve literature and knowledge and as well act as stakeholders to learning and teaching. Academic librarians therefore play a key role in these supportive roles of the library, and must understand these responsibilities (Macdonald, 2009).

Readiness of the Library for Lead Roles in Research Data Management

The study further sought from the respondents, their perception of the readiness of the two libraries in taking up their additional role in response to research data management in the Universities. The results, 14 (77.8%) from the Sam Jonah Library and 10 (62.5%) from Osagyefo library respectively, show that the libraries have what it takes in terms of human resource and infrastructure to take up this responsibility, however, in order to perform this role effectively, librarians need to understand the role dimension of managing research data and function within the right work settings with the requisite skills to ensure the sustainability of data services. An interviewee gave a response that, “*Sam Jonah Library should work in partnership with campus agencies like the ICT department to improve the management of data because it’s teamwork*”.

The study inquired from respondents, their views on measures the libraries are taking to ensure the effective and sustainable research data management for the university community.

Table 3: Measures put in place currently to handle research data management effectively by the libraries.

Statement	Yes	No
Research data management plan	5(17.9%)	23(82.1%)
Long term research data storage	7(25.0%)	21(75.0%)
Data preservation	9(32.1%)	19(67.9%)
Research data policy	6(21.4)	12(42.9%)
Research data dissemination	18(64.3%)	10(35.7%)

Source: Field data, 2018

The results, as shown in Table 3 above, indicate that apart from data dissemination both libraries do not have any known measures pertaining to policy and plan to ensure long term preservation and storage of research data. Most interviewees were of the view that, the libraries should start with a workable policy on data management to pilot it. It can therefore be concluded that, the library partially engages in research data management for the university community. This revelation makes the readiness of the library to take a lead role in data management as indicated by respondents debatable. It also confirms Ball's (2013) attestation that, many libraries are eager to take on new roles in providing support for effective research data management (RDM), but lack the necessary skills, plan and policies to guide it implementation sustainability.

Building Capacity for Research Data Management in the Library

Capacity building is a means to address the knowledge and skills gaps in professional competences. The need for data management skills development is important for librarians, as this will enable them to have the skills to effectively manage research data. Capacity building is one of the most important aspects of any work development because it builds both human and social capital which are integral elements to effective service provision.

According to Ball (2013) "capacity building" tends to be a general term which is not always well-defined, and there can be a risk that a library may waste time and money on programs and activities that can end up building the wrong skills or targeting the wrong people.

Need assessment should therefore be carried out by any library that seeks to build capacity for data management. The need assessment will identify whose capacity the library needs to build, which areas to build capacity for and why to build the capacity, when these capacities need to be built, who should deliver the capacity building and how to evaluate it.

Identifying capacity needs of the librarians with respect to research data and output management in any academic library should be of paramount importance to the management. The study sought from respondents if they have skills in research data management, majority, 23 (82.1%) of them affirmed that they have some basic skills, when the study further sought to find out areas in which respondents have skills, there was a contradiction as only few confirmed that they have skills for data technical infrastructure support and development, expertise in service provision, curation services and education service for data management. This reveals a great professional gap with respect to data management, starting with data management awareness among librarians (Kahn...et al, 2014).

How to Build Librarians Capacity to Perform Research Data Management Services

Ideally, most university researchers would seek the assistance of an expert throughout their research process if possible. Many research libraries are therefore building relationships with research service centers as researchers are often referred to a librarian when writing a grant proposal for a new research project and other research activities (Whitehead & Bourne-Tyson, 2016). Librarians can only meet this role when they have the requisite skills. In order to provide support in the data life cycle process the library staff needs competence development into new areas.

This study confirms the need for librarians to acquire the requisite skills for data management since much of the training and competence development could be performed in-house, by different university functions and specialist in the profession through training workshops, seminars, short courses, conferences and educational institutions that train professionals.

Training workshops address specific and general deficiencies in some research areas such as improve data collection, management and analysis. Workshops are quick to mount and also serve as a primary vehicle through which training needs can be addressed. It can also be tailored to deliver specific skills or updates on new developments in the particular area of specialization.

Libraries can therefore use workshops which are quick to mount and responsive to local needs to build capacity for research data management.

There is already some knowledge in the library organization on data management as identified by this study, but there is the need for more in-depth competence on these areas, if the library should be an essential partner in research data management at the university.

Professional training institutions can also incorporate courses on research data management in their curriculum to equip their graduates effectively.

Recommendation for Capacity Building and Research Data

➤ Workable policy for data management

Policies drive actions and make employees understand actions. It also spells out the scope of activities that can help identify training needs and staff to be trained. Well-written policies on data management will convey to employees what is expected of them with regards to research data management, and serve as a form of internal control.

➤ Managing data collections in Data Repository

Storing Research data in a repository can make it easily accessible. Properly formatted data citation for the dataset will be helpful. The library can use constant identifiers to help with easy identification and retrieval from the database (e.g. SSD/01/2011, Social Science data no.1 from 2011.). Specific keywords and tags that make the data more likely to be found can be used. The library can select a format for storing the data that is intended for long term.

- Research centers within the universities like the graduate schools can enable usage reporting on all data created by researchers within the institutions.
- Researcher/Library collaboration on data management. The library can also organize training on data management to researchers.
- Advocacy services, for example, promoting the benefits of Open access to Research data and research data management.
- Build infrastructure support and adequately train staff through workshops and seminars on Research Data Management.

Conclusion

Research data management is a relatively new concept in Ghanaian academic libraries as compared to other institutions in the developed countries. Nonetheless, the concept is very

important and librarians, research officers, records managers, information technology professionals and researchers need to explore the concept so as to effectively participate in good research data management practice. The establishment of research data repositories or the use of already established research data repositories can ensure that research data management standards are adhered to when doing research. There is also the need to partner with international organizations such as research centers and training institutions in managing research data professionally.

If research data are well organised, documented, preserved and made easily accessible, and their accuracy and validity is controlled at all times, the resultant effect would be high quality data, efficient research, findings based on solid evidence and the saving of time and resources. Researchers themselves will benefit greatly from good data management. Data management should be planned before research starts and may not necessarily incur much additional time or costs if it is engrained in standard research practice. Establishing the roles and responsibilities of all parties involved is key to successful data management and sharing.

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**AN ASSESSMENT OF THE CONTRIBUTION OF INSTITUTIONAL
REPOSITORIES TO THE VISIBILITY AND CITATION IMPACT OF
UNIVERSITIES IN GHANA**

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ABSTRACT

Over the past ten (10) years, a number of universities in Ghana have established Institutional Repositories to ensure the use and the dissemination of their academic content. Within these years, the functionality and contribution of these IR's to the visibility and citation impact of universities in Ghana have not been established. For the purpose of this study, the contribution of Institutional Repositories to the visibility and citation impact of universities in Ghana was explored. The study adopted the descriptive survey design as a research design. The mixed method approach which included interviews, questionnaires, document analysis, researchers' personal experiences and observations were used to solicit data from the respondents. A total of six (6) universities made of public and private that have full-fledged Institutional Repositories were purposively sampled for the study. In all, a total of 40 participants were used for the study and the Statistical Package for the Social Sciences was used to analyze the data. Although the concept of Institutional Repository is growing at a slower rate, this study found out that Institutional Repositories in the six institutions in Ghana are functional, thereby contributing to the visibility and citation impact of their institutions. The study recommended the need to address the various challenges confronting these institutions in the management of their IR's so that their achievement will attract other institutions to come on board.

Keywords: *Institutional repositories, visibility, citation impact, University of Cape Coast, Ghana*

Introduction

The rapid changes taking place in the Universities as a result of the advent of information and communication technology and the exponential growth of information resources, especially in the digital environment has affected the way University Libraries manage the research outputs of their institutions. University Libraries are working hard to create Institutional Repositories (IR), also known as Knowledge Banks, to gather and store the ever growing research outputs of their institutions. The Institutional Repositories are used as reservoirs to capture, disseminate and preserve intellectual outputs of academic and research institutions. A university-based institutional repository is used to manage and disseminate digital materials created by the academic institution for its community members (Lynch, 2003). Institutional Repositories enable institutions to create archives and make accessible their wealth of knowledge (Prosser 2003).

Knowledge banks have massively been used for scholarly communication in universities to obtain public value across the globe. Institutional Repository showcase the wealth of knowledge through the research outputs of an academic institution, thereby increasing the visibility and citation impact factor. According to Tsunoda et. al. (2017), the aim of institutional repository is to provide open access to an institution's research outputs in order to attain global visibility of the institution's research and digital assets. Several universities have developed comprehensive institutional repositories and academic staff, students and research affiliates have taken advantage of this avenue as an alternative publishing media for publicising their research outputs.

The Ghanaian Scenario

Lynch and Lipponcott, (2005) indicated that more than forty percent of academic institutions in the United States had set up institutional repositories. Unfortunately, the same cannot be reported on Ghana as the concept is now growing but at a slower rate. That is, the establishment of institutional repositories has not gained popularity and there is low awareness, even though some public and private universities have isolated institutional repositories. Also, there is no formalized way of sharing research outputs among institutions with existing repositories. This has emanated from the fact that there is no national policy on the establishment of institutional repositories in Ghana. Furthermore, the creation and management of institutional repositories is not an accreditation requirement for establishing tertiary institutions in Ghana.

Nevertheless, in the past ten (10) years, a number of universities in Ghana have invested significant resources in establishing institutional repositories for the purpose of capturing, preserving, disseminating and above all ensuring the visibility of their institutions. Taking the lead in the adoption and establishment of institutional repositories, Kwame Nkrumah University of Science and Technology library was the first to establish an institutional repository in 2008 to make its research findings available to its research community and the world as a whole. This enviable step taken by the KNUST attracted an unimaginable visibility for the University (Corleley, 2011).

Other Universities including the University of Ghana, University of Cape Coast, University of Education, Winneba, Ghana Institute of Management and Public Administration, the Methodist University College Ghana, Ashesi University, Central University, Regional Maritime University College, University for Development Studies, etc. recognized the need to also establish their institutional repositories to enhance the visibility of their institutions. The Consortium of Academic and Research Libraries in Ghana (CARLIGH) and the International Network for the Availability of Scientific Publications (INASP) were very instrumental and supported these institutions in the installation and training programmes (Corleley, 2011). The University of Ghana's institutional repository was established in 2011 to aid the capturing, sharing and preservation of its research outputs (University of Ghana, 2014).

The individual repositories vary in terms of content, scope and benefits, in that, these institutions have varying objectives. Some established benefits of institutional repositories outlined by Cullen & Chawner (2010) include 'benefits to the researcher, to the institution, and to the individuals. Despite this diversity, the ultimate goal of institutional repository is to house research outputs produced and generated by the institution's students, faculty, non-teaching, researchers, and staff of the university (Crow, 2002). Librarians are therefore expected to embrace this additional responsibility in managing and sharing of scholarly outputs of their institutions. As part of the changing role of librarians, institutional repositories are managed by academic libraries; and they have been proactive in advancing research, scholarship and knowledge in their new role (Cullen & Chawner, 2010).

Statement of the problem

Despite the growing trend of institutional repositories in Ghana, especially the massive contribution of the Consortium of Academic and Research Libraries in Ghana (CARLIGH) and the International Network for the Availability of Scientific Publications (INASP) to the establishment of institutional repositories in Ghana, no empirical study has been cited so far that examined the functionality and contribution of institutional repositories to the visibility and citation impact of the Universities in Ghana.

The purpose of this study was therefore to examine and explore the contribution of these institutional repositories to the visibility and citation impact of Universities in Ghana. This study explores how operational activities and managerial commitment have influenced patronage, visibility and citation impact of these Universities. The current challenges facing these universities in relation to the management of their institutional repositories were also investigated.

Objectives of the study

The objectives of the study were to:

- examine the state and functionality of institutional repositories in the selected Universities in Ghana;
- ascertain the views on the benefits and non-benefits of the institutional repositories in the selected Universities in Ghana;
- establish the relationship between institutional repositories and the visibility and citation impact of selected institutions; and
- make appropriate recommendations based on the findings of the study.

Null hypothesis: There is no relationship between promotion of IR usage and visibility and citation impact of the selected Universities in Ghana

Research questions

The following research questions were used:

1. What is the state and functionality of institutional repositories in the selected Universities in Ghana?

2. What are the views on the benefits and non-benefits of the institutional repositories in the selected Universities in Ghana?
3. What is the relationship between institutional repositories and the visibility and citation impact of selected institutions?
4. What are the challenges that confront the various institutions in the management of their institutional repositories?

Hypothesis:

1. H₀: There is no relationship between promotion of IR usage and visibility and citation impact of the selected Universities in Ghana

Literature Review

Impact of institutional repository on visibility, citation impact and open access

The need for sharing research outputs across the various disciplines and institutions in the academia cannot be over-emphasized. Proper management and patronage of institutional repository help to increase the visibility of an institution and the author's scholarship worldwide. Crow (2002) revealed that the use of institutional repositories help to increase the research profile of institutions, leading to visibility and increasing citation impact factor. It is an effective way of showcasing an institution's overall research outputs that have been captured in several publications (Crow, 2002). In order to increase accessibility, global visibility and good management of digital contents, academic institutions have established institutional repositories (Gbaje & Mohammed 2017). Publishing in an institutional repository will enable an institution to have a reliable internet database that can be accessed by all; there is also the chance of increased visibility and impact of research work (Repanovici, 2011). For this reason, academics are encouraged to submit their research outputs into institutional repositories in order to gain exposure. Thus, through publishing on the web their work stands the chance of being used and cited more, thereby gaining recognition over a period of time (Pinfield, Gardner & MacColl, 2002). Freely available articles in open access repositories gain more citation as compared to subscribed ones (Agyen-Gyasi, Corleley & Frempong 2010).

Open access is an important concept that promotes the visibility of an institution. It boost institutional prestige and citation impact factor, therefore, it is important that institutions should operate open access repositories. Institutional repositories aim to provide open access to

research outputs, obtain global visibility for institutions, and for the storage and preservation of institutional digital assets of unpublished venerable grey literature including theses, working papers and technical reports (Tsunoda et. al. 2017). Crow (2002) further, noted that “improved long term preservation of the institution’s digital assets is another benefit to be realised through centralising content in known, standardised formats”

In solving societal challenges, there is the need to experience some form of interdisciplinary dialogue and a new way of openness in the research process (Ministry of Education and Culture’s Open Science and Research Initiative, 2014). Research outputs need to be made available for current use or for further research leading to research collaboration, research availability, retrieval and management. In addition, open access repositories, to a very larger extent, help to minimize duplication of research and solve some of the challenges researchers go through during the publication phase of their research.

In Ghana, the Association of African Universities (AAU), the Consortium of Academic and Research Libraries in Ghana (CARLIGH) and the International Network for the Availability of Scientific Publications (INASP) are the leading organisations championing the propagation of Open Access.

Looking at the perceptions of authors on open access, a study by Koulouris et al. (2013) revealed that majority of the respondents knew that open access articles get more citations due to their higher visibility, however, a smaller percentage of the respondents were of the view that open access publications are susceptible to plagiarism, in that, they do not follow peer review process. Also, a study by Abrizah (2009) showed that faculty were eager to make a number of works including theses, dissertations, post-prints and conference papers available through open access repositories, but they were concerned about issues related to copyrights, plagiarism and publisher’s policies. Shearer (2003) noted that institutional repositories solve some of the subscription problems in scholarly publishing.

Managing Institutional Repositories in Academic Institutions

Managing institutional repositories require proper managerial skills to ensure smooth running and sustainability. Lynch (2003) is of the view that a collaborative effort of librarians, information technologists, archivists and records managers, faculty, university administrators and policymakers are crucial in managing institutional repositories. This collaboration must be

seen in the process of gathering and making accessible digital contents as well as ensuring long-term preservation of these institutional assets. Long term preservation of institutional repositories ensures further research and re-use of research outputs.

Quite apart from that, there is also the need for organizational commitment at every stage of building the repository. Institutional repositories run on computerized networks (i.e. software and hardware technologies) to enhance workflow and accessibility. First and foremost, print resources need to be converted into electronic or digital forms using technological means to enable access. It takes organizational commitment to acquire, maintain and sustain the relevant technological targets needed for the job. Lynch (2003) pointed out that, the important aspects of institutional repositories comprise management of technological changes including migration of digital content from one version of technologies to another, which should be part of the organizational commitment for the provision of repository services. There is also the need for IT staff to see to the proper running and maintenance of the technological equipment. Other library staffs who work under the institutional repository need to be trained periodically.

Furthermore, there is also the need to establish policies, procedures and standards to assess the overall performance of an institutional repository. In order to have a consistent workflow, there should be guidelines that spell out the components of an institutional repository, and this should include objectives, mission statement, preservation plan, and structure of staff, IT management framework and technical infrastructure support.

Challenges in Managing Institutional Repositories

There are several challenges that work against the proper management of institutional repositories. Agyen-Gyasi, Corleley & Frempong (2010) outlined a number of challenges that pertain in the African continent; lack of awareness of the institutional repository concept, inadequate ICT connectivity and infrastructure, unreliable power supply, inadequate funding, inadequate advocacy, copyrights and technical barriers as well as institutional cultures and policies. Also in some developing countries, there is the issue of high cost of ICT infrastructure coupled with poor telecommunication networks which make the smooth running of open access repositories very difficult and frustrating (Giarlo, 2005, Canada, 2009). Adetunji et. al. (2017) also mentioned lack of knowledge or awareness of institutional repository, inadequate ICT connectivity and infrastructure, inadequate power supply, inadequate funding, inadequate advocacy, technological obsolescence and media deterioration, insufficient technological

skills, copyrights, institutional culture and politics and lack of institutional repository policy as some challenges that pertain in Nigeria.

Research Methodology

The descriptive survey design was used for the study. This study adopted the mixed method approach which included interviews, questionnaires, document analysis, researchers' personal experiences and observations.

A total of eight (8) Universities made up of public and private that have full-fledged institutional repositories were purposely sampled for the study. They included University of Cape Coast (UCC), University of Ghana, Legon (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Education, Winneba (UEW), Methodist University College Ghana, Ghana Institute of Management and Public Administration (GIMPA), University for Development Studies (UDS) and Ashesi University.

The researchers concentrated on the managers of institutional repositories. In all, a total of forty participants (40) were purposively sampled for the study, thus five (5) participants from each institution were purposively sampled for the study. The sampled officials comprised the Head Librarians, Head of IT Department in the library, Head of Institutional Repositories, Head of Research Directorate and E-resources Librarian from each institution. Interviews were conducted and questionnaires administered both in person and by electronic means. The various institutional websites were also visited from time to time to capture the total number of submissions made. Pearson moment correlation co-efficient and frequencies were analysed using SPSS version 22 and content analyses were also used to analyze qualitative data.

Findings and discussions

Table 1: Total number of the research outputs in individual repositories

Institution	Year of establishment	Department	Institutional URL	No. items captured
Kwame Nkrumah University of Science and Technology	2008	Library	ir.knust.edu.gh	10, 900
University of Ghana	2011	Library and IT section	ugspace.ug.edu.gh	8, 757
UEW	2010	Library		1, 756
UDS	2014	Library	uds.space.com	1, 744
University of Cape Coast,	2012	Library	ir.ucc.edu.gh/dspace	1, 267
Methodist University	2010	Library	www.mucg.edu.gh	433
Asehyi University	2013	Library	www.air.ashesi.edu.gh	314
GIMPA				

Source: University Institutional Repositories websites 2018

Objective 1: To examine the state of IR in the selected Universities in Ghana

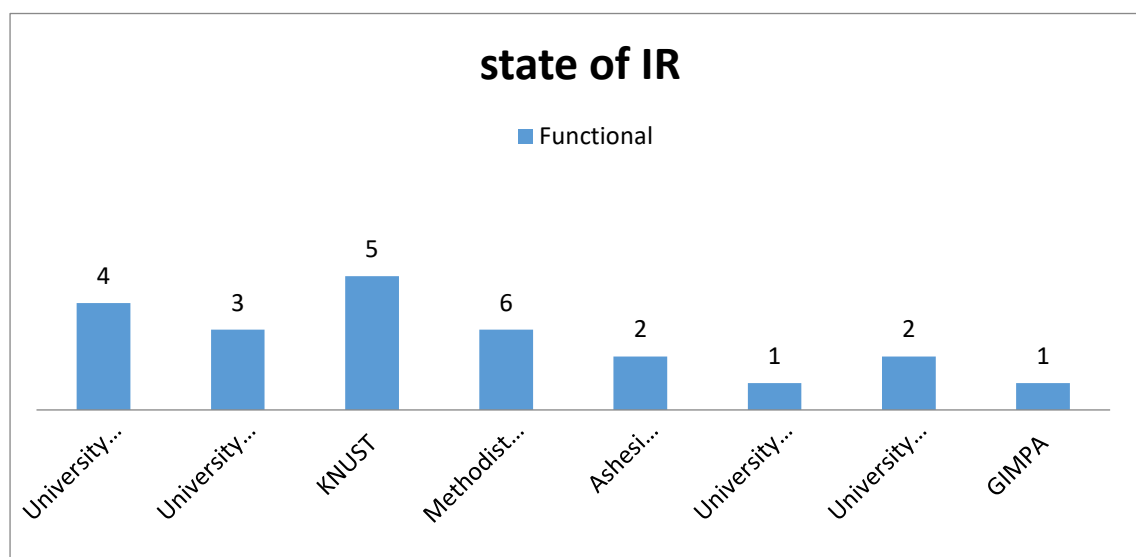
Table 2: Cross tabulation of selected Universities and state/functionality of the institution's IR

Name of Institution	State of Institutional IR			Total
	Functional	Not Functional	Yet to start	
University of Cape Coast	4(100.0%)	0(0.0%)	0(0.0%)	4(100.0%)
University of Ghana	3(100.0%)	0(0.0%)	0(0.0%)	3(100.0%)
KNUST	5(100.0%)	0(0.0%)	0(0.0%)	4(100.0%)
Methodist University College	3(100.0%)	2(33.3%)	1(16.7%)	6(100.0%)
Ashesi University	2(100.0%)	0(0.0%)	0(0.0%)	2(100.0%)
University of Education	1(100.0%)	0(0.0%)	0(0.0%)	1(100.0%)
University of Development Studies	2(100.0%)	0(0.0%)	0(0.0%)	2(100.0%)
GIMPA	1(100.0%)	0(0.0%)	0(0.0%)	1(100.0%)
Total	21 (87.5%)	2 (8.3%)	1 (4.2%)	24 (100.0%)

Field Data 2018

From Table 2, the cross tabulation analysis reveals that the states of the IR’s in the selected Universities are functional. The results of the interviews conducted on the Head Librarians or their representatives and Heads of IR confirmed the findings that IR’s are functional in all the selected Universities. Figure 1 shows the state of IR distribution across the selected institutions.

Figure 1: Distribution of functional/state of IR



Objective 2: Ascertain the benefits and non-benefits of IR in the selected Universities

Table 3: Benefits and non-benefits of IR

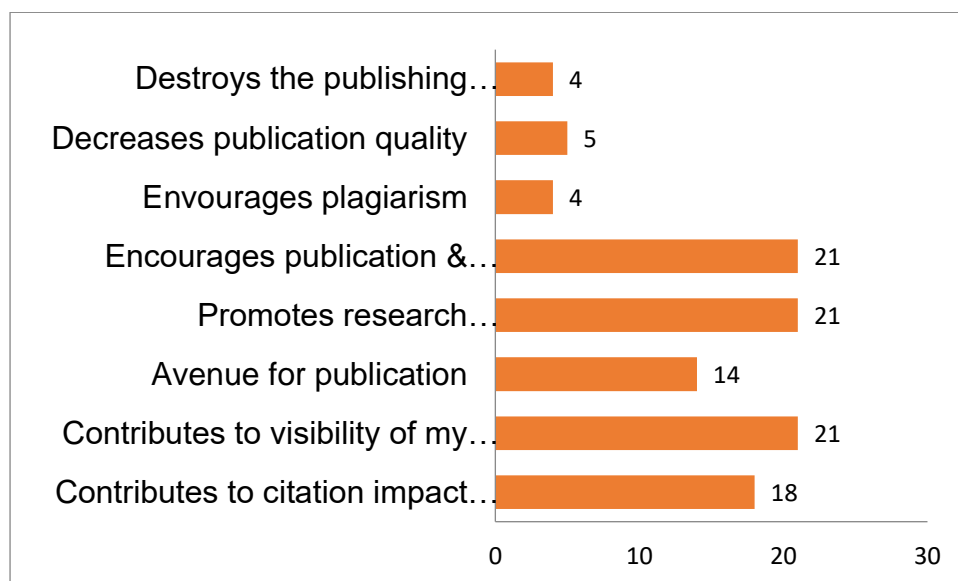
Functionality	Responses		Percentage of Cases
	Count	Percent	
Contributes to citation impact of institution	18	16.7%	81.8%
Contributes to visibility of institution	21	19.4%	95.5%
Avenue for publication	14	13.0%	63.6%
Promotes research dissemination	21	19.4%	95.5%
Encourages publication & author recognition	21	19.4%	95.5%
Encourages plagiarism	4	3.7%	18.2%
Decreases publication quality	5	4.6%	22.7%
Destroys the publishing industry	4	3.7%	18.2%
Total	108	100.0%	490.9%

Note: Multiple response, n=22

From Table 3, the views on the benefits of IR among respondents in the selected Universities were; contribution to visibility of institution (95.5%), promotion of research dissemination (95.5%). Others are; encourages publications and author recognition (95.5%), contributes to citation impact of the institution (81.8%), and also as an avenue for publication (63.6%).

On the other hand, (18.2%) of the respondents were of the view that it encourages plagiarism and destroys the publishing industry. These concerns expressed by some of the respondents agrees with the findings of Abrizah’s (2009) study which concluded that faculties were concerned with issues of copyrights, plagiarism and publishers policies

Figure 2: benefits and non-benefits of IR among respondents in the selected Universities



Objective 3: Establish the relationship between institutional repositories and the visibility and citation impact of selected institutions.

Hypothesis: There is no relationship between promotion of IR usage and visibility and citation impact of the selected Universities in Ghana.

Table 4: Correlation between Promotion of IR Usage, Visibility and Citation Impact

		Institutional Image	Promotion of IR usage
Institutional Image	Pearson Correlation	1	.406*
	Sig. (2-tailed)		.049
	N	24	24
Promotion of IR Usage	Pearson Correlation	.406*	1
	Sig. (2-tailed)	.049	
	N	24	24

*. Correlation is significant at the 0.05 level (2-tailed).

Note: The variable institutional image was used as proxy to capture visibility and citation impact since both variances were constant

The findings from correlation test showed that, the two variables showed a positive relationship as shown in Table 4. The Pearson correlation co-efficient (r) 0.406 means that there is a moderate correlation between promotion of IR usage and institutional image. Statistically, it is significant at the 0.05 alpha level (thus, $0.049 < 0.05$). The researchers therefore fail to accept the null hypothesis that there is no relationship between promotion of IR usage and visibility and citation impact of universities in Ghana.

Similarly, five (5) out of the eight (8) University Librarians interviewed confirmed these findings that IR contributes positively to the visibility and citation impact of their Universities. These findings confirm the assertion by Tsunoda et. al. (2017) and Crow (2002) that institutional repository contributes positively to the visibility and citation impact of academic and research institutions.

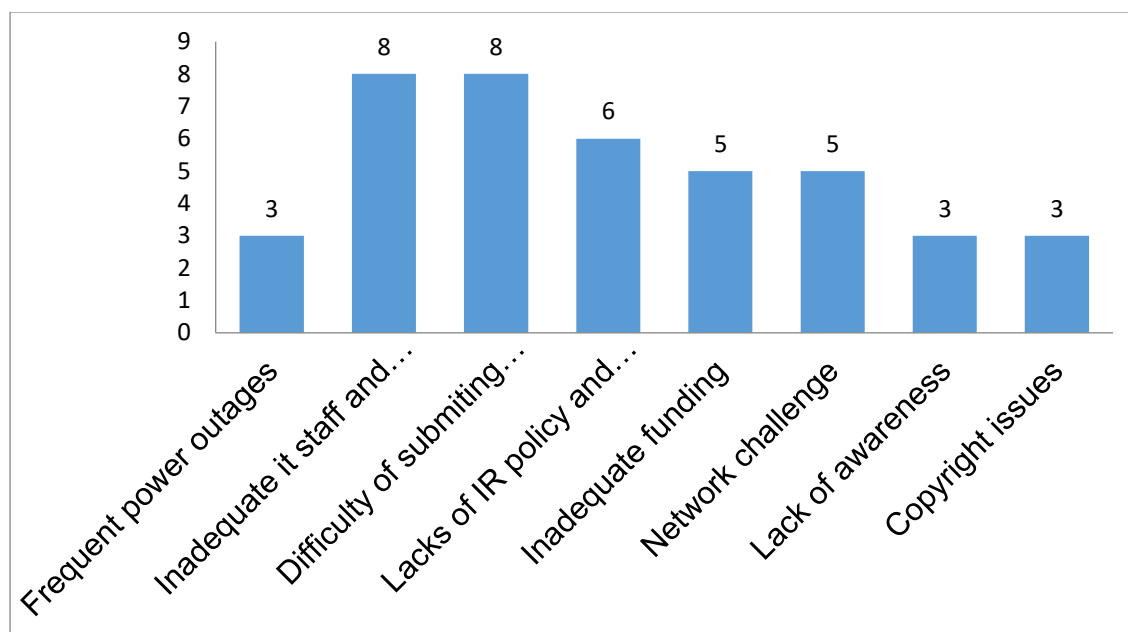
Objective 4: Explore challenges that confront the various institutions in the management of their IR

Table 5: Challenges that confront the management of IR

Challenges	Responses		Percentage of Cases
	Count	Percent	
Frequent power outages	3	7.3%	15.0%
Inadequate IT staff and robust IT equipment	8	19.5%	40.0%
Difficulty of submitting research work by authors and faculty	8	19.5%	40.0%
Lacks of IR policy and guidelines	6	14.6%	30.0%
Inadequate funding	5	12.2%	25.0%
Network challenge	5	12.2%	25.0%
Lack of awareness	3	7.3%	15.0%
Copyright issues	3	7.3%	15.0%
Total	41	100.0%	205.0%

Note: Multiple response, n=20

Figure 3: Challenges that confront the management of IR



From the above findings, the challenges listed by the respondents were confirmed by the interview results. Six (6) of the Head Librarians interviewed affirmed that all the above listed challenges exist with the IR in their various institutions. This finding confirms some of the challenges outlined by Agyen-Gyasi, Corletey & Frempong (2010), Giarlo, (2005) and Canada (2009) who indicated lack of awareness of the institutional repository concept, inadequate ICT connectivity and infrastructure, unreliable power supply, inadequate funding, inadequate advocacy, copy rights and technical barriers as well as institutional cultures and policies.

Recommendations based on findings:

Respondents were asked to make recommendations in order to improve the management of IR in their institutions

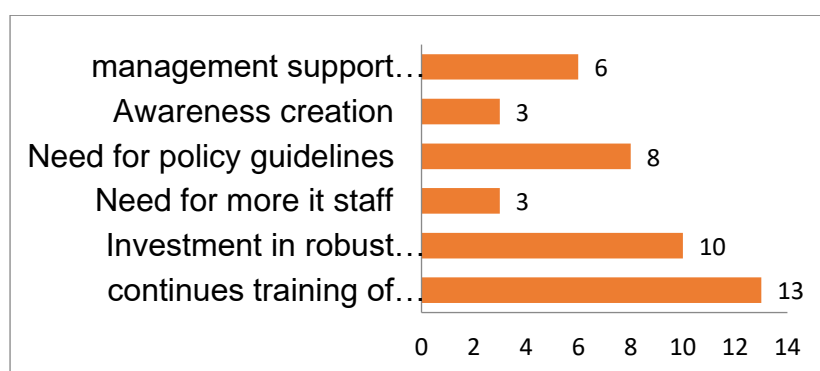
Table 6: Recommendations based on findings

Recommendations	Responses		Percentage of Cases
	Count	Percent	
Continuous training of library staff on IR	13	30.2%	65.0%
Investment in robust equipment and adequate funding from university management	10	23.3%	50.0%
Need for more IT staff	3	7.0%	15.0%
Need for policy guidelines	8	18.6%	40.0%
Awareness creation	3	7.0%	15.0%
Management support for IR	6	14.0%	30.0%
Total	43	100.0%	215.0%

Note: Multiple response, n=20

Table 6 indicates that training of library staff in IR (65%), investment in robust equipment and adequate funding from University management (50%), policy guidelines (40%) and management support for IR were paramount to the sustainability of IR management in the selected Universities.

Figure 4: Recommendations from respondents



Conclusions and recommendations

Institutional repositories have become an integral phenomenon in promoting institutional value and prestige of academic institutions. Even though the concept of institutional repository is growing at a slower rate in Ghana, the findings of this study indicates clearly that institutional

repositories in the various selected Universities are functional and contributing to the visibility and citation impact of the institutions. It is therefore recommended that the various challenges facing these institutions in the management of their IR be given the needed attention, especially in the areas of management support, staff training and policy guidelines. It is interesting to note that good management support will have positive impact on the success story of IR's which in effect will lead to the achievement of the purpose for which the IR's were established. Through this, other Universities in Ghana that are yet to establish institutional repositories will be motivated to do so. Looking at the prospects of institutional repositories, it is recommended that it should be an accreditation requirement. Also, universities should develop guidelines and policies to guide the submission of research outputs to institutional repositories.

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LECTURERS' AWARENESS AND PATRONAGE OF OPEN ACCESS INSTITUTIONAL REPOSITORIES (IRS): THE CASE OF UNIVERSITY OF CAPE COAST

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Abstract

Having been hardest hit by the crisis of inadequate funding for journal subscription, academic institutions, especially in Sub-Saharan Africa have embraced open access institutional repositories as alternative means of scholarly communication. Upon the embrace of this approach to knowledge sharing, the University of Cape Coast's Institutional Repository (UCCSpace), like most academic repositories has had to contend with the issues of sustainability in the area of content recruitment. The study thus assesses lecturers' awareness and perception of institutional repositories in the context of content population and sustainability of Institutional Repositories (IRs). Through the descriptive survey design, the study engages 714 lecturers in a questionnaire survey analyzed descriptively with a response rate of 21.8%. The results indicate that the respondents, some of whom still preferred traditional routes of publishing to the open access method, were much aware of open access institutional repositories with a positive perception about their value. Despite being aware of repositories in general, lecturers' knowledge of the existence and operations of UCCSpace was rather low, and this accounts for the low content submission of materials. Furthermore, reasons of Intellectual Property Rights (IPRs), fear of plagiarism, and absence of water-tight peer review accounted for the low patronage. The study recommends the education of lecturers and other members of the university community by increasing repository awareness through physical and virtual platforms, addressing issues of IPRs, and instituting motivation schemes.

Keywords: Scholarly Communication, Institutional Repositories, University of Cape Coast, Intellectual Property, UCCSpace

Introduction

Scholarly communication has gained the attention of many information scientists by virtue of the strategic position information occupies in the space of development. Access to knowledge is fundamental to all aspects of human development, yet access to academic publications is restricted in many developing countries. Moahi (2012) believes that Africa's share of global

research output is next to negligible, and the few of such studies from academic institutions on the continent are further obscured due to inadequate indigenous scholarly communication outlets (Alemna, 2005). This situation results from the fact that African academics strive to publish in internationally renowned peer-reviewed journals in order to ensure academic promotion, but then, not many of these articles do make it into such journals. However, the few, which do, become inaccessible to most university libraries thereby rendering access difficult. Without any forum for sharing this knowledge, replication becomes the order of the day resulting in the inability to integrate national research into global knowledge pool (Wellcome Trust, 2003; Abukutsa-Onyango, 2010; Harnad, 2010).

With the advent of information and communication technology, the avenues of scholarly communication keep on changing. The ICT revolution, coupled with increasing journal prices, has left actors in the knowledge creation continuum; authors, publishers and libraries to rethink the mode of knowledge sharing (Johnson, 2000; Ming, 2002; Bjork, 2004; Tihamiyu & Aina, 2008). Among the newest trends of scholarly communication in the era of serial crisis is Open Access Institutional Repository. According to Lynch (2003), Institutional Repositories (IRs) are the set of services an academic institution offers to members of the academic community for the creation and dissemination of scholarly contents created in the institution. Enumerating the inherent attributes such as registration, awareness creation, and certification as well as archiving, Crow (2002) and Prosser (2003), as cited in Bamigbola (2014), consider this mode of scholarly communication as appropriate. The IR approach of sharing scholarly output has been highly embraced due to its ability to limit restriction, increase readership, enhance the image of institutions and authors, and above all, break the monopoly enjoyed by traditional journal publishers (Johnson, 2002; Davis and Connolly, 2007).

The University of Cape Coast, which was established in 1962 to train the needed human resource in the education sector of Ghana, has over the years, expanded in both academic programmes offered and infrastructure, and driving the information agenda of the University is the library. The University of Cape Coast Library System supports the teaching, learning and research needs of the academic community through its various collections and services at the main library (Sam Jonah Library), College Libraries, Departmental Libraries and Hall/Student Residential Libraries. In 2012, the University of Cape Coast Library launched a repository with barely 300 records comprising research articles and theses. The contents of the repository have

since increased to 1,600 documents comprising postgraduate theses, journal articles, e-books and course slides.

Statement of the Problem

Academics and researchers in Ghana, as in the case of many African countries, have been left with very limited avenues of scholarly communication owing to journal crises compounded by issues of copyright. It, therefore, came as a huge relief that institutional repositories would gain acceptance in an era that ICT infrastructure are gradually becoming increasingly affordable and available. Several academic institutions, especially public universities, have positioned themselves to utilize the benefits that open access repositories offer (**Ukwoma & Dike, 2017; Ogbomo & Bibiana, 2015; Yang, & Li, 2015; van Westrienen & Lynch, 2005; Lynch, 2003**).

Notwithstanding the numerous virtues extolled about online Open Access Institutional Repositories, available literature suggest that this novelty is yet to be sustainable in many academic and research institutions in sub-Saharan Africa. Largely at the centre of the attrition of IRs has been content recruitment. Often times, much focus has been given to content access and usage, leaving out a significant issue as content population or generation (Bankier & Perciali, 2008; Xia, 2009).

There is always attention on how or when to launch and grant access to IRs as if regular content supply would be automatic. Thus, when an academic institution manages to populate its IRs with a few heritage materials, administrative documents and abstracts or full texts of journal articles, they declare it duly launched and operational amidst fanfare. Of all the attention given to the creation and management of IRs, the feelings of lecturers and other content generators are seldom accommodated (Ware, 2004; Jackman, 2007; Dolan, 2011). It has often been suggested that key stakeholders should always be on board in order for the success of repositories to be realized (Johnson, 2000; Ming, 2002; Tihamiyu & Aina, 2008; Bjork, 2004). Having focused much on software and engineering protocol, marketing campaigns at usage among others, a lot of gaps exist in literature as to the awareness and perception of lecturers regarding institutional repositories. It is for this reason that the study seeks to empirically assess University of Cape Coast lecturers' awareness, attitude and perception of institutional repositories and how these factors affect content population and sustainability of IRs.

Objectives

The study seeks to:

1. find the level of awareness of lecturers on institutional repositories;
2. point out the perception of lecturers on institutional repositories;
3. determine the extent of use of repositories by lecturers;
4. ascertain lecturers' contributions of materials to the IR; and
5. explore the factors affecting lecturers' submission of content to the IR

Significance of the Study

This study puts open access institutional repositories in a proper perspective for repository managers to identify the various issues which confront content generators. It also adds to the body of literature of scholarly communication and open access repositories.

Literature Review

The concept of Institutional Repositories (IR) has been defined from many perspectives. To Chavez et al., (2007), "a repository is a networked system that provides services pertaining to a collection of digital objects, and could include institutional repositories, publisher's repositories, dataset repositories, learning object repositories, cultural heritage repositories". Lynch (2003) regards Institutional Repositories (IRs) as the set of services an academic institution offers to members of the academic community for the creation and dissemination of scholarly contents created in the institution. Thus, a university's repository is expected to include research journal articles, before (pre-prints) and after (post-prints) undergoing peer review as well as digital versions of theses and dissertations, administrative documents, heritage materials, course notes, or learning objects (Shearer, 2003; Crow, 2002; Johnson, 2002).

Upon the introduction of the World Wide Web, it has been very easy to share information via the internet, and this has played a huge role in scholarly communication through open access platforms such as institutional repositories. Essentially, IRs exist to provide an institution with a mechanism to showcase its scholarly output, efficiently manage internal digital documents and subtly address the issue of journal or serial crisis emanating from the unbridled advantages enjoyed by academic publishers. Ukwoma and Dike (2017) recount how university lecturers in

five Nigerian universities have accepted the repository concept for reasons of improved accessibility to scholarly literature and increase the citation impact of their work.

It has been observed that awareness of the repository concept and all other issues surrounding it are key in their sustainability in any academic environment (Chan & Costa, 2005). Awareness further defines perception which also further defines one's attitude. As shown by Atiso et al., (2017), the adoption of the route of open access by academes largely hinges on their awareness. However, awareness of key stakeholders of an academic community often tends to be dependent on several factors including one's discipline of practice as well as a conscious effort of repository managers to promote to the members of the academic community (Crow, 2002; Rowland & Nicholas, 2005). Li and Yang (2015) insist that in order for IRs to be fully beneficial, there is the need for all stakeholders to be aware of their existence, understand their value and above all, be willing to contribute to their sustainability.

Several studies point to the fact that key stakeholders of the campus community upon whom repository sustainability resides often are not aware of the concept. In a study by the University of California in 2007, it was established that over sixty percent of respondents were not aware of digital repositories and online journals; and of those who were aware, only less than one-tenth had submitted contents to repositories. Similarly, Kim (2011, cited in Li & Yang, 2015) recalls, in a study of some Carnegie-funded institutions in the United States, that 60 per cent of respondents were unaware of the existence of their University's IR. Also, a study by Dutta and Paul (2014) of faculty members in an Indian University also suggests a rather low faculty awareness of repositories even though the attitude to the concept was positive. A study by Li and Yang (2015) revealed that of the 295 respondents less than a third (27%) were aware of TAMU IR, the OAKTrust of which 7% had deposited their works accordingly. Their study further revealed that half of the 68% who ranked IR least in finding articles were unaware of the institutional repository.

A study by Singeh, Abrizah and Karim (2013) examine conditions that inhibit authors from self-archiving in open access repositories and discovered issues of plagiarism as well as slow and inefficient process as leading causes. Again, in Van Westrienen and Lynch's (2005) European IR survey, low participation of faculty was attributed to lack of clarity on intellectual property issues as well as the perception that such contents are of low quality. In a similar vein, Hahn and Wyatt (2014) discovered in their study of business faculty of 125 academic and

research libraries that faculty most of the time failed to participate in open access platforms due to ignorance. However, on the part of those who knew, they perceived materials from such sources as being less prestigious and of lower quality such that they would not add to their career development.

Oforu-Ampong (2016), in investigating the uptake of institutional repository by faculty, came across a number of issues which he characterized as personal issues which caused lecturers' low or no contribution into repositories. His investigations into the UGSpace (the Repository of the University of Ghana, Legon) led to the conclusion that; lack of time, knowledge or awareness of the existence of the repository, and insufficient information on copyright constituted the major issues.

However, a study by Dutta and Paul (2014) of faculty members in an Indian University also suggested rather low faculty awareness about repositories even though the attitude to the concept was rather positive. It was also found out that copyright issues constrained most lecturers from sharing their scientific papers on open access platforms. Ogbomo (2015), in a study of attitude of lecturers in South-South Federal Universities in Nigeria discovered that lecturers in these institutions have positive attitudes toward the establishment of IRs in their respective institutions.

As a strategy to encourage more participation of faculty in the sustainability of repositories through content deposit, Ogbomo and Bibiana (2015) insist that universities should encourage promotional activities geared towards creating awareness of IR which will in turn enhance positive attitude towards IR establishment in universities. Repository sustainability demands that at every stage, the university community should be carried along in the development of the IR project. Ukwoma and Dike (2017) further admonish for training for the academics, librarians, and repository managers in order to equip them with the skills to enable them to organize the content for easy accessibility and retrieval of the documents.

Methodology

The study adopted the descriptive survey design. The University of Cape Coast has 714 teaching staff. The research was an attempt at a census study (engaging all lecturers through their email), but room was made for non-response. Google form was used to administer the

questionnaire through lecturers' institutional email. However, manual administration of the questionnaire was employed to augment the rather low response from this electronic data collection platform. As such, a questionnaire was put in each lecturer's pigeon hole to be self-administered.

The questionnaire was fashioned to accommodate all the objectives as well as to collect some background information of respondents. The IBM SPSS version 22 was used to analyze the data using frequencies, percentages, and presented through single tables, cross tabulation, charts and graphs. Ethical standards in empirical social research were strongly upheld.

Results and Analysis

Of the possible 714 pieces of the questionnaire 156 were returned and deemed useful for the SPSS analysis representing a 21.8% response rate. These included those issued to lecturers electronically through Google forms (37) as well as those reinforced by manual data collection (119).

Biodata

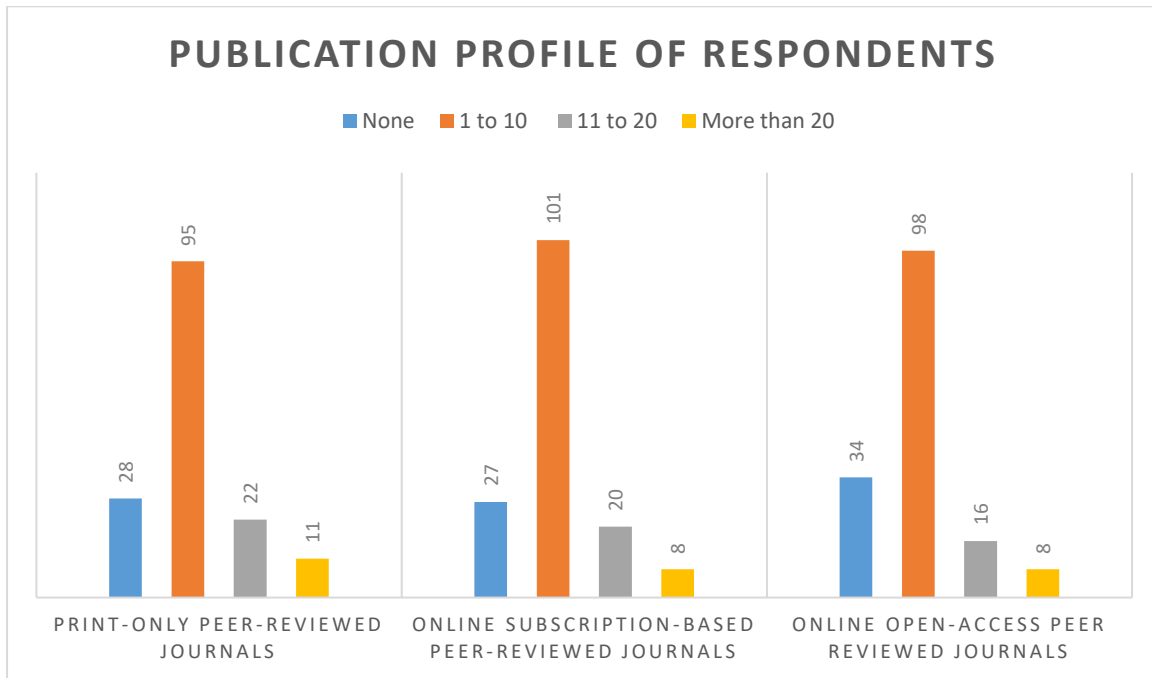
Respondents for the study, as could be seen from Table 1, were made up of 109 males representing 69.9% and 47 females (30.1%). The proportion of respondents aged 40-49 (35.3%) were more than any other age group. Table 1 again depicts that the College of Humanities and Legal Studies (39.7%) dominated amongst respondents of the study, with College of Health and Allied Sciences being the least (5.8%). Also, Lecturers constituted 35.9% of the respondents whilst Associate Professors constituted the least with 8 (5.1%) respondents.

Table 1: Biodata of respondents

Characteristic	Description	Frequency	Percent
Gender	Male	109	69.9
	Female	47	30.1
Age	Less than 30	16	10.3
	30-39	49	31.4
	40-49	55	35.3
	50-59	34	21.8
	60 or over	2	1.3
College	Humanities and Legal Studies	62	39.7
	Agriculture and Natural Sciences	46	29.5
	Education Studies	39	25.0
	Health and Allied Sciences	9	5.8
Rank	Assistant Lecturer	39	25.0
	Lecturer	56	35.9
	Senior Lecturer	44	28.2
	Associate Professor	8	5.1
	Full Professor	9	5.8

Figure 1 shows the publication profile of respondents. It could be seen that a quarter of respondents (39 respondents) have never submitted articles to Online Open-Access journals. In all, platforms (print only, online subscription-based and online open-access) respondents with 1 to 10 papers constituted the majority (95/60.9%; 101/64.8%; 98/62.8%) respectively.

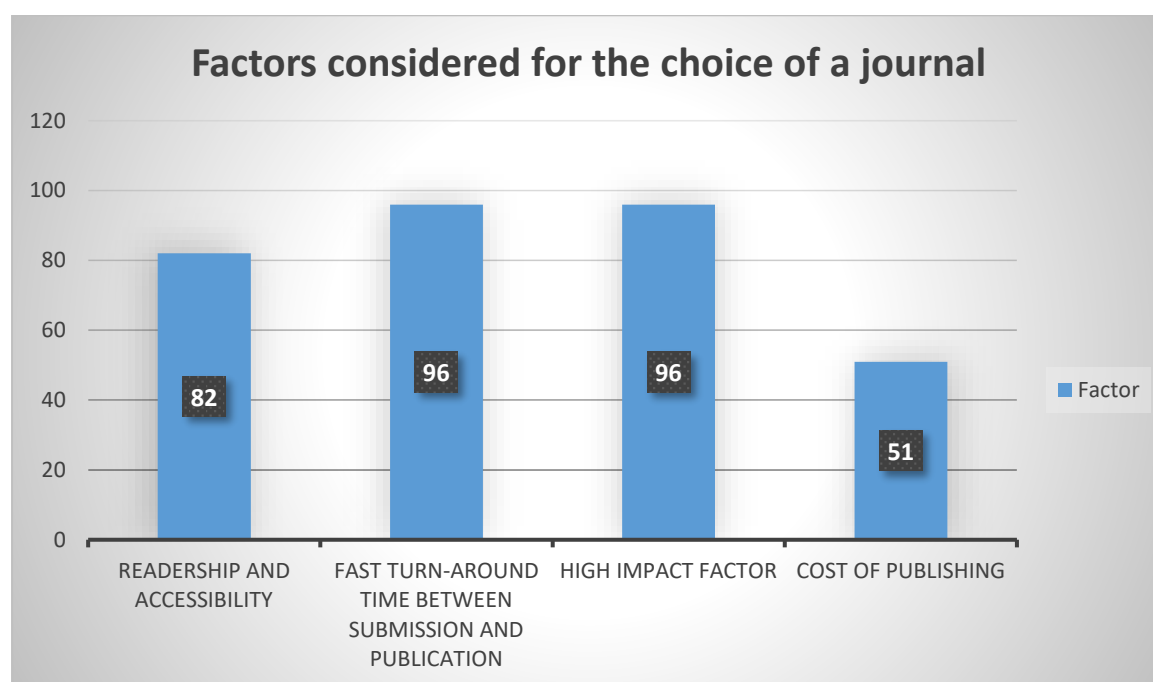
Figure 1: Publication profile of respondents



Factors which affect lecturers' choice of journal

The study reveals, as shown by Figure 2, that 'fast turn-around time between submission and publication', as well as the 'high impact factor of a journal' are the two most important issues lecturers consider before deciding to publish in a particular journal. This is, according to 96 respondents, representing 61.5% constituted the major factors. Again, the figure depicts that the cost associated with publishing in a journal is not so strong a factor to consider among respondents in a decision to publish with a journal. Only about a third of respondents (51 representing 32.7%) would consider this as an important factor.

Figure 2: Factors respondents consider in publishing in a journal



Awareness of open access institutional repositories

Table 2: Lecturers' awareness of open access institutional repositories

Statement	Aware*	%
Open access implies full text availability to online peer reviewed documents	128	82.1
IRs are online open access platforms	90	57.7
IRs showcase an institution's digital contents	115	73.7
IRs contain electronic theses and dissertations	95	60.9
IRs contain heritage or cultural materials of an institution	95	60.9
IRs contain manuscripts (pre-prints /post-prints)	98	62.8
IRs contain abstracts of peer-reviewed journal publications	116	74.4
IRs contain full text articles	102	65.4
UCC has an IR	84	53.9

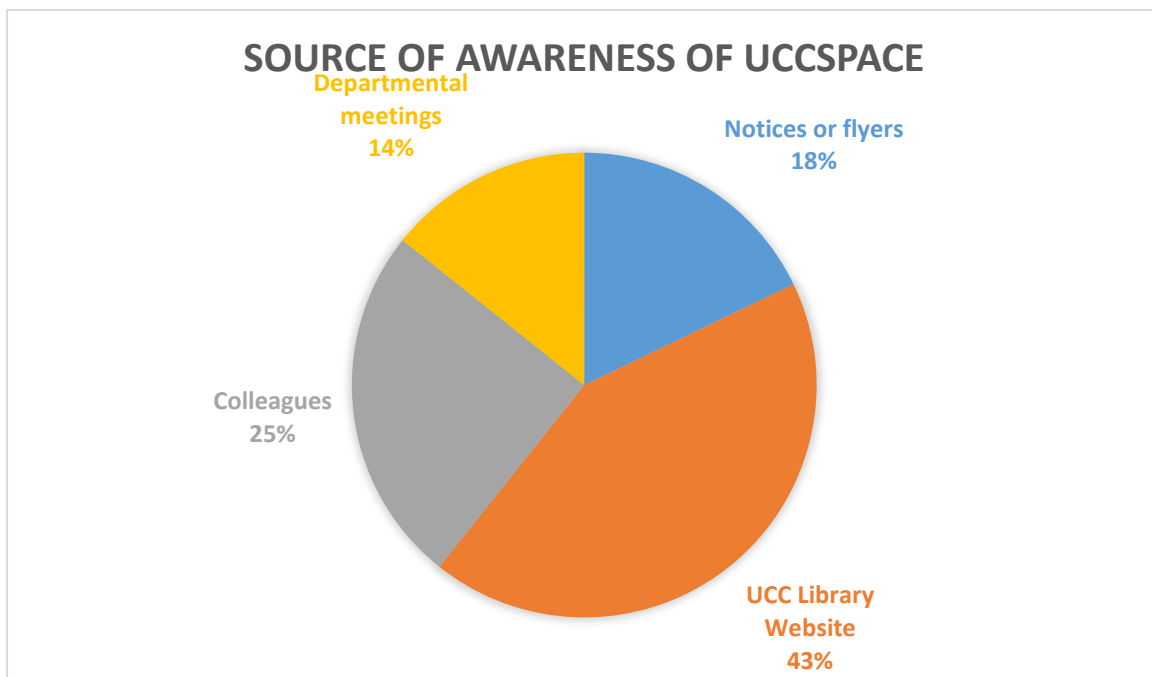
*Multiple choice, N = 156

Table 2 portrays lecturers' level of awareness of online open access institutional repositories. It shows that the majority of respondents are aware of the concept of open access and the attributes of online open access institutional repositories. At least more than half of the respondents indicated their awareness of what repositories are, by answering correctly to some sets of questions. For example, to a statement that 'open access implies full text availability to

online peer reviewed documents’, 8 out of 10 respondents (82.1%) could attest to that fact. Also, nearly three-fourth of respondents (73.7% and 74.4% respectively) were aware that “IRs showcase an institution’s digital contents” and “IRs contain abstracts of peer-reviewed journal publications”

It is, however, instructive to note that even though respondents generally knew about the concept of institutional repository, a comparatively smaller proportion knew about the existence of the University of Cape Coast IR – UCCSpace. That is, closely looking at the proportion of respondents who were aware of the concept of IR which generally hovered around 60% and over, the proportion of respondents who are aware of the UCC IR (53.9%) is comparatively low.

Figure 3: Sources of awareness of UCCSpace



Respondents were examined on the source through which they became aware of the University of Cape Coast’s Institutional Repository (UCCSpace). Out of the 84 respondents who claimed to know about its existence, about four out of every 10 (43%) got to know of it through the Library’s Website. This is shown in Figure 3. Again, a quarter of the respondents got to know about it through their colleagues; whilst notices constituted less than 20% of these sources.

Lecturers’ perception about IR benefits

On the whole, a good number of respondents demonstrated their knowledge about the benefits open access institutional repositories bring to an academic institution. Among the numerous perceptions stated, majority of the respondents believed that ‘improved visibility of the institution’ is the most significant. This, according to 111 respondents, constituted 71.2% of the entire respondents as depicted by Table 3.

Table 3: Lecturers’ perception about IR benefits

Benefit	Frequency	Percent
Enhanced image of authors via increased citations	78	50
Improved visibility of the institution	111	71.2
Preservation of digital materials	85	54.5
Improved sharing of scholarly contents	80	51.3
IRs are easy sources of literature	99	63.5

Multiple choice, n = 156

Material Deposits

The study sought to ascertain whether respondents had ever deposited materials for the repository. As shown in Table 4, 58 respondents, representing 37.2% had deposited materials into the repository, whilst about two-thirds (62.8%) had never deposited materials into the repository. Using a cross-tabulation table, it delves specifically into the proportion of respondents who have either deposited or never deposited documents for the repository based on their sex, college of affiliation and rank. It emerged that the proportion of males who had deposited (51:46.8%) were less than the proportion of males who had never deposited (58:53.2%). This, notwithstanding, a greater percentage of males (87.9%) had deposited materials into the repository as against 12.1% females out of the total 58 respondents who had ever deposited. This was the norm for almost all the category of faculty members surveyed. For example, out of 47 females, only 7, representing 14.9% had deposited materials into the repository. The only differing categories of significance were respondents who were lecturers of the College of Humanities and Legal Studies (56.5%), Senior Lecturers (56.8) and Professors (77.8%) where the proportion who had deposited were more than those who had never deposited.

Table 4: Material deposit by Lecturers

Biodata	Description	Ever deposited			Never deposited	Total
		n	% ↓	% →	n	
Sex	Males	51	87.9	46.8	58	109
	Females	7	12.1	14.9	40	47
	Total	58	100.0	37.2	98	156
College Affiliation	Humanities and Legal Studies	35	60.4	56.5	27	62
	Agriculture and Natural Sciences	10	27.2	21.7	36	46
	Education Studies	10	17.2	25.6	29	39
	Health and Allied Sciences	3	5.2	33.3	6	9
	Total	58	100.0	37.2	98	156
Rank	Assistant Lecturer	11	19.0	28.2	28	39
	Lecturer	12	20.6	21.4	44	56
	Senior Lecturer	25	43.1	56.8	19	44
	Associate Professor	3	5.2	37.5	5	8
	Professor	7	12.1	77.8	2	9
Total	58	100.0	37.2	98	156	

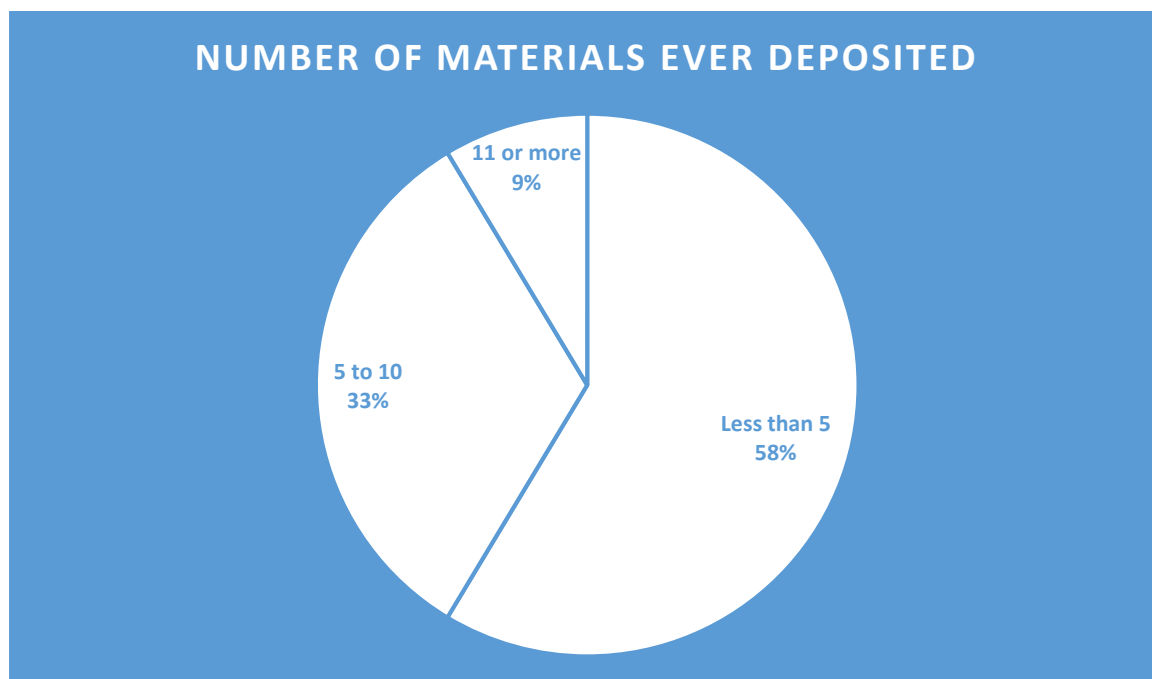
% ↓ = As a percentage of the proportion ever-deposited

% → = As a percentage of the cohort

Number of materials ever deposited

Of the proportion of respondents who had ever deposited materials into the repository, nearly six out of ten (58%) had less than five documents while less than a tenth (9%) have ten or more articles in the UCCSpace. Again, Figure 4 shows that a third of respondents have between five and ten documents in the repository.

Figure 4: Content Deposit



Reasons for not depositing materials

As stated earlier, 98 respondents, representing 62.8% of the total respondents admitted not having ever submitted articles/documents into the repository. When they were probed to ascribe reasons, the following responses, as depicted by Table 4, ensued. According to Table 4, all respondents raised the possibility of copyright infringements as the reason for not depositing documents into the repository. Also, a good number of these respondents believed that such contents are prone to plagiarism (93.9%); documents in IRs are not scholarly-worthy (91.8%); they do not go through water-tight peer-review (89.8%), and also, that they were ignorant of the existence of the UCCSpace (80.6%).

It is instructive, however, to note that reasons such as ignorance of the benefits of the IR (24.5%), only a few people will see (41.8%) were not strong enough to have caused a lecturer not to deposit documents into the UCCSpace.

Table 5: Reason for not depositing materials into UCCSpace

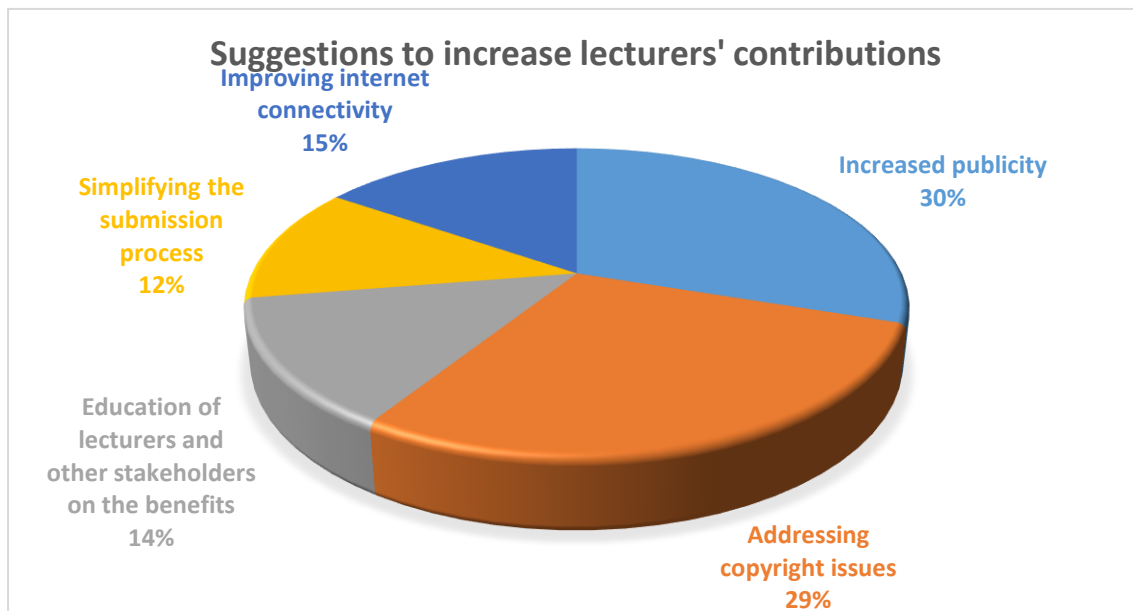
Reason	Frequency	Percent
Documents in IRs are not scholarly-worthy	90	91.8
Depositing work in the IR may result in copyright infringements	98	100
Depositing work in IR may lend it to plagiarism	92	93.9
IR documents don't go through water-tight peer review	88	89.8
Only a few people will see IR documents	41	41.8
Lack of interest	58	59.2
Cumbersome submission process	70	71.4
Erratic internet supply	59	60.2
Inadequate time	60	61.2
Ignorance of the existence of UCC Repository	79	80.6
Ignorance of the benefits of IRs	24	24.5
Procrastination	51	52.0

Multiple choice, n = 98

Ways to improve lecturers' contribution to the sustainability of the repository

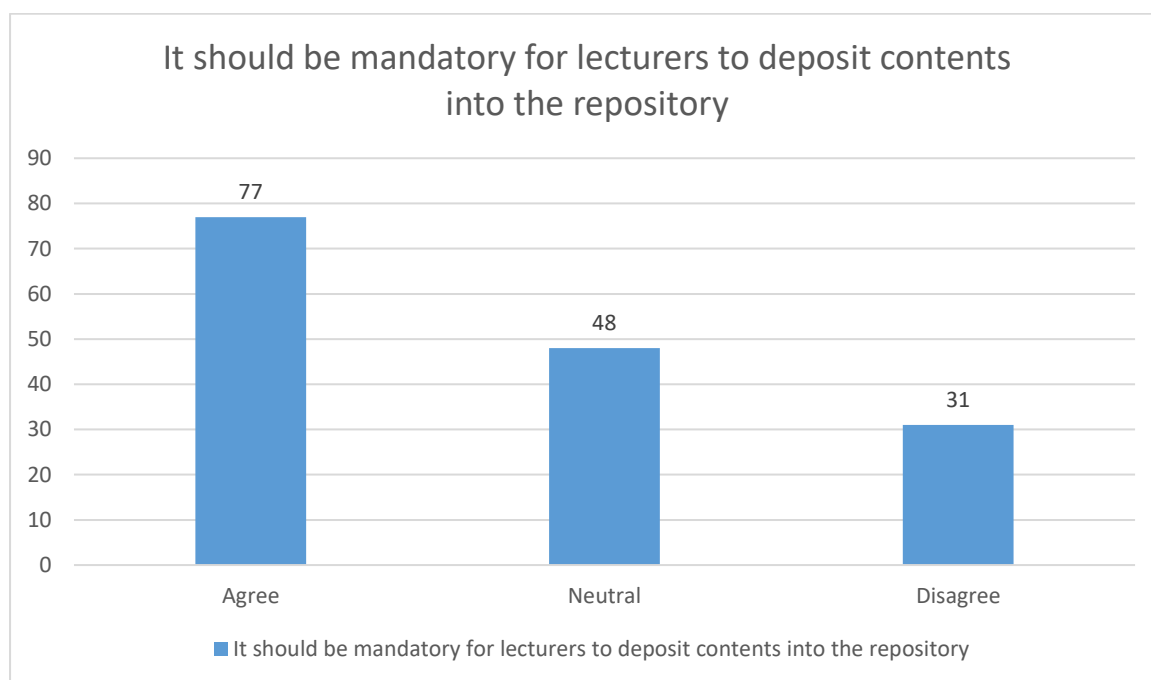
A number of suggestions, as shown by Figure 5, were made by respondents regarding how lecturers could contribute to the success of the repository of UCC. Among these were the need for increased publicity, education of lecturers and other stakeholders on the benefits, simplifying the submission process, improving internet connectivity and thorough education on copyright issues pertaining to repository documents. Of these, improving publicity and the need to address copyright issues are what came up strongly.

Figure 5: Suggestions to increase lecturers' contributions to UCCSpace



Also, the raging debate as to whether institutions should compel stakeholders to contribute contents for populating repositories was proposed to respondents of this study too. When respondents were directly asked if material submission into the repository be made a condition for promotion of lecturers, it emerged that 77 respondents, representing nearly half (49.4%) of the entire respondents welcome such a suggestion with 31 respondents (19.9%) disagreeing.

Figure 6: Should lecturers be compelled to deposit content?



DISCUSSION

The study delved into the awareness level of lecturers on open access institutional repositories and the extent of the level of contribution they make towards its sustainability. It revealed that the option of online open access platforms has not seen full embrace by faculty as compared to traditional routes to publishing. A quarter of the respondents have never published with any online open access platform. Again, fast turn-around between submission and publication, as well as high impact factor constituted the main determinants of where to publish. Cost was not a factor so if and when any or both of the earlier conditions were met, at whatever cost, lecturers would still publish. In a similar observation of faculty members of 21 universities and higher education institutions located in Islamabad, Sheikh (2017) asserts that Pakistani faculty members used open access avenues more frequently to access scholarly contents rather than to publish their own research works.

As has been observed in literature, awareness of the repository is key in its sustainability in any academic environment since awareness leads to knowledge, defines attitude, and also determines or defines one's perception (Atiso et al., 2017; Chan & Costa, 2005). Interestingly, there was high awareness and knowledge about the concept and attributes of institutional

repositories among lecturers, and these were in conformity with (Mammo & Ngulube, 2015; and Yang & Li, 2015). Similar results were arrived at by Sheikh (2017), where an online survey tool, Google Forms, was used to invite 3,000 faculty members from 21 Pakistani universities, with only 616 completing the survey indicating, an equally low turn-out rate of 20.5%. It emerged that majority of the Pakistani faculty members (71.5%) had high level of awareness of open access-related resources and initiatives.

Respondents were very positive about the benefits of institutional repositories, especially about the tendency to improve the visibility of the institution and researchers. Some other benefits outlined in this study:- improved sharing of scholarly materials, and the preservation of digital documents have also been captured in literature as the most significant reasons why many institutions set up repositories. A study of South-South Federal Nigerian Universities for instance, similarly suggested a positive attitude of lecturers towards IRs in their respective institutions (Ogbomo, 2015). According to Ukwoma and Dike (2017), evidence from five Nigerian universities show that improved accessibility to scholarly literature and increase in citation impact of their work are some of the benefits lecturers ascribe to the repository concept.

Amidst the appreciable level of awareness of online open access institutional repositories, the same could not be said of the level of awareness or knowledge about the University of Cape Coast's Repository. Notwithstanding, the appreciable level of awareness among respondents about what repositories are, close to half of respondents were not aware of UCCSpace per se and since awareness is directly related to perception and use, there is the need to re-look at approaches or methods to adopt to create more awareness. In a study of some Carnegie-funded US institutions, Kim (2011) reported that a sixth of respondents were not aware of their Universities' IRs. Dutta and Paul (2014) similarly posit that although attitude to the concept was positive, there was rather low faculty awareness about repositories.

Nearly two-thirds of respondents have never submitted materials into the repository. Owing to the fact that barely half of the respondents know about UCCSpace, it is not so surprising for such a low submission rate. As is the case with other studies where participants had an appreciable level of awareness of repositories, and even used contents from such repositories, a very small proportion of faculty had submitted materials into their local repositories. For instance, Li and Yang (2015) discovered that less than a third (27%) of respondents studied were aware of TAMU IR, the OAKTrust of which 7% had deposited their works accordingly.

In this study, there was visible difference among the proportion of respondents who were males, those who belonged to the College of Humanities and Legal Studies and Professors who had ever deposited as compared to their respective cohorts who had never deposited. Other studies also found association between lecturers' awareness and some background factors (Crow, 2002; Rowland & Nicholas, 2005). In a similar study with the application of Binary Logistic Regression Model, Oguz and Assefa (2014) discovered that faculty members' perception of IRs and willingness to contribute to the IRs were closely associated with scholarly productivity rather than prior knowledge of, and experience with IRs. They further contend that those who possessed more scholarly materials were significantly more likely to have a positive perception of IRs and, therefore, were more likely to contribute to IRs than those who did not.

The issue of Intellectual Property Rights has always been high on the radar of why faculty do not submit materials to their institution's repository, despite their awareness and positive attitude and perception about the benefits. As clearly shown in this study, all respondents who had never deposited cited this as key concern among all reasons. Plagiarism and lack of water-tight peer review have also found space in literature. Similar studies point out to lack of clarity on intellectual property rights issues (Dutta & Paul, 2014; van Westrienen & Lynch, 2005); plagiarism and slow or inefficient processes (Singh et al., 2013); as well as ignorance and perceived poor quality (Hahn & Wyatt, 2014).

Whether real or subtle, there seem to be a direct relationship amongst repository awareness and perception, attitude and use. Therefore, a call by respondents or lecturers to drive more publicity about the repository concept for increased participation is in the right direction. A study by Ogbomo and Bibiana (2015) similarly proposed promotional activities to cause increased awareness, positive attitude and total embrace of the IR concept in Nigerian universities. The library website emerged as the source through which most lecturers got to know of the repository. There is still the need to augment this with other workable approaches.

Again, any attempt at encouraging increased participation of lecturers which fails to address intellectual property rights may be counter-productive. This is because it has been the single most important issue so long as the willingness of faculty to submit materials without compulsion is concerned. Furthermore, education and training continue to be very significant

so far as building stakeholder interest in institutional repositories is concerned. The need to carry along the entire university community at every stage of the repository development is in harmony with the findings of Ukwoma and Dike (2017) who proposed the training of academics, librarians and repository managers with the skills necessary to organize content and retrieve documents.

RECOMMENDATIONS

This study carefully assessed lecturers' general background in open access participation through their experience in open access journals, awareness and knowledge about open access institutional repositories. It was carried out in the context of the University of Cape Coast open access institutional repository, UCCSpace. Based on evidence from the study, juxtaposed with similar studies, the following recommendations are made:

1. The University of Cape Coast Library, and for that matter, any other institution which yearns for the sustainability of its institutional repository should invest more efforts, time and resources to educate and inform all stakeholders about the repository and its benefits, and solicit views on improvement. A stakeholder conference/workshop/seminar could be held every semester to scrutinize all issues concerning the repository. This may include the University Library, Directorate of Information and Communication Technology, Directorate of Research, Innovation and Consultancy, Documentation Unit and Directorate of Public Affairs.
2. There should be deliberate marketing campaigns on all physical and virtual spaces available such as the University/Library website, fliers, radio stations, word of mouth, and special mentions during university occasions among others. Ideally, this needs to be done before the operation of the repository in order to attain maximum buy-in from the campus community.
3. Issues of Intellectual Property Rights should be handled thoroughly to enable lecturers contribute effectively. The Library, as a stakeholder in the scholarly dissemination process, should facilitate such initiative in order for lecturers to understand how they could contribute their scholarly work into the repository without infringing on any copyright law.
4. Also, while maintaining the conditions for appointment and promotions of faculty members, the University management could consider rewarding academics who contribute content regularly into the institution's repository. For instance, in the Annual Best Research Award that the University has instituted, a condition of merit could be

made to award points for applicants who have deposited their documents in the UCCSpace.

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REPORT OF THE RAPORTEURS

On proceedings of the third CARLIGH International Conference

Held at the Conference Hall of the Association of African Universities (AAU), Accra

Pre-Conference Workshop

Monday, 9th July 2018; to Tuesday, 10th July 2018

Topic 1: Overview of Research Data Management

Presenter: Dr. Sahn K. Nikoi

Dr. Nikoi in his presentation discussed the context and background of research data management; the key drivers of research data management, the key components of RDM and the benefits of RDM. He went further to talk about the role for librarians and ended by looking into the future of RDM. After his presentation, as part of a workshop activity participants were made to answer a number of questions.

Discussion

Q1. How can research insight be shared to help improve people's lives and thereby benefit society as a whole?

Response:

- Through data centres

Q2. What are the sources of research data in academic institutions?

Response: Data emanating from constituent members in the university i.e.

- Students- term papers, project work, theses, dissertations
- Researchers- Funded and voluntary research articles, surveys
- Lecturers-teaching/lecture notes, slides, teaching aids etc.
- Administrative staff- student records, reports

Q3. Who owns the research data?

Response: To a large extent the academic institution owns the research data since all the sources work for the organisation

Q4. Who are the stakeholders of RDM?

Response:

- The University Community (faculty, Students and other staff)
- The government, local community, research funders, members of the public etc.

Q5. Who should be the custodian of research data?

Response:

- Information Centres in particular institution (Data centres, Libraries, Archivist etc.)
- Researchers
- Institutions

Q6. What different types of research data can you expect to find in your institution?

Response:

- Observational data
- Experimental data
- Derived data
- Audio text photographs images, video
- Computer codes and simulation
- Interview recordings
- Lab notebooks
- Geographical data
- Samples
- Architectural drawings

Q7. What could research data be used for?

Response:

- Verification
- Scientific innovations
- Replication
- Re-use for new research
- Re-purposed for marketing purposes
- Evaluating and validating research findings
- To source for research funding

- Product development
- Planning and creating solutions

Q8. Who should be allowed to use research data?

Response: Everyone who needs it, however, there should be guidelines to regulate the uses of the data. We need to think critically who we give data to, consider security issues.

Q9: What role, if any, should librarian play in research data management?

Response: Librarians should be in charge of collections, organisation, storage and preservation, and education on how to use the data and making input into the guideline. Common RDM services include helping researchers to deposit data in institutional and disciplinary repositories, assisting with data management plans, and consulting with research teams. Librarians should also serve the research community by creating workshops, webinars, and tutorials. Providing RDM services does not require librarians to become experts at statistics, programming or IRB proposals, but instead to develop a robust understanding of tools and support mechanisms available on campus. This may prompt collaboration with campus computing or statistical support services.

Q10. What skills will they (librarians) need?

Response: IT, data curation / preservation skills, Knowledge management skills, Information literacy skills and data mining skills. Need to update knowledge.

Topic 2: Impact of globalization on technology systems

Presenter: *Mr. Emmanuel Sackey*

The discussion centered on data management in the knowledge-based economy which are purely built on knowledge. He stressed that Africa has two organisations for intellectual property:

- The African Regional Intellectual Property Organization (ARIPO)
- National offices in each country

The speaker was of the view the libraries and librarians needs to be equipped with Intellectual Property (IP) knowledge because, the public they serve need to know about their public lending rights. He reminded the participants that globalization is interdependence, and to this effect research has taken a collaborative nature. The collaborative nature of research also means that ideas must be protected and commercialized.

It was proposed that instead of 2Ps (publish or perish) it should rather be 3Ps, that is patent, publish and prosper (PPP). The speaker argued that having IP right does not occur by itself – it requires decisive resolution and action. He mentioned five technologies that will shape the future of the world; including biotechnology and artificial intelligence. The speaker admonished the conference attendees to develop IP policies for their various institutions.

Discussion

A participant sought to know what Africa might be doing wrong in recording low percentage ratings in filing intellectual property requests. The speaker explained that African(s) are not creating the right polices that could be used to create awareness. There is also the need to develop (IP) culture. Another participant in his contribution mentioned that it takes commitment to be able to achieve a functioning system for patenting. A follow-up was made by a participant who asked about how to manage research data from analog systems. The resource person in his response stated that there could be implementation problems and also the lack of use of research tools.

A question was asked for the relationship between open access and patent, since the participant was of the view that patent could undermine the librarian's efforts to provide access to research knowledge. The resource person observed that openness with respect to innovation makes access to knowledge free, consequently leading to loss of capital, especially among developing nations.

Topic 3: Information Privacy: Roles and Responsibilities

Presenter: *Mr. Ben Cobblah*

The presenter began by giving an overview, definitions, privacy categories, evolving risk and legal issues of information privacy. The author argues that there is the need for policy in place to protect RD and listed some automatic anonymisation, cookies-cutters and encryption as some privacy enhancing technologies. This should be updated regularly bearing in mind

emerging laws. It should be the role of the librarian to inform management about the need for privacy enhancement tools management. He cautioned that librarians should not compromise confidentiality, train staff and any person involved in handling RD.

Topic 4: Overview of Privacy in the Context of Research Data Privacy Impact Assessment

Presenter: *Mr. Ben Cobblah*

The paper emphasizes the need for librarians to put in security measures to protect data collected, need to know who else will handle data in the organisation, have the right to check, as a controller, on data protection and collaborate with the technology Unit of the organisation to ensure security of data. The presenter went ahead to mention issues an organisation could take to enhance data protection. The steps are that the organisation should define current business processes and data flow, perform risk assessment, skills assessment and communication. There is the need for policy and the need for staff to update themselves with emerging laws. Librarians should advocate privacy management in institutions, and must collaborate with other Units (e.g. ethical board, IT etc). Privacy must be practiced daily. Data protection Officers within the organisation should champion the cause.

Topic 5: Organising Research Outputs

Presenter: *Mr. Wilfred K. Biney*

The presenter set out to ascertain the techniques for planning research data efficiently and guidelines for appreciating the importance of organising data. The presenter argued that there is the need to put systems in place to ensure that data is organised efficiently to enhance discoverability. A system should be established, devoid of duplication, folders should be used, naming of files should be consistent and folders should be structured e.g. hierarchically. There is the need to separate ongoing and completed works; an archive folder could be created. There should be backups possible cloud accounts or preferably institutions should have data centers. Institutions should ensure documentation and metadata should conform to uniform standards. The presenter also suggested that there should be standards for data sharing and preservation in formats that could be migrated to new technology, should there be a need. He concluded by indicating that there is the need for harmony between librarians and IT personnel, and at the

planning stage all stakeholders should be involved (i.e. lecturers, students, librarians, managers and ICT personnel).

Topic 6: Information Security: Providing Effective Security Awareness

Presenter: Mr. Ben Cobblah

In three main broad sections the presenter discussed information security

PUBLISHERS' PRESENTATION

Presentation by EBSCO (Mr. Douglas Evans)

He introduced the audience to the various models EBSCO offers:

1. Flexible Acquisition model options
2. Perpetual acquisition
3. Demand Driven Acquisition
4. Concurrent access (after the 365th use of the title the subscriber no longer has access)
5. Subscription

Ordering options

1. Ebscohost Collection Management where the subscriber selects titles from list provided.
2. Request a custom collection

According to Douglas, what sets Ebsco apart are the following”

- No additional fees
- No platform fee
- MARC records are made available for free
- Has audio ebooks
- Html format of eBook for the visually impaired
- EBSCO discovery service- enhances discoverability.
- Has Google drive features

Discussion

- Participants agreed that there is the need to present ebooks to the Vice Chancellors of the universities

Presentation by Emerald (Soji Koledade)

The presenter took the participants through reasons why there is the need to publish, how to select the right journal, structure of an academic paper, the peer review process, length of the review process, reasons for rejection and ended with a few revision tips. Emerald has resources on writing sessions and publication ethics. Beyond authorship, Soji threw invitations for reviewers as well. Emerald is also prepared to extend support to beginning or struggling journals.

The presenter introduced EMERALD resources which include

- Case studies-majority of African based cases
- Ebooks
- journals

Opening ceremony

Wednesday, 11th July 2018

Arrival and registration of delegates for the conference started at about 08.30 GMT and continued till the event started at 09.00 GMT, when the master of ceremony (MC) of the event (Mr. Conrad Kakraba) invited Reverend Peter Osei Nyame to give an opening prayer. The chairperson for the event was introduced, and he was in the person of Professor Etienne Ehile, who serves as the Secretary-General of the Association of African Universities (AAU). In His remarks, Professor Ehile expressed pleasure in the partnership between the AAU and CARLIGH in organizing the conference, and more specifically, in hosting the event at the AAU Secretariat. He invited all delegates to participate and benefit from all the activities that have been scheduled for the week.

Dr. Joel Sam, chairperson for CARLIGH's Management Committee, was next to give a welcome address. In his address, he also reciprocated the delight for the partnership that CARLIGH had secured with the AAU. He specifically welcomed all paper presenters, emphasizing the difficult situations that had characterised earlier episodes of CARLIGH's international conferences. He mentioned that the communique that was to be produced after

the conference was going to be presented to government, particularly as the theme addresses pressing national development needs of the country.

Goodwill messages were shared by representatives of affiliate institutions, namely the Ghana Library Association (GLA), the Council of University Librarians and their Deputies (CULD), Emerald publishing and EBSCO publishing.

At 09.33 GMT, the Honourable Minister for Information, Dr. Mustapha Hamid, launched the conference, stressing in his address that the central theme and the sub-thematic areas for the conference were those that should form part of the daily conversation in Africa. He underscored the importance of libraries in education, and the prevailing challenges that confront young people of the continent in their quest to use the library. “Research should be the basis of every national policy, even in the continental development mix” he added.

As part of his concluding remarks he offered to serve as an additional spokesperson for CARLIGH, and recommended that, going forward such gatherings as Annual or Bi-annual Library Fairs could be used to provide the platform for libraries to host immediate and potential clients like students and academics. The conference was officially opened at about 09.47 GMT. Chairperson to CARLIGH’s Management Committee, took the opportunity after the launch to make a presentation to the Honourable Minister.

Next was the introduction of the keynote speaker, in the person of Prof. Naana Opoku-Agyemang, former Vice Chancellor of the University of Cape Coast (UCC) and a former Minister of Education. Prof. Opoku-Agyemang adequately addressed the theme through her speech, by registering the fact that she was personally interested in the conference topic because of her professional background as a teacher.

She emphasized that the library is a place where information is stored, and offered recommendations on how CARLIGH could work towards changing the face of the library in modern times. Her observation indicated that research leads to new data and new ideas, which together need to benefit society, which establishes a symbiotic relationship between the researcher, his/her output, and the ultimate user/beneficiary of the research (which again includes the researcher). It was therefore the duty of the universities to support research work, and this was to be facilitated by the libraries of these universities.

Closing remarks were made by the chairperson of the opening ceremony Prof. Etienne Ehile, who expressed appreciation to the effort of the keynote speaker, as well as the guest of honour, Honourable Dr. Mustapha Hamid. He encouraged all delegates once again to make good use of the content of the conference.

Closing prayer for the conference's opening ceremony was offered by Pastor Randy Kommeay at about 11.00 GMT, after which a group photograph was taken in front of the AAU building, after which the Honourable Minister for Information opened the Exhibition for the conference.

Paper presentations for Conference Day 1 – Wednesday.

Breakout Session A

Paper 1: Trends in Research Data Management

Presenter: Prof. Regina Appiah-Opong (Noguchi Memorial Institute for Malaria Research (NMIMR))

The speaker emphasized in her presentation that research data management was important for national development, and that, infrastructure and policies must be instituted to ensure sustainability of progress. She noted also within this context that data must be accessible and useable, emphasizing that credible data is important to research. She cited a circumstance in her presentation that UGSpace (the digital repository of the University of Ghana) was available but was not utilized by staff of her institute (Noguchi). With the presence of the University Librarian, there was agreement that the library will assist to rectify the situation through training.

Discussion:

During the session, issues were raised about the need to present content of consent forms during data collection by researchers into other comprehensible languages by respondents, as a result of promoting research ethics. The speaker confirmed this and suggested that the content could also be translated into such languages by the researcher(s) or someone assigned for that purpose. Related to this subject also, researchers were encouraged to co-sign ethical

clearance forms, so that research data generated could be maintained appropriately and also facilitate repository development.

Collaboration between researchers and libraries were encouraged to enable the making of research data and materials widely available, taking advantage of information technology. This, it was argued, could improve the visibility and ranking of their institutions. Libraries were challenged in this regard to consider mechanisms for such collaborations. It was argued also that intellectual property (IP) resources of the institutions hosted on cloud platforms could be further secure by the enablement of firewalls, since such platforms are prone to security issues.

Paper 2: *Managing indigenous knowledge on climate change by local people in the Offinso Municipality*

Presenter: *Mrs. Margaret Sraku-Lartey (Forestry Research Institute of Ghana (CSIR-FORIG))*

The second paper was by Mrs. Margaret Sraku-Lartey, Head librarian for the Forestry Research Institute of Ghana (CSIR-FORIG); and her presentation was on “managing indigenous knowledge on climate change by local people in the Offinso Municipality”. She started by registering the fact that indigenous knowledge (IK) was acknowledged globally to be part of the basis for decision making, but that policies related to climate change are normally based on scientific knowledge, although both kinds of knowledge are complimentary. She made an example of the climate change policy in Ghana. India was cited, as having developed a huge database for collecting and managing indigenous knowledge, which was sparked by their experience of foreign piracy and patenting of indigenous knowledge on turmeric.

Discussion:

The speaker reiterated the need to build stronger networks among researchers, looking closely at their needs. A discussant indicated that universities are driving at new policies to foster research output. He highlighted the commercialization of research output towards the growth of the economy; observing that there was the need to build the capacity of handlers of information. Librarians must have the skills to be able to manage data. There is the need to

encourage young professionals to acquire the requisite skills, and as well build confidence in them.

A participant asked whether there was the need to extract the economic gain of research before making it accessible to users. The second speaker mentioned that we live in a global value chain where products are made by different countries therefore, we need a balance between open access and protection. In his responds, one of the discussants stressed that though there is the need to patent, the outcome of research is a public good and should be made accessible to the public. The first speaker noted that researchers are always looking at a balance because there is the need to create an avenue for those who cannot use the library through technology.

A discussant in his submission indicated that since technology is driven by pedagogy, there is the need to distinguish between learning technology with technology, and learning through technology. Another participant raised a question related to what should be accessible and restricted in situations where there is lack of policy on RDM. The speaker reacted that Ghana had not done much when it comes to RDM. A participant wanted to know whether CARLIGH could have a repository to manage librarian's research output. Another participant recommended that policymakers be invited to join such discussions, with still another participant adding that there is the need to revive production of local journals.

Finally, another participant made a call for librarians to support their local Institutional repositories.

There was a call also to use all systems that are relevant for our national development, but caution should be made to repackage them. Universities should put more value on registration of patents to encourage more people to patent. Through collaborations and partnerships, academic and research institutions should be able to address prevailing shortcomings. A call was made for CARLIGH to take up RDM initiatives and drive them. He touched on the integration of all IRs of institution to conform.

Paper 3: Accessibility and Visibility of Agricultural Research Information produced at Matopo Research Station in Zimbabwe

Presenter: Ms. Thembelihle Hwalima (Lupane State University Zimbabwe)

This paper looked at the Matopo Research Station (MRS) and how it has been working on fulfilling its research mandate of livestock and pasture research, and on the accessibility of their research output. An Agricultural Knowledge and Information System (AKIS) was the main framework for discussion, and this centered on three pillars: research, education and extension. The speaker explained that each of these pillars (of AKIS) is directly linked to the other, and all the pillars were linked to the farmers, who are expected to be the ultimate beneficiaries in the production, dissemination and use of agricultural information to increase productivity.

Post positivist philosophy was the underlying philosophy for this research, which used quantitative research approach and a cross-sectional survey methodology. Among other things, findings of this research revealed that MRS had no stated information dissemination mechanism that they followed and adhered to, which consequently affect the opportunity to attract any further benefits. The overall conclusion of the study was that there is a great need for the MRS to align itself with current viable trends within the agricultural sector, hence recommendations were made to that effect.

Discussion:

It was agreed during discussions that funding was a core challenge to the research station. Hence they could have utilized alternate means for dissemination of research stations, including radio stations and town-hall meetings. The presenter was encouraged to consider sharing a suggestion of using community radio with stakeholders in Zimbabwe.

Paper 4: More than meets the eye: A perspective on using photographs for teaching and research

Presenter: Ms. Korklu A. Laryea (University of Mines & Technology)

The presenter explained that different types of research data may be contained in text and spreadsheet documents, notebooks, journals and diaries, data files stored separately, as well as in audio, video, films and photographs. The emphasis was made on pictorial information,

which was described as information that is captured using a camera or scanned by a reprographic device; and could be reproduced on paper or be digital. The point was made that research data is very much about *when* they are used as well as *what* they constitute and *the purpose* for which they are to be used. Pictographic data could therefore be created by researchers for one purpose and used by another set of researchers at a later date for a completely different research agenda.

Researching photographs would therefore require discovering historical information for the photographs. This implies the use of other records such as diaries, journals, archival materials, oral history/literature, etc.); because photographs may be poorly documented - cryptic, vague or demonstrably wrong captions, without date. The five dimensions (5 Ws) to consider in researching photographs were given as the when (date & time), the where (place/location), the what (description/caption), the why (reason/occasion), and the who (creator of the photograph). Ethical issues related to photograph research such consent, confidentiality, anonymity and copyright were presented also.

Discussion:

Issues discussed after the presentation included nudity and ethics, contextualization with respect to copyright and/or intellectual property and publishing nudity in cultural events (like ‘dipo’) online. A participant inquired on how interpretation of information within a picture was to be effected. The explanation given was that interpretation of pictographic information is difficult, hence care should be taken to identify all five dimensions stated earlier, using available complementary sources of information. An understanding of the culture was also identified to be necessary in interpreting photographic information. A follow-up direction was sought as what can be done about the identified challenges with researching photographic information. The speaker reacted by indicating that more education and dissemination of information related to intellectual property was necessary. Also necessary was a coordinated management of pictures. The point was also made the picture doctoring could be made either for a good or purpose.

Breakout Session B

Paper 1: Access to and use of agricultural information in the Svosve farming area of Zimbabwe

Presenter: Mutavayi S.A. Marondera University of Agricultural Science & Tech. Zimbabwe

How can we take our digital literacy programme to the field? Does information access have anything to do with level of production? The presenter believes that information is available but inaccessible. There is therefore the need to find out impact of various types on information on production.

Repackaging of information should be based on the information needs of farmers and this must involve the extension officers. There is the need to consider spaces and places for information. If information is gathered for non-traditional use by farmers for example what is the best place and space? Librarians should collaborate with researchers and ensure dissemination by re-packaging information. Repackaging could be in graphical forms such as; the use of drama, amidst dancing and drumming, use of images, traditional gathering of leaders, and community opinion leaders. Other media that could be used include; TV documentaries in local languages, dawn broadcast, gong-gong beaters, mobile vans, and mobile cinema vans as well as jingles and songs. There is the need to reach out to communities. Academic libraries should collaborate with public libraries, where the former collaborates with researchers and the latter disseminates information to grassroots people. Librarians and extension agencies should collaborate. We should look at information norms which should help disseminate agricultural information.

Paper 2: Bridging the gap between creation and access to research output: the UDS institutional repository in perspective

Presenters: Ms Angela Achiaa Aikins & Ms Deborah Mwintierong Bumbie-Chi (University for Development Studies (UDS))

The authors concentrated on the University for Development Studies (UDS) a multi-campus university. Each campus has a well-furnished library headed by a Campus Librarian who reports to the University Librarian at the Central Library at the Nyankpala Campus. The IR

was established in May, 2014 with two staff. Currently, the Unit has 4 permanent staff and 2 supporting staff. As at March 2018, it has about 1,650 items in its collections, out of which the most populated communities are research articles and theses. Institutional repositories provide visibility to individual institutions. It is mandatory that every academic work is deposited in the University for Development Studies IR.

The presenters set out to identify the role that UDS IR plays in managing research output of the university community in terms of content recruitment strategies, organization of items, preservation mechanisms, access and retrieval, identify the challenges faced by the IR team in managing research output, and identify some key indicators of IR impact.

They concluded that the current strategies used for the development of the repository are encouraging as they have contributed significantly to the increase in content. The UDS IR is serving as a platform for access to the scholarly content of the university community.

However, the success in planning and management of the UDS repository is highly dependent on coordination by the liaison librarian (IR Manager) and the existing relationships with faculties.

Discussion:

In the Kwame Nkrumah University of Science and Technology (KNUST), the first place university authorities check for research data and information is uploaded articles in the institutional repository. Even though there is too much emphasis on content, there should be interest in evidence of use. Are the collections in the IR impacting teaching, learning and research? There should be institutional and national values for populating IRs.

There are technical issues with uploading content on IRs, as they are not as user friendly as Researchgate and academia.edu. There is the need for a lot of sensitivity to create awareness among potential depositors in the IR.

Many IRs are not search engine friendly. Technicians and/or ICT staff need to work to ensure that this is possible. Technical staff should support user friendliness to match up with Researchgate etc.; and may need to work on internet connectivity since it impacts on downloading and uploading materials.

Teaching delivery methods affects use of library resources. Faculty should prompt and refer students to use the library resources and librarians need to encourage faculty to do so. That gap must be bridged because there is the need to confront teaching delivery methods.

Related to disaster management, the question was asked: how ready are we? Do we have policies? There is the need for backups and IT persons should be in charge if possible.

There is the need for business continuity planning, as every institution should establish such plans. Such policies should cover equipment as well, and should be operationalized.

Librarians should be advocates for such plans.

Paper 3: *Open access to research data: enabling access and sharing research data for a sustainable national research development*

Presenters: *Dinah Koteikor Baidoo and Isaac Kojo Agyeman (Ashesi University & Pentecost University College)*

The availability of secondary research data for re-use poses problems as there are no common sources of storage, access points for retrieval, sharing and re-use of such data for a sustainable national research development. The purpose of this paper, therefore, was to find out about open access sources of research data, access points for sharing and reuse. The objectives of the study was to find out available research data sources; the extent of the need to access and share research data; the extent of the need to reuse research data as a secondary data; how research data could be made open for sharing and reuse for sustainable national research development; and the factors that motivates or demotivates open research data sharing.

The presenters concluded that there was the need for the following: the quality and responsibility for data repositories need to be further developed; open access to research data to co-exist with the traditional mode of handling research data; open access sharing of research data from funded research should be mandatory; awareness creation of platforms for research data sharing and reuse; enabling open access sharing and reuse of research data for a sustainable national research development; and institution/consortium base research data for open access data sharing and reuse.

They also indicated that conducting research is very important for the sustainable development of every nation. Universities worldwide have embraced the sustainable

development goals (SDGs), hence the universities should be seen to be focusing R&D activities towards the achievement of these goals. Sharing research data will increase research and research findings leading to development of solutions to educational, health, national, and international problems. Such solutions will lead to a sustainable development of research in Ghana.

Discussion:

There is normally no idea where to access information. There are also challenges with data sharing. There is the need for clarity each time the word data is used. Are we referring to raw or processed data? When can data be shared – before, during or after data collection? If a researcher funds his own research is he/she obliged to share? What is the motivation for sharing? Is there a Consortium approach to research data sharing? Are there guidelines for data sharing? What do we have in our various institutions? There were some of the issues explored after this paper.

Paper 1: Research Data Management (RDM) at the University of Ghana: myth or reality

Presenters: Bright Avuglah and Prof. Perpetua Dadzie (University of Ghana)

The presenters introduced their paper by indicating that developments in ICTs are reshaping research practices. Research is therefore increasingly becoming more computational, data-intensive and collaborative over virtual and networked platforms. Research data is now a valuable institutional asset and therefore research data management (RDM) has become an issue of strategic importance to many research focused institutions.

This study was conducted to explore institutional response to RDM at the University of Ghana (UG), to assess RDM awareness and practices, including how it is understood within the UG research community, institutional response to RDM, and to explore the library's capacity and readiness to support RDM.

Findings from the study indicated the following: RDM is not fully understood, respondents often referred to RDM in terms of data storage; but respondents are aware of risks associated with poor data management and do recognize the importance of RDM; on the question of RDM practices, researchers manage their own data; data management planning is currently

not a requirement for internal research funding at UG; there was no specific RDM policy but RDM is covered in the general UG research policy; and there is no clear framework for monitoring compliance with policy and guideline provisions on RDM. Related to technical infrastructure, the underlisted are available in UG;

- high performance computing infrastructure (HPC) facility
- private cloud facility (HP Cloud Matrix)
- institutional repository (UGSpace)
- data analysis applications (SPSS and NVivo)

The presenters concluded that despite the lack of a formal institutional framework, RDM remains a critical research integrity concern for UG. The overall attitude toward RDM at UG has been positive and the recognition of its importance is useful for making a case for RDM development at the university. Existing infrastructure can also be harnessed for future and further development, but this will not be enough, and requires commitment from the university's management to support capacity development efforts for RDM development. They ended by a clarion call for Librarians at UG, in Ghana and throughout Africa, to embrace the RDM revolution in academic and research libraries, to proactively build capacity and to provide data management support for their researchers even in the absence of an official mandate. They recommend that the University should start engaging with the local community towards a more formalized and institutional uptake. University management should commit to supporting capacity building efforts for RDM at UG.

Discussion:

Questions that guided discussions included the following: what strategies should guide RDM policies? There was a suggestion for the need to publicise the benefits of data sharing for example, as it increases citation from other researchers.

Paper presentations for Conference Day 2 – Thursday.

Lead paper: Research Data Management for national development: the policy imperatives

Presenter: George Owusu Essegbey (CSIR-Science and Technology Policy Research Institute)

The Speaker started with a conceptual discussion of Research Data Management (RDM), blending a life-cycle perspective (from Sheffield University) with an institutional and national perspective. He covered also national development aspirations (expressed by a presidential address & national policies), linking them to aspirations for progress in science, technology, mathematics and innovations (STEM/STI). Adding to perspectives from national, regional and global development agenda, he underscored the importance of RDM in attaining socio-economic development, scientific and technological development, and national competitiveness, among others. To help realize these aspirations, he urged a consideration of the policy landscape, both at institutional and national levels.

At national level, he despondently observed a plethora of RDM policies, among which include the National STI Policy, 2017 (revised of 2010); the ICT4AD/ ICT in Education Policy, 2008; the Education Policy; the National Broadband Policy & Implementation Strategy, 2012; the Ghana Shared Growth and Development Agenda (2014-17). At institutional levels, he identified individual institutional policies for the CSIR, KNUST and the University of Ghana, among others. With the prevailing issues in the policy landscape, he registered the following challenges: limited implementation of policies and plans; limited commitment on part of authorities – national level, institutional level; inadequate infrastructure for data capture, storage and dissemination; limited (or lack of) investment in RDM; limited professional expertise/ practice; and weak collaboration among institutions and experts. His presentation underscored the importance of Research Data Management for national development, urging its prioritisation as the top national development agenda, amidst other recommendations.

Discussion:

At the point of discussions, a question arose whether the CSIR had a storage space on the National Data Centre or it had any private option. In response, the speaker affirmed that the

CSIR was linked to the National Data Centre, but has not yet realized the full benefits of the system. This notwithstanding, he added that the CSIR had set up its own system for performance management and appraisal at institutional level. Another question was asked to confirm whether or not the RDM was part of the earlier science and technology policy; which he affirmed also.

Another participant added that culture was affecting the RDM in Ghana through fabrication of data; and also lip-service to openness on data due to data protection regime (through existence of Data Protection Act). Two questions were asked to assuage whether the impending (at the time) Right to Information Bill has addressed openness and compliance; and also whether CSIR-STEPRI was in a position to develop a national STI policy? To the latter question, a negative response was given, and to the former, an affirmative answer. The speaker was encouraged to make reference to success stories in other countries in future presentations, to serve as resources for advocacy locally.

Breakout Session A

Paper 1: Adapting to a changing world in research management & funding innovation and commercialization

Presenter: Emmanuel Sackey (African Regional Intellectual Property Organisation)

The Speaker defined research as “creative work undertaken on a systematic basis to increase the stock of knowledge to use this stock of new found knowledge for the betterment of man and society”. He also presented a linear model of research, flowing from basic research, through applied research and development to commercialization. This was contrasted with a non-linear model of research, which did not have any particular direction of flow, but rather series of feedback that led to further development. Five different generations of the research landscape were also discussed, delineated by the marked developments in those eras – R&D as ivory tower, R&D as business, R&D as portfolio, R&D as integrative activity, and R&D as network. He also presented a 5-phased process for implementing research uptake management. A workshop is run initially to secure buy-in, after which a core team is constituted. University systems and policies are reviewed, and then a strategy is developed and written-out; followed by the development and implementation of a roadmap for research uptake management.

The university system was confirmed to play a crucial role in society, including education, research and community engagement. Outputs from the university currently are knowledge dissemination products like journal papers, presentations at seminars, and human resource development programmes (diplomas, bachelors and postgraduates). Two models for commercializing research outputs were presented – bottom-up approach and top-down approach. He suggested that the bottom-up approach (identified with the US) seem to work better than the top-down approach (identified with Sweden). Different examples were given from the US and across Europe to support the argument, creating the environment for innovation in research and development. Many other issues were explored, including new challenges that universities are facing; current situation in intellectual property (IP) management; guidelines for IP management by universities; WIPO/ARIPO guidelines; rationale for setting up IP management in universities; etc.

Paper 2: Determinants of effective research commercialization in the Council for Scientific and Industrial Research (CSIR)

Presenters: Prof. J. A Micah & Fokuo Donyina

Objectives of the study were to identify and assess the determinants of effective research commercialization in CSIR and recommend measures for improving research commercialization effectiveness in Ghana. The mixed design approach was chosen for the purpose of this research with the Council for Industrial Research as the target sample population.

The presenters explained that personal factors, institutional factors and environmental factors play a significant role in effective research commercialization endeavours. Appropriate measures for effective research commercialization will include increased attention to personal factors, more improved institutional factors as well as the environmental factors. There is the need for collaboration with tertiary institutions, private research institutions and local industries. The Government should take a cue from the United States where the promulgation of the Bayh-Dole Act facilitated economic boom in the 1980s. They also indicated that there is the need to strengthen CSIR's internal structures to enhance research commercialization.

Paper 3: Contemporary roles of librarians in navigating and addressing academic research ethical dilemmas: the technical universities in perspective

Presenters: Faustina K. Barfi, A. A. Alemna, Emmanuel Adjei and Edwin Mends Brew

The objectives of the study were to highlight the roles of Technical University librarians in academic research, identify the importance of research ethics compliance on scholarship, ascertain the components of research ethical dilemmas, explore the level of awareness, control measures, and applications to address the menace of ethical violations by librarians. Senior Librarians from Seven (7) Polytechnics which have been accredited Technical University status became the resultant population. Preliminary investigations carried out by the researchers revealed that though there were research departments where compliance to research ethics needs to be advocated, the onus of training and empowering researchers on ethics sits well with librarians. Technical University librarians have the role to support research and control ethical misconducts by adopting strategies, tools and applications that facilitate contemporary research trends and collaborative learning.

Discussion:

Collaboration is needed to emphasize the contemporary roles of technical university librarians. There is the need for a lot of training to help equip librarians to play such contemporary roles.

Breakout Session B

Paper 1: Organising Research Data

Presenter: Wilfred Biney

The Presenter initiated the discussion with an exploration of benefits of a Research data plan, which included effective use of adequate technological resources; robust data free from version errors and gaps in documents; and ensuring data back-up, which would be safe from sudden loss or corruption. He adequately communicated the need for organizing data, which is inherent in its use; admonishing a logical and consistent way of naming and organizing files. Some advices were offered on how to organize files; as well as things to consider when creating filenames. The Presenter explained the term documentation to encompasses all information necessary to interpret, understand and use in a given dataset or set of documents;

whiles metadata (data about data) was explained to be usually embedded in the data files/documents, noting that both terms were used sometimes interchangeably. He differentiated embedded documentation from supporting document – the former being information about a file or dataset included within the data or document itself, and the latter being information in separate files that accompanies data in order to provide context, explanation or instructions on confidentiality and data use or re-use.

A case was made for selecting items for storage on two grounds; one being the inherent cost for storage and retrieval, and the second being demands of a freedom to information regime, which is also present in Ghana. On this basis, two advices were given on storage: when possible, only store what you need to keep; and store crucial files in more than one secured location. Some best practices were also discussed for backing up data. Justifications for data preservation were presented also, whiles thinking through modalities and options for selection and preservation. Citing the need for managing references, the Speaker introduced Reference Management software that included Mendeley, EndNote and Citation Machine.

Paper 2: Management of Electronic Theses and Dissertations in Selected University Institutional Repositories in Nigeria

Presenter: Salau, Sadiat Adetoro; Oyedum, Georgina Uche; Abifarin, Fasola Petunola; UdohUdoh, Jimmy Samuel (Nigeria)

The speaker made the case for promoting access and preservation for electronic theses and dissertations, which he noted was not the case at the moment. The case was made for a repository, which was defined as a digital library of research findings, theses and dissertations etc., that have been deposited with the consent of the authors. Two initial findings from their research were poor visibility and accessibility of bibliographic information or electronic thesis and dissertations from Nigerian universities, and the presence of a cycle of repetitive researches in Universities with postgraduate students claiming oblivion of researches conducted in other Universities.

Through an administration of an online questionnaire and observation, the research identified results that centered around access and copyright issues, contents and system architecture

issues, and issues on policy. Recommendations were provided on practical ways electronic theses and dissertations repositories in Nigeria can be sustained; as well as those concerned with research communication and commercialisation, pursuit of action-oriented Masters and PhD researches, and the creation of research/scholarly communication units to handle issues related to research output management. A policy framework was proposed to enhance creation, management and sustainability of electronic thesis and dissertations repositories.

Paper 3: The effect of scientific publications on national development: a case of the Institute for Scientific and Technological Information (INSTI) of the Council for Scientific and Industrial Research (CSIR), Ghana

Presenter: Peter K. Osei Nyame

This study sought to determine the underlying reason(s) why development of the country has been so slow in spite of the numerous research activities and the subsequent fascinating results. In other words, it found out the basic reason(s) why research has not brought about the needed development in the country. It was also important to ensure that research findings are made public and utilized by policy makers for decision making.

The presenter concludes that publication of research output is very relevant to the development of the country. It is important for research and all its activities, including publications, to be well financed. To do this successfully, it is incumbent on the stakeholders of research works to set up a publishing house to give urgent attention to scientific publications. The initial capital for this project could come from the key players of the stakeholders which include the government, the private sector, the research institutions in the country and any other partner who has an interest in research output. Alternatively, the research institutions in the country can establish their own publishing centres. There is the need for the entire industry to also employ qualified personnel for the work. Both on the job training and orientation should be encouraged for both the publishing staff and researchers at all times to upgrade their knowledge and skills, bring them at par with other professionals elsewhere and meet the ever-increasing challenges posed by technological innovations.

Discussion

There are two worlds in scientific research – the researchers and industry (who have interest in product and services). There is the need for a bridge for one to take the output of the other. Need for better collaboration between the two worlds. Industry will not use research output, invest and use when research finding is already in public domain. There is a lot of research done in CSIR, technical reports produced, rich information and data however not much of these findings are in the public domain. Industrialists should be convinced at the pilot stage of research if we want them to invest in research activities. Individuals have made discoveries but are afraid of industries who might not take kindly to these new advancements.

PANEL DISCUSSION

There was a panel discussion which involved Prof Regina Appiah-Opong, Mr. Emmanuel Sackey, Mr. Clement Entuah Mensah and Dr. Sahn Nikoi. The following points were made, based on the theme for the conference;

1. There is the need for a main trend of RDM that we should adhere to as a country. We start from what we have, then we can tell where to move next, what we have done and what we need to change.
2. There is the need for stronger network among researchers. Need for building relationships. Look closely at needs of various groups and engage in careful networking.
3. Need for IP policy, and commercialisation of research outputs
4. Do we have skills? Need to build capacity of those in charge of RDM. Need to encourage younger librarians and information specialist to train, network, build confidence in them and create avenues for training. CPD.
5. Technical advancement; Librarians must embrace openness. Need to distinguish between popular and curated information. We should embrace technology which will support deep learning.
6. Bear in mind the need for balance, the need to make knowledge accessible to all but with caution.
7. Need for policy to guide RDM. There are various policies that mention RDM. This would guide what can be put out in the public

8. Need to sensitise researchers to populate IRs.
 9. Universities need to put value on patent. Patent assessment is normally equated with an article, which is not fair.
 10. CARLIGH should work to facilitate a national IP and/or a common platform for collecting/depositing published research.
 11. Commercial publishers are relevant in the industry
 12. There is the need to invite and involve policymakers and media agencies more
 13. Institutions need to drive commercialization to realize ‘Research Beyond Aid’
 14. Librarians need to re-demarcate their library space for the technology savvy public
 15. There is need for knowledge sharing first, and then commercialization later.
 16. Encourage use of local institutional repositories, even though papers may be published internationally
 17. More emphasis should be placed on patent than publishing in promotion schemes at universities and research institutions
 18. Skillset gaps could be developed through partnerships across institutions
 19. There is need to grow and aggregate institutional repositories
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Paper presentations for Conference Day 3 – Friday.

Lead paper 1: Research data: cyber-security and access issues

Presenter: Mr. Ben Cobblah

The presenter started by exploring the subject matter of cyber, computers and data. He emphasized that everything about the subject was computers and their mechanical attachments. Adding that the concept was all about data, the presenter suggested that the quality of data input into such an information systems (IS) influences the quality of output received from it. He compared the use of sensors by such systems with human sensory organs such as the eyes and ears that gather data from their environment; and made an analogy of the smart systems as human brains that figure out what to do with the data when it is collected.

There was mention made also of actuators, which were compared with the human hands and feet that make things happen or are used to do things to affect the environment.

The session delved into other concepts such as Internet of Things (IoT), big data, artificial intelligence and cloud computing. He delved deeper into different types of cloud computing, which are Platform as a service (PaaS), Infrastructure-as-a-service (IaaS) and Software as a service (SaaS). He also touched on different types of deployment plans for cloud computing, namely, public cloud, private cloud and hybrid cloud deployments. Three different mechanisms for protecting cyber systems were identified and explained, and they were organisational, technological and personal. Organisational mechanisms for protection included things like understanding and documenting organizational processes, policies and procedures (including blogs and social media), techno-legal undertakings, and awareness and training. Technology-related mechanisms were related to risk analysis, access controls, authentication, using authentic tools, malware detection and prevention, and data loss prevention. At the personal level, factors identified included staying aware, collaborating, and disseminating knowledge.

Finally, the presenter shared a case study that looked at growth in cyber systems development within an organisation from 2014 through, till 2018. Transitions started from developing policies and procedures and collaborations among multiple units in 2014, to the development and review of security bulletins and risk registers, as well as acquisition of tools for visibility and detection, culminating in awareness creation workshops for constituents and institutionalization of privacy and security issues within the organisation. Recommendations were made for building knowledge economies, leveraging on modern technologies, building individual and national data banks, using e-services to access library resources, classification of data, data and information literacy, and ultimately monitoring the changing technology transitions and preserving data appropriately.

Lead paper 2: Building capacity in research data and output management

Presenter: Mr. Clement Entsua-Mensah

A premise in this presentation was that research, undertaken by academic and research institutions, is usually conducted to generate new knowledge. Also, trends in social media are challenging conventional pathways for communicating such research. It was emphasized that

research had become increasingly data-driven, and that librarians need some extra competencies and skills-set to be fully integrated into data management. It proceeded to discuss basic concepts such as data, research data and big data. Three types of data were mentioned – structured, semi-structured and unstructured data.

Research Data Management (RDM) was described to consist of different activities and processes associated with the data lifecycle, and these involve the design and creation of data, storage, preservation, retrieval, sharing and re-use. These are said to take into account technical capabilities, ethical considerations, legal issues and governance framework. And key concepts within this realm are data collection, data ownership, data protection, data retention, data storage, data analysis, data sharing and data reporting. The presenter also observed that information technology has enhanced infrastructure for data storage, including the internet and the World Wide Web (WWW), data-sharing and content management platforms, etc.

An analytical framework by the European Centre for Development Policy Management (ECDPM) was presented as a conceptual model for capacity building related to research data and output management. Core within the framework were those related to the inter-connected dynamics of capacity, endogenous change and adaptation, and performance; which are shaped by four other factors: the external context, stakeholders, internal features and resources, and external interventions.

Capacity building for librarians within this field will therefore cover competencies such as data management and curation, metadata advice and use, preservation of project records, metadata schema development, sources of research funding, complying with mandates of various funders, data manipulation tools, data mining; as well as other technical skills like knowledge of interoperability standards and protocols, metadata statistics, repository software; and soft skills like leadership and project management.

The presentation also touched on underlying principles for building capacity in RDM, approaches to capacity building (either top-down and/or bottom-up; technical and/or organisational; individual and/or organisational), strategies for capacity building, and building partnerships.

Discussion

- DATAD full text of theses including research findings. Expanded coverage and includes whole continent. Open Access full text.
- Need to build attitudinal capacity, since too much emphasis is placed on human capacity building.
- Need to share knowledge acquired during training and seminars.
- Job rotation is one of the best training methods.
- Para-professionals should be encouraged to participate in training/seminars.
- Need for self-motivation/self-drive to train ourselves
- Network with others
- Capacity building should not be expected from Heads of Department only
- Staff training should be on-going especially during the inter semester break.

Paper 1: Building librarians' skill for research data and output management: Case study of librarians at Sam Jonah library, University of Cape Coast

Presenter: Vida Mensah & Matilda Ampah-Johnston

This paper set out to examine the roles of Sam Jonah library in supporting researchers to manage data in the University of Cape Coast; the readiness of Sam Jonah library and librarians in taking up their additional role in response to research data and output management in the University of Cape Coast. It also attempts to identify the capacity needs of the librarians with respect to research data and output management in the University of Cape Coast. Case study was the adopted research design for the study, and the population included management and staff of the Sam Jonah library. Questionnaires were the main tools for data collection, which were analysed using version 22 of SPSS. Tables were used to document and help with interpretation of the data.

Although majority of respondents had an idea of the constituents of research data and its management, the study confirmed the need for librarians to acquire the requisite skills for data management. Much of the training and competence development could be performed in-house, by different university functions and specialist in the profession through training workshops, seminars, short courses, conferences and also through educational institutions that train professionals.

Discussion

Participants agreed that self-motivation is necessary. Librarians need to read and teach themselves to improve upon their skills. There is the need to engage in capacity building to manage data.

Paper 2: Knowledge transfer from research to industry: the panacea for Ghana's socio-economic development

Presenter: Isaac Kojo Agyeman

The paper sets out to; find out the relationship between research and industry in Ghana, how research institutions and industry in Ghana are sharing and/or transferring knowledge as well as the challenges to knowledge transfer from research to industry in Ghana. A survey method was adopted for the research and CARLIGH members were the sample population. Five academic/ research institutions included the CSIR-INSTI, University of Ghana, KNUST, PUC and MUG. Purposive and convenient sampling techniques were used to select 50 researchers.

The study found out the following:

- Classroom lectures were tailored towards knowledge transfer to the industry.
- Academics and other researchers were recognized for taking initiative for industrial research.
- The institutions have clear procedures and processes in place to support academia-industry collaboration.
- Researchers received funding specifically towards innovation activities.
- Insufficient research capabilities for industry collaboration.
- Teaching and other administrative load preventing faculty from undertaking industrial projects.

The paper concluded that:

- Knowledge transfer from research to industry is key for innovations and socio-economic development of any country.

- There is the need for conscious awareness among researchers towards the knowledge needs of industry.
- Academic-industry collaboration to some extent has a negative influence on the instructional mission of universities.
- Insufficient research facilities by the university towards industrial research are serious issues that need a redress

Among the recommendations offered, the presenter suggested that;

- The motivation of faculty and other researchers towards industry oriented research
- Academics and other researchers ought to form active research teams focusing on industrial and commercial projects.
- Two-way communication between research and industry should be a regular activity on researchers' calendar

Paper 3: An assessment of the contribution of institutional repositories to the visibility and citation impact of universities in Ghana

Presenter: Dr. Mac-Anthony Cobblah & Gloria Tachie-Donkor

The Research objectives were to, among others, examine the state and functionality of IR's, ascertain the benefits and non-benefits of IR's, establish the relationship between IR's and the visibility and citation impact of selected institutions, and explore the challenges that confront the various institutions in the management of their IR's.

University of Cape Coast (UCC), University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Education, Winneba (UEW), Methodist University College, Ghana (MUCG), Ghana Institute of Management and Public Administration (GIMPA), University for Development Studies (UDS) and Ashesi University formed the sample universities in the study.

Even though the concept of IR is growing at a slower rate in Ghana, it was clear from the findings that institutional repositories in the selected Universities are functional. The findings established that IRs in the Ghanaian Universities are contributing to the visibility and citation

impact of the universities. However, management support is crucial to the sustainability of IR in Ghana. There is also the need for standardization and policies to guide the submission of research outputs to institutional repositories.

Discussions

Suggestion was made during discussions that it should be a requirement in Universities for researchers to deposit papers in the IR. This should be a basis of promotion as currently pertains in KNUST. IRs should be compliant with other search engines.