

**USAGE OF OPEN ACCESS INSTITUTIONAL REPOSITORIES IN UNIVERSITY
LIBRARIES IN GHANA**

by

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DECLARATION

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Usage of open access institutional repositories in university libraries in Ghana:

I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirement for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at UNISA for another qualification or at any other higher education institution.



14-01-2020

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DEDICATION

This work is dedicated to the Almighty God, to Dr. Kofi Ntim and Mrs. Adwoa Addai Ntim whose sacrifices, love and support encouraged me to complete the PhD degree programme.

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ABSTRACT

The study investigated the usage of Open Access Institutional Repositories (OAIR) in university libraries in Ghana to develop a strategy on how the usage of OAIR in university libraries in Ghana may be enhanced. The study adopted the Technology Acceptance Model (TAM), which was then modified to fit the study. Accessibility, availability and visibility were proposed in addition to the conventional variables of TAM to improve the fit between the data and the theoretical model. Pragmatism paradigm, mixed methods research approach and convergent parallel mixed method design (survey and case study designs) was used for the study. Simple random sampling, stratified random sampling, purposive sampling techniques and the sample size converter were the sampling procedures and methods employed.

A total of nine hundred and ninety-eight (998) respondents completed the questionnaires distributed, but for the qualitative phase twelve (12) OAIR managers were purposively selected. The questionnaire and interview guide were used as research instruments to gather relevant data for the study. Descriptive statistics (frequencies, percentages, means and standard deviation) and inferential statistics (multinomial logistic regression and CFA using SEM) were used as statistical tools to analyse quantitative data and thematic analysis was used to analyse qualitative data.

The study revealed that there was a low level of OAIR usage in universities among academic staff, notwithstanding the high level of understanding of OAIR. This was evident in the number of research work uploaded onto the OAIR by the OAIR team. Inadequate advocacy, ICT connectivity, infrastructure, funding, power supply, insufficient technological skills, institutional repository policy, absence of incentives, institutional culture and politics and copyright issues were the challenges facing the usage of OAIR in university libraries in Ghana.

The study concluded that advocacy, policies, software and staffing enshrined in an institutional guideline on OAIR would enhance OAIR usage. The study developed an OAIR Usage Model and OAIR User Manual, which would be very instrumental in the usage of OAIR in university libraries in Ghana. The model will enhance user satisfaction and intention to reuse the OAIR and making OAIR research outputs available, accessible and visible. The manual specifies the contents and documents accepted by the OAIR and ensuring the quality of documents archived.

KEY TERMS:

Academic staff; Ghana; Library staff; Model; Open Access (OA); Open Access Institutional Repositories (OAIR); OAIR managers; Technology Acceptance Model (TAM); Universities; University libraries; Usage

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ABBREVIATIONS AND ACRONYMS

AAU	Association of African Universities
ACRL	Association of College and Research Libraries
AGFI	Adjusted Goodness of fit Index
AIR	Ashesi Institutional Repository
APSR	Australian Partnership for Sustainable Repositories
ARL	American Research Libraries
ARROW	Australian Research Repositories Online to the World
ATICS	Africa Tertiary Institutions Connectivity Survey (ATICS)
AU	Ashesi University
AVE	Average Extracted Variance
AVOIR	African Virtual Open Initiatives and Resources
BOAI	Budapest Open Access Initiative
CARLIGH	Consortium of Academic and Research Libraries in Ghana
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
CSIR	Scientific Research and Industrial Research
CUUL	Consortium of Uganda University Libraries
DATAD	Database of African Theses and Dissertations
DOAR	Directory of Open Access Repositories
EFA	Exploratory Factor Analysis
eIFLnet	Electronic Information for Libraries Network
EU	European Union
FAQ	Frequently Asked Questions
HEI	Higher Educational Institutions
ICT	Information and Communication Technologies
INASP	International Network for the Availability of Scientific Publications
IT	Information Technology
KEWL	Environment for Web-based Learning
KNUST	Kwame Nkrumah University of Science and Technology
MIT	Massachusetts Institute of Technology

NAB	National Accreditations Board
NetTel	Africa Network of Telecommunications Policy, and Regulation in Africa
NFI	Normed-Fit Index
OA	Open Access
OAI	Open Archives Initiative
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting
OAIR	Open Access Institutional Repositories
PDF	Portable Document Format
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
R	Reliability
RePEc	Research Papers
RMSEA	Root Mean Square Error of Approximation
RMR	Root Mean Square Residual
ROAR	Registry of Open Access Repositories
RUBRIC	Regional Universities Building Research Infrastructure Collaboratively
SCIC	Secretariat de Corals Infantils de Catalunya
SEM	Structural Equation Modelling
SHERPA	Securing a Hybrid Environment for Research Preservation and Access
SPARC	Scholarly Publishing and Academic Resources Coalition
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UCC	University of Cape Coast
UCC-IR	University of Cape Coast Institutional Repository
UDS	University for Development Studies
UG	University of Ghana
UK	United Kingdom
UNISWA	University of Swaziland
USA	United States of America
UTAUT	Unified Theory of Acceptance and Use of Technology
WoS	Web of Science
χ^2/df	Model Chi-square

CHAPTER ONE

INTRODUCTON

1.1 Introduction and Background of the Study

The fourth industrial revolution, also characterized by the surge in Information and Communication Technologies (ICTs) and the Open Access (OA) movement in libraries, has brought forth the Open Access Institutional Repositories (OAIR) (Dlamini & Snyman 2017:535). The literature on OAIR throughout the world has gained a lot of attention (Adeyemi, Appah, Akinlade & Bribena 2017:297) and has provided researchers with the opportunity to enhance the visibility of their publications.

University libraries that are also known as academic libraries are termed as the 'heart' of the learning community and have embraced OAIR to communicate effectively with research output of all types (Bryson 2017:23). Academic libraries provide researchers with the scholarship and knowledge support to improve their responsibilities (Uzoigwe 2013:432; Yusuf & Iwu 2010:2). Based on the responsibilities of the university community libraries have continually provided diverse services to academic staff, students and researchers to carry out teaching, learning and research needs of the community.

Uzoigwe (2013:432) and Yusuf & Iwu (2010:2) accentuate the fact that libraries in institutions of higher learning play vital roles to academic staff and students to the realizations of their institutional requirements. As a result of the changes that occur in information and knowledge society, university libraries continue to deepen their roles of researching to ensure that the expectations of different users on the creation, dissemination and preservation of knowledge available in the library (Abrizah, Noorhidawati & Kiran 2017:55; Bryson 2017:9).

Therefore, the need to redesign the information products and services becomes necessary to meet the changing needs of patrons (Bryson 2017:9). The collection, processing, preservation and integration of information contents into OAIR are critical to the mission of the university, regardless of the format (Samzugui 2017:4). Universities of most less advanced nations are still grappling with making the results of their research accessible in OAIR (Adeyemi et al 2017:297).

The key to the provision of worldwide information and knowledge in OA is Internet connectivity which is required to enable libraries around the world to build OAIR for the implementation and capturing of the intellectual assets of their institutions (Ezema & Onyancha 2016:2). According to Dlamini and Snyman (2017:536), OAIR grew out of the OA movement with a goal of providing global OA to the scholarship created within that institution. The primary role of OAIR was to facilitate OA to the traditional scholarship in institutions (Abrizah et al 2017:55).

OA to information is the accessibility of information on the Internet, allowing its use without financial, legal or technical barriers (Loan 2014:35). OA began as a result of the restraints in the acquisition of information in journals enforced by commercial publishers demanding fees from authors (Abrizah et al 2017:53). According to Kakai (2018:207) and Loan (2014:35), the principle of OA is supported by OAIR through self-archiving copies of already published research articles in the author's institutional archive. They are made available for free and disseminated as widely as possible to contribute to knowledge building within their field without the constraints of access and costs.

Conversely, OAIR have now included courseware, back files of journals articles, subject-specific repositories, conference papers, technical reports, theses and dissertations and many more institution-specific materials. Recently, information from the Directory of Open Access Repositories (DOAR) and Registry of Open Access Repositories (ROAR) catalogue discloses that OAIR globally have largely multiplied in terms of materials deposited (DOAR 2018; ROAR 2018). OAIR tend to increase academic communication; however, OAIR as a mode of disseminating information is not yet pervasive in advancing countries compared to advanced nations such as the USA, Asia, UK and other European countries (Abrizah et al 2017:54).

The growth of OAIR in advanced countries as well as some developing countries like Brazil, India has been very remarkable; however, much has not been heard in sub-Saharan African countries (Adeyemi et al 2017:301). Although the number of OAIR systems in South African, Kenyan and Nigerian universities is increasing very quickly, this is not the same in other African countries (Adeyemi et al 2017:301).

DOAR (2018) indicates that there are 33 (21%), 29 (18%) and 21 (13%) active OAIR in university libraries in South Africa, Kenya and Nigeria respectively.

The small number of OAIR in most African countries exists as a result of the little information that potential contributors have and no government policies on OAIR implementation (Abrizah et al 2017:55). This is particularly so in Ghana where its development is still in its infancy in spite of the relevance of OAIR in increasing the visibility and better performance in the on-going web ranking of world universities. Amongst the 158 (100%) Institutional Repositories in Africa enumerated in the DOAR, only 5 (3%) are from Ghana notwithstanding the volumes of research output that emanates from Ghanaian universities (DOAR 2018; ROAR 2018).

The repository policies are undefined; metadata reuse policy explicitly undefined, full data item policy explicitly undefined, content policies explicitly undefined, submission policy explicitly undefined and preservation policies explicitly undefined (Adeyemi et al 2017:301). Although research is compulsory for both academic staff and students in Ghanaian universities either by job description or by a prescribed academic programme of study the research outputs reside in obscurity and are not visible to those who may need them.

The state of OAIR in Ghana accordingly emphasises the need for an effective process of information collection and dissemination within the universities in Ghana. In the light of this and the fact that the OAIR is not used, the study will seek to investigate the usage of OAIR to suggest a strategy for the usage of OAIR in university libraries in Ghana.

1.2 Contextual Setting

Information from the National Accreditations Board (NAB) of Ghana (2018) indicates that Ghana has ninety-two Higher Educational Institutions (HEI). These are categorized into nine national public universities, eight technical universities, ten professional institutions and sixty-five private universities and university colleges. Out of the ninety-two HEI, four public university libraries and one private university library will be purposively selected for the study. The four public university libraries are University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Cape Coast (UCC), University for Development

Studies (UDS), while the private university library is Ashesi University (AU).

The study purposively focused on these five university libraries with the understanding that they were the only universities on the DOAR and ROAR, authoritative global registries of repositories that provide data on the number of registered OAIR all over the world (DOAR 2018; ROAR 2018). Therefore, they were expected to meet certain operational criteria. Further criteria for selection included infrastructure and resources, the number of qualified and permanent staff, the notion of well-equipped libraries, postgraduate programmes and the operational status of their OAIR. These university libraries are registered universities located in various regions in Ghana.

UGSpace is the OAIR of the UG, a public university that has an OA electronic archive for the collection, preservation and distribution of digital materials. UGSpace was developed to enable the deposit of digital contents of a scholarly or heritage nature to disseminate, preserve and promote the intellectual output of the university in a managed environment. UGSpace digital collections have communities and RSS feeds for easy browsing (University of Ghana 2018).

KNUST is a public university credited as having been the first university in Ghana and West Africa to establish an OAIR in 2008 known as the KNUSTSpace. The platform showcase the intellectual output from the university. KNUSTSpace has communities such as Conference Proceedings, Journal of Science and Technology, Kumasi Centre for Collaborative Research, Research Articles, Speeches and Theses/Dissertations for one to easily browse its collections. The OAIR currently hosts theses, dissertations, conference papers and course materials of the university (Kwame Nkrumah University of Science and Technology 2018).

University of Cape Coast Institutional Repository (UCC-IR) is the OAIR of UCC that is also a public university. UCC-IR preserves and enables easy and open access to an online collection of student achievement and faculty research. Essentially, it is meant to collect and maintain the intellectual writings and other scholarly endeavours by UCC faculty and postgraduate students. The interface is in English. The UCC-IR provides free access to this intellectual capital and output of the university to the global academic community (University of Cape Coast 2018).

UDS is a public university that owns the UDSspace which preserves and enables easy and open access to the online collection of student achievement, faculty research and the university archival materials. The UDSspace consists of all digital contents including text, images, moving images, mpegs and data sets. The purpose of UDSspace is to make the university's digital scholarship available to a global audience and to serve as reliable digital storage. UDSspace has a dual function of a publication platform and a digital archive (University for Development Studies 2018).

Ashesi Institutional Repository (AIR) is the OAIR of AU. It is an archive for preserving and sharing AU scholarly work. Contributors to the repository ensure that their scholarly and creative work is preserved, indexed and showcased for a global audience. Students who do good work get the privilege of getting their work published on AIR. The OAIR is organized in 'Collections' that group publications by the department and/or subject (Ashesi University 2018).

1.3 Statement of the Problem

According to Abrizah et al (2017:55) OAIR have the potential of increasing the availability, accessibility, visibility and prestige, ranking and public value of researchers and research outputs in universities (Dlamini & Snyman 2017:536). OAIR improves the prominence and reputation of the institution's research interests. OAIR advertises the institution in terms of sourcing funds for potential new researchers and students (Abrizah et al 2017:55; Dlamini & Snyman 2017:536; Ibinaiye, Esew, Atukwase, Carte & Lamptey 2015:3; Lagzian, Abrizah & Wee 2015:197). Besides, OAIR provide access to the world's research, through ensuring the long-term preservation of academic output. These are accommodated in a large volume of research output (Ibinaiye et al 2015:3; Lagzian et al 2015:197).

Despite the potential benefits associated with the usage of OAIR by universities, the researcher observed that most universities in Ghana have not started the application of OAIR in their innovative practices. Also, the reluctance among academic staff to contribute to OAIR, most of them are not submitting their research outputs to be deposited in OAIR. This is evident in the low number of deposits in OAIR and analytics also showed a lower number of OAIR users. Many university libraries in Ghana still battle with many issues in an attempt to make their research outputs

open and accessible through OAIR.

The factors envisaged by the researcher could create a level of awareness of its importance, inadequate technological facilities, no specified policy to that effect, inadequate librarians with the technical know-how, organizational culture does not promote its use, copyright issue, perception of archiving problems among others. The study therefore, sought to investigate the usage of OAIR in university libraries in Ghana. The study established the achievements of OAIR, the challenges of OAIR and the strategies recommended as prospects.

1.4 Purpose of the Study

The purpose of the study was to investigate the usage of OAIR in Ghanaian university libraries. The study was to provide the much needed empirical data on the level of OAIR usage in universities to enable university management, library management and OAIR managers to design tools and initiatives to enhance OAIR usage and advance the mission to share knowledge.

1.5 Objectives of the Study

The research concentrated on the objectives below:

1. Determine the level of awareness of OAIR in university libraries in Ghana;
2. Examine the perceptions of universities in Ghana towards the usage of OAIR;
3. Establish the content archiving of OAIR in university libraries in Ghana;
4. Determine the level of usage of OAIR in university libraries in Ghana;
5. Identify the challenges encountered with the use of OAIR in university libraries in Ghana; and
6. Suggest strategies for the usage of OAIR in university libraries in Ghana.

1.6 Research Questions

The following specific questions served as a guide to the study;

1. What is the level of awareness of OAIR in university libraries in Ghana?
2. How is OAIR perceived in universities in Ghana?
3. How are contents of OAIR archived in university libraries in Ghana?
4. What is the level of usage of OAIR in university libraries in Ghana?

5. What are the challenges with the use of OAIR in university libraries in Ghana?
6. What are the strategies to enhance the usage of OAIR in university libraries in Ghana?

Table 1.1 A table showing a brief summary of the possible research objectives, research questions, approaches and data collection instruments

Research Objectives	Research Questions	Paradigm & Approaches	Data Collection Instruments
Determine the level of awareness of OAIR in university libraries in Ghana	What is the level of awareness of OAIR in university libraries in Ghana?	Pragmatism Mixed methods research	Questionnaire Interviews
Examine the perceptions of OAIR in university libraries in Ghana	How is OAIR perceived in university libraries in Ghana?	Pragmatism Mixed methods research	Questionnaire Interviews
Establish the content archiving of OAIR in university libraries in Ghana	How are contents of OAIR archived in university libraries in Ghana?	Pragmatism Mixed methods research	Questionnaire Interviews
Determine the level of usage of OAIR in university libraries in Ghana	What is the level of usage of OAIR in university libraries in Ghana?	Pragmatism Mixed methods research	Questionnaire Interviews
Identify the challenges with the use of OAIR in university libraries in Ghana	What are the challenges with the use of OAIR in university libraries in Ghana?	Pragmatism Mixed methods research	Questionnaire Interviews
Suggest strategies for the usage of OAIR in university libraries in Ghana.	What are strategies to enhance the usage of OAIR in university libraries in Ghana?	Pragmatism Mixed methods research	Questionnaire Interviews

Source: Kodua-Ntim, 2018

1.7 Significance of the Study

The main purpose of conducting research is based on of the problems that it seeks to solve by creating a clear rationale for different groups that may profit from reading and using it (Creswell 2014:163). This can be done by addressing the knowledge gaps, creating effective knowledge analysis methods, influencing policy and changing people's way of doing things. The study was important in the field of Information Science in the area of OAIR, as the knowledge gap on OAIR usage in universities will be bridged.

The research will be useful to university Library Management, Librarians and HEI. It will help them in developing and designing strategies on how OAIR can be sustained and managed in university libraries. The implementation of such would require the knowledge of stakeholders and experts in the field. University Library Management and Librarians will have a set of criteria when it comes to OAIR in libraries and its development in university libraries in Ghana.

Again, HEI will be able to establish the achievements of OAIR, the challenges of OAIR and the strategies that could be recommended as prospects in university libraries in Ghana. The outcomes of the research will improve the usage of OAIR in university libraries in Ghana. Thus, the study will be significant to academic staff as they will recognize the need to use OAIR and OAIR managers and administrators will be able to determine the factors affecting the usage of OAIR in university libraries. The results of this research could shed more light on the usage of OAIR in universities in general.

1.8 Scope of the Study

The study investigated the usage of OAIR in university libraries in Ghana. The research highlighted its foundation based on the Technology Acceptance Model (TAM). The study discussed the empirical findings based on the usage of OAIR in university libraries. The study focused on the usage of OAIR and its development in university libraries in Ghana with emphasis on the overview of OAIR, awareness of OAIR, perceptions of OAIR, content archiving of OAIR, usage of OAIR and challenges of OAIR in university libraries.

Five universities namely the University of Ghana, Kwame Nkrumah University of Science and Technology, University of Cape Coast, University for Development Studies and Ashesi University were involved in the study. The study outcome reflects what is important for other university libraries in Ghana. Consequently, the results can be generalized as the situation prevails in university libraries in Ghana, as these universities are leaders with regards to university education in Ghana.

1.9 Limitations of the Study

There are two major limitations in the study that could be addressed in future research. First, the study focused on the main university libraries, a number of the university libraries system are made up of departmental and faculty libraries. Owing to the time constraints, the study concentrated on five university libraries situated in the main university campuses. Second, there were other university libraries with OAIR but were deemed not operational. These libraries' OAIR were not listed in the DOAR and ROAR, OAIR must meet certain criteria to be listed. The study focused on the five OAIR, which were the only ones listed in DOAR and ROAR. It is expected that university libraries with operational OAIR have comparatively well-established libraries, thus, they are probably to gain the more.

1.10 Ethical Considerations

Ethical consideration is of paramount importance in research as a lot of researchers are concerned with different professions and their ethics. Ethical considerations include issues such as voluntary participation, protection from all types of harm, confidentiality, anonymity, informed consent, privacy and researcher conduct while carrying out the research activity (Maxfield & Babbie 2013:67; UNISA 2010:3). Ethics refers to the concepts of right and wrong used by individuals to direct their work (Ngoepe, Mokoena & Ngulube 2010:40).

Again, it is the duty and responsibility of the researcher to provide necessary information to the prospective participant on the nature and purpose of the research to be carried out (Babbie 2013:91; Stangor 2011:213). The participants and university authorities were fully aware of the type of information needed, why the information was obtained, the reason for which it was provided, how participants were expected to participate in the research and how it affected them directly and

indirectly before the actual study. Confidentiality refers to the researcher ensuring that no one outside the research team can recognise participants in the study and that the response of individuals to others has not been explicitly replicated (Babbie 2013:89).

The issues of confidentiality and anonymity were given serious consideration so that whatever information was gotten from the participants was used strictly for the benefit of the study. This was done by keeping the responses of participants private with a set of rules, promises and agreements that limit access to information from participants. Again, participants could not be identified by name, unknown names were used (code names were generated). UNISA has a Research Ethics Code (UNISA 2010) and as a UNISA student, the researcher adhered to the Research Ethics Policy of UNISA. In addition to discussing the research practices, this policy includes clear guidelines. For example, it outlines the importance of accountability, integrity and transparency.

1.11 Originality of the Study

Research originality is a key aspect of any postgraduate research since it focuses on the original contribution to the scholarship and something that nobody else has done before. (Cobb 2014). In ensuring the originality of research, the techniques and processes involved in the data collection were important. According to Neuman (2006:149), the multiple data collection instruments enable the collection of multiple data using various approaches, methods and strategies in such a way that the result is original. Cryer (2006:193) recognized the role of originality in the building of knowledge but clarified that it goes beyond the research itself and reflects the uniqueness of the researcher throughout the research process. Originality was shown in terms of the critical analysis of an in-depth study, a new model, a reinterpretation of an existing theory and arriving at some. The study developed the following two strategies for the usage of OAIR that is instrumental in the usage of OAIR in university libraries in Ghana. First an OAIR Institutional Guideline on awareness, national mandate, clear distribution of responsibility, stakeholders coordination and availability of funds and infrastructure for advocacy and marketing, policies, software and staffing which finally lead to OAIR usage. It is assumed that the usage of OAIR minimizes many problems and promotes information flow,

access, retrieval and sharing in the university.

Second, the OAIR Usage Model was generated because of a lack of supporting models and theories for the usage of OAIR. The model will enhance user satisfaction and intention to reuse the OAIR in university libraries. Making OAIR research outputs available, accessible and visible can solve the challenges encountered with the use of OAIR in university libraries. And the OAIR User Manual was also generated from the study. OAIR User Manual specifies the contents and documents accepted by the OAIR and additionally provide guidance to archiving and ensure the quality of documents archived. In this way, information can be easily obtained, stored and shared for future use.

The study also brought new insights (deep and accurate understanding of OAIR awareness, perception, content archiving, usage, challenges and strategies) from the multiple data collection tools using the pragmatism paradigm, mixed methods research, convergent parallel mixed method design (survey and case study design) in different ways made the result original. Furthermore, the comprehensive study provided an understanding of OAIR through the use of Technology Acceptance Model (TAM) an extension of the Theory of Reasoned Action (TRA) to explain the usage of OAIR in university libraries in Ghana.

The study examined similar studies conducted in Africa specifically South Africa, Kenya and Nigeria. But with a new interpretation, review and consideration of a new area of OAIR awareness, perception, content archiving, usage, challenges and strategies. Despite the conceptual importance given to the role OAIR in promoting research output in university libraries, not many studies exist which have critically examined the usage of OAIR in university libraries in Ghana. Therefore, the researcher investigated the usage of OAIR in university libraries in Ghana to add to the knowledge gap by carrying out an empirical study on the usage of OAIR in university libraries in Ghana.

1.12 Definition of Terms

This section presents the definition of key terms for the study;

1.12.1 Open Access Institutional Repositories

OAIR is an archive to collect, preserve and distribute digital copies of an institution's intellectual output, especially a research institution. Open access is a set of principles and a range of practices through which research outputs are distributed online, free of cost or other access barriers. OAIR increases visibility of the university, its works and researchers.

1.12.2 Library

A library may be defined as a collections of human culture records in various formats and languages, preserved, arranged and interpreted to meet the broad and varied needs of individuals for information, knowledge recreation and aesthetic pleasure. The collection can include books, periodicals, newspapers, manuscripts, films, maps, prints, documents, microform, CDs, cassettes, videotapes, DVDs, e-books, audiobooks and databases.

1.12.3 Academic library

An academic library constitutes an essential portion of tertiary education. The main purpose of the academic library is to meet the information and research needs of its students and staff by gathering information resources irrespective of design and ownership, organizing and describing these information sources to enable their retrieval at the time of need.

1.12.4 Academic staff

Academic staff are faculty staff of a university in a position as a professor and lecturer of various ranks. Academic staff are the teaching and research staff of a university, they are responsible for planning and directing within universities.

1.12.5 Library staff

Library staff are information professional often regarded as the 'custodian of knowledge', those who are saddled with the organization, acquisition, storage and dissemination of information in university libraries. They include all library staff from the position of a library assistant to the university librarian.

1.12.5 OAIR manager

The librarian in charge of the OAIR makes sure that the repository is fed with content. He does that by coordinating the various units in charge of the contents

such as faculty, the graduate school, the departments, the colleges and the public affairs. The manager makes sure the repository is alive to be used by the stakeholders that include the students and staff.

1.13 Organization of the Study

The outline of the proposed research was based on the procedures and recommendations from the literature (Babbie 2013; Creswell 2014; Teddlie & Tashakkori 2009). As presented below, the study will be divided into six chapters:

1.13.1 Chapter one: Introduction to the study

The chapter presented an introduction to the study beginning with an introduction and background to the study, then contextual setting, research problem, research purpose, research objectives, research questions, study significance, study scope, study limitation, ethical considerations, and organization of the thesis. This section also addresses the details underlying the originality of the study.

1.13.2 Chapter two: Literature review and theoretical framework of the study

The chapter consisted of the review of literature relating to the study area by disclosing what has been done previously on the subject and what has been done in the study. The chapter also established the theoretical basis for the study. Lastly, it provides an overview of OAIR in university libraries.

1.13.3 Chapter three: Research methodology

The chapter dwelt on research methodology that guided the study, including details on the research paradigm, research approach, research design and research methods.

1.13.4 Chapter four: Presentation and analysis of data

The chapter presented the findings of the study. The findings were obtained using the methods and instruments of the research collection described in chapter four. The findings were presented in line with the research problems.

1.13.5 Chapter five: Interpretation and discussion of research findings

The chapter discussed the findings of the study as described in chapter five. The discussion of the finding was in relation to the reviewed literature.

1.13.6 Chapter six: Summary, conclusions and recommendations

The research summaries, conclusions and recommendations are provided in the chapter. The chapter proposed areas for further research. Finally at the end of the dissertation appendices were added, including data collection instruments and data collection acceptance letters.

1.14 Chapter Summary

The chapter introduced a background to the study starting with an introduction and background to the study, contextual setting, research problem, research purpose, research objectives, research questions, significance of the study, scope of the study, limitation of the study, ethical consideration and organization of the thesis. The chapter also addressed the details underlying the originality of the study.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Introduction

The primary goal of this chapter is to provide a critical review of existing literature as well as the theoretical foundation on Open Access Institutional Repositories (OAIR) and their usage in university libraries throughout the world, Africa and Ghana. As a way of introduction, the significance of a literature review in research is included in this chapter. For easy referencing, the literature was reviewed under the following topics; overview of OAIR, awareness of OAIR, perceptions of OAIR, content archiving of OAIR, usage of OAIR and challenges of OAIR in university libraries. Additionally, relevant empirical work on OAIR in university libraries was reviewed. Finally, the theoretical framework and conceptual framework that guided the study is presented in this chapter as well.

Literature review deals with analysing scholarly materials compiled on the related topic of a study. A literature review is a systematic, explicit and reproducible method of identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners (Silva, Oliveira, Vilas-Boas, Fink, Pannuti & Vidal 2010). Bloomberg and Volpe (2012) state that the literature review involves locating and assimilating what is already known and entering the conversation from a critical and creative standpoint.

The figure below is a map that presents a literature review map that outlines how the objectives of the study which are linked to the theoretical framework that underpins the study. The literature review map starts from a general perspective of OAIR and ends with a more conceptualized perspective on the usage of OAIR in university libraries. To assist in bringing together related ideas and organizing a literature review, the study used a literature review map.

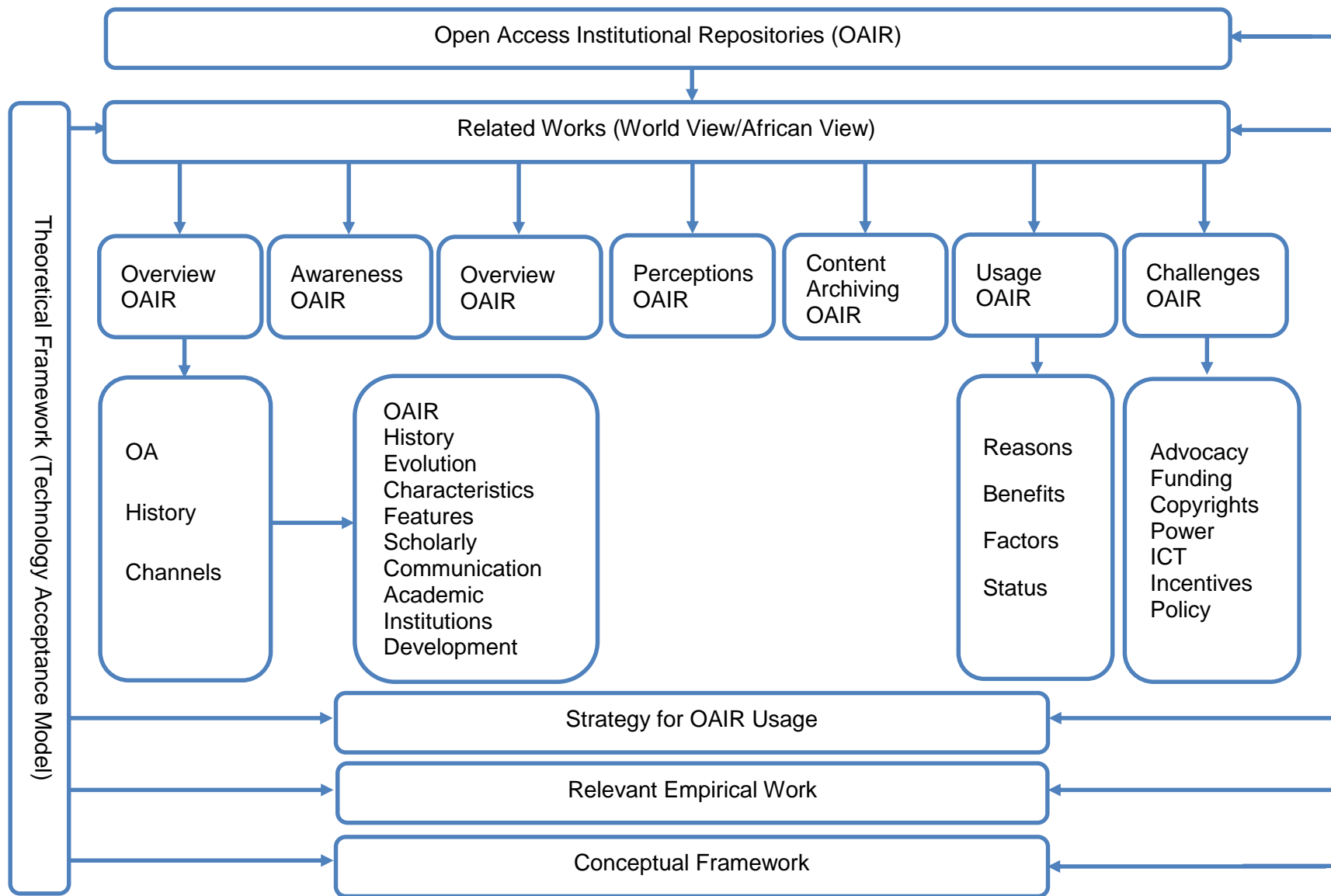


Figure 2.1 Literature Review Map

Creswell (2014) describes a literature map as a figure or drawing that displays the research literature (articles, books, chapters, essays and summaries) on a topic. He adds that this graphical representation helps to see overlaps in knowledge or major literature topics and to assess how a new study adds or expands existing literature instead of duplicating past studies.

According to Burton and Bartlett (2016:18), in order to provide background information on the general area of study, identify and assess the research context (social, political, cultural, educational and environmental) researchers need to access and review existing research and relevant literature. Furthermore, consider and reflect on what has already been published in the general area of research, concentrating in particular on the relationships (differences and similarities) between studies and addressing the relevance of existing research to the research focus and methodology (including any effect on the research questions being addressed). The following discussion in this section will address the various points outlined in figure two above, the first thing to be addressed is an overview of OAIR.

2.1 Overview of Open Access Institutional Repositories

Globally, ICT systems developments are increasingly becoming the core and vital component for organizational operations. Today, ICT-based approaches are increasingly being sought by organizations including universities to provide and enhance the delivery of quality services to clients (Ondieki & Makori 2013:209). ICT has eliminated many of the limitations traditionally associated with access to knowledge, including geographical barriers, time constraints and delays in dissemination and usability barriers, restricting the range of sources that a single person can access (Rahman & Panda 2012:47).

According to the Association of College and Research Libraries (ACRL), more and more institutions are setting up repositories to house the publications of their faculty to provide open access to these papers as a way to disseminate and view the academic performance of their institution (Dawson & Yang 2016:3). In terms of research performance, developing countries in Africa are ranked the lowest (Dlamini & Snyman 2017:536; Moahi 2009:1). Most of the research outputs by African academics and researchers gather dust in the various departmental offices and institutional libraries without getting published (Mohammed 2013:2). According to

Dlamini and Snyman (2017:537) and Moahi (2009:4), African academics strive to publish in internationally renowned peer-reviewed journals in order to ensure academic promotion.

Many of these scholars do not make it into these journals, and when they do, the journals are out of reach to most African university libraries. This makes the African researcher highly dependent on research generated from developed countries, which is often, to a large extent not relevant to African information consumers (Ezema 2011:473). One of the pathways being used to enhance the availability, accessibility and visibility of content from Africa is through OAIR (Cullen & Chawner 2010; Dlamini & Snyman 2017:537). The usage of OAIR in African academic institutions is therefore, a serious developmental issue that urgently needs attention (Ivwhighrehweta 2012:1).

OAIR provides authors with an audience worldwide greater than any subscription-based journal no matter how prestigious or popular the journal is, the exposure and influence of their research are demonstrably enhanced (Ali 2013:36; Jain 2012:4; Suber 2010:2). Many universities around the world have launched projects to build repositories that enable faculty and researchers to upload and access academic literature and use it to share resources within the institution or across the country. In this way, sharing resources could lead to improved teaching and learning efficiency, sharing good practice, greater consistency, and an increased sense of community growth.

While highlighting the importance of OAIR, Ali (2013:37) reveals that knowledge workers in developing countries are currently gaining access to academic and scientific publications and online resources at a historically incomparable pace. This is because of the movement for Open Access (OA) and the growing number of OAIR guarantees to provide even greater access to previously inaccessible resources and publications. Technology and interoperability requirements also provide libraries in developing countries with great opportunities to disseminate local research and bridge the knowledge gap.

2.1.1 Open Access

OA may be described as a philosophy to achieve the goal of accessing and making

available free of charge electronic content that may or may not be free of restrictions on copyright and licensing (Narayana, Biradar & Goudar 2009:3). There are a number of open access concepts and the term continues to evolve. Nevertheless, the best current definition of this concept is collectively comprised of several main documents that build on each other. These include the Budapest Open Access Initiative (2002), the Bethesda Statement on Open Access Publishing (2003), the Berlin Declaration on Open Access to Knowledge in Science and Humanities (2003) and the Bangalore Open Access Commitment (2006) (Mgonzo 2014:8160).

Budapest Open Access Initiative (BOAI) has been described as the first internationally focused formal statement to articulate a comment to open access (Peekhaus & Proferes 2015:1). The BOAI clearly defines the concept of OA as provided by the initiative; by OA to this literature, we mean its free availability on the public Internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the Internet itself. The only limitation on replication and dissemination and the only function for copyright in this area should be to grant authors power over the integrity of their work and the right to proper recognition and citation (Ezema & Onyancha 2016:2; Mgonzo 2014:8160).

Bethesda Statement on Open Access (2003) focuses on biomedical research access. The definition of Bethesda Open Access defines OA publication as one that fulfils the two following conditions:

- a. The author and copyright holder grant to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use (Dulle 2009:3; Mgonzo 2014:8160).
- b. A complete version of the work and all additional content, including a copy of the above-mentioned permission, in an acceptable generic electronic format is

deposited in at least one online repository immediately upon initial publication that is supported by an academic institution, academic society, government agency or other well-established entity seeking to promote open access, free dissemination, interoperability and long-term archiving (Dulle 2009:3; Mgonzo 2014:8160).

The Berlin Declaration on Open Access (2003), which was adopted for science and humanities research, defines OA as a new mode of scholarly communication through which the author(s) and the right holder(s) of scholarly work shall grant to all users a free, irrevocable, worldwide right of access and a license to publicly copy, use, distribute, transmit and display the work and to make and distribute derivative works for any responsible purpose in any digital medium subject to proper attribution of authorship. According to Dulle (2009:3), a complete version of the work and all supplementary materials should have been deposited in at least one online repository, using the suitable technical standards to allow open access, unrestricted distribution and long-term archiving of such works and including the permission to use the work (Dulle 2009:3).

However, the Berlin Declaration on Open Access to Knowledge in Sciences and Humanities adds that institutions must implement a policy to provide OA knowledge:

- a. Require their researchers to deposit in an OA repository a copy of all of their published articles.
- b. Encourage researchers to publish their papers in OA journals where an appropriate one exists (Mgonzo 2014:8160).

Bangalore Commitment (2006) is a commitment to mandate OA self-archiving in their own respective countries and thereby set an example for emulation by the rest of the world; self-archive unto others as you would have others self-archive unto you (Poornima, Biradar & Goudar 2009:4). The common definition of OA is referred to as the 'BBBB' and describes OA as electronic, online, free-of-charge, free-of-copyright and licensing literature for everyone with an Internet connection (Mgonzo 2014:8160).

Other scholars describe OA as complete, unrestricted, immediate and permanently accessible digital content that can be accessed and reused with minimal restrictions

(Pinfield, Salter, Bath, Hubbard, Millington, Anders & Hussain 2014:2404). OA may also mean free and unrestricted access to academic publications through the Internet, or free availability at the point of use of electronic academic articles. OA has two strategies, through OA journals and OA repositories (Mgonzo 2014:8160). All these are aimed at advocating for the provision of free access to information to assist researchers and libraries globally and more particularly in developing countries (Fox & Hanlon 2015:698; Peekkhaus & Proferes 2015:1).

The increasing interest in OA scholarly communication is because of the great opportunities OA initiatives provide for wider dissemination of research findings, particularly among developing countries. Access to scholarly information has traditionally been restricted by subscriptions, licenses or other fees to commercial publishing houses (Bjork 2017:174; Nick 2012:2). OA movement evolved as an alternative to the high cost of journal subscription among libraries (Lewis 2012). It is a platform that offers researchers greater opportunity for wider dissemination of findings without article processing charges (Van Noorden 2013).

OA movement provides researchers with opportunities for free availability of information (Nwagwu & Ojemeni 2013) as it increasingly breaks down access barriers that for years have slowed down the universal availability of information. However, a study by Solomon and Bjork (2012) observes that research grantors have started requesting for OA publishing from grantees. For instance, the National Institute of Health requires OA publishing for all its funded research to reduce the cost of subscription of health researchers (Ezema & Onyanha 2016:4). OA movement emerged with the development of the World Wide Web (WWW) in the 1990s as researchers found a new platform for research dissemination on the Internet (Ezema & Onyanha 2016:1).

2.1.2 Gold road channel to Open Access

They are peer-reviewed journals that are made available to the public on the Internet free of charge. In OA publishing, the end-user is not charged to access journal articles in contrast to the business-publishing model. Alternatively, various funding strategies such as direct author fees, institutional membership to sponsor all or part of author fees, funding agency payment of author fees and grants to OA publishers, and institutional grants, are used to cover the cost of publishing and distributing of

OA content for free access by the end-user (Dulle 2009:3).

2.1.2.1 Open Access journals

OA journals are electronic journals that are freely available (some OA journals have supplementary fee-based print versions as well). OA journals provide access to full-text contents of scholarly and peer-reviewed journals. There are two types of OA journals; the one, available in electronic version only and the other, available in both electronic as well as print versions such as Current Science. In the first type, the journals are published in regular intervals on the Internet that do not have any print-on-paper counterpart. In the second type, the journals are published in print-on-paper format and distributed to the subscribers. The same contents of print-on-paper are available to the scholars free of charge in electronic form. OA journals perform peer review and then make the approved content freely available worldwide. Some OA journal publishers are non-profit (Public Library of Science or PLoS) and some are for-profit (BioMed Central or BMC) (Poornima et al 2009:5).

2.1.3 Green road channel to Open Access

This allows authors to freely access articles on the Internet in digital form (Dulle 2009:3). This is achieved when authors make their research output available through their personal websites or through OA archives. OA archives are electronic repositories that may include already published articles (post-prints), pre-published articles (pre-prints), theses and dissertations, manuals, teaching materials or other documents that authors or their institutions wish to make publicly available without financial or other access barriers (Dulle 2009:3). DOAR and ROAR provide a worldwide list of open access archives from disciplinary and institutional archives.

2.1.3.1 Self archiving

Making available electronic preprints and post-prints on the home pages of the author or deposit them in digital archives and repositories. Self-archiving serves two main purposes; it allows authors to disseminate their research articles online free of charge and helps to ensure that these articles are preserved in a rapidly evolving electronic environment. A key problem with such archives is that they can be unreliable as authors move from institution to institution, retire, make other life changes or die.

As will be seen later, digital prints from such collections are not made readily accessible to the research community as those in disciplinary archives or institutional archives and repositories because they cannot be easily collected. While self-archiving on repositories ensures their conformity with Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) enabling their publications to be harvested by metadata harvesting services and general search engines like Google, archiving on their personal or institutional website may not. (Poornima et al 2009:6)

2.1.3.2 Subject based electronic print archives

Electronic prints are digital versions of academic research papers, which can be in the form of pre-prints (documents before referring) or post-prints (documents after referring). Electronic prints archive is essentially a digital collection of materials that is freely available on the web to disseminate information as widely as possible. Archives may include institutional research output such as universities and laboratories, or disciplines such as physics, economics, mathematics and others. OA repositories can be organized by discipline (arXiv for physics) or by the institution (eScholarship Repository for California University) (Poornima et al 2009:7).

2.1.3.3 Institutional Repositories

Institutional repositories are an essential OA platform and are relatively new to OA journals and subject-specific repositories in the system of scholarly communication. OAIR are databases designed to organize, store, preserve and distribute an institution's research output OAIR is a managed storage system with content deposited on a personal departmental, institutional national, regional or consortium basis, providing services to specified communities with content from a variety of digital tools that support learning teaching and research (Poornima et al 2009:7).

2.1.4 Open Access Institutional Repositories

OAIR create international exposure for academic research by an institution, offers open access to institutional research output through self-archiving, and stores and preserves other electronic institutional resources, including unpublished or grey literature. We offer critical components that expand access to research and increase competition while reducing the monopoly power of journals, thus providing economic relief to the institutions and libraries supporting them. OAIR act as concrete

indicators of the excellence of a university and increase the prestige, reputation and public value of the institution. Institutional repositories once again provide the current scholarly publishing model with an immediate and useful component, while promoting creativity in a new disaggregated publishing system that will develop and improve over time. Therefore, in the current scholarly journal framework, OAIR provides a strategic solution to systematic problems (Adeyemi et al 2017:298)

Okumu (2015:19) describes OAIR as the means by which diverse digital materials produced locally can be collected and accessed. OAIR is the collection of the organization's intellectual electronic resources (Okumu 2015:19). OAIR is the tool or system that allows an intellectual output of the institution to be recorded, stored, preserved and disseminated in electronic form. The author further emphasizes that such production differs from institution to institution; some will capture theses and dissertations, while others will capture published papers, unpublished preprints, working papers, conference presentations, data sets, teaching materials and other similar materials (Okumu 2015:19).

OAIR is a database that provides services to record, store, archive, preserve and redistribute research output in digital formats at a university (Dlamini & Snyman 2017:536). These are electronic intellectual product repositories created by an institution's faculty, researchers and students and open to end-users within and outside the institution, with few if any barriers to entry (Ezema & Onyanacha 2016:18; Ibinaiye et al 2015:2). Dlamini and Snyman (2017:536) define OAIR as a digital archive for storing and disseminating the findings of institutional research.

In research-intensive institutions, OAIR is now becoming a part of the technical infrastructure and a preferred option for open access to research output. OAIR is a web-based online archive that allows the full text of items available and it includes free and immediate access without restrictions. Ibinaiye et al (2015:2) considers that, regardless of intent or source, the OAIR may be any collection of digital material hosted, owned, managed or disseminated by a college or university. According to Adeyemi et al (2017:298), OAIR is an online locus to collect, preserve and disseminate an institution's intellectual output, particularly academic or research institutions in digital form.

This would include things such as research articles in a university before receiving peer review or preprint, and digital versions of theses and dissertations. OAIR also includes other digital assets provided by normal academic life, such as administrative records, course notes, or objects of learning (Adeyemi et al 2017:298). Consequently, OAIR is institutionally defined; the content may be purely academic but may include administrative, teaching and research material (both published and unpublished) cumulative and perpetual, accessible and interoperable and contribute to the system of academic interaction (Adeyemi et al 2017:298).

The OAIR idea was born out of the struggle for who would be responsible for disseminating the intellectual output of an institution through the Internet (Alemayehu 2010). Therefore, OAIR is viewed as one of the strategies used by different groups to address user information needs, although they face several challenges to evolve as expected. Also, keeping a critical view of how the OAIR would be the best tool for disseminating research results and recognizing its technical drawbacks, strengths and challenges are the most important things in operating an OAIR that clearly identifies its purpose. The undeniable fact here is that their contribution to education and research institutions will be fruitful if OAIR is implemented and treated in a coordinated manner (Alemayehu 2010). OAIR is also known as Institutional repositories or Electronic Repositories (Dlamini & Snyman 2017:536; Jain 2012).

2.1.4.1 History and evolution of OAIR

The history of OAIR started with the introduction of the first discipline-based repositories in the early 1990s. During this early period, Adeyemi et al (2017:299) identified several productive repositories, particularly the ArXiv repository. Van Wyk and Mostert (2011) believed that OAIR started concurrently with the WWW and that ArXiv was the first electronic archive to be created by physicist Paul Ginsparg at the Los Alamos National Laboratory in New Mexico in 1999. While its current home is in Ithaca, New York, Cornell University, where it has been since 2001. ArXiv began life in 1991 when it was known as xxx.lanl.gov, concentrating on theoretical physics as a database and preserved for a handful of high-energy physicists by Ginsparg.

According to Lariviere, Joosten, Malthouse, Van Birgelen, Aksoy, Kunz & Huang (2013), the creation of arXiv in 1991 has become central to the diffusion of research

in a number of fields, combining data from the entirety of arXiv and the Web of Science (WoS). It has expanded to include most other areas of physics, as well as, mathematics and computer science. Its success led to the establishment of other OAIR, such as Research Papers (RePEc) in Economics, CogPrints and Education Line respectively, for economics, cognitive and computer science and education, all of which were initiated in 1997. They eventually led to the Open Archives Initiative (OAI) in 1999, which enables OAIR to operate together, a phenomenon known as interoperability.

In 2002, when major research universities in the USA (Massachusetts Institute of Technology (MIT) and Cornell University) and UK (Southampton and the University of Oxford) released their own institutional database systems using respectively Dspace and Eprints technology. In the same year, Raym Crow, senior consultant for the Scholarly Publishing and Academic Resources Coalition (SPARC) based in Washington, D.C., released a seminal paper called 'The Case for Institutional Repositories' to further improve the history of the institutional repository. In that regard, Crow made the important point that, in addition to academic and scientific institutions, the maintenance of OAIR would support non-academic institutions such as governments.

Xia and Opperman (2010) argued that the early adopters of OAIR were large academic libraries when the idea came to the fore in 2002. Australian OAIR is posing an interesting case, as the Australian government has been crucial to promoting OAIR's growth in Australia. In 2002, the Chief Scientist emphasized the importance of science accessibility and distribution in a report to the Australian government (Kennan 2009:3).

In 2003, as a major research funder, the Australian government provided funds on a competitive basis for the development of research information systems like OAIR in universities through the department responsible for research funding. As a result, from this time on, a number of universities and consortia have begun repository testing and deployment (Australian Department of Education and Training 2002). Three of the many projects funded are directly related to OAIR, Australian Sustainable Repositories Partnership (APSR), Australian Research Repositories Online to the World (ARROW) and Regional Universities Building Research

Infrastructure Collaboratively (RUBRIC).

The ARROW initiative, consisting of a group of universities and the National Library of Australia, focuses on the detection and evaluation of OAIR-supported applications or solutions. The APSR project focused on demonstrating the viability of using open source software to build OAIR capable of providing free access to a wide range of research-related electronic objects. The RUBRIC project was sponsored to support the establishment of OAIR by small universities using products tested or produced by ARROW and APSR (Shipp 2006:4; Kennan 2009:3).

Certain reports indicate a rise in the use of Eprints and Dspace, the two major database platforms. Eprints use grew from 125 to over 200 repositories in 2004 to 2005, according to Lomangino (2006). ROAR reports that 227 repositories were configured using Eprints as of mid-2007, with Dspace being the chosen software platform for 234 repositories. Cullen and Chawner (2008) have found that the number of repositories that met OAI interoperability requirements increased from 243 repositories to 617 repositories.

Van Wyk and Mostert (2011) have announced that a list of no less than 400 leading OAIR was posted on the Spanish website Secretariat de Corals Infants de Catalunya (SCIC) in 2010, as the development of OAIR continues at a faster pace than ever before. Of the 400, arXiv, the first-ever OAIR, was ranked number one, with six of the world's top ten OAIR being American, namely, in addition to arXiv, CiteSeerX, Scientific and Technical Information Network, Social Science Research Network, Smithsonian/NASA Astrophysics Data System and MIT Dspace, respectively, at numbers 2, 3, 4, 6 and 10. DOAR reveals a tremendous growth in the number of repositories with over 3500 in the year 2018. ROAR says there are 472 known repositories using Eprints as of 2018, with Dspace being the preferred platform for 1538 repositories.

2.1.4.2 Characteristics of OAIR

1. Institutional Defined: OAIR retains the original research and other intellectual property created by the constituent population involved in many fields, as opposed to discipline-specific repositories and subject-oriented or thematic virtual libraries. OAIR is the historical and tangible embodiment of the

institution's intellectual life and production, and to the degree that institutional affiliation itself acts as the primary qualitative filter, becoming a significant indicator of academic quality (Ezema & Onyanacha 2016:2; Okumu 2015:2).

2. **Scholarly Content:** OAIR can contain any work product created by the students, faculty, non-faculty researchers and staff of the institution, depending on the goals set by each institution. Such resources could include electronic portfolios for students, instructional materials for schools, annual reports for institutions, video recordings, computer programmes, photos for data sets, and works of art, or practically any digital content that the institution wants to preserve. Appropriate policies and processes, including content management and document version control systems, are necessary to control and manage content access. The repository policy framework and technical infrastructure must provide institutional managers with the flexibility to track who can submit, authorize, access and update digital content from a variety of institutional communities and stakeholders, including academic departments, libraries, research centers and laboratories and individual authors (Ezema & Onyanacha 2016:2; Okumu 2015:26).
3. **Interoperability and Open Access:** Interoperability here means that there is no or little obstacle to access to the intellectual products generated by the institution to increase awareness of research contributions. Users outside the university must be able to find and retrieve information from the archive in order to provide access to the wider research community. In order to provide access to numerous search engines and other discovery tools, OAIR systems must therefore be able to support interoperability. The other dimension of interoperability is the open archive approach that allows access to use web-based materials for metadata sharing, publishing and archiving through interoperable repositories. OAI-PMH determines the framework for collecting metadata in any format accepted by the community (Peters 2010:255).
4. **Cumulative and perpetual:** The essential feature of OAIR is that it must be cumulative and perpetual. This has two implications; first, whatever the content submission criteria for the repository, items once submitted cannot be withdrawn, cases of withdrawal can only be done in presumably rare cases involving allegations of libel, plagiarism, copyright infringement (Okumu

2015:27). This removal would be the functional equivalent of revoking the registration initially granted to the contribution or accession into the repository (Ezema 2011:478). Ezema further explains that the other aspect of this feature is that repositories tend to preserve and make accessible digital contents of the institution on a long-term basis. Institutions and their repositories are in a better position than individual researchers to ensure that even after decades the content is accessible and that the archive is updated systematically, for instance, to take into account changing file formats and media. OAIR is an integral part of the long-term strategy of the university. The institution's own production of theses and working papers can easily be put into such databases. However, in the long run, the uploading of the core output of the university's scientists, that is, their conference and, in general, journal articles, is essential. While OAIR can be considered as useful marketing channels for individual universities, its significant impact on the global scale can only be achieved through cooperation through open access indexing services (Ezema & Onyancha 2016:2).

2.1.4.3 Essential features of OAIR

Authors in Ezema & Onyancha (2016), Mgonzo (2014) and Pinfield et al (2014) describe repository form, subject scope, type of content, language and size as key features defining OAIR. DOAR and ROAR can define a number of key characteristics of a repository database. The following are the online public records of the DOAR;

1. Organization: the title and country of the organization owning the repository.
2. Description: contains information about the repository and the services it provides.
3. OAI-PMH: information about the Base URL for the Open Archive Initiative for Metadata Harvesting Protocol.
4. Software: information about the software platform used to implement the repository.
5. Size: the number of items or records in the repository.
6. Subjects: contains information about the subjects with a broad description of them either as subject-specific or multidiscipline.
7. Content: describes the content types of the repository as including items like

articles, thesis, conferences and more.

8. Languages: the official language of the repository.
 9. Policies: defined at various levels, provides information about permissions and rights for metadata and full items, and content on preservation.
 10. DOAR ID: the repository unique entry ID as reflected in the DOAR database.
- These key data points are the basis for describing the characteristics of most open access repositories. Furthermore, DOAR includes information on protocols of interoperability implemented by repositories and device geographic coordinates.

2.1.5 OAIR and scholarly communication

The process of disseminating information to academic communities is often referred to as academic communication (Dlamini & Snyman 2017:536; Jain 2012). OAIR enables the use and promotion of scholarly correspondence by these institutions. Asamoah-Hassan (2010:420) notes that academic contact has been the age-old means of revealing research findings to the public. This can be achieved by writing an article in a scholarly journal, delivering it as a presentation at a conference and publishing it as a book or even a chapter in a book. ACRL (2015) describes it as the process by which research and other scholarly writings are produced, evaluated for quality disseminated to the academic community and submitted for future use.

Currently, it is said that Africa accounts for less than 5% of the research output of the world. While this is clearly not enough, African universities have a substantial amount of research activity, but the stumbling block lies in publishing the work to ensure academic advancement (Moahi 2009:4). Moahi (2009:4) further notes that not many of these researchers make it into academic journals, and when they do the papers are out of reach of most university libraries making it difficult to access them. Another consideration is that with the lack of research funding it is necessary to avoid duplication of study and because many researchers conduct their work on their computers and do not always have a platform for knowledge sharing, it results in considerable duplication (Okumu 2015:18).

Krishnamurthy and Kemparaju (2011:187) claim that OAIR has the potential to bring major benefits to institutions in enhancing visibility, reputation, public value,

managing research expertise for individual research, setting priorities for research findings and research impact. Krishnamurthy and Kemparaju further explains that interoperable of OAIR has the potential to accelerate changes in academic communication that allow open access to a wide range of academic materials. Therefore, OAIR is seen as a tool for African universities to boost availability accessibility and visibility as research output will be visible online.

2.1.5.1 OAIR in academic institutions in the world

Numerous researches on the use of OAIR have been performed. OAIR and its association with the OA movement is a new trend in worldwide scholarly interaction, the need for wider access to information with the goal of democratizing the distribution of research results and the cost coupled with reduced library budgets has led to a strong movement aimed at free online access to research output (Okumu 2015:14). Over 40% of higher education institutions in the United States have OAIR in place, while 88% of institutions are expected to set up one (Abrizah et al 2017:55). Abrizah further states that in the European Union (EU), approximately 230 universities in the EU have OAIR in which textual materials are the dominant work production being deposited.

According to a study carried out in ten European countries, Belgium, France, the United Kingdom, Denmark, Norway, Sweden, Germany, Italy and the Netherlands, the amount of OAIR ranges from as low as 1.5% (Finland) to as high as 100% (Germany, Norway and the Netherlands) (Abrizah et al 2017:54). In a recent study in New Zealand on OAIR, findings show that although the overall use of OAIR is lagging, there is a rise in subject-based or disciplinary repositories (Cullen & Chawner 2010:136).

This may be because New Zealand researchers are more motivated than individual recognition and educational award to share research output with a specific community. It is confirmed that by mid-2006, all Australian universities had set up OAIR with the main objective of providing researchers with a platform to increase the availability of their publications. Japan, India and Taiwan have been identified as major contributors to OAIR development in Asia (Abrizah et al 2017:57). The promotion and development of OAIR in Asia began relatively late compared to the

USA, UK and other European countries (Abrizah 2017:54). The recent study places India as the second-largest contributor to the OAIR environment in the Asian region (Prabhat & Guatam 2010).

2.1.5.2 OAIR in academic institutions in Africa

The usage of OAIR in Africa has been an issue of great concern among scholars within and outside Africa (Bowdoin 2011; Chalabi & Dahmane 2012; Ezema & Onyanha 2016; Ezema 2011; Ezema 2013; Fox & Hanlon 2015; Nwagwu 2013; Ratanaya 2017). Access to academic research in developing countries is growing as a result of the growth of OAIR and related advances in information technology (Ratanya 2010:15). However, Ratanaya adds that the growing number of academic institutions encourages students to send theses in an electronic format that are becoming increasingly accessible in the dynamic research environment. In addition to paper copies, higher education institutions request that electronic versions be made available for inclusion in OAIR, while many institutions also digitize.

The growth of OAIR in African countries has been very slow, given the international recognition it has gained through conferences and workshops (Ezema 2011:49). South Africa, Kenya and Nigeria are more adaptable to the development of OAIR among the African countries. According to DOAR (2018), of the 158 OAIR in Africa, South Africa alone has 33 of them. Recent studies show that in terms of developing OAIR, South Africa is the leading country in Africa. Although not a university, the Council for Scientific Research and Industrial Research (CSIR) is also a major research institute with a wealth of available research information for the development of OAIR in South African.

The potential of Kenyan universities to become Africa's base for information technology has been fuelled by the software giant international business network set up by a research laboratory at the Catholic University of East Africa in Nairobi (Milimo 2013:19). The laboratory plays a key role in the advancement of OA in the academic research goals of the university. Jomo Kenyatta University of Agriculture and Technology recently adopted an OA policy as part of the university's strategic objective of investing and engaging in productive collaboration with national and international institutions and industry to facilitate the creation and exchange of

information through OAIR.

Research in Kenya shows that several universities have initiated the establishment of OAIR. University libraries in Kenya have been found to support OA in a number of ways, including setting up OA, author funds that, although limited, cover OA journals payment. Universities in Kenya, including the Catholic University of East Africa, the University of Nairobi, the University of Strathmore and the University of Agriculture and Technology Jomo Kenyatta, have begun creating OAIR, namely Dspace and Greenstone, while including them in library collections to promote learning and teaching (Milim 2013:18). According to Ezema (2011:479), the factors contributing to the failure of OAIR in Nigeria were lack of awareness of OAIR, insufficient power supply, and the lack of trained personnel in information communication technology. While OAIR is a capital-intensive venture, no nation that wants to be part of the current information economy should neglect the critical role of OAIR in aggregating the research productivity of scholars.

2.1.6 The development of OAIR in Africa

When comparing the number of OAIR in other countries, as shown in the most recent international repository databases such as Cybermetrics Lab, DOAR and ROAR, it is evident that African countries are lagging behind in developing and using OAIR. Only a few academic institutions in Africa have taken up the challenge of making their in-house research output accessible through OAIR to the global world (Van Wyk & Mostert 2011).

Limited work has been carried out to investigate the reasons for perceived underdevelopment and under-use of OAIR in the continent of Africa. Most of these OAIR studies in Africa have been conducted in South Africa, Kenya and Nigeria. Nevertheless, the number of OAIR in African universities has increased significantly in recent years (Macha 2012:69). Before 2006, Africa moved from a single archive to 13 by the end of 2007, 35 by 2010, 136 by 2015 and 158 by 2018. There are signs that more will follow (Asamoah–Hassan 2010; DOAR 2018; Jain 2012).

This significant growth indicates that Africa accepts the OAIR idea and that there is an increasing awareness of the usefulness of OAIR in Africa (Macha 2012:69). Nevertheless, given the substantial increase in the number of OAIR in Africa, most

African countries have not yet established OAIR in their universities. Of the 55 sovereign countries in Africa, only 22 have OAIR (DOAR 2016). As has already been pointed out, the bulk of OAIR in Africa is in South Africa, Kenya and Nigeria. DOAR reported 3520 repositories in 2018, with the largest share coming from the developed nations of the world.

Loan (2014:36) also stated that Europe and Asia contributed as much as 1619 and 704 repositories respectively, while only 158 repositories were contributed by Africa (DOAR 2018). Most African countries are in the development phase of the OA movement; it is obvious that the growth rate of repositories in African countries is relatively low compared to other developed countries (Mukherjee & Nazim 2011:317; Roy, Biswas & Mukhopadhyay 2012:1). The contribution of all African countries is less than that of the United States alone, with a share of approximately 501 OAIR.

In 2000, the Association of African Universities (AAU) initiated the African Theses and Dissertations Database (DATAD) project to improve access, maintain and use of African scholarly works and to ensure that members of the Association set up an OAIR. In 2003, eight universities in Africa established African Virtual Open Initiatives and Resources (AVOIR), a new network for capacity building in network engineering to create free and open-source technology to promote electronic learning and business transactions in Africa as a first step, according to Keats (2008).

AVOIR built Knowledge Environment for Web-based Learning (KEWL), which was used to deliver the postgraduate programme in Telecommunications Policy and Regulation, funded by the Tanzania-based Network of Telecommunications Policy and Regulation in Africa (NetTelAfrica). Therefore, it is clear that African universities were already acquainted with open source software when the libraries embraced OAIR (Dulle 2010; Mgonzo & Yonah; Otanda et al 2015; Samzugui 2017).

2.1.7 The Development of OAIR in Ghana

Despite the importance of OAIR to the increasing visibility and better performance in the on-going online ranking of world universities, the development of OAIR is still in its infancy in Ghana. Corlety (2011:1) said KNUST was the first institution to create an OAIR in Ghana and West Africa in June 2008. The library implemented Dspace, an open-source self-archiving programme, Moodle to provide online learning, and

Drupal to operate the website of the university as an open-source content management system.

KNUST University Librarian first conceived the idea of setting up an OAIR for a university in Ghana after attending a workshop in the UK in 2006 in her capacity as Coordinator for the Electronic Information for Libraries Network (eIFLnet) in Ghana. In June 2007, a workshop was organized by the Consortium of Academic and Research Libraries in Ghana (CARLIGH) and eIFLnet to introduce the OAIR concept and the different software packages needed to set up an OAIR. Participants in the two-day workshop included staff from the various universities and research institutions across the country from librarians, faculty and ICT personnel. Most of the participants shared their willingness to use the Dspace programme to set up their OAIR.

CARLIGH and International Network organised a second workshop in July 2008 for the Availability of Scientific Publications (INASP) and the third workshop for faculty members from different universities was organized in February 2009. The KNUST Library soon organized itself after these workshops to set up the country's first effective institutional repository. The DOAR (2018) identified the vital issues of the only five operational OAIR in Ghana. Their repository policies are not described and evaluated. Metadata reuse specifically undefined policy, explicitly undefined full data item policy, explicitly undefined content policy, explicitly undefined submission policy and explicitly undefined preservation policy.

2.2 Level of awareness of Open Access Institutional Repositories

Despite OAIR promising potential to improve scholarly communication, this mode of knowledge sharing in developing countries is not yet widespread compared to developed countries (Abrizah et al 2017:54; DOAR 2018). Most authors are unfamiliar with OA and making their works available on OAIR and a more serious problem is the lack of awareness of the existence of OAIR (Hulela 2010). Although there has been a steady increase in OAIR, the adoption of this technology in universities is slower than expected (Abrizah et al 2017; Hulela 2010). The lack of awareness of OAIR among researchers and academics and the limited staff involved in repository activities were also part of the reasons why there was a low level of

OAIR content and therefore less OA (Kakai 2018:211). The majority of respondents in the author's PhD study (91% at Makerere University, 98% at Kenyatta University and 86% at MUHAS) expressed a need for awareness building on OAIR.

Librarians have not adopted the practice of creating informative websites to guide users on how OAIR is applied at the university and how they can participate. Dependence on one-on-one, seminars and conferences, newsletters and marketing materials for advertising are not enough to reach the broader university community. OAIR websites and how they relate to individual institutions could be a reliable and lasting source of information and a simple guide for those who might not be able to attend face-to-face workshops. Dulle (2009) suggested that users access to OA information sources be connected to library websites. This could be an easy way to get researchers one place to find information about OAIR, which could still be circulated off course by promotional materials such as leaflets and brochures.

Abrizah (2010) suggested that providing Frequently Asked Questions (FAQs) cover issues such as copyright ownership, the use of creative commons licenses when providing OA, self-archiving and plagiarism access, content preservation and file protection, how to decide what to self-archive using SHERPA RoMEO (Securing a Hybrid Environment for Data Preservation and Access). Kakai (2018) argued that the number of staff working to advocate and promote the OAIR could have an impact on the repository's visibility and development. It was established that the staff working on OAIR activities in African universities were limited to a few librarians who had been assigned OAIR responsibilities, with minimal or no support from the reference or other librarians, particularly in marketing and soliciting content for OAIR.

Giesecke (2011) noted that OAIR staffing should consist of those directly responsible for the day-to-day operation of the services and those with new responsibilities added to their service support positions, such as marketing roles, metadata contribution and training. Librarians in branch, faculty or university libraries also communicate with researchers and are best able to promote OAIR and OA in their locations. In addition, all OAIR stakeholder groups such as administrators, librarians, researchers and students, should be active in OA and OAIR advocacy for any progress to be achieved within the university.

Otanda, Muneja and Kuchma (2015) considered it important to include students in the OAIR advocacy strategies to reach out to research administrators, academic staff and their fellow students, but after training them for specific events such as OA week; they do not appear to continue to promote the cause. Targeted learning in instructor workshops could be used for students in various fields. Otanda et al (2015) add that efforts to raise awareness among the university community about the benefits of OAIR and how to populate it have been made by OAIR managers, but the patronage of the research community has been appalling.

Those might be some of the reasons why some of the OAIR actually have not been registered in DOAR and ROAR because there has not been much to show the world yet. McMillan, Ramirez, Dalton, Read and Seamans (2011) study also found that OA choice has relatively little consideration among researchers in the selection of channels for publication. Nonetheless, Xia (2010) uses a four-year longitudinal study to document an increasing awareness of OA writing. The awareness increased from 50% to 85%, according to the report. While Ezema (2011) invited libraries and researchers to create awareness, Zaid and Okiki (2015) believe the situation would be improved by building cooperation between libraries.

2.3 Perceptions of Open Access Institutional Repositories

Recent university studies have been conducted to assess users' attitudes towards OA and willingness to contribute to OAIR (Abrizah 2010:19, Okumu 2015:37). OAIR is predicated in research universities on contributions from stakeholders that include both academic staff involved in teaching and research as well as postgraduate and undergraduate students as potential authors and readers of OAIR materials (Abrizah 2010:19, Okumu 2015:37).

Scholars also claim that the magnitude of the input from the university community depends on whether or not OAIR is part of the intellectual infrastructure. The Faculty cites a variety of reasons for reluctance in contributing to OAIR, such as the learning curve of new technology, copyright issues, reservations about whether contributing to repositories is equivalent to publishing, worries that the reliability of certain OAIR materials would impact their work, and concerns regarding plagiarism.

Hard-pressed academics can perceive contributing content to user-generated or self-service sites as time-consuming. They may be happy to contribute content, but are reluctant to do it on their own that requires mediated deposit services (Jain 2010:131). The author also states that it may take time to become part of normal academic behaviour, constant encouragement and compulsory policies for routine self-archiving. Permanent, reliable mediated deposit services, possibly based at the library, may also take time to determine, in particular if existing staff carry out this role in addition to normal tasks, as well as policies developed to monitor the quality of submissions.

The lack of peer review in this format of some of these published articles raises concerns about the academic reputation of the author and worries of stolen or plagiarized work (Dawson 2016:2; Yang & Li 2015:2). The alleged low editorial performance and peer review process are another impediments to OAIR (Ezema & Onyancha 2016:4). Some claim that OAIR does not go through adequate peer review processes and are therefore frequently rejected if submitted for marketing or other purposes of study evaluation (Ezema & Onyancha 2016:4).

Ibinaiye et al (2015) also discussed how self-archiving of OAIR has become necessary following the serials crisis, but goes on to consider some of the objections to it; that there is no refereeing of OAIR content, that this makes available untested hypotheses, reduces demand for subscription-based journals causing subscription prices to increase and damaging organisations that depend on journal profits. He also cautions about the public confusion that could result from the public availability of preprints in major search engines.

Despite some of these constraints, there has been growing interest in accessing OAIR research materials due to several perceived benefits such as visibility and increased availability of academic research outputs (Bjork & Solomon 2012; Ezema 2011), higher citations and impact and higher reader penetration (Oguz 2011:12). Melero, Abadal, Abad & Rodriguez-Gairin (2009:3) have consistently identified many important factors supporting the growth of OAIR. Increasing the visibility and citation of the research work, the friendliness and ease of use of the OAIR facilities and additional services that OAIR could provide such as search and quote index services were among the factors. Subsequently, the lack of policy, lack of national and

international integration and lack of university academic awareness have demotivated implementation (Abrizah et al 2017:54).

2.4 Contents Archiving of Open Access Institutional Repositories

Here, the library finds itself stepping into the world of IT infrastructure, often from its comfort zone, and this is where problems can arise. Several proprietary and free online software packages for archiving and managing digital collections have been developed. Nevertheless, open-source software packages such as Dspace developed by MIT and Hewlett-Packard (HP) (www.dspace.org), Eprints developed by Southampton University (www.eprints.org), Fedora developed by Virginia University and Cornell University (www.fedora.info) drive the OA movement, particularly the development of OAIR worldwide (Poornima 2009:8).

In Australia, Fedora is a more popular platform for OAIR development and most deposited content type are journal articles and conference papers (Abrizah et al 2017:57). Another study by Ezema & Onyancha (2016:5) looked at the archiving software used in the management of OAIR in Africa and found that Dspace and Eprints are the most popular. Roy, Biswas & Mukhopadhyay (2013:182) study reveals that several key issues such as contents quality, metadata standards, preservation technique, workflow pattern, customization and technical specifications of software, copyrights policy and OAI-PMH compatibility need to be properly considered.

Self-archiving is a term that comes up regularly when OAIR is mentioned. It refers to the right of scholars to place their journal articles in searchable and free electronic archives (Ibinaiye et al 2015). Ibinaiye et al (2015) clarify that self-archiving is not an alternative to publishing in learned journals, but a supplement, a supplementary practice in which an author publishes his or her article in whatever journal he or she prefers and then simply self-archives a copy. By practice this means that the file is stored, which is typically the final version of the article after peer review in an OA archive or database has been completed. Researchers sensitized to the benefits of self-archiving and long-term literature preservation are positive about OAIR (Kakai 2018:210).

First, to deposit their refereed journal papers in open digital databases, scholars need the tools and assistance. This is where libraries come into the picture, they facilitate the process of self-archiving by providing the resources that allow researchers to openly access their research on the Internet. These resources include not only the expertise of the librarian in mediating the submission of the research to the archive, but also the addition of appropriate metadata to enable other researchers to find the research and the infrastructure on which the archive is running. Hashim and Jan (2011:229) outline several parameters worth investigating during OAIR evaluation; visual interface, resource discovery, access, system features (hardware, software, supported file types, available metadata and workflow processes) and content management policy.

Subsequently, Melero et al (2009:3) conducted a nationwide web survey on Spanish OAIR, including academic, research and cultural institutions. The objective of the study was to investigate the materials deposited in OAIR, the technical issues of infrastructure, institutional policies and services created for OAIR. The findings indicate that Spanish repositories mainly contained full-text and journal articles and thesis metadata. The most widely used software platform is Dspace, followed by Eprints, and the common standard used to describe deposited materials is Dublin Core metadata.

As far as services are concerned, research assessment and evaluation services and use statistics services were of high priority. On the other hand, printing in order and publishing was the lower priority product (Abrizah et al 2017:56). Schopfel, Prost and LeBescond (2011:2) analyzed French archives and found that 18% of all documents consisted of grey literature. The results of both studies established the existence and development of the quality of grey literature in OAIR. Siegel (2010:69) looked at organizational grey literature in the university environment. In an evaluation of the archive material, the study found that 33% of the items in the OAIR were full documents, while 62% of the records were grey literature. The analysis also noted that grey literature is contributing to the progress of OAIR.

According to data from 38 French archives registered with DOAR was collected in an evaluative survey on grey literature in French OAIR (Schopfel & Stock 2009:181). Out of thirty-eight, twenty-one sites did not provide a policy statement on archiving

materials. Moreover, the study found that 71% of repositories in France gave access to the full-text document, while 48% gave access to all documents in OA. More recently, Schopfel, Chaudiron, Jacquemin, Prost, Severo and Thiault (2014:612) discussed issues related to OA policies about their level of openness, with specific attention being paid to OAIR which contains various categories of documents. They found that some of the metadata items in the repository were provided without full-text links.

This practice tends to defeat the true essence of OAIR. They suggested as a way out that institutions should clarify their policies of openness and be explicit. The purpose of the study in the context of Tanzania is to explore policy issues that influence the best practices of operating OAIR and their mandates on grey literature. It is not authorized to upload all copies of publications into repositories but many publishers can download pre-prints or post-prints (Samzughi 2017:7).

Adeyemi et al (2017:298) note that the materials provided by an organization and its community members are highly diverse and include various types of grey literature and other unpublished materials such as preprints, working papers, theses and dissertations, scientific and technical articles, conference proceedings, newsletters and bulletins from departmental and research centres, grant applications, status reports to funding agencies, committee reports and memoranda, statistical reports, technical documentation and surveys. Such grey literature is part of the process of informal academic communication (Adeyemi et al 2017:298). The majority of respondents in the Kakai study (97% at Makerere University, 91% at Kenyatta University and 100% at MUHAS) agreed in OAIR to provide open access to content (Kakai 2018:211). Since 2000, OAIR has evolved from being subject-based to incorporating the complementary institutional model and timely project funding from a variety of sources has driven its growth.

Both ROAR and DOAR are now showing an increasing number and variety of repositories; subject, organizational, national, national or topic, global, local, consortium, funding agency, publisher and information archives (Krishnamurthy & Kemparaju 2011; Poornima 2009:9). According to Kakai (2018:213), many African universities have adopted the Dspace programme, which is free to download but not easy to install and maintain. The libraries are mostly dependent on the department of

university IT, which is often already overburdened with other IT systems and therefore leads divided attention, slowing down the entire operation. The inability within the library to build IT capacity to initiate and sustain OAIR activities is hindering progress.

2.5 Level of Usage of Open Access Institutional Repositories

Cullen and Chawner (2010:133) state that the reasons for the establishment of OAIR vary from institution to discipline. Academic libraries benefit from involvement in OAIR initiatives, and scholarly communication is involved. Other potential benefits concentrate on reputation status and public interest, improving teaching and scholarship performance in colleges and universities, enhancing open access, engaging the college community and enhancing student partnerships, remaining responsive to evolving community needs and open archiving. OAIR has many resources that can be used by institutions and academics.

OAIR has great value-added services potential and provides academics, researchers, learners and institutions a range of benefits. In Crow's opinion, while publication by faculty members in scholarly journals could affect the reputation of the institutions in which they reside, OAIR is likely to have a greater impact by centralizing the research outputs produced by the institution and the researchers. Consequently, this will serve as a much better and simpler tool for assessing the performance of academic research, profitability and reputation institutions (Adeyemi et al 2017:301).

OA articles are cited significantly more than non-OA articles, even when other factors are taken into account. The growing number of institutions and funding agencies for research are beginning to set OA criteria (Agyen-Gyasi 2010). Agyen-Gyasi further claimed that open access online articles enjoy significantly higher citation rates than traditionally published articles with adequate indexing and search mechanisms in place.

2.5.1 Influence of OAIR on higher education Institutions

Global research suggests that the growth of OAIR in higher education institutions has increased significantly with the implementation of an open-source initiative in the

field of scholarly communication and software development (Campbell-Meier 2011:152) Campbell further states that the demand for OAIR has increased as a result of improvements in scholarly communication models and the divine need to develop. Academic libraries need to incorporate technological solutions into traditional information products and services, including integrated information systems, digital information systems, computing, radio frequency recognition software and local area and wide area networks (Makori 2009:12).

Since the OA campaign gained momentum as a global effort to provide free online access to scholarly research, the movement to adopt the OAIR initiative in Africa has been building up (Otando 2011). The author also explains that several institutions have already created OAIR. OAIR is now the latest indicator of the quality, reputation and visibility of universities. Nevertheless, even with these benefits, the slow response to OAIR was recorded in Africa (Adewumi & Ikhu-Omoregbe 2011:1; Ezema 2011:473; Kakai 2009:2; Zaid & Okiki 2014:103) compared to other regions such as Europe, Asia and America.

2.5.1.1 Visibility, status and public value

One of the major benefits of OAIR is the recognition of African scholarships as a whole, the academic output of individuals and their institutions are acknowledged. The current closed-access publishing model does not define the quality and quantity of African universities and African scholars' study (Okumu 2015:21). The visibility and integrity of each institution are determined by the number of work reflected in their OAIR, OAIR does not only produce quality research work but also provides excellent researchers.

Pfister and Zimmerman (2008:15) also identified justifications for OAIR to include, increase visibility and impact of research output, change in the paradigm of scholarly publication, and improvement of internal communication within the institution. Ezema (2011:480) noted that the visibility of publications is usually associated with the extent to which other scholars read and cite the said published work and how much the paper contributes to the growth of human knowledge from a broad perspective. The author further explains that the OAIR is meant to generate greater impact by centralizing research outputs generated by the researchers of the institution, thereby

serving as much better and simpler metrics to assess the quality of the academic scholarship, productivity and prestige of the institution.

Hixson and Cracknell (2007:39) observed that when the research engine returns search results that lead to the faculty and institution, the popularity of both the researchers of the faculty and the institution could be increased. Academics can therefore, benefit from depositing in the OAIR their copyright-owned content, personal recognition for research projects as well as professional careers. The OAIR system increases access to materials that would otherwise be hard to obtain and lead to related electronic resources and databases.

2.5.1.2 Enhancing the quality of teaching and scholarship

Nagra (2012:139) states that OAIR allows the archiving of institutional research and academic activities that enable the university to find and access the institution's previous and current projects in one place and enhance the quality of scholarship through sharing and collaboration, and this fundamentally creates the basis for new ideas for dissemination and sharing in teaching and research.

2.5.1.3 Enhances OA

Bailey (2010:2) reiterates that OA applies to publications that are freely available on the public Internet, enabling any user to read, download, copy, distribute, print, search or link to the full text of those articles, to ensure that they are indexed, transmitted as data to software or used for any other legal purpose, without financial, legal or technical barriers other than those inseparable. Bailey noted that OA is concerned with free access and reuse of free and free research works. Ezema (2011:477) states that what is apparent with the OA campaign is that the accessibility and access to information are being democratized, and this will go a long way in bridging the information gap between developed and developing countries.

Dulle (2010:15) points out that the exposure and availability of research papers published in OAIR from both developed and developing countries can be made easy and unrestricted via OA. The author further emphasizes that removing restrictions on access to knowledge through OA ensures that developing countries' educational

problems with access to academic work can be greatly eased, much of the research output recorded as grey literature in developing countries have a better chance of being visible and accessible through OA.

2.5.1.4 Engaging the university community and enhancing scholarly collaborations

The OAIR helps the university to disseminate the research output to the global research community, strengthening community outreach and opening up new opportunities for national and international research collaboration. Nagra (2012) claims that it helps ensure that scholarly activities and research projects conducted at the institution are accessible to the public, as well as to the international educational and research community.

2.5.1.5 Relevant to the changing needs of communities

The latest trends in Internet-based e-resources are changing the way that research group patrons seek information. To address the trend in the growth, distribution, access and use of academic materials, OAIR was established. Faculty, researchers and higher education institutions have an important role to play in researching and developing scholarly efforts to establish a functioning OAIR. Institutions follow the latest trend in academic communication that increases engagement and role in the system of research and interaction as well as visibility and public value (Okumu 2015:23).

2.5.1.6 Open archiving

For the digital environment, scholarly communications are being restructured. A lot of discussions about the future of academic publishing has already resulted in extensive open archiving studies (Okumu 2015:24). Okumu further states that these were enabled by the creation of the protocol for metadata processing of the open archiving initiative. The knowledge produced by scholars and parent institutions appears to be disseminated by commercial publishers, who are expected to perform the work of finding and selecting suitable materials to collect, conserve and distribute. Through OAIR, new ways of knowledge sharing and new opportunities for institutions to use information as a more powerful measure of academic quality have

been created.

3.5.1.7 Digital preservation

Digital preservation refers to the sequence of controlled activities necessary to ensure as long as necessary continuous access to digital resources (Okumu 2015:24). Okumu states that, coupled with the tremendous increase in computer power and network capacity, the ease with which digital information can be generated has contributed to the proliferation of a large amount of born-digital data. This data overflow has prompted many to tackle the long-term preservation issue to ensure that information produced today will withstand technology changes and be accessed in the future.

Furthermore, the broad view of OAIR as a way of efficiently maintaining and preserving the knowledge of an organization based on intellectual property results in the content of OAIR reaches beyond digital printing to include research data, electronic learning materials and other materials and other types of institutional intellectual output that are typically not published or maintained elsewhere. Researchers students, staff and institutions may need on-going content accessibility within the OAIR (Okumu 2015:25). OAIR provides institutions and faculty with the ability to collect and coordinate long-term preservation of digital information. Content-type may be in any digital format, but the author should be allowed to post it to OAIR. Besides, the material that could be lost or at risk can be stored in the institutional repository.

2.5.2 Promotion of institutional research output and prestige

OAIR offers access to a wealth of knowledge in the form of important scientific and technological information for growth. According to Chisenga (2006), many research outputs from Africa exist in the form of unpublished data and knowledge tools, such as research reports, theses and dissertations, seminars and conference papers. Much of the intellectual output and quality of the intellectual property of an institution is currently being disseminated by academic journals.

OAIR focuses on the academic output generated by the researchers of the university, offering a better explanation of its science, educational, social and economic importance and thus adding prestige to both staff and institution. These archives can link local and international research and, above all, provide a better picture of the research performance and specialization areas of the country. This will encourage future international cooperation, collaborative studies, plans for funding, and even recruitment and retention of faculty members.

2.5.3 Visibility of university in terms of ranking

The immediate benefit of OAIR is that all research contributions collected and stored in OAIR are unconditionally made available to its staff and all other members affiliated with it. In addition to easy access for universities to educational information, OAIR is a good marketing tool. This is because it communicates the capability and value of the institution by highlighting faculty and student research and other academic activities (Agyen-Gyasi 2010:16). The goal is to encourage online publications to support OA programmes, digital access to scientific publications, and other educational materials, according to the cybermetrics laboratory that organises the World Universities Ranking Online. As a result of traffic inflows to the OAIR website, OAIR also lets organizations see how much influence they have on the scholarly map.

The number of uploads from the site shows how the related work conducted by the institution is viewed. The web ranking gives 15 % weight to Rich Research data, 20 % to volume, 15 % to Google Analytics Visit Statistics and 50 % to visibility links. As a result, the OAIR also positions the institution in a strong ranking status (Agyen-Gyasi 2010:16). Consequently, Africa is often regarded as the only consumer of scientific research productivity leading to a low ranking of African universities as reported in the 2014-2015 World University Rankings of the Times Higher Education (2015), powered by Thomson Reuters. It appears that the low visibility and ranking of African universities are linked with the inability to adopt and use OAIR (Ezema & Onyanha 2016:3).

2.5.4 Status of OAIR

The phenomenon of OAIR development is encouraging in Australia and New Zealand. Kennan and Kingsley (2009) conducted a web-based survey of Australian institutional repositories status. Their study showed a very high OAIR implementation rate (84.2%) resulting from a response rate of 97.4% of a total of 39 Australian universities. He suggested that the high rate of adoption of OAIR was anticipated because of the Australian government, which sponsored OA production through funding and policy-making to make its research output more available (Abrizah et al 2017:57).

In a recent study in New Zealand, Cullen and Chawner (2010) investigated the success factors of OAIR. An interesting conclusion drawn by these authors is that, although the overall development of OAIR is lagging, there is a rise in subject-based or disciplinary repositories. They argue that this may be because researchers in New Zealand are more driven to share work results with a particular community relative to individual or institutional or educational award recognition. They propose that the establishment of OAIR should be part of the scholarly communication patterns of different disciplines to encourage increased material contribution (Abrizah et al 2017:57).

Also, the Asian countries tried to keep up with the OAIR. As a major contributor to OAIR growth in Asia, Japan, India and Taiwan have been identified. Roy et al (2012:13) used the DOAR data to conduct a study on OAIR development in Asia. Our findings show that the total number of OAIR in Asia is 138, with Japan being the largest contributor (69) followed by India (30), while other Asian countries contributed between 1 and 6 OAIR each. The most commonly used programme was Dspace (95 countries) followed by Eprints (15 countries).

Journal articles were the most prominent form of content deposited and English was the most commonly used language for deposited materials (Abrizah et al 2017:57). Another recent study (Prabhat & Gautam 2010:174) placed India as the second largest contributor to OAIR in the Asian region. As of 2010, the authors investigated the Indian OAIR registered in ROAR. Of India's 221 Asian OAIR, 49(22.2%) were found to be deployed. Indian OAIR is predominantly from research institutions and mainly Dspace is the technology used. Kiran and Chia (2009:24) studied the success

of OAIR in Malaysia from end-users.

They reported that, based on ROAR results, Malaysia was the fourth largest OAIR contributor in Asia in 2009. A maximum of 12 OAIR are present, all of which are universities. The most commonly used application is Eprints, and theses and dissertations are a large number of materials deposited in the OAIR. They concluded that, due to the empty collections, OAIR use in Malaysia is at its infancy (Abrizah et al 2017:58).

There are many known advantages of OAIR published in the literature, OAIR can provide wider online distribution of research outputs (Dlamini & Snyman 2017:536), including processing and access to a wide variety of materials (Dlamini & Snyman 2017:536; Jain 2011:126). In maintaining and disseminating academic research outputs OAIR can also play an important role (Dlamini & Snyman 2017:536). OAIR can optimize the quality, accessibility, discoverability and usability of scholarly research outputs at no cost to users (Dlamini & Snyman 2017:536; Jain 2011:125).

Because of these qualities, OAIR has the potential to play an important role in growth, mainly because it enhances access to and exchange of research-based knowledge produced in specific countries. As major primary research producers and as intellectual and scientific content centres, educational and research institutions (whether in developed or developing countries) are expected to take an interest in information creation, dissemination and preservation (Dlamini & Snyman 2017:536; Kapasule & Chawinga 2016). It is also necessary to engage these institutions in better ways to collect, preserve and disseminate research outputs generated within the institution (Singeh, Abrizah & Karim 2013). Over 300 funding agencies are estimated to allow researchers obtaining grants to publish the results within 1 year of publication in OA repositories (Mounce 2013). Finally, the US government requires more of its research-funding agencies to have publications available online (ACRL 2015).

There have been attempts to provide evidence of Africa's contributions to OAIR by scholars such as Fox and Hanlon (2015) and Chimah, Ugwoke and Ogwo (2015). A related study by Sanchez-Tarrago and Fernandez-Molina (2009) only reported that 85% of authors consented to archive their OAIR publications. This is related to the

study of Frass, Cross and Gardner (2013) which reports that the majority of the respondents agree to free availability of research literature. Some universities in East Africa have recognized the role of OAIR in centrally gathering, disseminating and maintaining the institution's academic records and invested in implementing OAIR projects, although some of these universities are not very old and still need to accumulate online visibility and accessibility of collections.

The initiatives used to promote government support in supporting OAIR, which is a growth strategy. Every college board at Makerere University is sensitized about the different policy statements in the OAIR Policy and this generates an understanding of how content is supposed to be created in the repository, with responsibilities allocated to different categories of stakeholders. Kakai (2018:209) advised that a top-level champion and a management structure that includes relevant advisory committees would contribute to sustained success.

Harnad and McGovern (2009) stressed the importance of mandates embedded in policies to ensure that deposits are made to ensure OAIR development. Referring to the findings of the Kakai (2018) study, 68% of respondents supported having university mandates requiring researchers to deposit research output into OAIR. This has been corroborated by many other studies (Abrizah 2009; Chilimo 2016; Dutta, Goutam and Dibyendu 2014; Singeh et al 2013; Yang & Li 2015). The University Libraries Consortium of Uganda (CUUL) universities have incorporated compulsory statements into their OAIR policies.

Although mandates are great and highly recommended, Quinn (2010) pointed out that mandates alone would not overcome the psychological reluctance of the researcher to engage in OAIR and proposed that this should be done in conjunction with other approaches to enable faculty to deposit in OAIR (Kakai 2018:209). Institutions that initiated repositories in the early 2000s did not begin with policies, which affected OA implementation. The situation is improving with the education and guidance given so far, with universities with OA policies aiming to provide more material in the repositories (Kakai 2018:212).

2.6 Challenges with the Use of Open Access Institutional Repositories

Scholars have identified the challenges of OAIR in Africa; some of which include funding shortages (Ezema 2011; McKay 2011), language barriers (Bowdoin 2011; Chalabi & Dahmane 2012), inadequate ICT infrastructure and highly qualified personnel (Ezema 2011; McKay 2011; Nwagwu 2013). The technological challenges suggest low web usage and lack of access to global scientific information on the web (Nwagwu & Ibitola 2010) resulting in a skewed distribution of knowledge in favour of the West. Other hindrances to OAIR bother on institutional inertia because of doubt of its acceptability by some institutions for promotion, retention of tenure and access to research grants (Schonfeld & Housewright 2010; Singeh et al 2013), creation of awareness (Utulu & Bolarinwa 2009) which reported increasing awareness of OA publication, but its low use as publication channel.

Furthermore, Jain (2011:133) notes that, as a result of institutional repository set-up challenges, OAIR's development has so far been primarily concentrated in institutions in the developed world. Wacha and Wisner (2011) agree with the criticism of OAIR and argue that issues could be solved if libraries shift their focus from their own needs to those of the faculty. The benefits provided by institutional repositories are yet to be fully exploited by educational and research institutions (Adeyemi et al 2017:302). Some of the problems defined as responsible for the slow take-up of institutional repositories by existing literature include:

2.6.1 Inadequate advocacy

One of the best ways in developing countries to promote the development and use of OAIR through advocacy. The stakeholders need to advocate for it to be effective (Christian 2008:38). Christian further argues that poor advocacy and marketing of OAIR is one of the reasons for the slow uptake of OAIR in Africa, resulting in a lack of knowledge or awareness of OA, which in turn influences development and use. There is a lack of proper understanding of the role, purpose and work of the OAIR. For most academics, OAIR is comparatively new, especially in developing countries. The benefits offered by OAIR are difficult to promote while easing stakeholder concerns and a relentless promotional and marketing aspect is crucial to the successful implementation of OAIR (Jain 2010: 132).

The use of advocacy is an effective method of bringing about change in institutions and society as a whole. OAIR is a new approach to the dissemination of research and a lot of stakeholders know little or nothing about it. The library should be at the centre of this advocacy as the hub for the dissemination of information (Ezema 2011:482). To be successful, all OAIR stakeholders such as faculty, researchers, librarians and students must be involved. Advocacy draws both investors and contributors. A high percentage of stakeholders in Africa, sadly, have little or no awareness about what OAIR is about to be able to act as advocates. Strong lobbying presupposes the idea is well known to stakeholders or investors (Adeyemi et al 2017:303; Agyen-Gyasi 2010:20).

2.6.2 Content recruitment

The goal of OAIR is to act as the institution's intellectual storage and to show the tangible results of these outputs internationally. Therefore, the success of OAIR on contributions from the faculty, yet not all faculties contribute to repositories in the institution (Casey 2012:2). Especially at the beginning, there may be obvious difficulties in producing material. Academics also refuse to deposit their work (Jain 2010:130). The author also noted that observations indicate that only when a mandate is in place to fill it will OAIR work to its full potential. Researchers may react negatively to any indication of pressure and may not respond to OAIR's invitation to add research output. Lack of motivation and low priority for faculty members and researchers, low deposit rates are often due to a lack of institutional policies and compulsory requirements.

As academic institutions implement OAIR, faculties are often reluctant to contribute. Faculty contributions are low or non-existence institutional repositories in universities (ACRL 2015). However, in a 2009 study, Schonfeld and Housewright (2010) found that less than 30 % of the faculty in universities in the United States contributed to OAIR. Submission policies define the protocol for uploading digital content into OAIR, while self-archiving is the most common procedure for depositing the author's contents into the database personally. New users who wish to submit content may register with OAIR and then select the collection to be submitted (Shoeb 2010: 206).

Therefore, the success or failure of OAIR depends on its ability to meet the needs of the members of the institution it represents. Several studies have noted that OAIR has not attracted the initially expected volume of deposit, nor has it been adopted as a standard practice in the framework of scholarly communication (Tapfuma 2016). Researchers have not responded with much interest to the services OAIR has so far failed to deposit their materials at the rate originally predicted (Bamigbola & Adetimirin 2018; Nunda 2019; Simms 2019).

2.6.3 Different publication types, multiple versions and relationships

There are many more element styles in the discussion surrounding OAIR; book chapters, working and discussion papers, reports, questionnaire, doctoral theses, conference papers and presentations (Rumsey 2006:183). Furthermore, repositories provide the means to store, search and access all types of research output, these knowledge hubs have an important role to play for creators and users of such materials, multimedia and teaching materials can be added, and managers must ensure that metadata for all types of items are provided with high quality and international standards to facilitate access and use.

From a different perspective, research is based on questionnaire and other works that contribute to the final findings, and conference presentation may have preceded the final publication. When depositing into the OAIR, it may be necessary for the author to be able to link the item to other relevant items in complex digital objects so that this relationship can be conveyed between objects. Knowing the content, subject matter, files and media type for submission in your OAIR (Nagra 2012:143) is critical. The author further claims that, to find out the essence and form of material found in their research output, the institutions need to perform surveys for the need to assess faculty and students. The type of content in repositories varies from institution to institution, it is advisable to know the institution community's content needs to plan guidelines, policies and identify the criteria for file formats accordingly.

2.6.4 Intellectual property rights and copyright issues

The other issue affecting the creation and use of institutional libraries is the protection of intellectual property, the field of law that covers various legal rights that occur in creative work. Intellectual property law covers certain exclusive copyright,

trademark, patent, industrial design, trade secrets and trade name protection (Christian 2008:39). The right of the author to reproduce the work includes the right to transfer the work from a paper format to a digital or electronic format, which is particularly important since the creation of OAIR often involves the scanning of previously published works in a paper format and converting them to a digital format for uploading to OAIR. It amounts to an infringement of copyright that ultimately prohibits the use of OAIR (Adeyemi et al 2017:303; Agyen-Gyasi 2010:20) unless this is achieved with the permission of the copyright holder or with a legal exception as fair dealing.

Often researchers are worried about violating the right of publishers and lack sufficient knowledge of their intellectual property rights (Jain 2010:130). The author also notes that OAIR is often seen and misinterpreted by publishers as a potential obstacle and threat to their business. Publishers also often have policies that at least aim to complicate if not antagonise institutions, and authors can be reluctant to make their pre-published work available online before or even after a conventional publisher releases it. Because OAIR is a paradigm shift from traditional publishing, the management of intellectual property issues also needs to evolve (Jain 2010:130).

2.6.5 Internet self-efficacy

Self-efficacy on the Internet refers to the ability of the individuals to use the Internet through their skills. In general, it is important to have the necessary skills for individuals to access or publish scholarly content on the Internet and OAIR channels (Dulle 2010:9). Readers must develop information and computer literacy skills to benefit from OA initiatives. Likewise, to use the electronic media system more effectively to access and disseminate scholarly content, it is equally important for researchers to become Internet literate. Lynch noted that OAIR has no case for existence without the commitment of the respective tertiary institutions to train staff and students to use OAIR (Dlamini & Snyman 2017:535). Moreover, Makori (2009:11) suggests that information professionals in academic libraries through motivation, encouragement and further training can master the use of ICT systems and other skills.

2.6.6 ICT connectivity and infrastructure

The unavailability of ICT infrastructure and services is a major problem impacting the use of OAIR in African libraries. According to Adeyemi et al (2017:302), the implementation of OAIR in developing countries is much more of a capital-intensive project than in developed countries. This is because in developed countries academic and research institutions already have a well-established state-of-the-art ICT infrastructure to build on, but this infrastructure or foundation is not in place in developing countries. Access and maintenance of OAIR will require an Internet connection and ample bandwidth.

Adeyemi et al (2017:302) noted that bandwidth allocation in Africa is so costly that most universities are unable to afford more than 1,544 Mbps, which is less than most North American home broadband users. A survey conducted by the African Virtual University in 2005 for Africa Tertiary Institutions Connectivity Survey (ATICS) showed that the average African university has a bandwidth capacity equivalent to a broadband residential connection available in Europe, pays fifty times more for its bandwidth than its educational counterparts in the rest of the world and fails to monitor, let alone manage the connection. As a result, what little bandwidth is available makes research and scholarship purposes even less useful.

For maximum benefit, OAIR requires a reasonably fast and reliable Internet connection. This is not the case in Ghana, sadly. Despite the growth in Internet use in Ghana, the bandwidth in most academic and research institutions is inadequate. The low availability of Internet bandwidth is an obstacle for OAIR. In developing countries, the high cost of Internet bandwidth makes it very difficult for academic institutions in the field to provide enough bandwidth to host OAIR. Ideally, OAIR needs a dedicated Internet link and the expense of such dedicated services goes beyond most institutions (Agyen-Gyasi 2010:17).

Bandwidth is the life-blood of the information economy of the world. According to Mohammed (2013), it is scarce where it is most needed in Africa's developing nations, which need low-cost connectivity to accelerate their socio-economic development. While little infrastructure is needed to set up OAIR, much more is needed to get the full benefit. Accessibility requirements include network coverage of the entire institution, provision of access points, network equipment and other

accessories that are too high for some institutions to implement (Agyen-Gyasi 2010:18).

The most important prerequisite for electronic networking that affects the OAIR is the availability of an efficient telecommunications service. Telecommunications infrastructure remains underdeveloped in most countries in sub-Saharan Africa. Although the situation in Ghana has changed, more needs to be done to get the situation to the level of developed countries. According to Agyen-Gyasi (2010), in developed countries more bandwidth is available at a lower cost than is open to some African universities. The main factor responsible for the high cost of Internet bandwidth in Africa is the use of satellite bandwidth relative to the much cheaper fibre-optic network.

Universities in Ghana are hindered by monopolies and inefficiencies in telecommunications that restrict interaction and communication with colleagues at home and abroad, thus delaying work. Unfortunately, academic institutions with limited financial resources in developing countries end up paying more for the same bandwidth as their counterparts in the developed world. These factors contribute to an increase in the cost of establishing OAIR in developing countries (Agyen-Gyasi 2010:18).

2.6.7 Institutional culture and politics and commitment

Continuous support and commitment to management and academic staff are often difficult to maintain (Jain 2011:130). The author further states that stewardship is easy and inexpensive to claim, expensive and difficult to honour. And maybe it will prove easy to abdicate Management commitment and support later on, is vital to the successful implementation of OAIR to ensure preservation and maintenance, IT infrastructure, digital rights management and institutional mandate (Lagzian et al 2015).

The establishment of OAIR is a major undertaking for an institution that requires the commitment of financial and staff resources to ensure the success and maintenance of the OAIR (Lagzian et al 2015:198). Successful OAIR requires institutional commitment, start-up resources are relatively high, and technical and advocacy skills

are needed to make the OAIR part of academia's regular work practice, a tireless commitment to marketing and improving services, and feedback from users is needed (Jones 2006:124).

OAIR developers are more likely to face stakeholder challenges related to an institution's politics and culture, namely the faculty, library staff, IT staff and instructional designers. The viability of OAIR can be further damaged by any single institutional failure. OAIR can collapse over time for several reasons; if the organization decides to stop funding it and inability to manage or incompetence. Any of these failures can lead to access interference or, worse, total and permanent loss of stored material in OAIR (Adeyemi et al 2017:303; Agyen-Gyasi 2010:21).

2.6.8 OAIR policies

The momentum to embrace OA initiatives had been building up in Kenya, Tanzania and Uganda. However, the growth of digital content, accessible through the Internet was still slow. Some of the reasons given for this included the fact that it was sometimes difficult to get researchers to agree to share their work, especially when there were no OA policies in the institution. Although some organizations have succeeded in drawing up OAIR policies, some of them are stagnated because it was necessary to include all administrative stakeholders.

The failure to enforce the policies drafted slowed down the selection of material and OAIR are affected. The lack of government and funding initiatives in East Africa has also influenced the collection and distribution of OAIR. Otanda et al (2015) noted that there was no OA was enabling the institutions to guide how to proceed. Some of the policies lacked compulsory provisions for depositing content in OAIR, making the archiving voluntary. It was also noted that monitoring publications from individual authors at the institution and the numerous publishers around the world were a slow and tedious process.

Kakai (2018) noted that one of the most challenging and time-consuming activities is to ensure that correct clearances for copyright have been obtained. One of the reasons that OAIR in Africa has more metadata content is because the process of contacting publishers for self-archiving permission was minimal, if not done at all. When OAIR managers have decided that a particular publisher does not support the

self-archiving of the publisher's PDF, which is in many cases the only alternative available, they do not contact the author for other copies, nor do they contact the publisher. The result is to add the metadata and upload the description that is part of the metadata already.

A key component of repositories is that they rely on the permissions of others. Before content is deposited in an OAIR, the copyright owner should seek permission, and this may include university administration, employees, students, and publishers in a university setting. OAIR must have policies to direct its work in Africa. The OAIR policy document must cover issues such as what to accept or not accept, copyright issues, self or mediated archiving, submission and withdrawal policies, types of materials to be accepted and any other issues needed to regulate the activity of OAIR (Adeyemi et al 2017:303).

2.6.9 Awareness of OAIR

The lack of knowledge or awareness of OAIR is a major challenge for the development of OAIR in Africa. Christian (2008) argues that there is empirical evidence that OAIR knowledge is very low among the major stakeholders in Africa, including faculty members, researchers, librarians and students. He further revealed that OAIR is extremely unfamiliar to more than 74% of the respondents surveyed during the course of the research. For the successful implementation of OAIR, active lobbying and promotion are essential. Lack of knowledge of OAIR seems to be a major issue in the use of OAIR in developing countries. The full benefits can only be achieved if its potential roles are fully understood to stakeholders (Adeyemi et al 2017).

2.6.10 Inadequate funding of OAIR

Maintaining OAIR is not cost-free; impacting factors include the number and type of personnel, type of repository technology chosen, services provided, and data preservation costs. Technology costs include the digitization of content or hardware and software required for such services, backup system charges and digital storage (McGovern & McKay 2008). The institution can determine the staffing needed to run OAIR once the software platform is resolved. Staffing will include those directly responsible for the day-to-day operations and those with new responsibilities added

to their positions to support the service. The latter include employees who can assume marketing roles, employees who contribute metadata, and training staff.

Operating costs include promotional material costs such as brochures, equipment, including software upgrade costs and cost of replacing hardware. With these expense classes in mind, by adding all these OAIR cost to its set of services, an institution can assess the additional costs it will bear. The cost of scanning materials for OAIR may also need to be decided by libraries, especially if the institution wants to digitize OAIR dissertations and theses (Giesecke 2011: 534).

The initial financial costs for OAIR open-source software chosen by most institutions are not large but the on-going maintenance costs may be substantial and may preclude the OAIR project from moving beyond the proposed stage (Jain 2010:130). Funding is another major challenge for academics and research institutions in developing countries are likely to face in their efforts to establish OAIR. The condition of ICT infrastructure in educational and research institutions in developing countries such as Ghana is weak and needs a revision to sustain the growth of OAIR (Agyen-Gyasi 2010:19).

2.6.11 Reward systems and incentives

In the absence of any direct or financial incentive, academics may have little motivation to provide even bibliographic details of their academic work, especially when they see opportunities at other institutions (Jain 2010:131). The author also noted that, according to the academic argument, the core mission of the university is to promote research and scholarship. It is secondary to archiving material and making work accessible to the public. Unable to use papers submitted to OAIR to assess and support authors makes them unwilling to contribute openly to the OAIR framework. The quality of materials that would be submitted to OAIR will, therefore, be affected (Agyen-Gyasi 2010:22).

2.6.12 Power supply

Adeyemi et al (2017:302) noted that poor power supply in African universities is a major obstacle to the development and growth of ICT. According to him, only a trickle of the daily production of electricity dribbles erratically into institutions that

make unstable ICT systems. Another challenge in the academic institution associated with Internet connectivity is the power supply issue. OAIR should be available to all users at all times (within the week, 24 hours a day). Therefore, a continuous and regular supply of electricity will be required to power the ICT facilities. In Ghana, as in other African countries, an electricity supply is a major problem. This issue will make OAIR's development in Ghana a challenging and costly venture, as back-up generators need to be enlisted and also additional funds needed to fuel them (Agyen-Gyasi 2010:19).

2.7 Strategy for the Usage of Open Access Institutional Repositories

Many factors need to be considered in the use of OAIR. These include technology, management, advertising and advocacy policies. There is also a need for reliable back-up power in most African countries, which is a real problem (Agyen-Gyasi 2010:6). The main factors to be considered while using the institutional repository are as follows:

2.7.1 Software

Whatever service is selected, the software will still need to be evaluated in several areas: hardware requirements, user interface, functionalities, acceptable data formats that can be uploaded to the platform, ability to accept imports and exports and integrate into existing library management programmes, the standard harvesters that could be collected. Also, computer information, data type, the volume or size of data that can be managed without freezing or hanging the programme, the number of queries and traffic that can be handled at once (Agyen-Gyasi 2010:9). Agyen-Gyasi further states that, while selecting the software for OAIR, the security provided for hacker data and the necessary auxiliary software to support software such as Portable Document Format (PDF), picture managers, is important. The author also noted that Dspace, Eprints and Fedora are the available software used by most universities with institutional repositories.

2.7.2 Staffing

An increasing body of literature explored the roles librarians play in creating OAIR. Being familiar with electronic collection management and open archive information

system management skills is mandatory for library staff. To prepare documents in an appropriate format and apply the material to OAIR, using a simple interface, library staff and researchers must be qualified. Some libraries, such as Glasgow University, emphasize a fully mediated service for their faculty members, where library staff manage the entire submission process from metadata entry to upload file conversion.

Library staff needs to develop content management policies in terms of identifying the collection. In finding, describing storing and organizing information content, library workers are skilled. They can negotiate with users on content priorities such as what metadata to store and present, if teaching materials are included, and how to handle successive drafts of the same paper. Also librarians should evaluate the performance of the collection and make decisions on access, sustainability and preservation. Ideally, voluntary research submissions will seed the OAIR and support its development.

Researchers may in theory support the plan, but very few voluntarily take action. Therefore, library staff should take a proactive position in the collection of OAIR material and strive towards a sustainable approach. The role of library staff is now growing to include working with IT staff and academics to manage and disseminate research output and learning objects from their institutions. Libraries have gone beyond a custodial role to actively contribute to the evolving process of academic communication.

2.7.3 Advocacy and marketing

An important crucial factor is the promotion of OAIR with the staff. This needs the employees of the library to support OAIR relentlessly. Changing the culture of academic communications is not an easy job, and academic acceptance remains slow. A critical mass of content will attract other researchers by improving the infrastructure and supporting early adopters and will demonstrate to the administration how OAIR can fulfil organizational needs (Westwell 2006:217). For many researchers, OAIR is an uncommon term. Advocacy is then a critical aspect of any OAIR project.

Library staff visit departments at the University of Melbourne, maintained a promotional website and showed impressive usage statistics on specific articles. They also published in their university journals and held related seminars (Kakai 2018:214). The consensus is that the central challenge for the development of OAIR lies not in its technical implementation, but in instilling a change of mind among researchers to make self-archiving an integral part of their academic life. Further investors need to be involved in OAIR advocacy. Engaging researchers to sensitize their colleagues and include more library staff in advertising of OAIR could go a long way towards reaching a broader university community.

It served quite well at the University of Kansas Libraries (Emmett, Stratton, Peterson, Church-Duran & Haricombe 2011), the Grand Valley State University of Michigan (Beaubien, Masselink & Tyron 2009) and the University of Oregon Libraries (Kakai 2018:214). Kakai (2018:214) suggested that a top-down development of OA policies should begin with government and funding agencies to smooth the process taken by institutions to develop OAIR policies, as OAIR stakeholders would, then, have prior knowledge of OA policies and easily implement OAIR policies.

2.7.4 Policies

An incentive programme has been launched by one OAIR to add content to OAIR. The Faculty competes for grants that are then used to develop and add content to OAIR, an innovative way to increase the funding and interest of researchers is the archiving of their work. Carlson (2010:153) noted in a review of web-linked citations in scholarly articles that about one third were no longer active and another third no longer referred to information relevant to the citation. This is more difficult to measure as a success factor, however, it is proposed that researchers who are familiar with OAIR from both the input and search sides should use it. Together with an institutional mandate, these inducements may encourage scholars to deposit their work.

2.8 Relevant Empirical Work on Open Access Institutional Repositories

The researcher purposefully reviewed works within the background of the study that are empirically related to the study. Ukwoma and Dike (2017) examined academic attitudes towards IR use in Nigerian universities. They conducted the study to assess

academic attitudes regarding the use of IR in Nigerian universities. The findings of the study were that IR was developed by universities to create a forum for their research to collaborate with colleagues and to ensure long-term preservation.

Academics have positive attitudes towards the use of IR and send their publications enthusiastically. They believe that publishing works on IR will improve the accessibility of scholarly literature and increase the impact of their work. This implies that the IR support of academics favours the growth of IR in the country. Their contributions and observations have a significant impact on the overall improvement of IR.

However, the study by Ukwoma and Dike (2017) is related to the one being investigated because the study took the form of a descriptive survey to gather information on the IR perspectives of the respondents. The study population consisted of university library staff and academics with IR. DOAR, a global registry of OA educational repositories, was used to select five universities. TAM was also used as the theoretical framework for the study.

Moreover, Tapfuma (2016) on utilization of OAIR in Zimbabwe's public universities, the study explored the utilization of OAIR in the universities. The study revealed a high awareness of OAIR by the academic community, but the content of deposits was very low despite the existence of research and OAIR policies (in some universities) that mandated the deposit of university-funded research. Eight public universities, including all academic levels, research directors, library managers and OAIR library staff were surveyed.

The study concluded that university libraries were faced with numerous challenges in marketing and promoting OAIR, so the concept of OAIR remains in the infancy stage. It was recommended that libraries intensify efforts at OAIR education, encourage scholars or academics and library staff, resolve issues related to intellectual property rights, and strengthen deposit mandates. The study of Tapfuma (2016) relates to the study as TAM was used to understand the behaviours of individuals towards technology acceptance.

A study by Achieng (2015) analysing the use of a digital repository in an academic institution investigated the use of digital resources by the different user groups at the

University of Nairobi with a specific focus on OAIR. Achieng analysed the use of OAIR from the user perspective of effectiveness, performance, satisfaction and awareness building. The research found that OAIR was underused, that there was no access to computers and resources, and that many products and services were rarely used on the library portal.

The research revealed that the effectiveness, performance, satisfaction, and perception of independent variables contribute to the positive or negative use of OAIR. The research revealed once again that the construct of efficiency, efficiency, satisfaction, and awareness has a positive impact on repository usage and can be used to increase OAIR usage. The study was led by TAM and engaged OAIR users. It was a mixed study, using both qualitative and quantitative data.

The choice of the respondents was based on probability sampling. Empirical data were used to investigate the use of digital resources from the perspective of efficiency, effectiveness, awareness, usefulness, and usability. Subjective tests are based on a questionnaire that has questions of the five-point Likert type that score statements to get their answers and open-ended questions were combined.

Furthermore, Saulus, Mutula and Dlamini (2018) studied technological acceptance factors in the use of institutional repositories: the case of the Faculty of Agriculture and Consumer Sciences of the University of Swaziland (UNISWA). The purpose of the study was to examine the influence of technology acceptance factors including effort expectation, performance expectation, social influence and conditions facilitation, on the adoption and use of UNISWA OAIR by the Faculty of Agriculture and Consumer Sciences, and to assess the future intentions of the faculty member to use UNISWA OAIR.

Research findings revealed that expectations of performance, the expectation of effort, and conditions facilitation influenced the intentions of UNISWA faculty to accept and use the repository. However, social influence did not affect the decisions of the faculty to use the OAIR. However, the study is partly related to the one under investigation because it was conducted in the same area of study. The study was also supported by TAM, which evaluated what happened as users interacted with the OAIR and predicted their future usage intentions. A post-positive paradigm was

adopted for the study. The qualitative approach was used using a survey research model to collect data from academic staff using a questionnaire. A pragmatism model and a mixed methods research approach and questionnaire and interview process for data collection are adopted by the research under investigation.

Also, Makori, Njiraine and Talam (2015) on the integration and use of institutional repositories in public universities: the University of Nairobi case was to assess the integration and use of OAIR in public universities with special reference to the University of Nairobi. The study found that OAIR was not well incorporated into the core of the library's information services, while OAIR must be a key source of information, expertise and interaction. The findings also indicate that students and staff were lacking in knowledge. Therefore, the study suggested the need for effective marketing and promotion of OAIR.

The study relates to the current study in that there is a connection between the sample, the sampling technique the design of the research, the data collection method and the analysis. The study used a cross-section descriptive survey design to gather and analyze both qualitative and quantitative data. The study used a questionnaire, the interview schedule and observation guide to collect data. Data collected were analysed using both qualitative and quantitative analysis. The quantitative data were presented, using the arithmetic mean, frequency distributions and percentages while the qualitative data were collected using open-ended questions in the questionnaire, interview schedule and observation guide. Through prose and through verbatim discourse, qualitative information is presented. On the contrary, all the studies have been conducted in Africa, but not in Ghana, while the current study is on university libraries in Ghana.

2.9 Theoretical Framework

According to Creswell (2014:75), a theoretical framework is any empirical or quasi-empirical theory of special or psychological processes at a variety of levels that can be applied as a lens to the phenomenon's understanding. The purpose of the study was to investigate the use of OAIR in university libraries in Ghana. To understand the study, it was important to use theories and models that demonstrate the acceptance and use of technology.

Researchers use models of predictive behaviour to explain beliefs, attitudes and intentions regarding embracing and using technology. Three popular models used in technology acceptance and use research are Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and Technology Acceptance Model (TAM). TAM models how users come to accept and use technology for understanding and therefore it was deemed appropriate for the study.

TRA shows that the intentions and subjective norms of an individual are the strongest predictors of the actual behaviour of the individual (Chan & Lu 2004; Luarn & Lin 2005). Also, a subjective norm is the overall perception that others have of the relevance of what the individual should or should not do (Chan & Lu 2004; Luarn & Lin 2005). TRA is a model of predictive behaviour used to analyse the factors affecting the intentions of a person to perform or not to perform an action. TRA can be used to explain and predict behavioural intentions in general settings.

The three components of the TRA model are behavioural intention, behavioural attitude and subjective norm. Behavioural intention is the assessment of the intention of a person to perform a particular behaviour (Chan & Lu 2004). Behavioural attitude is related to the feelings of a person committing a particular behaviour (Chan & Lu 2004). Subjective norm is what the individual thinks about how others who are important to them, think about their decision to perform a particular behaviour (Chan & Lu 2004; Wang, Lin & Tang 2003). TRA typically assumes that the intent of an individual to conduct action or not is based on the attitude and subjective norm of an individual (Chan & Lu 2004; Wang et al 2003).

TPB extends TRA by adding another variable called perceived behaviour control introduced by Ajzen (2005) to compensate for a weakness found in the TRA that does not account for behaviours over which a person does not have voluntary control (Sullivan 2012). Perceived behaviour control is simply a behaviour that is not governed by a person (Luarn & Lin 2005). In contrast, Luarn and Lin (2005) claimed that the TPB argues that the attitude, subjective norms and perceived behavioural control of a person directly influence the behavioural intention of that individual to perform a particular behaviour. Overall, behaviour is a weighted function of intent and perceived control of behaviour, and intention is the weighted sum of the

component of attitude, subjective norm and perceived control of behaviour (Sullivan 2012).

2.9.1 Technology Acceptance Model

Technology Acceptance Model (TAM) is a theory of information systems that models how technology is accepted and used. The model suggests that many factors influence their decision about how and when they will use it when users are presented with new technology. The notable factors influencing decision-making are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Fred Davis described PU as the degree to which a person believes using a particular system would enhance job performance.

And Davis described PEOU as the degree to which a person believes that it would be effortless to use a particular system (Davis, Bagozzi & Warshaw 1989). TAM has been continuously studied and expanded; major upgrades include TAM2 (Venkatesh 2000; Venkatesh & Davis 2000), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis & Davis 2003) and TAM3 in the context of e-commerce, including trust effects and perceived risk on system usage (Venkatesh & Bala 2008).

Davis's TAM (Davis et al 1989) is the most commonly used framework for the adoption and use of technology (Abbasi, Tarhini, Elyas & Shah 2015; Venkatesh 2000). According to Bagozzi, Davis and Warshaw (1992), because new technologies, such as personal computers, are complex and there is an element of uncertainty in the minds of decision-makers about the successful use of them, people are forming attitudes and intentions to try to learn how to use new technology before starting the user-oriented effort (Abbasi et al 2015). Attitudes to use and intended use may be ill formed or lack conviction, or they may occur only after a preliminary effort to learn how to use the technology. Consequently, real use may not result directly or instantly from such attitudes and intentions (Bagozzi et al 1992).

TAM emerged from the TRA of Fishbein and Ajzen and the TPB of Ajzen and Fishbein (Sullivan 2012). Original TAM work by Davis (1989) resulted in the theory that perceived usefulness and perceived ease of use are the key determinants of the

decision to use information systems. Davis carried out additional TAM research to address the determinants of behavioural intention in technology acceptance and use. TAM is, therefore, unique to information system behaviour, while TRA and TPB typically analyse human behaviour (Luarn & Lin 2005).

Researchers of the information system investigated the historical use of PU and PEOU in support of TAM, using computer self-efficacy, perceived risk, learning and previous use (Chan & Lu 2004; Gefen, Karahanna & Straub 2003; Legris, Ingham & Colletette 2003; Lu, Yao & Yu 2005; Venkatesh & Davis 2000; Venkatesh, Thong & Xu 2012; Wang et al 2003). Davis (1993) TAM model did not include the subjective norm of TRA as a determinant of behavioural intent because the subjective norm is one of TRA's least understood aspects (Sullivan 2012). As a result, due to its indeterminate definition and psychometric status, the subjective norm was not included in TAM (Davis et al 1989).

Although it has proved to be an effective tool for determining behavioural intentions to use IS, the classical TAM model has several limitations (Legris et al 2003). Nonetheless, several researchers modified and expanded Davis' TAM design due to these limitations (Sullivan 2012). Several previous TAM studies involving student participants using automation software or system development applications and the resulting measurements represented the variations in self-reported use and highlighted a weakness in TAM (Legris et al 2003).

Accordingly, Legris et al (2003) reported that researchers such as Lucas and Spitler (Sullivan 2012) believed that better results could be achieved if the TAM processes were carried out in a business environment, using business professionals or real customers as participants as well as the application of business processes. As defined by Legris et al (2003), another weakness of the classical TAM is that information system is a separate issue in organizational activities. Researchers Sullivan (2012), however, believed that the IS change process should rely on the following relationship to be effective; the model used to manage change, technology, and the context of the organisation.

In summary, past research has shown that classical TAM is a useful theoretical model that can help explain the behaviour of users when implementing information

systems (Gefen et al 2003; Legris et al 2003). Indeed, past empirical testing on TAM has shown that the tools used in these tests are statistically reliable (Davis et al. 1989; Legris et al. 2003; Sullivan 2012; Venkatesh et al. 2003). Overall, many researchers claim that TAM remains an effective robust model and theoretical framework for predicting the use of information systems (Davis et al 1989; Gefen et al 2003; King & He 2006; Legris et al 2003; Venkatesh et al 2003).

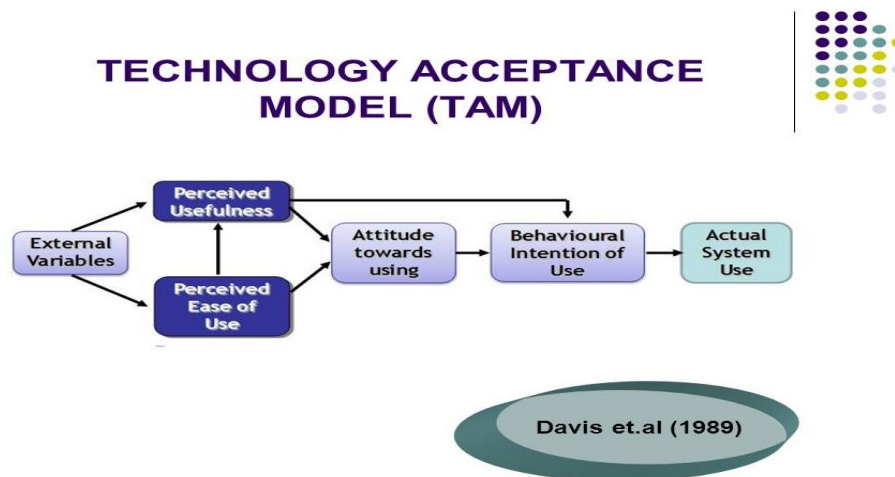


Figure 2.2 Technology Acceptance Model (Davis et al 1989)

2.9.2 Technology Acceptance Model 2

Venkatesh and Davis built up an expansion to TAM that outlined perceived usefulness and usage intentions related to social influence and cognitive instrumental cycles (Venkatesh & Davis 2000). Venkatesh and Davis reported that in numerous observed TAMs perceived usefulness depends on usage intentions. It is critical to understand the determinants of the construct of perceived usefulness since it drives usage intentions and how these determinants change after some time with the expanded use of the framework.

Despite the fact that the first TAM model depended on the PU determinants (Venkatesh & Davis 2000), the PEOU determinants permitted organizations to plan interventions that would expand the acceptance and use of new systems by users. Consequently, an investigation distributed in 2000 to broaden TAM was conducted by Venkatesh and Davis that examined how perceived usefulness and usage intention constructs change with continued IS use (Sullivan 2012). Addition by the TAM2 model is a theoretical construct involving processes of social influence

(subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, demonstrability of results, and perceived ease of use).

Following TRA, the subjective norm is what other people think about the subject performing or not performing a particular behaviour, which is important to the subject. TAM2 states that the direct compliance-based effect of the subjective norm on intention above and beyond PU and PEOU will occur in a mandatory environment, but not voluntary, system usage settings in a computer usage context. Therefore, volunteering is shown as a moderating variable in TAM2.

TAM2 suggests that the subjective norm positively influences image because, if the working group of individuals considers it important to perform a task when using the system, performing the task increases the image of the individual in the group. Furthermore, TAM2 theorizes that the direct effect of subjective norms on intentions for mandatory use contexts will be strong before implementation and during early use, but will weaken over time as increasing direct experience with a system provides a growing basis for on-going use intentions (Sullivan 2012).

A series of determinants of perceived usefulness in the TAM2 model are job relevance, output quality and demonstrability of results and perceived ease of use. Job relevance is based on the ability of the system to support the job function of an individual. Venkatesh and Davis (2000) described output quality as the perception of an individual how well a particular task is performed by the system. Result demonstrability implies that if the differences between use and positive outcomes can be easily observed, individuals will have a more positive attitude about the usefulness of the system. Besides, perceived ease of use examines how easy or friendly a system is to use. Venkatesh and Davis claimed that TAM2 suggests that all cognitive instrumental processes have a positive effect on perceived usefulness and ultimately the intention of an individual to use an IS (Sullivan 2012).

Table 2.1 A table showing TAM2 Instrumental Determinants

Process	Variables	Definition of variables
Social influence	Subjective norm	A person's perception that most people who are important to him or think he or she should or should not perform the behaviour in question.
	Voluntariness	The extent to which potential adopters perceive the adoption decision to be non-mandatory.
	Image	The degree to which the use of an innovation perceived to enhance one's status in one's social
	Experience	The direct effect of subjective norm on intentions may subside overtime with increased system experience.
Cognitive instrumental	Job relevance	An individual's perception regarding the degree to which the target system applies to the individual's job. Job relevance is a function of the important within one's job of the set of tasks the system is capable of
	Output quality	In perceptions of output quality, users will take into consideration how well the system performs the tasks that match their job relevance.
	Result demonstrability	The tangibility of results of using the innovation will directly influence perceived usefulness.

Source: Sullivan 2012

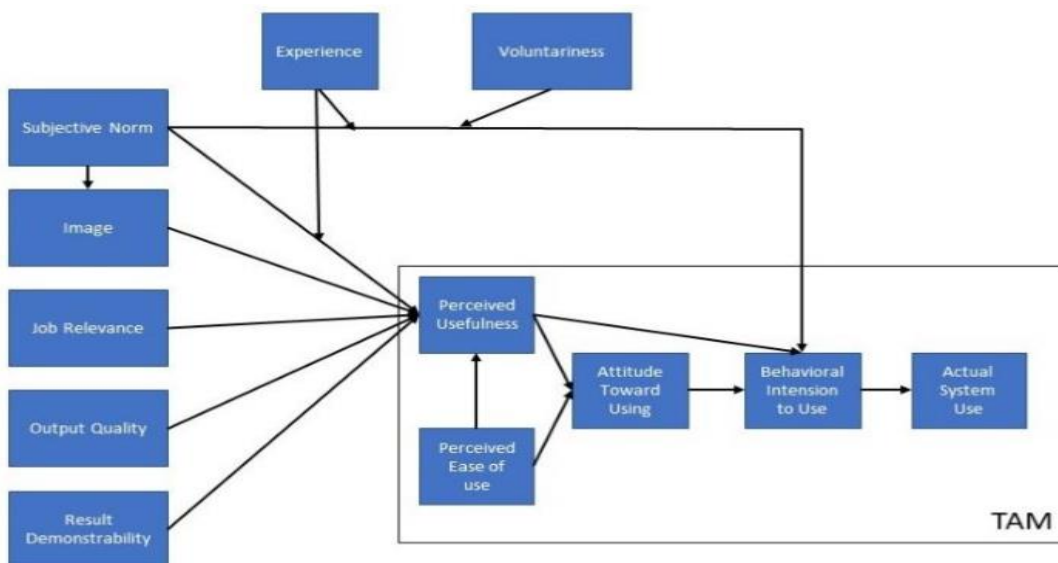


Figure 2: Technology Acceptance Model 2

Figure 2.3 Technology Acceptance Model 2 (Venkatesh et al 2000)

2.9.3 Unified Theory of Acceptance and Use of Technology

UTAUT is a technology acceptance framework proposed by Venkatesh, Morris, Davis and Davis in 'User acceptance of information technology: towards a unified view' (Abbasi et al 2015). UTAUT aims to explain the intentions of users to use an information system and the subsequent behaviour of use. The theory argues that four key constructs exist: performance expectancy, effort expectancy, social influence and conditions facilitating. The first three are direct determinants of intention to use and behaviour, and the fourth is a direct determinant of user behaviour; gender, age, experience and willingness to use are posed to moderate the impact of the four key constructs on the intention to use and behaviour.

Evaluating developed the theory and consolidating the concepts of eight models used in previous research to describe the use of information systems (Reasoned Action Theory, Technology Acceptance Model, Motivational Model, Theory of Planned Behaviour, A Combined Theory of Planned Behaviour, Technology Acceptance Model, Personal Computer Use Model, Diffusion of Innovations Theory and Social Cognitive Theory). Subsequent validation of UTAUT by Venkatesh et al (2003) in a longitudinal study revealed that it accounted for 70% of the variance in Behavioural Intention to Use and about 50% of the actual use (Rahimi, Nadri, Afshar & Timpka 2018).

UTAUT has been employed in several fields of study to analyse the individual's acceptable behaviour in the use of new technologies (Venkatesh et al 2012). The UTUAT has been widely used in research areas such as information systems, healthcare, education, telecommunications, and finance (Attuquayefio & Addo 2014; Lai 2017). Users of IS willingness to implement the systems relate directly to their acceptance rate of the new technology.

The TAM outlines two issues relating to individual acceptance: usefulness and ease of use. As a result, by studying these issues from different dimensions, researchers developed several different models. Researchers Venkatesh and Davis (2000) concluded that the perceived usefulness of the information system was influenced by users' perception of their image and the value of their work. Venkatesh and Davis then revised the TAM to include social influence as a new building and named TAM2. Sullivan (2012) studied user behaviour while using PC and introduced two

additional variables to TAM2 that included the long-term effects of new technology and circumstances.

TAM and TAM2 models were created to help customers and employees understand the reaction of companies and organizations to new technology. These models also help businesses to focus on how employees would respond to new technology. By contrast, due to limitations in some of the dimensions and structures of TAM and TAM2, companies and organizations were prevented from listing the reasons why customers or employees did not accept the new technology.

After reviewing eight well-known models, Venkatesh et al (2003) proposed an integrated model called UTAUT. UTAUT consists of four components: facilitation conditions, effort levels, performance expectancy and social influence. Both concepts have been derived from the eight well-known models and discuss the behavioural intent to use technology directly. The four UTAUT constructs, as defined by Venkatesh et al (2003) are:

- a. Performance expectancy is the level a person considers that the use of new technology would help to improve their work performance. This construct is included as perceived usefulness in TAM.
- b. Effort expectancy is the degree to which the user perceives the system as easy to use. This construct includes scale items from TAM.
- c. Social influence is the degree to which the user perceives that others who are important to the user believe that the user should use the system. The construct includes scales from subjective norms in TAM.
- d. Facilitating conditions is the degree to which the user believes that conditions are adequate for effective use of the system, including organizational readiness and infrastructure adequacy. This construct encompasses perceived behaviour control, TAM and other variants.

The UTAUT model has been used in past research studies to test a variety of areas involving technology acceptance. For example, Robinson (2006) used the UTAUT model to study student adoption of technology in marketing education. Also, several researchers have conducted studies validating the UTAUT model in Internet and virtual communities (Anderson, Schwager & Kerns 2006; Chieh-Peng & Anol 2008;

Debusse, Lawley & Shibl 2008; Hennington & Janz 2007; Lin & Lee 2006; Loke 2008; Pappas & Volk 2007; Park, Yang & Lehto 2007; Wang, Wu & Wang 2009).

Furthermore, Koivumaki, Ristola and Kesti (2008) used the UTAUT model to research the adoption of mobile technology, thereby contributing to the literature on technology acceptance. Further studies have added more dimensions to the UTAUT that reflect the flexibility of the model. For example, a research study conducted by Wang et al (2009) included an additional dimension of self-management and perceived playfulness as independent variables moderated by age and gender. The study examined age and gender as important determinants of mobile learning technology adoption.

Given its usefulness in the study of technology acceptance, the UTAUT model is limited in that it does not include a task-technology fit (TTF). Venkatesh et al (2003) noted that the UTAUT model did not include this and that further research was warranted. Essentially, the models underlying the UTAUT model do not include the constructs of tasks. Users typically intend to use IT if it meets the requirements of their task. Sullivan (2012) conducted a study adding TTF constructs to the UTAUT to determine whether this addition resulted in an improvement in the explanatory power, similar to that reported by Dishaw, Strong and Bandy (2004). Their study results produced a new model combining the models TTF and UTAUT.

UTAUT identifies four key factors (performance expectancy, effort expectancy, social influence and facilitating conditions) and four moderators (age, gender, experience and voluntariness) related to predicting behavioural intention to use technology and actual technology primarily in organizational contexts. According to UTAUT, performance expectancy, effort expectancy and social influence have been theorized and have been shown to affect the behavioural purpose of using technology, while behavioural intentions and influencing conditions have been determined by the use of technology. In addition, various combinations of the four moderators were theorized and found to control different UTAUT relationships. UTAUT explained 77% of the variance in behavioural intent to use technology in longitudinal field studies of employee acceptance of technology, and 52% of the variance in technology use.

Recently, Venkatesh et al (2012) proposed and tested UTAUT2, which is focusing on new consumer mechanisms (Bagozzi 2007; Benbasat & Barki 2007; Venkatesh, Davis & Morris 2007) in new constructs (hedonic motivation, price value and habit) in companies. UTAUT2 clarified 74% of the variance in the intention of the user to use technology and 52% of the variance in the use of technology. While research considers that UTAUT has reached its practical limit of explaining the adoption and use of individual technology decisions in organizations (Venkatesh et al 2003), UTAUT-based research has thrived (Venkatesh et al 2012).

Specifically, research has applied UTAUT as it is, applied it to different theories, or expanded it to examine a variety of technologies in both organizational and non-organizational settings. The continued development of UTAUT-based research has partly emerged because of the expansion and diffusion of new IT such as enterprise systems (Sykes, Venkatesh & Johnson 2014), collaboration technology in knowledge-intensive firms (Brown, Dennis & Venkatesh 2010), mobile Internet for consumers (Thong, Venkatesh, Xu, Hong & Tam 2011; Venkatesh et al 2012), agile IS (Hong, Thong, Chasalow & Dhillon 2011), e-government for citizens (Chan, Thong, Venkatesh, Brown, Hu & Tam 2010) and health IS in the healthcare industry in organizations and society (Venkatesh, Sykes & Zhang 2011).

IT has penetrated nearly every aspect of society and different individuals in different contexts are now using it. While a large number of new ITs and associated studies based on UTAUT have been produced over the past decade, in reviewing the literature, we found that the IS discipline is at a crossroads regarding what the future holds for UTAUT and, in general, the possible theoretical contributions from further research into technology acceptance and use. They conclude that the systematic analysis of the contributions of existing UTAUT-based studies will expose the utility of UTAUT and the shortcomings of existing UTAUT-based research from which a new framework of technology acceptance and use can be established to chart promising future directions for study (Venkatesh, Thong & Xu 2016:2).

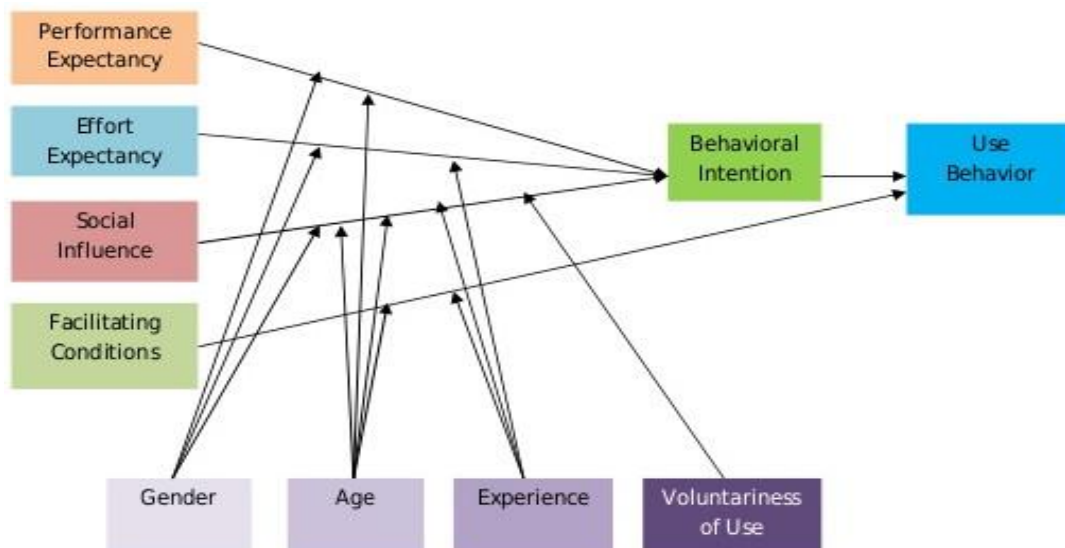


Figure 2.4 Unified Theory of Acceptance and Use of Technology (Venkatesh et al 2000)

2.9.4 Technology Acceptance Model 3

Venkatesh and Bala (2008) merged TAM2 (Venkatesh & Davis 2000) with the perceived ease of use determinants model (Venkatesh 2000) and created an integrated technology acceptance model called TAM3. The authors developed the TAM3 using the four different types including the differences, system characteristics, social influence, and conditions that are determinants of perceived usefulness and perceived ease of use.

In TAM3, experiences moderated the perceived ease of use to perceived usefulness, technology anxiety to perceived ease of use, and perceived ease of use to behavioural intent. TAM3 has been tested for IT implementation in real-world settings (Lai 2017:28). Venkatesh and Bala (2008) revised the TAM from version 2 to TAM 3, concentrating on increasing the number of determinants influencing PU and PEOU of an innovation's, creating a constructive behavioural intention matched by usage behaviour.

Subjective norm, image, job relevance, performance quality and demonstrability of results are factors that influence PU. PEOU is determined by variables of anchor (computer self-efficacy, external control perceptions, system anxiety and playfulness) and adjustment (perceived pleasure and objective usability). Experience and willingness act as behavioural intention modifiers (Jeffery 2015:7).

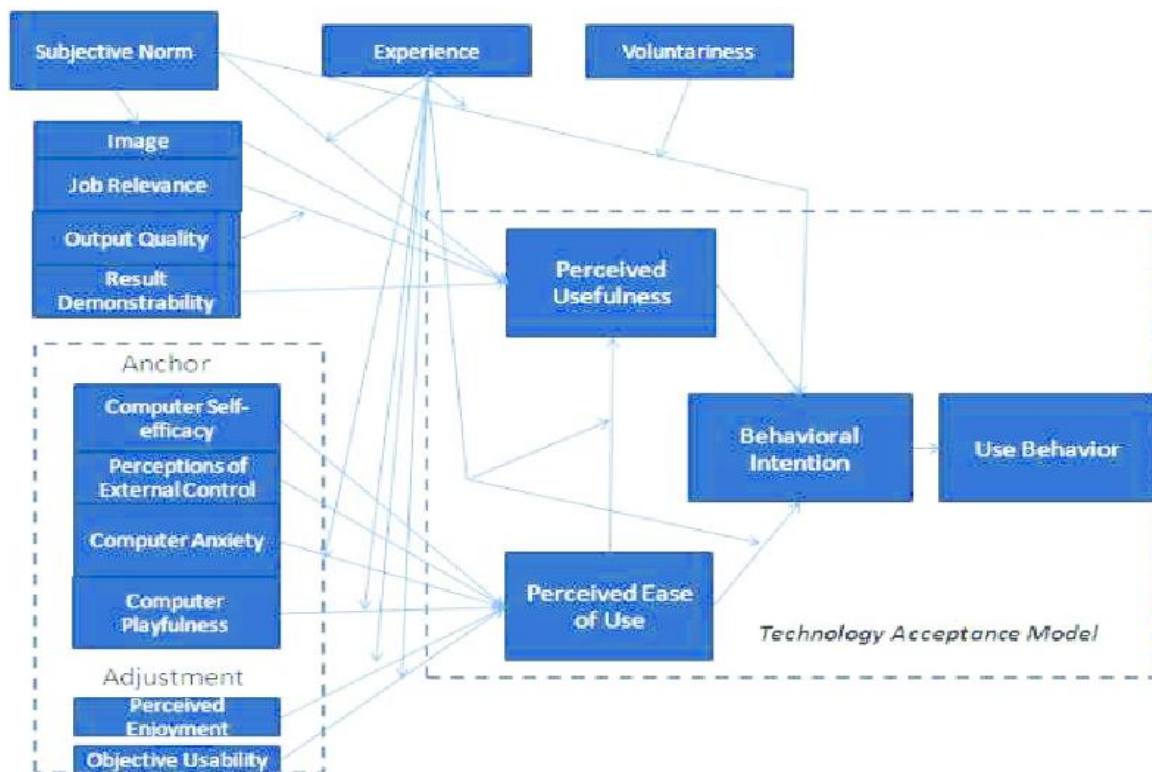


Figure 2.5 Technology Acceptance Model 3 (Venkatesh & Bala 2008)

2.9.5 Usage of TAM

A few researchers repeated the first study by Davis (1989) to give empirical proof of the relationships between usefulness, ease of use and use of the method (Adams, Nelson & Todd 1992; Davis et al 1989; Hendrickson, Massey & Cronan 1993; Segars & Grover 1993; Subramanian 1994; Szajna 1994). A lot of consideration has been given to testing the robustness and validity of the questionnaire used by Davis. Adams et al (1992) replicated the work of Davis et al (1989) to exhibit the validity and reliability of his instrument and its measurement scales. They also extended it to various settings and showed the internal consistency and reliability of the two scales by using two distinct examples. Hendrickson et al (1993) found high reliability and test re-test reliability and Szajna (1994) found the instrument to have predictive validity for purpose of use, self-reported use, and attitude to use. The entirety of the work supports the reliability of the Davis instrument and promotes its use with different user groups and different software choices.

Segars and Grover (1993) re-examined the replication of the Davis study by Adams et al (1992). They criticized the measuring method used and postulated a different model based on three constructs, usefulness, effectiveness and ease of use. It

seems that these results have not yet been replicated. Workman (2007) tested and supported some aspects of these findings, however, by separating the dependent variable into information use and technology use.

Keil, Beranek and Konsynski (1995) developed (perhaps made it more popular) Davis model into what they call the Usefulness or EOU Grid, a two-by-two grid where each quadrant represents a different combination of the two attributes. This provides a mechanism for discussing the current mix of Usefulness and EOU for specific software packages in the context of software usage. And also to plot a different course if one wants a different mix, such as introducing even more powerful software (Keil et al 1995).

In most technical and geographical contexts, TAM has been used; one of these contexts is the rapidly growing information systems (Rahimi et al 2018). Venkatesh and Davis extended the original TAM to explain perceived social influence (subjective norms, voluntariness and image) and cognitive instrumental processes (job relevance, output quality, demonstrability of results and perceived ease of use).

In both voluntary and compulsory environments, the extended model, referred to as TAM2, was tested. TAM2 (Venkatesh & Davis 2000) was strongly supported by the findings. Venkatesh et al conceived UTAUT in an attempt to integrate the major contrasting user acceptance models. UTAUT was found to perform each of the models (69% Adjusted R square) and was adopted by some recent studies (Venkatesh et al 2003).

2.9.6 Comparing TAM (TAM, TAM2, TAM3, UTAUT)

TAM2 is an extension of the TAM developed by Venkatesh and Davis (2000) due to the shortcomings of the TAM in terms of explanatory power (R²) (Jeffery 2015:7). The aspiration for the TAM2 was to keep the original TAM constructs intact and include additional key determinants of the perceived usefulness and intention constructs of TAM, and to understand how the effect of these determinants changed with increasing user experience with the target system over time (Venkatesh & Davis 2000:187).

TAM2 centred only on the determinants of TAM's perceived usefulness and usage intention constructs, but TAM3 by Venkatesh and Bala (2008) added the

determinants of TAM's perceived ease of use and use intention constructs for robustness. Consequently, TAM3 presented a complete network of user IT system usage determinants (Venkatesh & Bala 2008). Venkatesh et al (2003) included four key determinants in the UTAUT model, including performance expectations, effort expectations, social influence and conditions of facilitation, as well as four key moderators such as gender, age, voluntariness and experience.

According to Bagozzi (2007), UTAUT may be an effective model due to its logically consistent design and higher explanatory power (R²), but the model did not investigate direct effects that might reveal new relationships. Also, TAM2 and TAM3 did not measure and analyse the direct effects that could reveal new relationships and important factors from the research (Jeffery 2015:7).

TAM by Davis and Bagozzi (1989) TAM2 by Venkatesh and Davis (2000), TAM3 by Venkatesh and Bala (2008) and UTAUT by Venkatesh, Morris, Davis and Davis (2003) were selected as the situation was for OAIR to be used in universities and for the study involving the novelty technology of the OAIR method to take into account the subjective standard that included society. Davis, Bagozzi and Warshaw (1989) explained that the scale of social norms could have some effects on the behavioural intention of users, particularly when the use of information systems such as OAIR is quite personal while the use of individuals is voluntary.

UTAUT is an extension of TAM2 and TAM3 is an extension of TAM2 that includes social influence, so it is used based on the social norm. TAM2, TAM3 and UTAUT use moderators, factors and user intention to use OAIR system, the study focuses on using OAIR system in the same way.

2.10 Conceptual Framework

The conceptual framework, according to Kumar (2019:54), is an aspect that is derived from the concepts and theories and becomes the basis for a research problem. A conceptual framework is the argument about why the topic one wants to study matters and why the proposed means of studying it are appropriate and rigorous (Wong, Teo & Russo 2012:2). The study opted to use a conceptual framework to identify and indicate the various aspects that influence OAIR's use,

creating an OAIR Usability Model. Usability is a multidimensional structure that can be looked at from different perspectives (Kim 2008:388).

The International Organization for Standardization defines usability as the extent to which specific users can use a product to achieve specific objectives in a specific user context with efficiency, effectiveness and satisfaction. Other studies share similar perspectives where usability is defined by Brink, Gergle and Wood (2002) as functionally correct, user-friendly, easy to learn and remember, error-tolerant and subjectively pleasing, whereas Oulanov and Pajarilo (2002) proposed five attributes including efficiency, helpfulness and adaptability, the usability guidelines of ten attributes including navigation language and content, architectural and visual clarity and functionality were also provided by the MIT Information Services and Technology Department (2004).

The following issues can be attributed to hinder the usability of OAIR; mandate, interoperability, copyright issues, content recruitment, promotion and preservation strategies. The independent variables of availability, accessibility and visibility of OAIR are influenced by the intention to reuse and user satisfaction. Additionally, the intention to reuse and user satisfaction impacts on usage benefits of OAIR that is the efficient and effective dissemination of scholarly information. A variable is linked to at least one objective or more.

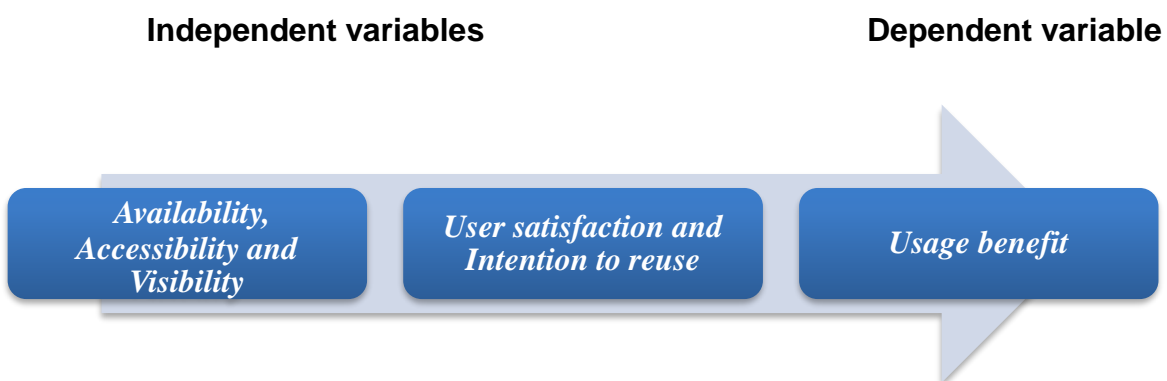


Figure 2.6 Conceptual Framework for Usage of OAIR (Kodua-Ntim, 2019)

Libraries have traditionally been a source of information and knowledge. This gives the ability of university libraries to impact academic education, teaching, and science. University libraries acquire, store, organize, distribute and manage information tools for students in connection with reading, teaching, study and

community services (Makori 2015:18). The author also states that library staff provides high-quality information services to students, staff, scholars and the university community to promote higher satisfaction and better return on investment, which in turn fosters national and institutional growth. The constructs used in the conceptual framework are accessibility, availability, visibility, user satisfaction, intention to reuse and usage benefits. Therefore, the descriptions of the constructs are as follows:

2.10.1 Accessibility

Accessibility in the study is the number of clicks that a user needs to navigate from those results to the full text of the paper itself; thus, accessibility refers to the amount of work that a user needs to obtain the item after determining that it is available. Accessibility also refers to the support provided by library staff and OAIR managers to users to access OAIR materials within university libraries.

The interactive and participatory nature of OAIR can influence lecturers, researchers and students to make use of their research work. On the one hand, library staff play important roles in providing support to OAIR users by delivering planned services efficiently and accurately (reliability), providing timely assistance (responsiveness), fostering confidence and trust (assurance), and providing programme users with individual attention (empathy) (Chua & Goh 2010).

Accessibility measures in the study included responsiveness, content and timeliness, reliable Internet access, system use guidelines, assurance, availability of technical support and reliability. Accessibility was found to affect both user satisfaction and perceived net benefits (Wang 2008). The study has investigated how accessibility affects both user satisfaction and intention to reuse OAIR. Therefore, the following hypotheses were proposed:

H1: Accessibility has a positive effect on satisfaction in the OAIR context.

H4: Accessibility has a positive effect on the intention to reuse OAIR.

2.10.2 Availability

The availability of the study is the ability of search engines to obtain clear links to an individual paper within the first two pages of results. Availability refers to the simple

presence of an item in a search result set, an indication that the item exists. According to Jennex and Olfman (2006:52), availability ensures that the correct information is captured at the right time and available to the right users. Availability in the study means that the right information is generated and shared for the benefit of the university libraries and their parent institutions.

According to Jennex and Olfman (2006), the availability process looks at organizational processes such as identifying OAIR users and collecting and reusing OAIR items. Formalities of these processes include the planning and formatting and context of information to be stored in OAIR. Jennex and Olfman (2006) mentioning accuracy and timeliness construct could be used to measure availability and information wealth and links between components of information to ensure availability.

Examples of availability constructs are personalization, completeness, relevance, easy to understand, currency, timeliness, and usability (Delone & Mclean 2004; Petter, Delone & Mclean 2008). Availability was found to have a strong influence on user satisfaction in the context of university libraries (Masrek, Jamaludin & Mukhtar 2010). Previous studies have shown that availability has positive effects on perceived value and user satisfaction, which in turn has a significant impact on reuse intention (Dwivedi, Kapoor, Williams & Williams 2013).

Academic staff perceive the quality of the information provided in their libraries by OAIR to be better than others; therefore, they are more likely to continue to use the system. Therefore, when investigating the satisfaction and intention to use OAIR, availability is important. Reliable information, accurate information, relevant information, understandable information, completeness, feasible and significant information and up-to-date information are accessible constructs used in this analysis. Therefore, the following hypotheses were developed in the study:

H2: Availability has a positive effect on satisfaction in the OAIR context.

H5: Availability has a positive effect on the intention to reuse OAIR.

2.10.3 Visibility

Visibility in the study is how well the framework performs knowledge creation, storage, and retrieval, transfer, and application functions. In the context of the study,

visibility measures the desired characteristics of OAIR and how universities could use it. In the context of OAIR, visibility was found to be a strong indicator of user satisfaction (Petter & McLean 2009) and is moderately influenced by perceived net benefits (Petter et al 2008).

Therefore, due to visibility, academics are more likely to continue to reuse the OAIR. Visibility thus increases user satisfaction with the use of OAIR in university libraries. Because of better interaction with the system, lecturers, researchers and students are more likely to continue to reuse OAIR services. Jennex and Olfman (2006) provide the following constructs used to measure visibility; the amount or number of experiences already gained in the development and maintenance of the system; the amount or number of experiences used to develop and maintain the system; and the software and hardware used.

The constructs employed in the study to measure OAIR visibility include usability, adaptability, availability, flexibility, stability, reliability and accessibility of the system. Therefore, the following hypotheses were proposed in the study:

H3: Visibility has a positive effect on satisfaction in the OAIR context.

H6: Visibility has a positive effect on the intention to reuse OAIR.

2.10.4 Satisfaction

The satisfaction of the study is the level of satisfaction that users feel they have with a system relative to what the user expects when the system is first used (Jennex & Olfman 2006; Serumaga-Zake 2017). Jennex and Olfman (2006) add that when using a system is required, satisfaction is the most applicable as a measure of success. The efficiency of use, on the other hand, depends on users being satisfied with the system in use (Jennex & Olfman 2006). Satisfaction in the OAIR setting refers to the feeling of pleasure or displeasure that results from combining all the benefits that a person hopes to receive from the interaction with the OAIR system (Masrek et al 2010).

Satisfaction can be measured using factors such as adequacy, effectiveness, efficiency, enjoyment and satisfaction with information and the system (Urbach & Muller 2012). Factors of satisfaction measured in the study include efficiency, effectiveness, knowledge needs satisfaction, enjoyment and adequacy. Significant

satisfaction factors are net benefits and intention to reuse the system (Dwivedi et al 2013; Petter & McLean 2009; Tandi Lwoga 2013). Therefore, the following hypotheses were tested:

H7: Satisfaction has a positive effect on the intention to use in the OAIR context.

H8: Satisfaction has a positive effect on usage benefits in the OAIR context.

2.10.5 Intention to reuse

In the study, the intention to reuse the system refers to the favorable attitude of the user towards the OAIR, which results in the repeated use of content gathering and sharing behaviour (Wang 2008). In the study, the intention to reuse the system was explained as a repetition of OAIR application and use after being satisfied with the benefits it brings to the user. Previous studies have consistently shown that reuse of the system is an important factor in determining user acceptance of the information system in the field (Wang 2008). The measures used in the study to measure the intention to reuse OAIR include making the right decision, recording information, communicating information with colleagues, creating specific information and sharing such information. Thus, the following hypothesis was proposed:

H9: Intention to reuse has a positive effect on usage benefits in the OAIR context.

2.10.6 Usage benefits

According to Delone and Mclean's (2004) model, usage benefits in the study refer to both positive and negative impacts of the system on the user; however, the researcher needs to define the stakeholders clearly and carefully and the context in which usage benefits are to be measured. Serumaga-Zake (2017:2) described usage benefits as an individualized comprehensive measure of the amount of all past and expected future benefits due to the use of the IT system.

Any use of resources (including time) in the building, learning how to use and using the system is costly. Therefore, to measure usage benefits, one must adopt the point of view of some stakeholders on what is valuable and what is not. The expected usage benefits in the sense of the study relate to the positive impact that OAIR use will bring to the client. Constructs used to measure perceived usage benefits in the study, therefore, include new knowledge and innovation, ideas for acquisition, management and storage of information, task performance, job improvement and

quality of work improvement.

2.11 Chapter Summary

This chapter provided a critical review of existing literature as well as a theoretical foundation on OAIR and its usage in university libraries throughout Africa and Ghana. Additionally, it discusses the overview of OAIR, awareness of OAIR, perceptions of OAIR, content archiving of OAIR, usage of OAIR and challenges of OAIR in university libraries, relevant empirical work on OAIR in university libraries and explain f key concepts in the literature. Finally, a conceptual framework that guided the study, suggests that when users are presented with a new technology, several factors influence their decision to use it.

Literature related to the usage of OAIR in university libraries was reviewed and presented. The usage of OAIR is an issue of great concern among scholars within and outside Africa. However, researchers have few published articles and theses from various countries. Some of the notable works reviewed in this chapter are from scholars such as; Achieng (2015), Tapfuma (2016), Makori et al (2015), Saulus et al (2018) and Ukwoma and Dike (2017).

The review of related both locally and worldwide established that university libraries are aware of OAIR. Universities, however, have not fully embraced its usage. Related studies also highlighted advocacy as one of the challenges hindering the usage of OAIR in university libraries. Therefore, these findings certainly support the justification and significance of the study. Therefore, these findings certainly support the justification and significance of the study. The next chapter situates the methodology used for the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The research methodology adopted for the analysis is discussed in this chapter. A research methodology is the way used to systematically solve the research problem (Kothari 2004:8). The research methodology is the general research strategy that describes how to conduct research and defines the methods to be used in it, among other items. These methods, described in the methodology, define the means or modes of data collection and how to calculate a specific result (Howell 2012).

Research methodology also refers to the basic principles, procedures and practices that govern research geared towards solving a particular identified problem. Kazdin (2003) pointed out that methodology should be thought of as encompassing the entire process of conducting research. It focuses on the methods adopted in the collection and analysis of data, links methods to outcomes and governs the choice and use of methods. The methodology chapter is delineated as follows: research paradigms, research approach, research design, population, sampling procedure and methods, data collection methods, data analysis, validity, reliability and trustworthiness and evaluation of the research methodology. The diagram below is an overview map of the research methodology adopted for the study.

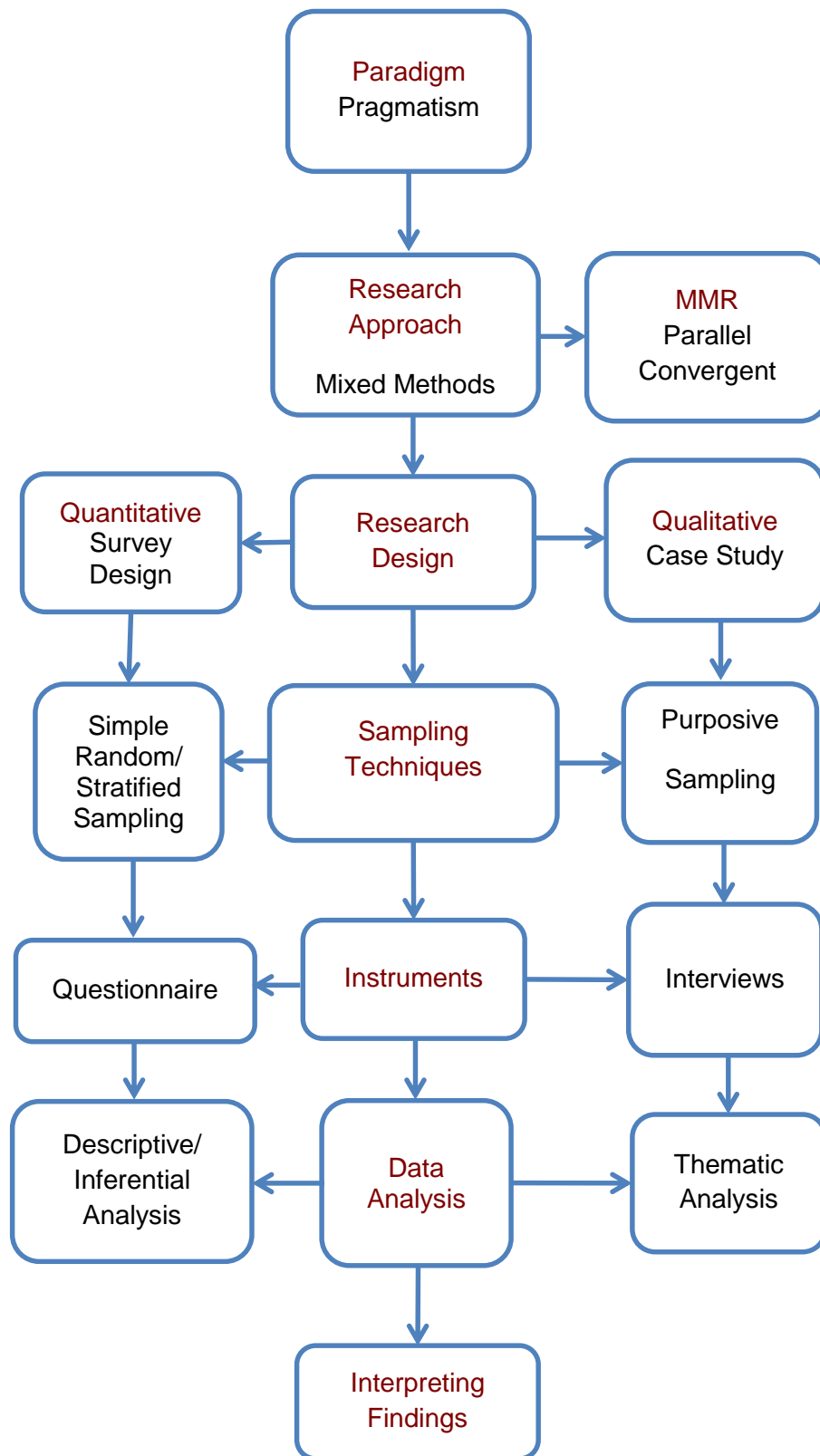


Figure 3.1 Research Methodology Map (2019)

3.1 Research Paradigm

A research paradigm is a term derived from science history; it has been used to describe a cluster of beliefs and dictate what to study, how to conduct research and how to interpret results (Bryman 2012:714). Creswell (2014:7) adds that a paradigm is a general philosophical orientation of the world and the nature of the research brought to a study by a researcher. Therefore, a paradigm is the collection of shared beliefs and agreements between researchers on how to interpret and address the problem. A paradigm in the social sciences is seen as a set of assumptions about the social world and the proper methods and areas of study (Punch 1998:28). Babbie (2006:31) defines paradigms as the basic models or frameworks of reference that we use to organize our observations and reasoning, the lens through which a person perceives, describes and makes sense of an experience.

Paradigms are shared beliefs among members of a specialty that focuses on what members of a particular research field think are the basic principles governing research. Also, an analysis of a paradigm as a research model is based on the notion that paradigms are models of how research is conducted in a given field (Morgan 2007). Research paradigms are also referred to as assumptions (Miller & Brewer 2003), frameworks (Ngulube 2015), worldviews and beliefs (Creswell 2014:7) and approaches (Neuman 2014).

There are four elements in a paradigm, namely, ontology, epistemology, methodology and axiology (Kivunja & Kuyini 2017; Patel 2015; Saunders et al 2009). Such elements constitute the basic assumptions, principles, norms and values of each paradigm. Therefore, demonstrating knowledge of these elements is significant. Ontology is a branch of philosophy concerned with the assumptions that we make to believe that something is real or meaningful. Epistemology is used to describe what we know; how we know reality or truth. The methodology is the broad term used to refer to the research design, methods approaches and procedures used in a well-planned investigation to find out something. Axiology refers to the ethical issues that need to be considered during study planning (Kivunja & Kuyini 2017).

Three dominant research paradigms apply specifically to social science in educational research, namely, positivism, interpretivism, and pragmatism (Babbie

2011; Creswell 2014; Neuman 2014; Tashakkori & Teddlie 2003). Although many scholars have identified several other paradigms that are still linked to positivism, interpretivism, and pragmatism paradigms such as postpositivism, critical and subjectivism, the pragmatism paradigm was adopted for the study. It uses a combination of methods and ideas that help one of the best frames address and provide tentative answers to one's research questions to mix the approaches. These three common paradigms are elaborated in the next sections.

3.1.1 Pragmatism

The term 'pragmatism' can also be described as doing what works best. Pragmatism is based on the ontological position of non-singular realism and the epistemological position of rationalism. Pragmatists believe that reality is constantly renegotiated, debated and interpreted and therefore the best method to use is the one that solves the problem. Pragmatism is a deconstructive paradigm that advocates the use of mixed methods in research, sidesteps the contentious issues of truth and reality and focuses instead on 'what works' as the truth regarding the research questions under investigation (Feilzer 2010:8; Guido, Chavez & Lincoln 2010:7). An important feature of pragmatism is that it rejects the distinction between realism and anti-realism, which has been the core of debates about positivism versus interpretive in the social sciences. For pragmatists, there is indeed such a thing as reality, but it is ever changing, based on our actions and looks at the way different worldviews derive from lived-experiences (Morgan 2014:1045).

Pragmatism as described by Creswell (2009:10) and Pansiri (2005:191) is the philosophical underpinnings of mixed methods research. Therefore, mixed methods research paradigm, which is termed as pragmatism paradigm, was developed after positivism and interpretivism paradigms (Polit & Beck 2003). Pragmatists are in a position that argues that it is possible to work with both positivism and interpretivism positions (Saunders et al 2009:598). Cherryhomes (1992:13) explains that the word pragmatism was invented to express a certain maxim of logic. The maxim is intended to furnish a method for the analysis of concepts. The method prescribed in the maxim is to trace out in the imagination the conceivable practical consequences that are, the consequences for deliberate, self-controlled conduct of the affirmation or denial of the concept.

Cherryhomes (1992:13) further elaborates that William James and John Dewey shifted attention to the importance of the consequences of actions based upon particular conceptions. Dewey wrote that pragmatism does not insist upon consequent phenomena or upon the precedents, but possibilities of actions (Cherryhomes 1992:13). Pragmatism offers an epistemological justification (that is via pragmatic epistemic values or standards) and logic (that is, it uses the combination of methods and ideas that help one best frame, address and provide tentative answers to one's research questions for mixing the approaches) (Johnson, Onwuegbuzie & Turner 2007:125). The pragmatist focuses on the consequences of research, the primary importance of questions asked rather than the methods and multi-methods of data collections that inform the problems under study.

Creswell (2013) and Saunders et al (2009:598) add that pragmatism is a position that it is argued that the most important determinant of the adopted research philosophy is the research question, arguing that it is possible and wise to work within both positivism and interpretivism paradigms (Saunders et al 2009:598). As a result, Creswell (2009:11) states that pragmatism opens the door to multiple methods, different worldviews and different assumptions, as well as different forms of data collection and analysis. For this paradigm, the main focus is the research problem and how best to get the solution for this problem. A brief summary of research paradigms and how they relate to ontology, epistemology, methodology and axiology have been explained in detail in the table below.

Table 3.1 A table showing a brief summary of the research paradigms

Paradigm	Positivism	Interpretivism	Pragmatism
Ontology What is reality?	Naive realism There is a single reality or truth.	Relativist There is no single reality or truth. Individuals in groups create reality.	Non-singular reality Reality is constantly renegotiated, debated, interpreted in light of its usefulness in new unpredictable situations.
Epistemology How can I know the reality?	Objectivist Reality can be measured and hence the focus is on reliable and valid tools to obtain that.	Subjectivist Therefore, reality needs to be interpreted. It is used to discover the underlying meaning of events and activities.	Rational The best method is one that solves problems. The means is finding out, change is the underlying aim.
Methodology Which method do you use to know something?	Experimental (Quantitative) Experimental Survey research Correlational Causal comparative	Naturalist (Qualitative) Naturalist Case study Ethnography Grounded theory Phenomenology Action research Narrative inquiry	Mixed methods (Quantitative and Qualitative) Mixed methods research Multiple methods of research Action research
Axiology What ethical issues need to be considered?	Beneficence Researcher is detached, neutral and independent of what is researched. Value-free research	Balanced Researchers are part of what is researched; their interpretations are key to the contribution.	Value-laden Researcher acknowledges bias by worldviews, cultural experience and upbringing. Researcher tries to minimize bias and errors.

Source : Kivunja & Kuyini 2017 ; Patel 2015 ; Saunders et al 2009.

3.2 Research Approach

The quantitative, qualitative and mixed methods are the three basic approaches to research. Quantitative research is appropriate where quantifiable measures of variables of interest are possible, where hypothesis can be formulated and tested and inferences drawn from samples of the population (Connaway & Powell 2010:77). Qualitative research, on the other hand, is a scientific method of observation to gather non-numerical data (Babbie 2013). The qualitative research approach tends

to apply a more holistic and natural approach to the solution of a problem than quantitative research that is the systematic empirical investigation of observable phenomena via statistical, mathematical, or computational techniques (Given 2008).

The mixed methods research approach combines elements of quantitative and qualitative approaches for the broad purposes of breadth and depth of understanding and corroboration (Johnson & Christensen 2008:123; Creswell 2014). Each approach has its utility, procedures, strengths and weaknesses that are dependent upon the research context (Creswell 2014). Creswell (2017:206) views mixed methods research as an umbrella term that includes many research approaches such as sequential explanatory, sequential exploratory and convergent parallel mixed methods design.

Given the objectives of the study, the mixed methods research approach employed was convergent parallel mixed methods design whereby quantitative data and qualitative data will be collected concurrently in one phase. The data are analysed separately and then compared and combined. In the study the researcher collected survey data and interview data at the same time and compare the results, this will help confirm, cross-validate and corroborate findings. This is often used to overcome a weakness in one method with the strength of another.

Convergent parallel mixed methods design adds trustworthiness to the results obtained and provides a variety of results as well. This approach requires the researcher to collect both quantitative and qualitative data simultaneously and analyse them at the same time. Thus, in this approach, one set of data complements the other, helping to overcome any weakness associated with each other (Creswell 2014). The different research approaches are explained in the next section.

3.2.1 Quantitative research approach

Quantitative approach informed by the positivist paradigm; emphasises objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaire and surveys, or by manipulating pre-existing statistical data using computational techniques (Given 2008). There are four main

types of quantitative research designs: descriptive, correlational, quasi-experimental and experimental (Creswell 2013).

In quantitative research, the data are usually gathered using structured research instruments, the results are based on larger sample sizes that are representative of the population and the study can usually be replicated or repeated, given its high reliability. The main purpose of the quantitative approach is to make an optimal decision by using mathematical and statistical models in a situation when the probability of all outcomes is uncertain, once the problem and conditions are defined, the decision-making process becomes quick (Anderson, Sweeney, Williams, Camm & Cochran 2015).

3.2.2 Qualitative research approach

A qualitative approach is informed by the interpretive paradigm. It is a general way of thinking about conducting qualitative research. It describes, either explicitly or implicitly, the purpose of the qualitative research, the role of the researcher, the stages of research, and the method of data analysis. Qualitative research is a scientific method of observation to gather non-numerical data (Babbie 2013). This the meanings, concepts definitions, characteristics, metaphors, symbols and description of things and not to their counts or measures. Qualitative research approaches are employed across many academic disciplines, focusing particularly on the human elements of the social and natural sciences (Given 2008). A popular and helpful categorization separates qualitative methods into five groups: ethnography, narrative, phenomenological, grounded theory and case study (Creswell 2014).

3.2.3 Mixed methods research approach

The mixed methods research approach is informed by the pragmatist paradigm, there have been several typologies for classifying and identifying types of mixed methods research approaches that researchers use in their mixed methods research studies. Creswell and Plano Clark (2007) identify 12 classification systems drawn from the fields of evaluation, nursing, public health, education policy and research and social and behavioural research. In these classifications, authors use diverse terms for their types of designs, and a substantial amount of overlap exists in the

typologies. In the study, the researcher discussed the three main designs in mixed methods research (explanatory sequential, exploratory sequential and convergent parallel mixed methods design) that were advanced by Creswell (2003).

3.2.3.1 Explanatory sequential

This method is a two-phase approach where the quantitative data are collected first followed by qualitative data collection. The purpose is to use the qualitative results to further explain and interpret the findings from the quantitative phase. For example, a survey may be used to collect quantitative data from a larger group. Members of that group may then later be selected for interviews where they can explain and offer insights into their survey answers.

3.2.3.2 Exploratory sequential

This method is also a two-phase approach. The qualitative data is collected first, followed by the collection and analysis of quantitative data. The purpose of this approach is to develop an instrument (such as a survey), to develop a classification for testing, or to identify variables. Using the information from journals or diaries to develop an appropriate survey to administer to a larger sample would be an example of this approach.

3.2.3.3 Convergent parallel

In this approach, qualitative and quantitative data are collected concurrently in one phase. The data are analysed separately and then compared and combined. An example would be if a researcher collected survey data and interview data at the same time and compared the results. This method is used to confirm, cross-validate or corroborate findings. It is often used to overcome a weakness in one method with the strengths of another. It can also be useful in expanding quantitative data through a collection of open-ended qualitative data.

3.2.4 Mixed methods research approach development

Developing a mixed methods research approach can be challenging. The researcher must choose the appropriate quantitative and qualitative approaches necessary to answer the research question and design their mixed methods research using those approaches. There are many ways to combine these approaches and there are no rigid formulas for designing a mixed methods

research. However, the following guidelines by Creswell were very helpful in designing the overall methodology of the study.

- Consider your philosophy and comfort level with quantitative and qualitative approaches.
- Spend time considering your resources, including time, skills and funding. Be certain that the approaches you select are realistic for your timeframes and parameters.
- List the goals or aims of each part of the study and determine whether these portions of the study will require quantitative or qualitative methods.
- The fundamental principle of mixed methods research is that the researcher will use a mix of quantitative and qualitative methods that have complementary strengths and do not have overlapping weaknesses. Haphazardly choosing quantitative and qualitative approaches will result in poor results. Choosing the appropriate methods to mix in the study requires logical and purposeful thought and planning.
- Consider methods of data collection for both the quantitative and qualitative approaches in the design. What type of data will be collected? When will it be collected? Will the data be collected simultaneously (concurrent) or in different stages of the project (sequential)? How will it be integrated? How will it impact other parts of the study?
- Consider how the data collected may impact the development of the study over time. Will it be a pre-determined fixed methodology throughout the project? Or is it best suited to an emergent methodology that is flexible and may change over time based on data being collected?

After considering the mixed methods research approach development factors above the researcher choose the convergent parallel mixed methods design.

3.2.5 Convergent parallel

The convergent parallel mixed methods design is probably the most familiar of the six major mixed methods research approaches. In a convergent parallel mixed methods design, the researcher collects both quantitative and qualitative data concurrently and then compares the two databases to determine if there is

convergence, differences or some combination. Some authors refer to this comparison as confirmation, disconfirmation, cross-validation or corroboration (Greene, Caracelli & Graharn 1989; Morgan 1998; Steckler, Mcleroy, Goodman, Bird & McCormick 1992).

This approach generally uses separate quantitative and qualitative methods as a means to offset the weaknesses inherent within one method with the strengths of the other (or conversely, the strength of one adds to the strength of the other). In this approach, the quantitative and qualitative data collection is concurrent, happening in one phase of the research study. Ideally, the weight is equal between the two methods, but often in practice, priority may be given to one or the other. The convergent parallel mixed methods design was chosen because it can result in well-validated and substantiated findings. Also, the concurrent data collection results in a shorter data collection period as both the qualitative and quantitative data are gathered at one time at the research site and analysed separately.

The mixing during this approach is usually found in an interpretation or discussion chapter is to merge the data or integrate or compare the results of two databases side by side in a discussion. This side-by-side integration is done in the discussion chapter by first providing quantitative statistical results followed by qualitative quotes that support or disconfirm the quantitative results. This is presented in figure 3.2.

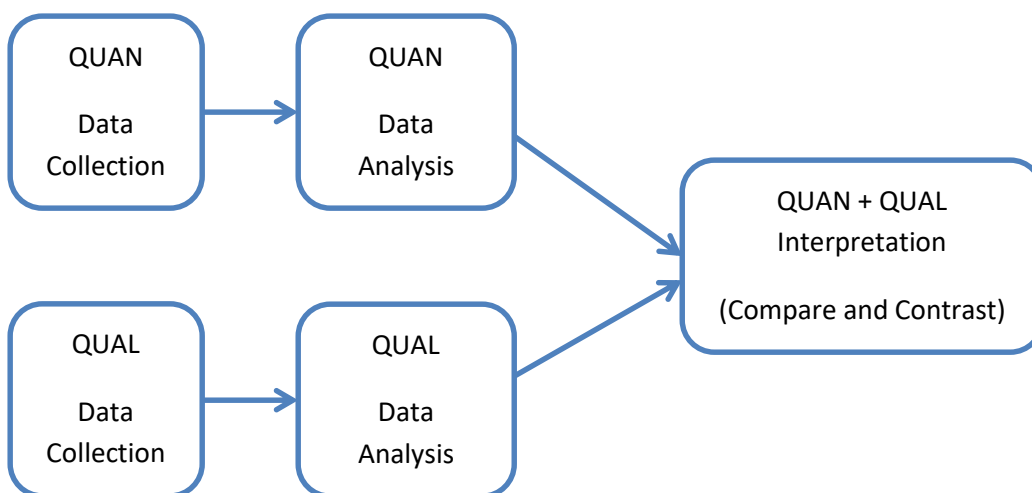


Figure 3.2 Convergent Parallel Diagram (Kodua-Ntim, 2019)

3.3 Research Design

Once an approach for the study had been selected, the researcher had to choose a research design to ensure that the research study would progress logically. A research design is a plan of study. Maxwell (2012:2) views a research design as a preconceived plan according to which data are to be collected and analysed to investigate research questions. A research design is a framework for the collection and analysis of data, choice of research design reflects decisions about priority being given to a range of dimensions of the research process (Bryman 2012:46). Therefore, the research design clearly outlines the targeted sample, research methods utilised to collect data, research instruments and how the collected data was analysed.

This means a research design is a programme that guides the researcher as he or she collects, analyses and interprets data. The researcher showed practitioners the design that represents the quantitative and qualitative phase since the study is a convergent parallel mixed methods design. The researcher chose a survey for the quantitative phase and case study for the qualitative phase.

De Vaus (2001:10) argues that the research design enables the researcher to determine what evidence is required to answer the research question convincingly. Logically it contributes to the validity and reliability of the study, as Jupp (2006:266) asserts that an effective research design will demonstrate that the research will produce valid and credible conclusions that flow logically from the evidence generated.

3.3.1 Quantitative phase: Survey design

Surveys are directed towards the determination of the nature of the situation, as they exist at the time of the study (Babbie 2013:281). Survey research is a non-experimental design that uses a series of written and verbal prompts to quantify the personal opinions, beliefs and ideas from a group of respondents; the survey instrument translates order to observe patterns across a group of respondents (Abbott & McKinney 2013:206). This design is found suitable because it gives an in-depth description of the phenomena in their existing setting and economical in collecting data from a large sample with high data turn over (Kumar 2019:41).

Bowling (2014:214) describes a survey as the study of existing conditions, prevailing viewpoints, attitudes, on-going processes and developing trends to obtain information that can be analysed and interpreted to come up with a report of the present status of subject or phenomenon under study. Thus, the researcher employed the survey in his research because he is interested in the opinions of a large group of people on the topic of evaluating the usage of OAIR in university libraries in Ghana. The survey design is deemed the most appropriate research design for the study, because the focus of the study is to assess stakeholders' view on the current university libraries faces in the usage of OAIR. Thus, the study will give an account of known facts, prevailing conditions and give recommendations on how OAIR can be used in university libraries in Ghana.

3.3.2 Qualitative phase: Case study design

A case study allows an investigation to a real-life event or in-depth analysis conducted, usually over a limited time and focuses upon a limited number of subjects (Maxwell 2012; Silverman 2013). The premise of the case study design is that any unit of investigation that involves people can only be understood through the perspectives of those involved in the investigation to ensure that the very nature of the phenomenon that is being researched into is unique and not open to the generality beyond the study participants (Kumar 2019).

A case study can be a quantitative or qualitative study, depending on whether it is a single case or multiple cases (Kaplan 2011:242). The study is a multiple case situation as there are five cases, with each university being a case. The data collected and the subsequent analysis using a case study gives a rich and deep description of the data. To achieve this, the researcher will spend adequate time in the context of the study to collect extensive data. The researcher intends to use the case study so that he can make an in-depth assessment of the current situation of usage of OAIR in university libraries in Ghana.

3.4 Population

Stangor (2011:110) indicates that the study population comprises an entire group of people that the researcher desires to learn about. Population refers to the aggregate of cases about which a researcher would like to make generalizations (Kaplan 2011).

Creswell (2014:158) noted that when we are identifying the population, we should state the size if the size can be determined. The population is, thus, the group to which a researcher would like to make references.

Five university libraries in Ghana out of the ninety-two Higher Education Institutions were purposively selected for the study. These university libraries were selected because they were the only universities on the DOAR (DOAR 2018). Therefore, they are obligated to meet certain operational criteria such as infrastructure and resources, the number of qualified and permanent staff, the notion of well-equipped libraries, postgraduate programmes and the operational status of their OAIR were considered.

The target population of the study was the 3454 academic and support staff working in the five selected universities. This includes the 3439 academic staff for the quantitative phase and 12 Library Staff for the qualitative phase. The population is a homogeneous one because the researcher believes they are stakeholders when it comes to enhancing the learning environment through instruction, applied research, scholarly activity and service that support the mission of the university. The population of the study is presented in table 3.2 below.

Table 3.2 Population for the Study (Quantitative)

Universities	Academic Staff			Total
	Professors	Senior Lecturers	Lecturers	
UG	197	283	685	1165
KNUST	160	260	522	942
UCC	122	237	357	716
UDS	33	167	366	566
AU	4	9	37	50
Total	516	956	1967	3439

Table 3.3 Population for the Study (Qualitative)

Universities	Library Staff
UG	3
KNUST	2
UCC	3
UDS	2
AU	2
Total	12

3.5 Sampling Procedures and Methods

Sampling as the process of selecting observations to be included in the study (Babbie & Mouton 2001). According to Leedy and Ormrod (2010), sampling is done to create a small group from a population that is as similar as possible to the larger population. Leedy and Ormrod (2010) add that it should be a little group that is like the big group, so the degree of resemblance and representativeness is important. Sampling is a technique that hinges on a sample tends to substantively represent the population.

Therefore, the methods adopted to select the sample are vital to the strength of the research findings. According to Creswell and Plano-Clark (2007), there are two types of sampling techniques that are probability and non-probability sampling techniques. A probability sample is a sample in which every unit in the population has a chance (greater than zero) of being selected in the sample, and this probability can be accurately determined.

The combination of these traits makes it possible to produce unbiased estimates of population totals, by weighting sampled units according to their probability of selection. Probability sampling includes simple random sampling, systematic sampling, stratified sampling, probability proportional to size sampling and cluster or multistage sampling (Creswell & Plano-Clark 2007; Kombo & Tromp 2006). These various ways of probability sampling have two things in common, every element has a known nonzero probability of being sampled and involves random selection at

some point.

Non-probability sampling is any sampling method of which some elements of the population have no chance of selection or where the probability of selection cannot be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection. Hence, because the selection of elements is non-random, non-probability sampling does not allow the estimation of sampling errors.

These conditions give rise to exclusion bias, placing limits on how much information a sample can provide about the population. Information about the relationship between sample and population is limited, making it difficult to generalize from the sample to the population. Non-probability sampling methods include convenience sampling, quota sampling and purposive sampling (Creswell & Plano-Clark 2007; Kombo & Tromp 2006). Probability sampling techniques were used to select participants for quantitative data collection; while non-probability sampling techniques were used to select participants for qualitative data collection (Creswell & Plano-Clark 2007; Kombo & Tromp 2006). A simple random sampling technique, stratified probability sampling technique and purposive sampling technique were used for the study. The next section will discuss the sampling techniques adopted for the study.

3.5.1 Simple random sampling

Simple random sampling is a non-probability form of sampling. In a simple random sample of a given size, all such subsets of the frame are given an equal probability (Moring 2014:181). Each element of the frame thus has an equal probability of selection: the frame is not subdivided. This minimizes bias and simplifies the analysis of results. In particular, the variance between individual results within the sample is a good indicator of variance in the overall population, which makes it relatively easy to estimate the accuracy of results (Moring 2014:181). A simple random sample can be vulnerable to sampling errors because the randomness of the selection may result in a sample that does not reflect the makeup of the population.

The simple random sample may also be cumbersome and tedious when sampling from an unusually large target population. Secondly, it was employed because the researcher wanted to remove the unbiased selection of individuals so that if a large number of samples were drawn, the average sample would accurately represent the population. Again, the simple random sampling was chosen because it merely allowed one to draw externally valid conclusions about the entire population based on the sample.

This was done by writing 289 “Yes” and 876 “No” on pieces of paper mixed in a bowl. Then the researcher chooses from the bowl for a UG University Lecturer. When the researcher chose “Yes” UG university lecturer is allowed to participate in the research, 289 UG university lecturers were chosen. This procedure was applied in selecting the 273, 250, 229 and 44 respondents from KNUST, UCC, UDS and AU respectively.

3.5.2 Stratified random sampling

Stratified sampling is a probability form of sampling which addresses the weakness of a simple random sample. When the population embraces some distinct categories, the frame can be organized by these categories into separate ‘strata’. Each stratum is then sampled as an independent sub-population, out of which individual elements can be randomly selected (Groves, Fowler, Couper, Lepkowski, Singer & Tourangeau 2011). The ratio of the size of this random selection (or sample) to the size of the population is called a sampling fraction. There are several potential benefits to stratified sampling.

First, dividing the population into distinct, independent strata can enable researchers to draw inferences about specific subgroups that may be lost in a more generalized random sample. Secondly, utilizing a stratified sampling method can lead to more efficient statistical estimates. Finally, it is sometimes the case that data are more readily available for individual, pre-existing strata within a population than for the overall population; in such cases, using a stratified sampling approach may be more convenient than aggregating data across groups.

There are, however, some potential drawbacks to using stratified sampling. First, identifying strata and implementing such an approach can increase the cost and complexity of sample selection, as well as leading to the increased complexity of population estimates. Second, when examining multiple criteria, stratifying variables may be related to some, but not to others, further complicating the design and potentially reducing the utility of the strata. Finally, in some cases, stratified sampling can potentially require a larger sample than would other methods.

A stratified sampling approach is most effective when three conditions are met

1. Variability within strata are minimized
2. Variability between strata are maximized
3. The variables upon which the population is stratified are strongly correlated with the desired dependent variable.

In the study, stratified sampling was also used to select respondents for the study. Stratified sampling was used to select separate samples from subgroups of the population that are called 'strata' and the strata were professors, senior lecturers and lecturers. Out of the 1085 sample size, as calculated above, 154 was allocated to professors, 304 was allocated to seniors lecturers and 627 allocated to lecturers. This was done to increase the accuracy of survey results.

3.5.3 Purposive sampling

Purposive sampling is a non-probability form of sampling (Bryman 2006:418). The goal of purposive sampling is to sample cases or participants strategically so that those sampled are relevant to the research questions that are being asked. Kumar (2019) adds that the use of purposive sampling is determined by the judgment of the researcher as to who can provide the best information to achieve the objectives of the study. Kumar (2019), Leedy and Ormrod (2010) and O'Sullivan, Rassel and Berner (2008) all said that, the use of purposive sampling depends on the researcher's judgment of who to include in a sample.

In the study, purposive sampling was used to select cases for the study and participants for semi-structured interviews. For the semi-structured interviews, all the 12 members in the second category (library staff) were purposively selected. The sample size for the participants was 12 from all the university libraries because it is

manageable and in the qualitative study, it is necessary to select a sample size that would enable the phenomenon under study to be explored for a better understanding (Creswell 2014; Kusi 2012). Creswell further asserts that selecting a large number of interviewees will result in superficial perspectives and the ability of the researcher to provide an in-depth picture diminishes with the addition of each new individual.

The researcher purposively selected the five university libraries. The stratified sampling technique was used to divide participants from the first category (academic staff) into strata namely; professors, senior lecturers and lecturers, while the simple random sampling technique was used to select samples from the various strata and purposive sampling technique was again used to select all the participants from the second category (OAIR managers)

3.5.4 Sample size

A sample is defined as a set of elements taken from a larger population according to certain rules and the number of people or elements in a sample is regarded as the sample size (Johnson & Christensen 2008:224). The size of the sample used in the study depended on the total number of participants researcher aimed to participate in a study. On the other side, the sample size is determined by how large a sampling error an investigator is willing to accept, and the variability within the population from which the sample is drawn (O'Sullivan et al 2008).

Onwuegbuzie and Collins (2007) add that sample size should be informed by the research objective, research question and research design. Kumar (2019) reported that the sample size is determined by three factors: the level of confidence the researcher wants to test the results, the degree of accuracy the researcher requires to estimate the population parameters and the estimated level of variation to the main variable being studied. The sample size for the participants for the quantitative phase will be 1085 from all the universities. But for the qualitative phase, all the 12 members in the second category will be purposively selected. In this case, Creswell and Plano-Clark (2007:113) suggest that if the study is a survey, sampling error formulas can help identify the appropriate size for the sample.

The study used a statistical power analysis software package known as the Sample Size Calculator of Creative Research System to calculate the sample size for

quantitative data (Creative Research Systems 2003). The confidence level is usually of either 95% or 99%; this states that the probability of including the population mean within the confidence interval (Gray 2009:238). In the study, a confidence level of 95% will be used. According to Gray (2009:238) in many studies, a confidence level of 95% is often deemed sufficient. Kothari (2004:155) also adds that If we take a confidence level of 95%, then we mean that there are 95 chances in 100 (or .95 in 1) that the sample results represent the true condition of the population within specified precision range against 5 chances in 100 (or .05 in 1) that it does not.

To get a sample size of the population of the study area, the sample size formula for sample size calculator was used. The formula is stated as:

$$SS = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice expressed as a decimal
(.5 used for sample size needed)

c = confidence interval expressed as a decimal
(e.g., .04 = ±4)

Confidence interval

The confidence interval (also called the margin of error) is the plus-or-minus figure usually reported in newspaper or television opinion poll results. For example, if you use a confidence interval of 4% and 47% of your sample picks an answer you can be 'sure' that if you had asked the question of the entire relevant population between 43% (47-4) and 51% (47+4) would have picked that answer.

Confidence level

The confidence level tells one how sure one can be. It is expressed as a percentage and represents how often the true percentage of the population who would pick an answer lies within the confidence interval. The 95% confidence level means you can

be 95% certain; the 99% confidence level means you can be 99% certain. Most researchers use the 95% confidence level.

When one puts the confidence level and the confidence interval together, you can say that one is 95% sure that the true percentage of the population is between 43% and 51%. The wider the confidence interval one is willing to accept, the more certain you can be that the whole population answers would be within that range. Putting population size from each university (3439) into the formula should proportionately be as in table 3.4.

Table 3.4 Sample Size for the Study (Quantitative)

Universities	Academic Staff			Total	Percentages (%)
	Professors	Senior Lecturers	Lecturers		
UG	49	70	170	289	27
KNUST	47	75	151	273	25
UCC	42	83	125	250	23
UDS	13	68	148	229	21
AU	3	8	33	44	4
Total	154	304	627	1085	100

Therefore, the sample size for the participants for the quantitative phase will be 1085 from all the universities. But for the qualitative phase, all the 12 members in the second category were all taken. This is presented in table 3.5 below.

Table 3.5 Sample size for the Study (Qualitative)

Universities	Library Staff
UG	3
KNUST	2
UCC	3
UDS	2
Total	12

3.6 Data Collection Methods and Instruments

Data collection refers to the actual process of gathering and recording data which are guided by the process of administering the questionnaire, conducting an interview, presenting a test to individual respondents and recording their responses (Drew, Hardman & Hosp 2008:53). The data collection technique is determined by the chosen research design. After carefully examining the research questions, the type of information the researcher wanted to obtain, the paradigm of the study, the purpose of the study and also related studies, the researcher chose the questionnaire for the quantitative phase and semi-structured interview guide for the qualitative phase as instruments for the study. Garaba (2010) adds that the triangulation of quantitative and qualitative methods ensures that the findings are valid and reliable. The quantitative and qualitative data were collected together, the data collection methods used for the study were questionnaire and interview

3.6.1 Questionnaire

The questionnaire is a data collection tool (Powell & Connaway 2007). Saunders et al (2009:361) add that the questionnaire is the most widely used data collection instrument within the survey research whereby respondents are asked to respond to the same set of questions. The study employed a survey design in which a questionnaire was used to collect quantitative data. The questionnaire is a data collection method or tool that is used to gather information in a wide geographical area, and it is also useful to identify trends or preferences across a large number of people (Lankshear & Knobel 2004:36). The main reasons for employing a questionnaire as a survey tool in the study include:

- a) It is an efficient data collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest (Kripanont 2007),
- b) The questionnaire is considered advantageous for the administration of large numbers of individuals simultaneously to facilitate the collection of data in a relatively short period and thus less expensive and less time consuming (Gray 2009; Kombo & Tromp 2006) and
- c) It is free from bias of the researcher. There is evidence that different researchers obtain different answers because of different ways of asking

questions (Gray 2009; Kothari 2004).

Abbott and McKinney (2013:206) assert that the questionnaire is a cost-effective way to conduct research. Other advantages of the questionnaire include that the fixed format of the tool that eliminates variation in the questioning process, it encourages open and reliable responses; as well as adequate time for participants to give well thought of their answers (Gray 2009; Kothari 2004). Babbie (2011:294) further explains that a questionnaire is useful when it comes to describing phenomena, especially in situations where large population samples are involved.

On the other hand, the questionnaire poses some drawbacks as presented by various authors as follows: Powell and Connaway (2007) mention that the absence of explanations to ambiguous questions, as well as a certain degree of non-responsiveness of respondents, might lead to wrong data or information. Given the limitations, certain preventive measures have been taken to minimize these issues. Many methods of data collection (questionnaire and semi-structured interview) were used in the measures. However, the questionnaire were pre-tested before the main test and the questionnaire was properly designed. Therefore, using the questionnaire and the interview in the data collection for the study reduced some of the limitations.

3.6.1.1 Questionnaire design

Kumar (2019) explains that a well-designed questionnaire will make it easy for respondents to provide the details they need and for the interviewer to properly record the response. A well-designed questionnaire thus allows a researcher to achieve the research objectives (Powell & Connaway 2007). To design a suitable and reliable data collection questionnaire, the researcher must concentrate on four aspects of questionnaire design including focus, phraseology, sequence and question form (Kothari 2004).

Ndunguru (2007:94) adds that a well-focused questionnaire is the one whose questions answer all the different aspects of the research problem sufficiently and in precise detail. The questions asked must, in other words, be relevant to the research topic. The study, therefore, used the research objectives, research questions and research models to establish a robust questionnaire layout to ensure that a well-focused questionnaire was developed.

The study maintained a consistent sequence of questions to ensure that respondents were readily aware of the relationship between one question and another. Initially, questions that were the simplest were posed to allow the participants to proceed with the other questions. Kothari (2004:102) adds that a correct sequence of questions greatly reduces the likelihood of misunderstanding individual questions. Therefore, to create a better and more accurate questionnaire, a researcher must review relevant questions or items from previous studies to be included in the questionnaire design.

In the study, the questionnaire was used to collect data in the quantitative phase. It had eight parts, Part 1 contained questions on background information about the academic staff. Specifically, Part 2 asked questions on awareness of OAIR, Part 3 on perceptions of OAIR, Part 4 on content archiving of OAIR, Part 5 on the usage of OAIR, Part 6 on challenges of OAIR, Part 7 on strategies for the usage of OAIR and Part 8 on recommendations for usage OAIR in university libraries.

3.6.1.2 Structure of the questionnaire

The layout of the questionnaire relates to the order and design of the questions used by the researcher. The questionnaire consists of several questions (Flick 2011; Kothari 2004) typed and printed in a definite order. The order of the questions must be answered in sequential order and the accuracy of the answers must be affected. Powell and Connaway (2007) recommend that a questionnaire should start with more general questions that put the respondent at ease, followed by more specific questions. A researcher must, therefore, make a lot of effort to have questions that respondents can answer easily.

Kothari (2004:102) adds that when preparing the questionnaire, a researcher should pay attention to the sequence of questions when preparing the questionnaire to make the questionnaire more successful and to ensure the reliability of the answers obtained. Also, the questionnaire includes two main forms of questions that are closed-ended questions and open-ended questions (Kothari 2004). Closed and open-ended questions as used in the study are the following sections.

Closed-ended questions

Closed-ended questions comprise questions that provide several alternative responses that asked respondents to choose fixed answers or organized questions (Saunders et al 2009:588). A single choice, multiple choice or rating system can be the answers to closed questions (Connaway & Powell 2010). Questions based on closed questions must have two possible answers that are either “Yes” or “No” (Kothari 2004), while the second type is where multiple answers can be selected as needed.

Emphasis was placed on the fact that the researcher must have a clear definition of the objectives of the study before being able to ask the relevant research questions, and these require clarity and consistency in the questions used in the questionnaire. Therefore, to collect quantitative data was to use closed-ended questions. Since people’s opinions were sought, the type of scale used needed to be accurate, such as the Likert scale (Leedy & Ormrod 2010). The questionnaire design used in the study was based on a frame form of a Likert scale that is useful for attitudes measurement (Powell & Connaway 2007). The Likert scale is used to indicate how strongly respondents agree or disagree with a claim (Saunders et al 2009:594); thus, the Likert scale was used as a fitting scale for the design of the questionnaire used in the study.

Powell and Connaway (2007) may use a Likert scale type of frame to design the questionnaire, as it is useful and more applicable to measuring attitudes (Powell & Connaway 2007). The Likert type scale is also referred to as a summation scale and is built using the item analysis approach, whereby a particular item is measured based on how well it discriminates between those people whose total score is high and those whose score is low (Kothari 2004).

The main objective of the Likert scale was to develop strategies for enhancing service or action, or to formulate policy and to promote attitudes on different aspects of the issue under study (Kumar 2019). This analysis used the Likert scale, which was based on the five-point scale proposed by Kothari (2004) with the following attitudes: “strongly agree”, “agree”, “positive”, “disagree” and “strongly disagree”. All parameters had similar values and the weights of the choices were equal.

Open-ended questions

Open-ended questions allow respondents to provide answers based on their own words and what they think about the particular issue (Saunders et al 2009:597). This can help the researcher get in-depth information and a clear picture of the study from the respondents; a researcher can therefore, create more research sub-questions based on the views, ideas and opinions of the respondents about the study (Ellis 2013).

Open-ended questions may also encourage participants to use their own words to provide answers and to more accurately identify and describe a specific situation or event (Powel & Snellman 2004:128; Saunders et al 2009:337). O'Sullivan et al (2008) suggest that open-ended questions reduce bias because they are followed by a list of responses that can initiate, provide richer details and provide detailed comments to help a researcher define a range of possible responses. Respondents may also have the opportunity to clarify their responses (O'Sullivan et al 2008). To collect both quantitative and qualitative data, the present study used both close-ended and open-ended questions.

3.6.1.3 Length of the questionnaire

To encourage complete answers, the questionnaire should be as short as possible. This statement is supported by a study by Galesic and Bosnjak (2009:349) in the cabinet-making industry which found that the longer the reported size, the fewer respondents began the questionnaire and completed it. Adams and Cox (2008:19) note that the attention spans of people make it less reliable to complete a long questionnaire as people rush to complete them. They also continue to explain that long questions discourage respondents from reading the questions carefully and, as a result, there is a strong propensity to provide incorrect answers.

3.6.1.4 Administering the questionnaire

Before stepping out for data collection, permission letters and ethical clearance were obtained from the Department of Information Studies and the College of Human Sciences respectively. This was presented to the various registrars of the selected universities to seek permission to carry out the study in their universities. Also,

appointments were booked with the academic staff as well as the library staff of the universities as to when they would be available for the researcher to contact them after being granted permission. Positive feedbacks were given and the days and dates were fixed for the collection to commence; AU was on 10th to 15th December 2018, KNUST was on 7th to 12th of January 2019, UCC was on 21st to 26th of January 2019; UDS was on 28th January to 2nd February 2019 and UG was on 4th to 9th February 2019.

Distribution of questionnaire

Questionnaire can be distributed by traditional mail, using the postal system or by e-mail. The questionnaire can be distributed online by post or by physical means. According to Powell and Connaway (2007), online questionnaire encourages faster data collection because it will be fairly easy to collect and analyse data in a short space of time; however, it depends on the availability of the Internet for researchers and participants.

Also, the postal questionnaire may take time to reach respondents and are expensive in terms of postage and printing costs. Nevertheless, the postal questionnaire may allow a researcher to gather data from a large sample and a variety of regions. There is no opportunity for respondents to ask for additional information on the answers provided (Kombo & Tromp 2006:89). Saunders et al (2009) list factors that help to increase the response rate of a postal questionnaire, including sending an introductory letter explaining the purpose of the questionnaire and emphasizing the significance to the respondents.

In the study, the researcher was present at each university physically to handle the questionnaire to respondents. The researcher and colleagues presented them physically to the selected university respondents. Distributing the questionnaire personally offered the researcher the opportunity to explain to the respondents in detail how to respond to the items on the questionnaire. Based on the approved dates for the data collection to begin, the researcher followed exactly the said dates for the data collection process to begin. Administering the questionnaire was done with the help of some colleagues already working at various universities, this took two (2) months. The first week was for AU, the second week was for KNUST, the

third week was for UCC, the fourth week was for UDS and the last week was UG.

Collection of the administered questionnaire

The researcher, then, left the questionnaire with the respondents for not more than a week, after which the filled questionnaire were collected from the respondents. This phase was when the administered questionnaire were collected from all the respondents in the five (5) universities. The collection of the questionnaire was also done with the help of colleagues as the respondents were told to leave the questionnaire with them or the University Librarian.

3.6.2 Interview

The interview is a method of gathering qualitative data that includes interpersonal communication in which one person has a researcher role (Gray 2009). The interview is a data collection process that involves providing verbal oral stimuli to be implemented in terms of verbal responses (Kothari 2004; Saunders et al 2009). Using interviews can help a researcher obtain valid and reliable research-related data (Saunders et al 2009:318). Interviews generally start with some defined questioning plan, but a more conversational style of an interview may see questions answered in a natural order to the flow of the conversation. The driving force of qualitative research is to dig deep, tell the story and not hold back.

3.6.2.1 Structure of interviews

The interview is essentially a qualitative data collection technique that, depending on the intent of the interview, sees the interviewer guiding the communication and inquiry in a very structured or unstructured way (Denzin & Lincoln 1994:365). Interviews are in many ways; however, semi-structured interviews were used in this analysis. Semi-structured interviews are used to collect data across a wide range of study designs and are mostly related to the collection of qualitative data when the researcher is interested in the experiences attitudes and understandings of people (Matthews & Ross 2010:221).

The semi-structured interview process was used to elicit emotions, feelings and reveal honesty and truth. A semi-structured interview gave participants a feeling of comfort and accessibility (Creswell 2013). This made all participants share some

deep emotional information and provided data of immense value to the researcher. Semi-structured interviews offer guidelines for focusing interviews and encouraging cross-case analysis while also providing space for addressing new and relevant topics that surface during the interview (Carson, Guilmore, Perry & Gronhaug 2001).

A researcher explores those themes or questions in greater depth and also explores any new areas when they surface during the interview (Glesne & Peshkin 1992:65), but the order of questions can vary depending on the flow of conversation and additional questions may be needed to discuss research issues and research objectives (Saunders et al 2009:320). Using the concise method allows for more clear and efficient test questions and lets the researcher understand when something significant has been said (Carson et al 2001).

Besides, specific questions may be needed in semi-structured interviews to discuss research questions and objectives given the context or nature of events within a particular institution. For example, if a question on the previous question has already been answered and the researcher is satisfied with the answers given, the same question could not be asked again.

On the other hand, the interviewer may ask emerging questions that have not been mentioned in the interview guide to explore answers for clarity or to obtain more information on the answers; however, it is suggested that the question be within the context of the research objectives. Saunders et al (2009:320) report that, given a specific institutional context to the research topic, a researcher can omit, add and edit some of the questions, in particular interviews.

Advantages and disadvantages of semi-structured interviews

A semi-structured interview is very flexible and information that the researcher had not intended to ask for but that is useful for the analysis is likely to be given (Bryman 2004:321; Leedy & Ormrod 2010:137). Matthews and Ross (2010:224) note the following benefits of semi-structured interviews: the use of an informal interview guide will allow the study respondents to address their experiences in their way; the semi-structured interview format will enable the researcher to talk in detail to the respondents and to examine specific issues relevant to the study and face-to-face interviews that enable the respondent to respond.

However, participants do not need special skills, and because the interviewer is physically present, a longer session with more complex questions is possible without misunderstandings. This physical presence also enables non-verbal stimuli and spontaneous responses to be documented (Payne & Payne 2004:132), while simultaneously performing non-participant observations. Interviews of respondents can also be relaxing and thus aid in recall (Fontana & Frey 2005:705).

There are several limitations to semi-structured interviews. During interview sessions, the researcher may receive different information from different respondents and may not be able to make comparisons between respondents; thus, the results obtained cannot be generalized (Leedy & Ormrod 2010:137). This is attributable to open-ended questions (Creswell 2003:186; Patton 2002:306; Payne & Payne 2004:132) in terms of data collection, reporting, etc. Notwithstanding the researcher being in charge, fieldwork is difficult to organize; thus, the researcher cannot know all that is going on (Payne & Payne 2004:132-133).

Lack of skills and language barriers may also prevent the interviewer from asking questions that elicit respondents' long narratives (Marshall & Rossman 1999:110). Results from the interview are also subject to recall error, interviewer reactivity, and self-serving answers (Patton 2002). Also, the respondents can provide the researcher with indirect knowledge that may deceive. The involvement of a researcher may be biased, and people may not be equally articulate and perceptive (Creswell 2003). To direct this method, an interview guide has been created. Mason (2002) maintains that the interview guide allows the interviewer to match the questions with the objectives of the study.

3.6.2.2 Interview guide design

In designing the semi-structured interview guide, the researcher's prime aim is to collect data that would answer the research questions. Therefore, sets of questions relating to the central issue in each of the research questions were stated to elicit the desired responses and opinions of the participant. The interview guide contained questions on the usage of OAIR in university libraries. It contained specifically asked questions on awareness of OAIR, perceptions of OAIR, content archiving of OAIR, usage of OAIR, challenges of OAIR, strategies for the usage of OAIR and

recommendations. Kusi (2012) stated that employing this approach enables the researcher to ensure that all his or her research questions are answered.

The study employed an interview guide that includes a list of questions arranged according to research objectives. Welman, Kruger and Mitchell (2005:166) assert that an interview guide used in semi-structured interviews must comprise a list of themes that are contained in the research objectives and questions that the interviewer should use during the interview. The interview guide starts with opening questions, then introduction questions, transition questions, key questions and ending questions in that order.

3.6.2.4 Conducting the interview

The face-to-face interviews were conducted, using a semi-structured interview guide. The interview was recorded using an audio recorder and by writing some of the responses given by the interviewees. The researcher conducted the interview and spent an average time of 30 to 40 minutes for each OAIR manager or administrator. The introductory part of the interview was the explanation of the objectives of the study. The interview was conducted in the offices of the OAIR managers or administrator. The respondents for the interview were twelve (12) OAIR managers selected from the five (5) universities.

3.7 Data Analysis and Presentation

Data analysis in a mixed methods research requires knowledge and techniques used in quantitative and qualitative data analysis. This may include the understanding of the meaning and functions which may be allocated to the data. The review was carried out based on the research questions that were set for the study. Descriptive and inferential analysis were employed for the quantitative phase of the study and the qualitative phase of the study.

3.7.1 Quantitative data analysis

Quantitative data are collected in numeric form (Chireshe 2015). Quantitative data refer to all such data that can be a result of all research techniques ranging from simple counts like occurrence frequency to more complex data such as test scores (Saunders et al 2009:414). We need to be evaluated and interpreted to make

quantitative data more useful. Therefore, quantitative data analyses follow these steps:

3.7.1.1 Organising quantitative data for analysis

Kombo and Tromp (2006) add that organising quantitative data for analysis include: gathering data from a questionnaire, checking for data incompleteness and accuracy and ignoring or removing those data that do not make any sense. Creswell (2009:151) recommends the following research tips for data analysis process;

1. Report information on the number of members of the sample who did and did not return the questionnaire,
2. Discuss the method by which respondents bias will be determined, that is the effect of non- responses on the survey estimates,
3. Discuss a plan to provide a descriptive analysis of data,
4. Identify the statistics and statistical computer programme for testing the major inferential research questions and
5. Present the results in tables or figures.

Chireshe (2015:109) adds that this type of data analysis uses statistical methods to describe, summarise, and compare data. On the other hand, Fowler (2014:127) highlights that the analysis of quantitative data involves the following steps:

1. Designing the code (the rules by which a respondent's answers will be assigned values that can be processed by machine),
2. Coding (the process of turning responses into standard categories),
3. Data entry (putting the data into computer-readable form) and
4. Data cleaning (doing a final check on the data file for accuracy, completeness and consistency).

Two basic errors that typically occur during this procedure are coding decision errors and transcription or entry errors (Bryman 2012; Fowler 2014). These errors occurred in the study, coding decision errors were corrected on the questionnaire and entry error on the computer.

3.7.1.2 Quantitative data analysis

Quantitative data analysis is a process of identifying, summarizing and analyzing information using statistical methods (Creswell & Plano-Clark 2011:206; Polit & Beck

2003:729). The main objective of quantitative data analysis is either to explain a hypothesis or to check causal inferences, to forecast them (Ahlquist 2010). In the study the scale used was as follows: Strong Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strong Agree (5).

The quantitative data obtained was compiled and processed, using descriptive statistics and inferential statistics, which were assisted by SPSS. Specifically, Tables 5.1 through 5.22 was analysed using mean score; where decision-making was based on the test value; which is 3.0. Consequently, the test value for this five-point Likert scale was rated from five (5) through to one (1) in that order and are calculated thus:

$$\text{Test Value } (\bar{x}) = \frac{5+4+3+2+1}{5} = \frac{15}{5} = 3.0$$

Therefore, a test value of 3.0 was the benchmark for acceptance or rejection of statements. Hence, any mean score (x) that was equal to or greater than the test value was accepted or otherwise rejected. Finally, this formula was used to obtain the individual mean score (x) of the variables.

$$\text{Mean Score } (\bar{x}) = \sum_{i=1}^n \left(\frac{F_i X_i}{f_i} \right)$$

Where:

PC = Population Concerned, TP = Total Population, F_i = frequency of variable, x_i = variable, n= number of variables, S = sigma (summation)

The total mean scale was used to determine how the five-point scales explain the results obtained. Graphs and tables were used to present the summary of the quantitative data (Babbie and Mouton 2001:458). Mean scores 'between' 3.0 to 3.6 were ranked as low, 3.7 to 4.2 were ranked as medium and 4.3 to 5.0 were ranked as high. Also, between 50% to 66% percentage scores were ranked as low, 67% to 84% were ranked as medium and 85% to 100% were ranked as high.

Two main techniques of data analysis namely descriptive and inferential analysis were employed using SPSS and AMOS. The choice of this software was based on its high descriptive and inferential statistical power for analysing quantitative data. SPSS enables the input of raw data, modification and organisation of data to carry out a wide range of simple and statistical analyses (Blaxter, Hughes & Tight 2010).

Data obtained for the study were coded and organised into data files with the help SPSS programme. The software has been widely applied by many scholars specifically in technology acceptance and user studies (Pelizzari 2003), and therefore considered suitable for the study as well.

3.7.1.3 Descriptive analysis

In the study, descriptive data analysis was used to address the entire research objectives. Frequencies, percentages, means and standard deviation were employed for the study. Kripanont (2007) adds that descriptive statistics have many benefits including describing the characteristics of the sample, checking variables for any violation of the assumptions underlying the statistical techniques used and addressing specific objectives.

3.7.1.4 Inferential analysis

The inferential analysis makes inferences and predictions about a population based on a sample of data taken from the population in question. According to Harlow (2006), using inferential statistics allows rich and realistic research designs to enable researchers to understand the complex relations among the variables being studied. The inferential analysis was adopted to investigate the usage of OAIR in university libraries. However, in the study, multinomial logistic regression, measurement model, Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were employed.

Multinomial logistic regression

Multinomial logistic regression is the regression analysis to conduct when the dependent variable is nominal with more than two levels. Multinomial logistic regression is a predictive analysis used to explain the relationship between one nominal dependent variable and one or more independent variables. Multinomial logistic regression was used to explain the relationship between the respondent's background information and usage of OAIR as well as deposits in OAIR in university libraries in Ghana. Using a very small size as the reference can be a problem. When sample sizes are very unequal in the categories, which is very common for naturally occurring groups. It makes sense to just use the largest category as the reference. Therefore, the largest category was used as the reference category in the analysis.

Measurement model

The measurement model is used to explain the relationships between measured items (variables) and latent variables and is assessed in terms of construct validity (Stoelting 2002). The conceptual framework was measured to see if it fits the study. Six constructs to be measured were identified, if they will enhance the intention to use the framework to enhance the usage of OAIR in university libraries in Ghana that include: accessibility, availability, visibility, user satisfaction, intention to reuse and usage benefits. AMOS was used to test the measurement model. There are more than a dozen different fit statistics researchers use to assess their measurement models and structural models. Kline (2015) and Cornell University Statistical Consulting Unit (2017) suggest that the minimum set of fit statistics that should be reported are Model Chi-square (χ^2/df), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Root Mean Square Residual (RMR), Adjusted Goodness of Fit Index (AGFI) and Normed-Fit Index (NFI). These six fit statistics were used for the study

Confirmatory factor analysis (CFA)

Confirmatory Factor Analysis (CFA) was conducted to examine the reliability and validity of the measurement model employed in the study. Three criteria were used to assess the measurement model namely, Reliability (R), Composite Reliability (CR) and Average Extracted Variance (AVE). Reliability according to Hair, Black, Babin, Anderson and Tatham (2010) is an assessment of the degree of consistency between multiple measurements of a variable. CR assessed the internal consistency of the model. The recommended criteria for composite reliability are 0.70 or above (Hair et al 2010). Also, AVE was used to assess convergent validity (O'Leary-Kelly & Vokurka 1998:399). The recommended thresholds for CR could be 0.70 or above, and an AVE of more than 0.50, then construct internal consistency is evidenced (Hair et al 2010).

Structural Equation Modeling (SEM)

In the study, the same set of fit statistics was used to observe the structural model. The standardized path coefficient indicates the strengths of the relationships between the independent and dependent variables. The p-value represents the statistical effect the independent variables have on the dependent variables and the

total, direct and indirect effect of variables was also reported.

3.7.2 Qualitative data analysis

Data analysis in qualitative research consisted of preparing and organizing the data (i.e. text data as manuscripts, or image data as in photographs) for analysis, then reducing the data into themes through a process of coding and condensing the codes, and finally representing the data in figures, tables or discussion (Creswell 2013). The qualitative data were analysed using thematic analysis.

Thematic analysis is a widely used qualitative data analysis method. Thematic analysis is an analytical process which requires working with data, organising them, breaking them into manageable units, coding them, synthesizing them and searching for the pattern (Merriam 2002; Wright 2013). According to Braun and Clarke (2006:79), it is a qualitative analytic method for identifying, analysing and reporting patterns or themes within data. It minimally organizes and describes your data set in detail. However, frequently it goes further than this and interprets various aspects of the research topic.

The audio-recorded interviews collected for the study were transcribed verbatim. Both audio and transcribed files were stored in a computer database. These were read and coded manually, keywords and themes emerged from the data were grouped and classified as guided by the research objectives. Then thematically analysed, for instance, the statement below represents interviewee from the University of Education, Winneba on comment on measures to resolve the challenges that hinder the usage of OAIR during the pretesting of instruments.

There should be a national policy on OAIR in the country and the level of awareness should be intensified.

Furthermore, to attribute comments to the interviewee from UG, KNUST, UCC, UDS and AU were assigned some serial codes. For example, UG Participant-1 was UGP1 and UG Participant-2 was UGP2. The rest were UGP3 KNUSTP1, KNUSTP2, UCCP1, UCCP2, UCCP3, UDSP1, UDSP2, AUP1 and AUP2.

3.8 Reliability, Validity and Trustworthiness

Reliability and validity are of primary concern for data quality control measures in research (Ndunguru 2007:89). Reliability and validity help a researcher to establish the truthfulness, credibility and believability of findings (Gray 2009; Neuman 2006). The following sections explain how validity and reliability trustworthiness were maintained in the present study.

3.8.1 Reliability

Reliability refers to the consistency or stability of the test scores (Gay, Mills & Airasian 2009; Hair et al 2010; Johnson & Onwuegbuzie 2004). This means that the assessment tool would yield the same or almost the same scores any time it is administered to the same individual or group. Reliability refers to the degree to which outcomes are consistent and reliable in the measurement system (Ndunguru 2007:89; Sekaran 2003:203). Sekaran (2003) adds that the consistency of the measure reflects the degree to which it can occur without bias (error-free) and, therefore, guarantees accurate measurement over time and across different parts of the instrument. Similar results would be observed if the same study were to be carried out or replicated in a similar context or circumstances on a similar group of respondents (Babbie & Mouton 2001; Gray 2009; Newman 2006; Welman et al 2005).

The accuracy of the quantitative method is synonymous with dependability consistency and replication over time, instruments and groups of participants (Cohen, Manion & Morrison 2007; Leedy & Ormrod 2010). Reliability in quantitative terms also refers to the degree to which the experiment, test or measurement yields the same outcome or reliable measurement in repeated trials (Cohen et al 2007; Silverman 2006; Welman et al 2005).

The reliability of measurements in quantitative research is accomplished in four ways; clear conceptualize designs, use of precise measurement levels, use of multiple indicators and use of pilot tests (Newman 2006). On the other hand, qualitative approach accuracy is achieved through a variety of data sources and use when multiple measurement approaches are used (Newman 2006).

In terms of qualitative research, whether or not alternate researchers should report similar information is concerned with reliability (Silverman 2006). The reliability of the qualitative approach is addressed in two ways: through the use of systematic methods for writing field notes and preparing transcripts, and by comparing the study of the same data by several researchers in the case of interviews and through textual studies (Silverman 2006).

It is estimated that Cronbach's alpha is the most commonly used method of measuring an instrument's internal consistency (Kimberlin & Winterstein, 2008). Kimberlin and Winterstein (2008) indicated that they were used for summed scales or Likert scale items. Since the questionnaire were primarily Likert scale style and the author wanted to estimate the internal consistency of the instruments, Cronbach's alpha was considered the best tool for estimating the reliability of the instrument. The Cronbach's alpha has a correlation coefficient ranging from 0 to 1. The closer a reliability coefficient value is to 1, the more reliable the test, while the closer the reliability coefficient value is to 0, the less reliable the test (Gay et al 2009).

3.8.2 Validity

The idea of validity hinges on the extent to which research data and the methods of obtaining the data are deemed accurate, honest and on target. Validity is defined as the appropriateness of the interpretations, inferences, and actions that we make based on test scores (Johnson & Onwuegbuzie 2004:140). They suggested that, in ensuring validity, one must ensure that the test measures what it is intended to measure, for the particular group of people and the particular context, and also the interpretations that are made based on the test scores are correct.

As a result, Hair et al (2010) opined that validity refers to how well the concept is defined by the measure. In practice, the validity of an instrument is measured as to how much evidence can be produced to support the claim that the instrument measures the attributes targeted in the proposed study (Berg & Coetzee 2014). Validity is the degree to which the findings of the study accurately represent what happens in the real situation (Leedy & Ormrod 2010; Saunders et al 2009; Welman et al 2005). Validity tests how well an established instrument calculates its specific

content (Gray 2009; Leedy & Ormrod 2010). Validity means truthfulness (Newman 2006).

Validity in quantitative research is more concerned with the accuracy of measurements. Measurement validity refers to the extent to which the empirical indicator and the conceptual meaning of the construct that the indicator is to measure fit together (Newman 2006:192). Diligent screening, correct instrumentation and appropriate statistical data treatment can maximize the validity of the quantitative approach (Cohen et al 2007:133).

Many researchers have suggested different ways of reducing validity in quantitative research (Cohen et al 2007; Onwuegbuzie & Johnson 2006; Shadish, Cook & Campbell 2001). For instance, Onwuegbuzie (2003) presented 50 different internal and external validity threats that could arise during research design or data collection and quantitative research process and data analysis phases. Some of the threats are sampling bias, history, experimenter effect, Hawthorne effect, testing effect, situation effect and aptitude treatment. According to Shadish et al (2001), validity is divided into four main steps; statistical conclusion, internal, construct and external validity. Validity guarantees reliable and concrete inferences based on data obtained. Experts must analyse the objects of the instrument and determine their representativeness (McMillan & Schumacher 2010).

3.8.3 Trustworthiness

Onwuegbuzie and Leech (2007:233) suggest that while the value of validity among quantitative researchers has long been recognized, this definition has been a contentious issue among qualitative researchers. Nonetheless, Romm (2014) argues that speaking about validity in qualitative research is still important as long as the concept is reworked to do justice to the distinctive features of what qualitative research provides. As a result, the term “validity” has usually been replaced by the term trustworthiness (Onwuegbuzie & Johnson 2006:51) or validation within qualitative research due to the correlation with the quantitative conceptualization of the research process (Creswell 2007:207).

Pickard (2007:139) argues that in qualitative research, trustworthiness is important because it gives a researcher the credibility of the investigation in terms of problem solving and solution testing. Therefore, a researcher needs to be familiar with the environment in which the analysis will be performed to demonstrate trust. The trustworthiness or goodness of qualitative research was derived from natural and experimental sciences for directions (Marshall & Rossman, 1999). Marshall and Rossman (1999) put forward alternate structures used to capture the trustworthiness of qualitative research, including credibility reliability conformity and transferability. The definition of trustworthiness in the qualitative method is largely based on its ability to demonstrate both the rigour (in the data collection process) and the validity of the results of the study (Ellis 2013).

Marshall and Rossman (1999) report that trustworthiness can be achieved in qualitative research through sustained field participation, continuous observation, shared information and analysis with participants' peer debriefing and multiple conceptual lenses. Therefore, the researcher conducted semi-structured interviews in the study to study the problem in-depth and to share with participants' information and interpretations. Various methods used in this research to ensure the validity and reliability of the study findings included pre-testing techniques for data collection, triangulation, sampling adequacy and saturation and CFA for measuring model.

3.8.4 Pre-testing the instruments

Pre-testing provides an opportunity for the researcher to recognize questionnaire or interview instructions that are misunderstood by respondents and may prevent the researcher from obtaining the information needed (Powell & Connaway 2007; Sekaran 2003). The pre-test aims to increase the reliability, validity, trustworthiness and practicality of the instrument (Cohen et al 2007; Ngulube 2005; Powell & Connaway 2007). Pretesting includes using a limited number of participants to assess the suitability and interpretation of the questions (Sekaran 2003:249).

In general, pre-test subjects do not need to include a representative sample, although the instrument used should be important to the participants at least (Babbie & Mouton 2001:244). In this review, according to various guidelines, a questionnaire and a semi-structured interview guide were prepared (Cohen et al 2007; Bryman

2004; Leedy & Ormrod 2010; Newman 2006; Patton 2002; Welman et al 2005). The resources were, therefore, given to information science PhD students for their feedback and comments to boost face validity.

To further refine the questionnaire and interview guide, the supervisor and experts in the UCC Library went through each item on the questionnaire and interview guide to evaluate their relevance to the objectives of the study. For supervisors and other experts, additional sheets of paper were added to the questionnaire to provide feedback on transparency, shortcomings, inadequacies, ambiguities, and problems on all aspects of the products in the instrument. As a result of these remarks, statements considered vague or misleading or redundant for clarification were either deleted or revised.

The refined instruments were pretested at UEW for the main study. The recommendations of these specialists were then used to improve the instrument before the pre-test. Pretesting of instruments was conducted in November 2018. The instrument was pretested at the University of Education, Winneba. The campus was chosen for the pilot exercise because it shares similar characteristics and the situation there was no different from that of the five selected universities. The pilot was conducted with twenty (20) academic staff and three (3) library staff for quantitative and qualitative study respectively. The comments of the participants were considered before the actual interview data collection began. Pilot testing was carried out on the instruments to determine their appropriateness before they were used for the main study.

The pre-test was done to identify questions on the questionnaire and interview guide that respondents might have difficulty understanding or interpreting as intended. This was done to ensure that instructions and questions on the items were clear and also devoid of ambiguous and misleading items. Again, those that were not related to the research questions were corrected before the final administration. Despite the pre-testing, other attempts that were taken to ensure that the results were valid and reliable were;

1. Heading (date, interviewer and interviewee) for all instruments used,
2. Instructions for the interviewer to follow so that standard procedure are used,

3. Well-designed questions,
4. Probes for the questions,
5. Space between questions to record responses (for the interviews),
6. A final thank you statement to acknowledge the time the interviewee spent during the interview.
7. Ensuring that data and computer programmes are secure, including the use of encrypting techniques to prevent unauthorised access so that no one can tamper with the data collected before and after the analysis.

3.8.5 Data screening and examination

For data screening and examination Exploratory Factor Analysis (EFA) was used. EFA was used to condense several statistical measures into a small set of factors (latent variables) with minimal information loss. In this regard, by using SPSS version 21, 998 datasets used in this analysis are coded and analysed. To test the existence of outliers, Z score (standardization of values) was used. On the other hand, measuring Cronbach's alpha assessed the reliability of the variables.

The Cronbach's alpha value obtained from SPSS was .890 (number of items =104). Therefore, the instrument was judged to be reliable and acceptable for collecting useful data for the study. To determine the reliability of the sub-section on the questionnaire, Cronbach's alpha was computed for each of the variables (basically on the conceptual framework). Table 3.6 shows the reliability of the variables measured in the questionnaire.

Table 3.6 Reliability Coefficient for Each of the Variable

Variables	Reliability Coefficient (α)
Accessibility	.893
Availability	.962
Visibility	.813
Intention to reuse	.852
Satisfaction	.827
Usage benefits	.891

Source: Kodua-Ntim (2018)

3.9 Evaluation of the Research Methodology

Research methods should be evaluated to understand what data were needed, how they were obtained and analysed (Ngulube 2005:139). Evaluation of research methods, according to Willig (2001), ensures that the research methods are suitable for research questions and consistent with the form of knowledge that the analysis aims to produce. In evaluating the research methodology, the study examined some issues including the suitability of data collection methods, the successes and difficulties experienced during data collection, how the study resolved the difficulties and whether the author recommended this approach for future research in a similar field.

The studies of Achieng (2015), Makori et al (2015) and Tapfuma (2016) on OAIR employed the mixed methods research approach combining quantitative and qualitative approaches. The studies also used the survey research design to gather and analyse both qualitative and quantitative. The study adopted a similar methodology but used differently, with the help case study design and convergent parallel mixed methods design was used to obtain a deeper understanding of the research problem.

The study used a mixed methods research approach in which both quantitative and qualitative data are obtained. While the interview guide was used to gather qualitative data, the questionnaire was used to gather quantitative data. The use of mixed methods specifically convergent parallel mixed methods design allowed the researcher to triangulate the methods (quantitative and qualitative), resulting in rich data sets and increasing the reliability and validity of the findings of the study. As argued by Creswell (2009), Jupp (2006) and Neuman (2014), triangulation helps a researcher to make the most of the strengths of different methods of research while minimizing the weaknesses of the same methods of research.

Furthermore, Romm and Ngulube (2014) note that mixed methods research as conceptualized by Creswell (2013) has been designed to ensure the reliability and validity of quantitative measures even though they may be used in qualitative studies. The author was able to collect data from different sources by using a mixed methods research approach and offered definitions and interpretations that would not have been possible if a single method had been used. Bryman (2006) indicates

that a mixed methods research approach will mitigate the shortcomings of each approach while building on strengths, thereby providing better and more precise interpretations. The study was conducted in five universities to investigate the usage of OAIR in university libraries in Ghana to ensure the transferability of the findings. The result of the study is expected to be applicable and used in other academic libraries (both private and public) in the country and outside the country.

The researcher physically visited all the research sites; the problem observed in some of the research sites was that some of the respondents were not in their offices but at lecture rooms during the visits. Despite the problem faced during data collection, respondents were ready to co-operate and answered all of the questions asked. Generally, the mixed methods research encouraged high levels of critical thinking so that processes and resources were appropriate and conclusions based on supporting evidence where both quantitative and qualitative research methods were used. The study thus recommends that future researchers use mixed methods research design when they are conducting studies investigating the usage of OAIR in university libraries.

3.10 Chapter Summary

In this chapter, the research methodology of the research was outlined and situated within a mixed methods research. The research paradigm, research approach, research design, population, sampling procedure and methods, data collection procedure and methods, data analysis and evaluation of the research methodology were discussed in this chapter. The questionnaire and interview were chosen for data collection. The convergent parallel mixed methods design enabled the study to gather both quantitative and qualitative data and to check for the accuracy of the data gathered by each method.

Quantitative data analysis techniques using descriptive and inferential methods and qualitative data analysis techniques using thematic analysis were adopted in the study. In addition to that, reliability, validity and trustworthiness issues were critically considered in ensuring the credibility of the research findings. Data collected in the study completely addressed the research objectives and questions. In the next

chapter, the responses of the research participants to the questionnaire and interviews were presented.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS OF THE STUDY

4.0 Introduction

This chapter presents the results of the quantitative and qualitative findings from the usage of OAIR in university libraries in Ghana to suggest a strategy for the usage of OAIR in university libraries in Ghana. According to Bryman (2016:329), data analysis is the management, analysis and interpretation of the data. Analysed data helps the researcher to draw conclusions and therefore to answer the research questions. Given the observation by Creswell (2014:273) that the description of convergent parallel mixed methods design, questionnaire and interview databases are analysed independently and compared side by side in the discussion.

Descriptive and inferential statistics were used to analyse the quantitative data and thematic analysis was used for the qualitative analysis. Descriptive statistics consist of frequencies, percentages, means and standard deviations. Inferential statistics, on the other hand, consist of multinomial logistic regression and Confirmatory Factor Analysis (CFA), using Structural Equation Model (SEM). The findings in the chapter have been divided into two parts, the first part is the quantitative analysis of data while the second part is the qualitative analysis of data. The division prioritizes the methods equally and keeps the strands independent during analysis (Creswell & Plano Clark 2011:70). The analysis was done based on the following research questions:

1. What is the level of awareness of OAIR in university libraries in Ghana?
2. How is OAIR perceived in universities in Ghana?
3. How are contents of OAIR archived in university libraries in Ghana?
4. What is the level of usage of OAIR in university libraries in Ghana?
5. What are the challenges with the use of OAIR in university libraries in Ghana?
6. What are strategies to enhance the usage of OAIR in university libraries in Ghana?

4.1 Findings from Quantitative Analysis

4.1.1 Response rate

As noted in Chapter Three precisely section 3.5.4, on sample size the total number of academic staff from the five universities was three thousand four hundred and thirty-nine (3439) out of which one thousand and eighty-five (1085) participants were randomly selected for the quantitative study. Specifically, out of the total number of one thousand and eighty-five (1085) respondents selected for the study, nine hundred and ninety-eight (998) respondents completed the questionnaire distributed face to face, given a response rate of 91.98% as presented in table 4.1 below. Bryman (2012:235) noted that a response of 60-69% is more acceptable while a 50% relative rate is barely acceptable.

Table 4.1 Response rate of questionnaire in universities

Universities	Questionnaire Distribution (N=1085)	Response Rates (N=998)
UG	289(27%)	260(26.1%)
KNUST	273(25%)	250(25.1%)
UCC	250(23%)	231(23.2%)
UDS	229(21%)	216(21.6%)
AU	44(4%)	41(4.1%)

Source: Field Survey, 2019

4.1.2 Statistical analysis of background information

The first section of the questionnaire was designed to elicit personal information from the respondents. It was relevant for determining the level of usage of OAIR and analysing the study findings. The demographic data on respondents' university, academic rank, gender, age, number of years of service and subject area is presented in Table 4.2 below using frequencies and percentages.

Table 4.2 Background information of respondents (questionnaire)(N=998)

Background Information		Frequencies	Percentages
Universities	UG	260	26.1
	KNUST	250	25.1
	UCC	231	23.1
	UDS	216	21.6
	AU	41	4.1
Rank	Professor	80	8.0
	Senior Lecturer	291	29.2
	Lecturer	627	62.9
Gender	Male	816	81.8
	Female	182	18.2
Age	31-40 years	258	25.9
	41-50 years	257	25.8
	51-60 years	360	36.1
	61 years and above	123	12.3
Years of service	1-5 years	244	24.4
	6-10 years	331	33.2
	11-15 years	212	21.2
	16-20 years	61	6.1
	Over 21 years	150	15.0
Subject area	Arts	60	6.0
	Humanities	696	69.7
	Sciences	151	15.1
	Business	60	6.0
	Others	31	3.1

Source: Field data, Kodua-Ntim (2019)

As noted in Table 4.2 in terms of universities, the majority were 260(26.1%) from UG, 250(25.1%) from KNUST, 231(23.1%) from UCC, 216(21.6%) from UDS and 41(4.1%) from AU. For academic rank, the majority were lecturers 627(62.9%), 291(29.2%) were senior lecturers and 80(8%) were professors. With regard to gender, most were male academic staff 816(81.8%) while female academic staff

were 182(18.2%). In terms of age respondents within the ages 51-60(36.1%), those within the ages 31-40(25.9%), 41-50(25.8%), and 61 and above (12.3%). The majority of respondents were within the ages of 51-60.

In terms of longevity most academic staff, 331(33.2%) had worked for 6-10 years in the study. Also, 244(24.4%) had worked for 1-5 years and 212(21.2%) had worked for 11-15 years. Only 150(15%) had worked above 21 years while 61(6.1%) had worked from 16-20 %. In terms of the subject area, 69.7% were from Humanities, 15.1% were from the Sciences, Arts was 6%, Business was 6% and others recorded 3.1%. Therefore, the majority of respondents were in the Humanities.

4.1.3 The level of awareness of OAIR

The first research question was to find out the level of awareness of OAIR among respondents. To achieve the objective, the researcher sought to find out how much academic staff knew about OAIR and how they found out about OAIR through frequencies and percentages. The findings are presented in table 4.3 and 4.4 respectively. The findings on OA presented in table 4.3 below revealed that the majority of the respondents 725(72.6%) had adequate information about OA. This implies a medium level of OA awareness among respondents. Also, 122(12.2%) had heard about OA but were not sure what it entails. On the other hand, 486(48.7%) found out about OA through the Internet and 181(18.1%) knew about it through the library.

Table 4.3 Descriptive analysis of OA awareness among respondents

		Frequencies	Percentages
How much do you know about OA?	Adequate information	725	72.6
	Heard but not sure	122	12.2
	Heard but	91	9.1
	challenging	60	6.0
	Never heard		
How did you find out about OA?	Internet	486	48.7
	Library	181	18.1
	Friends	180	18.0
	Faculty	151	15.1

Source: Field data, 2019

The key findings from the respondents from the open-ended questions on the level of awareness of OAIR revealed the following:

OA is when all information published is opened to everyone who wants to use it, to get access to it freely without any compensation.

The information is in OA when it is available for use without restrictions such as codes or passwords or financial requirements.

OA is free to access to data, documents and publications being it research material paid for by the third party.

OA is freely accessing information from the Internet, but at times you have to pay for certain information.

OA is a medium through which information is made available to everyone electronically.

OA is the free unfettered access to information on the Internet.

OA is a system where research works or documents are deposited on the Internet.

OA is acquiring information freely from the Internet at no cost.

OA is free access to articles and books online without any payment.

OA is information available on the Internet that I can access without paying for it.

OA is a digital platform where research information can be assessed.

OA is any information you can access on the Internet without any cost.

OA is free access to information without any financial involvement.

OA is the free availability and accessibility of information

One that is readily available to all persons at any time without charges is OA.

According to the academic staff, OA is the free availability of information on the Internet that is one is permitted to use such information without any financial, legal or technical barriers.

To further understand their level of awareness questions were asked to determine their knowledge of IR and where they found out about IR. The findings are presented in table 4.4 below. The findings with regards to the level of awareness of IR revealed

that the majority of the respondents 665(66.6%) had adequate information about IR. However, 182(18.2%) had heard about IR but not sure what it was. On the other hand, 362(36.3%) found out about IR through the library and 304(30.5%) through the Internet.

Table 4.4 Descriptive analysis of IR awareness among respondents

		Frequencies	Percentages
How much do you know about IR?	Adequate information	665	66.6
	Heard but not sure	182	18.2
	Heard but challenging	91	9.1
		60	6.0
	Never heard		
How did you find out about IR?	Library	362	36.3
	Internet	304	30.5
	Faculty	181	18.0
	Friends	91	9.1
	Others	60	6.0

Source: Field data, 2019

Responses from some respondent from the open-ended questions revealed the following:

IR is institutional, always available and new ones are added when they come up.

IR is where students and academic staff are given access to concurring materials in the library through the university website.

Faculty publications, conference proceedings, reports can be published in an IR.

IR is where faculty members deposit their research works to be accessible by other members of the university.

The institution manages IR and makes the necessary decisions.

An IR is a collective base of knowledge generated in an institution.

IR is none other than that which has been stated above.

IR is a database of scholarly works for an institution, generally not available to outsiders.

IR is a platform through which the scholarly works of staff of an institution are showcased.

IR is a collection of scholarly materials of the staff of a university.

I have very little understanding of it.

IR is the library helping you to get access to educational materials.

I got to know of IR in my university in the UK when being contacted by a book publisher.

Most academic staff were of the view that IR is storage for preservation of an organization's digital information or knowledge assets, this indicates academic staff were aware of OAIR.

4.1.4 The perceptions of OAIR

The second research question was to find the perceptions of OAIR among respondents. A five-point Likert scale was used to collect data specifically on characteristics of OAIR and level of understanding of OAIR. The general medium mean of means and standard deviation of (M=3.89, SD= .923) shows that most of the items elicited positive responses from respondents. To confirm some of these responses with statistical evidence, OAIR being institutionally based produced a medium mean and standard deviation of (M=4.09, SD= .935) showing that respondents understood that OAIR were institutionally based.

Scholarly materials in digital formats proved significant with a medium mean and standard deviation of (M=4.09, SD= .836). This shows that respondents understood that OAIR contained scholarly materials in digital formats. Free to access was also significant with a medium mean and standard deviation of (M=3.81, SD= .890), indicating that respondents understood that OAIR were free to access. The findings are presented in table 4.5 below.

Table 4.5 Descriptive analysis of characteristics of OAIR among respondents

Characteristics of OAIR	Means	Standard Deviation
Institutionally based	4.09	.935
Scholarly materials in digital formats	4.09	.836
Free to access	3.81	.890
Cumulative (successive additions)	3.75	.987
Perpetual (permanent)	3.72	.965
Mean of Means	3.89	.923

Source: Field data, 2019

The researcher sought to find out the level of understanding of OAIR among respondents. A five-point Likert scale was used to collect data. The general mean of means and standard deviation of (M=2.68, SD= .928) shows that the majority of the items elicited negative responses from respondents. The findings are presented in table 4.6 below.

To confirm some of these responses with statistical evidence, few people would see my work in OAIR was with a mean and standard deviation of (M=2.70, SD= .919) showing that respondents understood that more people would see their work in OAIR. Difficult and time-consuming to deposit my work in OAIR was also with a mean and standard deviation of (M=2.69, SD= .857) showing that respondents understood that it was not difficult and time-consuming to deposit their work in OAIR.

On the contrary, the following two responses proved to be significant, “Others might copy my work without my permission” with a low mean and standard deviation of (M=3.19, SD= .993) and “no peer-review process” with a low mean and standard deviation of (M=3.12, SD= .993) were the only responses which were above the test value.

Table 4.6 Descriptive analysis of level of understanding of OAIR among respondents

Level of understanding of OAIR	Means	Standard Deviation
Others might copy my work without my permission	3.19	.993
No peer-review process for research papers	3.12	.953
Few people would see my work in IRs	2.70	.919
Difficult and time-consuming to deposit my work in IRs	2.69	.857
Prefer to make my work available only on my personal website	2.67	.972
Do not know how and what to deposit in IRs	2.65	.935
Publishers would not let me put my work in an IRs	2.57	.848
Concerned that if I deposit my work in IRs I may not be able to publish it elsewhere	2.48	.875
Concerned that my work might not be preserved in the long term	2.48	.956
Open access Institutional Repositories is not prestigious	2.24	.967
Mean of Means	2.68	.928

Source: Field data, 2019

Other perceptions academic staff have about OAIR in university libraries that emerged from the open-ended questions revealed the following:

It is difficult and time-consuming to deposit my work in IR and others might copy other people's work without permission.

It is institutional, documents are always available, new documents are added when they come up. Also, plagiarism and might not be able to publish elsewhere.

This is storage or a database of scholarly materials in digital that are accessible to members of the institution and the public. The general view is that open access materials are of low quality and some are devoid of the peer review mechanism.

It supports publishing, dissemination of research results and access to a huge amount of citation information. It is limited in scope and has a

low impact factor.

They are in PDF formats, contain hyperlinks and are interdisciplinary. OAIR makes publication difficult and people may scarcely cite the work.

Much more needs to be done about OAIR, even though some research work has not been published they end up there. I will suggest that if something has not yet been published it should not be documented in the OAIR.

It exposes the institution to the world; very useful to academia and it is a collection of research works. Most people think that their work will be copied.

OAIR helps to extend the research to other parts of the world and also help to bring value to the work.

I will say that so far so good, poorly supervised and used a lot without permission.

There are financial barriers to access OAIR.

One needs institutional registration and it is quite restrictive.

I think OAIR is not well known to many people.

There is very limited knowledge and understanding of OAIR.

It is a good concept.

They are not published by high impact factor journals.

This is a good avenue to make the outcome of research work accessible to others.

OAIR is always available and it is costly.

OAIR is accessible but expensive.

The perception of academic staff towards OAIR varies, some think OAIR is free, easy to access and only those who are linked to it can access it. Also, some think people are not aware of it and some do not want to send their work to that place.

4.1.5 The content archiving of OAIR

The third research question was to find out the content archiving of OAIR among universities, that is how contents are uploaded onto OAIR and activities engaged in by universities. Data on this were presented in frequencies and percentages and

also mean and standard deviation. The frequencies and percentages revealed that all the respondents 998(100%) said the OAIR team on their behalf did contents uploaded onto the OAIR. The findings are presented in Table 4.7 below.

Table 4.7 Descriptive analysis of OAIR contents upload among respondents

		Frequencies	Percentages
How are contents uploaded onto the open access Institutional Repositories?	Mediated- deposit (done by the IR team on your behalf).	998	100

Source: Field data, 2019

The researcher sought to find out the activities engaged in by universities. A five-point Likert scale was used to collect data on the activities engaged in by universities. Data on this was analysed and presented in mean and standard deviation. The general medium mean of means and standard deviation of (M=3.34, SD= .879) shows that the majority of the items elicited positive responses from respondents. To confirm some of these responses with statistical evidence, documenting research data with a low mean and standard deviation of (M=3.45, SD= .959) showing that universities engage in activities of documenting research data in OAIR.

Storage and backup recorded a low mean and standard deviation of (M=3.39, SD= .775) showing that universities engage in storage and backup activities when it comes to OAIR. Data security, protection and confidentiality were also with a low mean and standard deviation of (M=3.09, SD= .964) showing that universities engage in data security, protection and confidentiality when it comes to OAIR. The findings are presented in Table 4.8 below.

Table 4.8 Descriptive analysis of content archiving activities of OAIR in universities

Activities engaged in by your institution activities	Means	Standard Deviation
Documenting research data	3.45	.959
Storage and backup	3.39	.775
Training on research data management services	3.39	.851
Research data management plan	3.36	.848
Data security, protection and confidentiality	3.09	.964
Mean of Means	3.34	.879

Source: Field data, 2019

Academic staff were asked about activities engaged in by their universities. Few of the respondents reported on it that:

The university supervises most of the research works.

At times, the university organizes workshops on these issues.

The university helps keep data for long and also protect our data.

Most of the academic staff were not abreast of the activities engaged in their universities when it comes to OAIR usage.

4.1.6 The level of usage of OAIR

The fourth research question was to find out the level of usage of OAIR among respondents. The data on this was analysed and presented on whether respondents had used and deposited in the university's OAIR, multinomial logistic regression for respondents associated with OAIR usage and depositing, deposit types and formats of OAIR, reasons for OAIR usage, benefits of OAIR usage and factors that affect the usage of OAIR among respondents. The majority of the respondents 629(63%) said No, when they were asked if they have you ever used the university's this indicated a 37%(369) low level of OAIR usage among respondents. The findings are presented in Table 4.9 below.

Table 4.9 Descriptive analysis of use and deposits of OAIR among respondents

Have you ever used the university's open access Institutional Repository?	Frequencies	Percentages
No	629	63.0
Yes	369	37.0

Source: Field data, 2019

Further multinomial logistic regression analysis was used to determine the level of usage of OAIR based on universities, rank, gender, age, years of service and subject area. From the regression analysis, there was no significant difference between the universities to the usage of OAIR. In terms of academic ranking, there is a significant difference of ($p=0.001$) between professor position when compared to lecturer position but no significant difference between senior lecturer position when compared to the lecturer position. With regard to gender, there was a significant difference of ($p=0.000$) between males when compared to females when it comes to usage of OAIR.

Again, there was a significant difference between the ages of 31-40 with ($p=0.000$) and 41-50 with ($p=0.001$) when compared to 51-60 years but no significant difference when compared to the 60 years and above. Also, there was a significant difference between the years of service from 1-5 with ($p=0.000$) when compared to 6-10 years but no significant difference when compared to 11-15, 16-20 and over 21 years. Lastly, Sciences with ($p=0.000$) and Others with ($p=0.000$) were statistically different when compared to Humanities but no significant difference when compared to Art and Business. The findings are presented in table 4.10 below.

Table 4.10 Multinomial logistic regression for respondents associated with OAIR usage

Background Information		N	Std. Error	Sig.	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Universities	UG	260					
	KNUST	250	.182	.778	1.052	.737	1.502
	UCC	231	.185	.960	1.009	.702	1.450
	UDS	216	.188	.883	.973	.673	1.406
	AU	41	.348	.712	1.137	.575	2.250
Rank	Professor	80	.334	.001*	3.082	1.603	5.928
	Senior Lecturer	291	.163	.185	.806	.586	1.109
	Lecturer	627					
Gender	Male	816					
	Female	182	.212	.000*	4.040	2.667	6.119
Age	31-40 years	258	.182	.000*	2.226	1.557	3.182
	41-50 years	257	.165	.001*	.564	.408	.779
	51-60 years	360					
	61 years and above	123	.214	.686	1.091	.716	1.660
Years of service	1-5 years	244	.224	.000*	5.912	3.811	9.171
	6-10 years	331					
	11-15 years	212	.177	.258*	.623	.440	.882
	16-20 years	61	.279	.429	.802	.464	1.385
	Over 21 years	150	.200	.276	1.243	.840	1.839
Subject area	Arts	60	.162	.973	1.006	.733	1.381
	Humanities	696					
	Sciences	151	.183	.000*	1.000	.698	1.432
	Business	60	.270	.973	2.742	1.614	4.659
	Others	31	.240	.000*	.338	.211	.542

Source: Field data, 2019. * Significant at p=0.05

The researcher sought to find out the rate of depositing research documents into OAIR among respondents. To achieve this, frequencies and percentages were deemed appropriate for the analysis. Respondents were asked whether they had

deposited any of their research work in the university's OAIR. The majority of the respondents 606(60.7%) said no, this means only 40% are depositing in OAIR among academic staff. On the other hand, all respondents were willing to deposit their works in the OAIR in the future. The findings are presented in Table 4.11 below.

Table 4.11 Descriptive analysis of deposits of OAIR among respondents

	Frequencies	Percentages
Have you deposited any of your work in open access Institutional Repositories?		
No	606	60.7
Yes	392	39.3
Will you consider depositing your work in open access Institutional Repositories in the future?	Frequencies	Percentages
Yes	988	100

Source: Field data, 2019

Further multinomial logistic regression analysis was used to determine the level of deposits in OAIR based on universities, rank, gender, age, years of service and subject area. From the regression analysis, there was no significant difference between the universities to depositing in OAIR. There was a significant difference of ($p=0.003$) between professor position when compared to lecturer position but no significant difference between senior lecturer position when compared to the lecturer position in terms of depositing in OAIR. There was a significant difference of ($p=0.000$) between males when compared to females when it comes to deposits of research documents in OAIR.

Again, there was a significant difference between the ages of 31-40 with ($p=0.000$) and 41-50 with ($p=0.001$) when compared to 51-60 years but no significant difference when compared to the 60 years and above. Also, there is a significant difference between the years of service from 1-5 with ($p=0.000$) and 11-15 with ($p=0.004$) when compared to 6-10 years but no significant difference when compared to 16-20 and over 21 years. Lastly, Sciences with ($p=0.000$), Art with

(p=0.000), Business with (p=0.000) and Others with (p=0.000) was statistically different when compared to Humanities. The findings are presented in Table 4.12 below.

Table 4.12 Multinomial logistic regression for respondents associated with depositing in OAIR

Background Information		N	Std. Error	Sig.	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Universities	UG	260					
	KNUST	250	.184	.877	.972	.678	1.393
	UCC	231	.187	.649	.919	.637	1.325
	UDS	216	.191	.911	.979	.673	1.423
	AU	41	.367	.368	1.391	.678	2.854
Rank	Professor	80	.334	.003*	2.666	1.387	5.126
	Senior Lecturer	291	.161	.148	.792	.577	1.086
	Lecturer	627					
Gender	Male	816					
	Female	182	.212	.000*	3.601	2.376	5.456
Age	31-40 years	258	.185	.000*	2.141	1.489	3.079
	41-50 years	257	.166	.001*	.566	.409	.783
	51-60 years	360					
	61 years and above	123	.218	.576	1.130	.737	1.732
Years of service	1-5 years	244	.225	.000*	5.101	3.284	7.921
	6-10 years	331					
	11-15 years	212	.177	.004*	.603	.426	.854
	16-20 years	61	.279	.187	.692	.400	1.196
	Over 21 years	150	.203	.298	1.235	.830	1.838
Subject area	Arts	60	.412	.000*	.043	.019	.096
	Humanities	696					
	Sciences	151	.187	.000*	.240	.166	.346
	Business	60	.725	.000*	.011	.003	.046
	Others	31	.240	.000*	1.338	1.211	1.542

Source: Field data, 2019. * Significant at p=0.05

The researcher sought to find out the various deposit types and formats in OAIR usage among respondents. To achieve this, frequencies and percentages were used to present the analysis of data. Respondents were asked what types of material have they or would they like to deposit in OAIR. The majority of the respondents 767(19.0%) choose post-print. Conference proceedings and seminar papers followed with 594(14.7%) respondents. On the other hand, respondents were asked which file formats would they generally use and therefore might wish to deposit their research papers in OAIR. The majority of the respondents, 800(30.0%) preferred PDF, followed by MS Word and MS PowerPoint with 495(19.2%) respondents. The findings are presented in Table 4.13 below.

Table 4.13 Descriptive Analysis of deposit types and formats of OAIR among respondents

		Frequencies	Percentages
What types of material have you/would you deposit in OAIR?	Postprint	767	19.0
	Conference proceedings	594	14.7
	Seminar papers	594	14.7
	Reports	562	13.9
	Thesis and Dissertations (Abstract)	495	12.3
		429	10.6
	Books and Book Chapters	297	7.4
	Thesis and Dissertations (Full text)	231	5.7
		66	1.6
		Images, Audio and Video Preprint	
Which file formats do you generally use and therefore might wish to deposit in OAIR?	PDF	800	30.0
	MS Word	495	19.2
	MS PowerPoint	495	19.2
	Postprint	231	9.0
	IMAGE	198	7.7
	Database	132	5.1
	AUDIO	99	3.8
	MS Excel	66	2.6
VIDEO	66	2.6	

Source: Field data, 2019. NB: Multiple responses were allowed

The researcher again sought to investigate the reasons for OAIR usage in university libraries in Ghana. A five-point Likert scale was used to collect data on this. The data was analysed and presented in means and standard deviation. The general result shows that there are numerous reasons for OAIR usage in university libraries. The general mean of means and standard deviation of (M=3.83, SD= .795) shows that the majority of the items elicited a positive response from respondents. To confirm some of these responses with statistical evidence, to communicate research results produced a high mean and standard deviation of (M=4.54, SD= .498).

This shows that communicating research results was a topmost reason for using OAIR among respondents. Work is disseminated more quickly proved significant with a medium mean and standard deviation of (M=4.12, SD= .728) showing that work being disseminated more quickly among the respondents attributed to OAIR usage. Published material is easy to find was also significant with a medium mean and standard deviation of (M=4.09, SD= .755). This shows that published material is easy to find can result in OAIR usage among respondents. And lastly, work will be permanently archived and available with a medium mean and standard deviation of (M=4.03, SD= .799) is as a result of usage of OAIR among respondents in the five universities. The findings are presented in Table 4.14 below.

Table 4.14 Descriptive analysis of reasons for OAIR usage among respondents

Reasons for usage of OAIR	Means	Standard Deviation
To Communicate Research Results	4.54	.498
Work is disseminated more quickly	4.12	.728
Published material is easy to find	4.09	.755
Work will be permanently archived and available	4.03	.799
Number of citations of my work gets increased	4.00	.852
Access to work is cheaper to others	3.84	.824
Repository is well indexed and archived	3.79	.727
IR protects it from plagiarism	3.33	.939
Chances for promotion are increased	3.30	.972
Can add multimedia data to my work	3.24	.855
Mean of Means	3.83	.795

Source: Field data, 2019.

The researcher further sought to investigate the benefits of OAIR usage in university libraries in Ghana. A five-point Likert scale was used. Means and standard deviation were used to present the data that was analysed. The general high mean of means and standard deviation of (M=4.38, SD= .557) shows that the majority of the items elicited positive responses from respondents. Engaging the university community and enhancing scholarly collaborations was a benefit of OAIR usage among respondents.

The high mean and standard deviation (M=4.52, SD= .500) gives statistical evidence to those results. On the issue of “visibility status and public value” it was evident it was a benefit of OAIR usage among respondents in Ghana. The high means and standard deviation (M=4.45, SD= .498) gives a strong indication to that effect. Again, enhancing the quality of teaching and scholarship was as a result of usage of OAIR among respondents, the high mean and standard deviation (M=4.27, SD= .616) gives statistical evidence to that fact. The findings are presented in Table 4.15 below.

Table 4.15 Descriptive Analysis of benefits of OAIR usage among respondents

Benefits of usage of OAIR	Means	Standard Deviation
Engaging the university community and enhancing scholarly collaborations	4.52	.500
Visibility status and public value	4.45	.498
Relevant to the changing needs of society	4.36	.594
Digital preservation	4.30	.676
Enhancing the quality of teaching and scholarship	4.27	.616
Mean of Means	4.38	.577

Source: Field data, 2019.

Other benefits of using OAIR stated by respondents in university libraries included; easy access to information, no financial cost involved, for publication and institutional ranking. Respondents believed that:

It is easy to access it for information.

It is used for publications of research works.

OAIR enhances institutional ranking.

You get materials from OAIR without paying a fee for them.

Information at times is readily available for use in OAIR.

OAIR usage comes with a lot of benefits for academic staff and the university as a whole.

4.1.7 Factors that affect the usage of OAIR

There are several factors that could be integrated to facilitate the usage of OAIR within university libraries. TAM explained in section 2.9.1 was employed for the study to identify those factors, with the help of a conceptual framework. Before analysing the data, data screening was conducted to determine if there is any violation of the assumptions. The conceptual framework was made up of six variables (factors), which was consistent with the literature. Variable one has five items representing accessibility. Variable two is composed of seven items representing availability. Variable three is composed of seven items representing visibility. Variable four is composed of five items representing an intention to reuse the system. Variable five is composed of five items representing satisfaction. Variable six is composed of five items representing usage benefits.

Therefore, the six variables with 34 items were considered for Confirmatory Factor Analysis (CFA). SEM was employed in the study to explain relationships among the factors that affect the usage of OAIR. SEM is a confirmatory method providing comprehensive means for validating the measurement model of latent variables. The validating procedure is called CFA. The researcher performed CFA for all the latent variables involved in the study before modelling their inter-relationship in the structural model. In the context of SEM, the CFA is often called 'the measurement model', while the relations between the latent variables (with directed arrows) are called 'the structural model'.

4.1.7.1 Measurement model

CFA is a special form of factor analysis. It was employed to test whether the measures of a construct are consistent with the researcher's understanding of the nature of that construct. Every measurement model of a latent construct needs to undergo CFA before modelling in SEM. The conceptual framework has three (3) exogenous variables namely accessibility (2 items), availability (4 items) and visibility (2 items) and three (3) endogenous variables namely intention to reuse (2 items), satisfaction (4 items) and usage benefit (2 items). The measurement model was employed to represent how measured items come together to represent variables. The findings are presented in Figure 4.1 below.

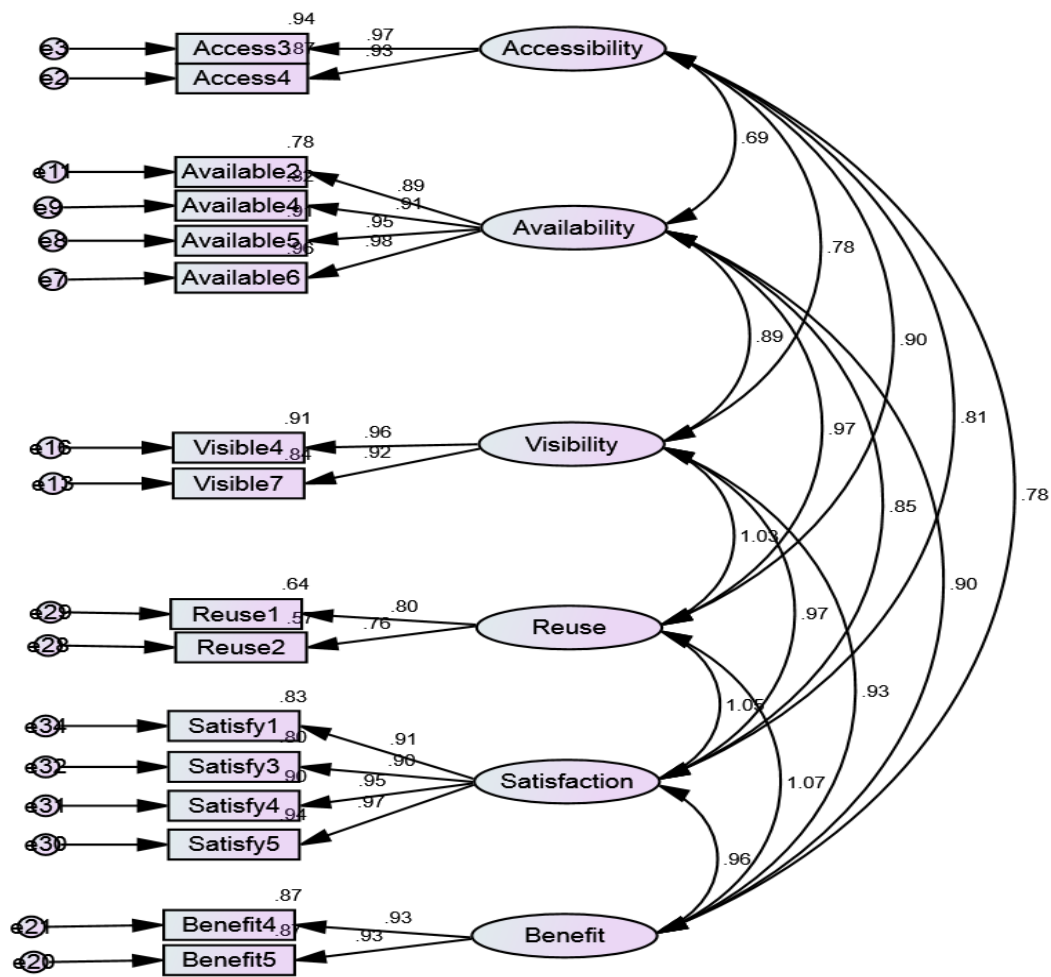


Figure 4.1 Measurement Model

The first-order CFA was conducted using AMOS version 23 to test the measurement model. There are more than a dozen different fit statistics researchers use to assess their measurement models and structural models. Kline (2015) and Cornell University Statistical Consulting Unit (2017) suggest that the minimum set of fit statistics that should be reported are χ^2/df , RMSEA, CFI, RMR, AGFI and NFI. These six fit statistics were used for the study. This is presented in Table 4.16 below.

Table 4.16 Fit statistics for the measurement model

Fit Statistics	Measurement Model	Cut-Off for Good Fit
χ^2/df	0.678	≤ 3.0
RMSEA	0.023	≤ 0.06
CFI	1.000	≥ 0.90
RMR	0.021	≤ 0.08
AGFI	0.997	≥ 0.90
NFI	0.998	≥ 0.95

Source: Field data, 2019.

The measurement model was further assessed for convergent validity of scale items by using reliability, CR and AVE. The reliability of factors was estimated by assessing the Cronbach's alpha and factor loadings from the CFA. Thus, the Cronbach's alpha coefficients of all six constructs were 0.8 to 0.9 which indicates that the measurement model used for the study was highly reliable.

Convergent validity was further evaluated by examining the factor loadings from the CFA. In the study, all the factor loadings of the items in the CFA for the measurement model were between 0.98 and 0.75. Thus, all the factors in the measurement model had good reliability and convergent validity. Table 4.17 below presents the result of CFA for the measurement model.

Table 4.17 CFA results for the measurement model

Factors		M	SD	Factor Loadings	α
Accessibility	IRs are easy to use (usability)	4.15	.703	.969	.893
	IRs are easy to learn and adapt (adaptability)	4.09	.570	.933	
Availability	IRs provide reliable information for research work (reliable)	4.03	.834	.886	.962
	IRs provide accurate information for research work (accuracy)	4.15	.820	.905	
	IRs provide relevant information for research work (relevance)	4.00	.920	.952	
	IRs provide detailed information	3.91	.792	.980	
Visibility	Users within IRs can easily access their information needs (content or scope and timeliness).	4.06	.693	.956	.813
	Library provides reliable technical support and personnel.	3.82	.868	.919	
Intention to reuse	I will use IRs to communicate research output with colleagues	4.24	.552	.799	.852
	I will use IRs to share my research output	4.30	.522	.755	
User satisfaction	I am satisfied with IRs efficiency	3.67	.841	.913	.827
	I am satisfied that IRs meet my research processing needs	3.79	.807	.896	
	I am enjoying using IRs (enjoyment)	3.70	.836	.951	
	I am satisfied with IRs adequacy	3.36	.851	.970	
Usage benefits	IRs help me to acquire new knowledge and innovative ideas	4.09	.793	.934	.891
	IRs help me effectively manage and store information I need	4.03	.759	.935	

Source: Field data, 2019

Further, the CR and AVE that were also indicators of the convergent validity were conducted. CR was measured by assessing the internal consistency of the measurement model. Discriminant validity was used to assess the extent to which a concept and its indicators differ from another concept and its indicators. The study findings indicated that the square root of the AVE was greater than its correlations with all other constructs. Therefore, discriminant validity was established. The findings also showed that the CR was ranging between 0.6 and 0.9 that shows that the research model can be considered and it had acceptable convergent validity.

On the other hand, all the six constructs indicated the AVE of 0.6 and 0.9; therefore, the measurement model in the study had an acceptable AVE. All diagonal values exceeded the inter-construct correlations, and thus, the results confirm that the research instrument had satisfactory construct validity. Also, the CFA measurement model had adequate reliability, convergent validity and discriminant validity. Therefore Table 4.18 below presents CR, AVE, and discriminant validity of constructs.

Table 4.18 Composite Reliability (CR), Average Variance Extracted and Discriminant Validity of constructs

Factors	CR	AVE	Satisfaction	Reuse	Benefits	Visibility	Availability	Accessibility
Satisfaction	.871	.870	.757					
Reuse	.605	.604	.458	.365				
Benefits	.874	.873	.668	.360	.762			
Visibility	.879	.879	.736	.341	.579	.773		
Availability	.868	.867	.574	.337	.498	.540	.752	
Accessibility	.905	.904	.464	.263	.364	.401	.315	.817

Source: Field data, 2019.

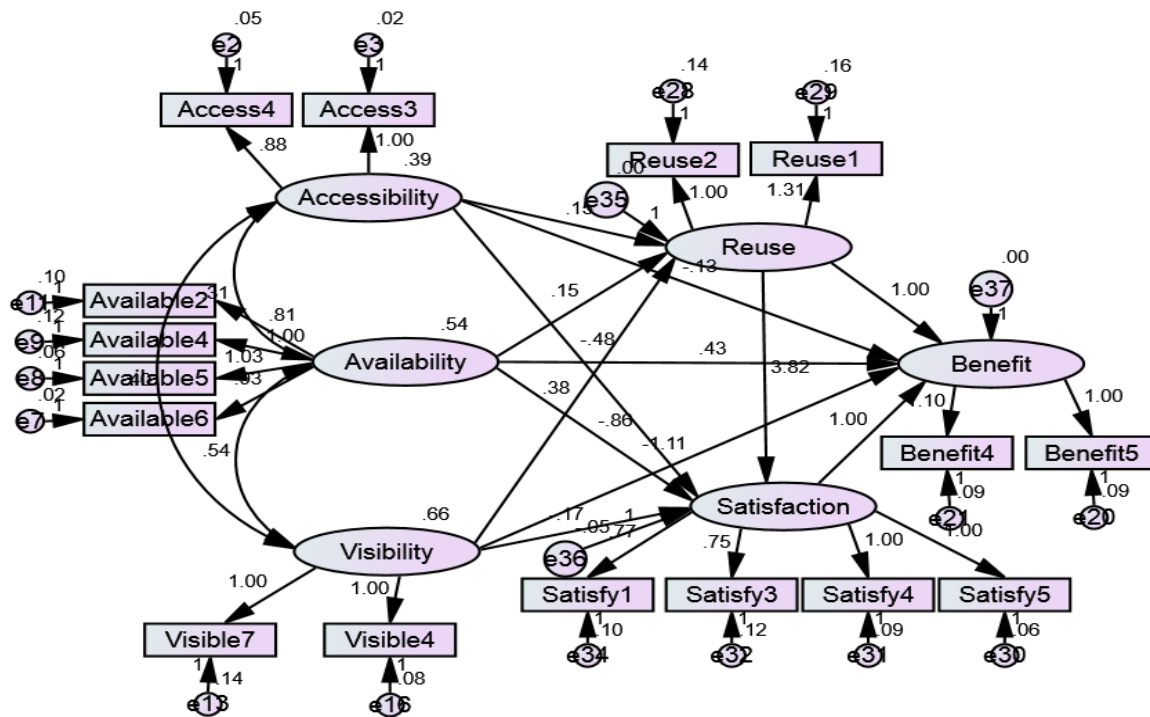


Figure 4.2 Structural Model

When the structural model was compared to the measurement model, the results showed no significant difference between the two. This means that the structural model had an excellent statistical fit as compared to the measurement model. Therefore, the researcher decided to continue with the structural model. This is presented in Table 4.19 below.

Table 4.19 Fit statistics for the structural model

Fit Statistics	Structural Model	Cut-Off for Good Fit
χ^2/df	0.679	≤ 3.0
RMSEA	0.023	≤ 0.06
CFI	1.000	≥ 0.90
RMR	0.021	≤ 0.08
AGFI	0.997	≥ 0.90
NFI	0.998	≥ 0.95

Source: Field data, 2019.

SEM results showed standardized path coefficients, their significance for the structural model and the coefficients of determinants for each endogenous construct. The standardized path coefficient indicated the strengths of the relationships between the independent and dependent variables. Therefore, in the study, out of twelve hypotheses, nine of them were found significant.

Firstly, accessibility had no significant effect on satisfaction. Therefore, hypothesis H1 was rejected ($P > 0.099$). Further, the study showed that accessibility had a significant effect on the intention to reuse OAIR and usage benefit. Therefore, the hypotheses H4, H10 were accepted ($p < 0.000$ and $p < 0.000$).

Secondly, availability had a significant effect on satisfaction and intention to reuse OAIR. Therefore, hypotheses H2 and H5 were accepted with the significant value of ($p > 0.005$ and $p > 0.000$). Further, availability had a significant effect on usage benefit. Therefore, hypothesis H11 was accepted ($p < 0.000$).

Thirdly, visibility had no significant effect on satisfaction. Thus, hypothesis H3 was rejected ($p > 0.790$). Further, the study findings showed that visibility showed a significant effect on the intention to reuse OAIR and usage benefit. Therefore, hypothesis H6, H12 was accepted ($p < 0.000$ and $p < 0.000$).

Fourthly, satisfaction had no significant effect on the intention to reuse OAIR. Therefore, hypothesis H7 was rejected ($p < 0.030$). Satisfaction had a significant effect on usage benefit. Thus, the hypothesis H8 was accepted ($p < 0.000$).

Lastly, the intention to reuse OAIR had a significant effect on usage benefit. Therefore, hypothesis H9 was accepted ($p < 0.000$). The findings are presented in table 4.20 below.

Table 4.20 Result testing of Hypotheses

Hypotheses	Path	P-value	Decision
H1	Accessibility → Satisfaction	.099	REJECTED
H2	Availability → Satisfaction	.005	ACCEPTED
H3	Visibility → Satisfaction	.790	REJECTED
H4	Accessibility→Intention to reuse	.000	ACCEPTED
H5	Availability → Intention to reuse	.000	ACCEPTED
H6	Visibility → Intention to reuse	.000	ACCEPTED
H7	Satisfaction→ Intention to reuse	.030	REJECTED
H8	Satisfaction → Usage Benefit	.000	ACCEPTED
H9	Intention to reuse → Usage Benefit	.000	ACCEPTED
H10	Accessibility → Usage Benefit	.000	ACCEPTED
H11	Availability → Usage Benefit	.000	ACCEPTED
H12	Visibility → Usage Benefit	.000	ACCEPTED

Source: Field data, 2019.

The direct, indirect and total effects of accessibility, availability, visibility, intention to reuse, satisfaction and usage benefit on the usage of OAIR were established. The findings revealed that user satisfaction had the strongest direct effect on usage benefits. Among the three exogenous variables, accessibility had the strongest total effect on the intention to reuse OAIR in university libraries. Further, availability had the strongest effect on satisfaction, whereas visibility had the largest effect on net benefits. Table 4.21 below depicts the direct, indirect and total effects of the variables.

Table 4.21 Direct, indirect and total effect of the variables in the model

Factors	Total Effects			Direct Effects			Indirect Effects		
	Intention to reuse	User satisfaction	Usage benefits	Intention to reuse	User satisfaction	Usage benefits	Intention to reuse	User satisfaction	Usage benefits
Accessibility	.153	.103	.123	.153	.438	.133	.000	.586	.256
Availability	.150	.285	.281	.150	.861	.433	.000	.576	.134
Visibility	.380	.298	.550	.380	.174	.112	.000	.455	.661
Intention to reuse	.000	.835	.845	.000	.825	1.000	.000	.000	.825
User satisfaction	.000	.000	.773	.000	.000	1.000	.000	.000	.000
Usage benefits	.000	.000	.000	.000	.000	.000	.000	.000	.000

Source: Field data, 2019.

4.1.8 The challenges of OAIR usage

The fifth research question was to find out the challenges of OAIR usage among respondents in Ghana. The general result shows that there are several challenges of OAIR among respondents in Ghana. The medium mean of means ($M=4.09$, $SD=.889$) that is greater than the test value of 3.0 gives evidence to that effect. Ten items indicated challenges of OAIR usage, they had individual mean scores exceeding the test value of 3.0. To sample a few of these challenges, inadequate advocacy was a challenge of OAIR usage among respondents, the high mean and standard deviation of ($M=4.42$, $SD=.821$) gives a strong indication that inadequate advocacy is one of the key challenges of OAIR usage among respondents. Inadequate ICT connectivity and infrastructure produced a high mean and standard deviation of ($M= 4.40$, $SD=.736$) which shows that one of the challenges of OAIR usage among respondents is inadequate ICT connectivity and infrastructure.

To find out whether “insufficient technological skills” could be a challenge of OAIR usage among respondents, the medium mean and standard deviation of ($M=4.24$, $SD=.955$) gives a strong indication that insufficient technological skills is one of the key challenges of OAIR usage among respondents. Copyright issues among the five universities gave a medium mean and standard deviation ($M=4.12$, $SD=.979$). This shows that copyright issues in the five universities were a challenge of OAIR usage. However, a rundown of Table 5.8 shows that all ten items were challenges of OAIR usage among respondents. This is simply because their means were more than the test value. The findings are presented in table 4.22 below.

Table 4.22 Descriptive analysis of challenges of OAIR among respondents

Challenges with the use of OAIR	Means	Standard Deviation
Inadequate advocacy	4.42	.821
Inadequate ICT connectivity and infrastructure	4.40	.736
Insufficient technological skills	4.24	.955
Copyright issues	4.12	.979
Lack of knowledge or awareness of OAIR	4.09	.996
Inadequate funding	4.03	.837
Institutional culture and politics	4.00	.819
Absence of incentives	3.97	.906
Inadequate power supply	3.85	.956
Lack of institutional repository policy	3.79	.880
Mean of Means	4.09	.889

Source: Field data, 2019.

These were some of the challenges with the use of OAIR in university libraries among respondents. Some of the respondents were of the view that:

Lack of adequate ICT platforms, slow Internet speed and electricity and no information on OAIR existence.

The libraries have their operational schedule, different from that of users.

There is a lack of understanding and lack of interest by users.

There are unstable Internet connectivity and power fluctuations

There should be more education and training on OAIR.

Academic staff do not have much information about OAIR and it makes them find it difficult to even think about considering it.

4.1.9 Strategy for usage of OAIR

The last research question was to suggest a strategy to enhance the usage of OAIR in the universities. A five-point Likert scale was used to achieve this. The data on this was presented in mean and standard deviation. To achieve this, respondents were asked whether an institutional guideline exists on OAIR in their universities. Half of the respondents 512 representing 51.3% said yes and the other 486 representing

48.7% said no. The findings are presented in Table 4.23 below.

Table 4.23 Descriptive analysis of institutional guideline existence of OAIR

Does an institutional guideline exist on open access Institutional Repositories?	Frequencies	Percentages
Yes	512	51.3
No	486	48.7

Source: Field data, 2019.

The researcher further looked into the strategies that could be employed by universities to enhance the usage of OAIR among respondents through the use of an institutional guideline. A medium mean of means and standard deviation of (M=3.71, SD= .930) was obtained. The individual mean score of these ten items was also above the test value. Some of these reasons include; general lack of awareness on OAIR with a medium mean and standard deviation of (M=3.94, SD= .885), absence of national guidelines or mandate or policies by research funders and/or unclear legal frameworks (M=3.91, SD= .964), unclear distribution of responsibility and lack of institutional coordination among the different stakeholders (researchers, departments, libraries, funders) (M=3.82, SD= .912) and lack of infrastructure or absence of funds to develop the needed infrastructure (M=3.82, SD= .967). The findings are presented in Table 4.24 below.

Table 4.24 Descriptive analysis of reasons for institutional guideline on OAIR

Reasons for an institutional guideline on OAIR	Means	Standard Deviation
General lack of awareness on the topic	3.94	.885
Absence of national guidelines or mandate or policies by research funders and/or unclear legal frameworks	3.91	.964
Unclear distribution of responsibility and lack of institutional coordination among the different stakeholders (researchers, departments, libraries, funders)	3.82	.912
Lack of infrastructure or absence of funds to develop the needed infrastructure	3.82	.967
Lack of expertise on the topic at institutional level	3.79	.976
Priority given implementing institutional policy on Open Access to research publications	3.67	.876
Novelty of the topic	3.58	.854
Low interest levels from researchers	3.58	.921
Technical complexity in implementing Open Access to research data (e.g. variety of research fields in institution, multiple data formats)	3.49	.989
Complexity of the topic	3.46	.957
Mean of Means	3.71	.930

Source: Field data, 2019.

OAIR institutional guidelines aim to streamline all processes for using OAIR in a certain routine. These are some of the reasons for an OAIR institutional guideline some respondents said that:

There is no policy document at the institutional level on OA in the university and there is the need for legal framework to govern the use of OA materials and how to protect, intellectual property.

Guidelines are very necessary for helping others use a product and they provide clarity for usage.

More sensitization work should be done on it to create more awareness of OAIR.

The level of education on OAIR is very low.

The academic staff made recommendations for the usage of OAIR in university libraries. Most of the respondents reported that:

Education or cultural change, funding, ICT infrastructure, access to the Internet (high speed or reliable connectivity), training of individuals who manage the OAIR, stable electricity power (support) the computer servers, provision of hardware or software to back computing systems and information management and the need for skilful data managers.

Researchers should be encouraged to put their works on the OAIR and awareness creation should be done seriously on OAIR.

There should be a national policy on OAIR in the country and the level of awareness should be intensified.

Advertising it in other journals and at least yearly seminars on the availability of OAIR in the university.

Simplifying the meaning of OAIR and having a strong user-friendly system and advocacy.

Increase awareness and proper ICT connectivity.

Appropriate funding and advocacy required.

Greater publicity and training and greater awareness of potential benefits.

Improve or enhance ICT infrastructure and provide clear policy and incentives.

There should be more education on OAIR and reliable Internet connectivity.

There should be more publicity on the ease and advantages for use.

Adequate and sustained advocacy or publicity and more incentives required.

There should be training on the technical skills and adequate power supply.

Libraries should provide brochures and workshops to enlighten people.

There should be strong advocacy and managing Internet service properly.

Adequate access to the Internet and more education on OAIR.

The creation of awareness and the technicalities involved should be explained to the academic staff and the general university community.

4.2 Findings from the Qualitative Analysis

4.2.1 Introduction

The section presents the result of data collected, using the semi-structured interview guide to investigate the usage of OAIR in university libraries in Ghana. The study sought to establish the achievements of OAIR, the challenges of OAIR and the strategies recommended as prospects in Ghanaian university libraries. The total number of OAIR managers among the five universities was twelve (12); all of whom were selected for the interview because they see to the day to day running of the OAIR (section 3.). Interviews were conducted with all the three library staff from UG, all the two from KNUST, all three from UCC, all two from UDS and all two from AU. The total number of participants for the interview was twelve (12), all participants targeted answered and saturation was obtained.

The interview data were categorized into six (6) main sections. The time spent on each participant was estimated between thirty to forty-five minutes and the interviews took place at the convenience of the participants. The researcher observed all ethical issues related to the conduct of interviews.

The qualitative data were analysed using thematic analysis under the following themes:

1. Determine the level of awareness of OAIR in university libraries in Ghana;
2. Examine the perceptions of universities in Ghana in OAIR;
3. Establish the content archiving of OAIR in university libraries in Ghana;
4. Determine the level of usage of OAIR in university libraries in Ghana;
5. Identify the challenges encountered with the use of OAIR in university libraries in Ghana and
6. Suggest strategies for the usage of OAIR in university libraries in Ghana.

4.2.2 Background information of participants

For the qualitative study, twelve library staff (OAIR managers) were approached and interviewed. The background information of participants included their universities, gender and age. Participants were interviewed in which ten were males and two were females. With regards to age, eight participants were between thirty-one to forty years, three participants were between forty-one to fifty years and one participant was between fifty-one to sixty years. To attribute comments to the participants from UG, KNUST, UCC, UDS and AU some serial codes were assigned. For example, UG Participant-1 was UGP1 and UG Participant-2 was UGP2. The rest were UGP3, KNUSTP1, KNUSTP2, UCCP1, UCCP2, UCCP3, UDSP1, UDSP2, AUP1 and AUP2.

4.2.3 The level of awareness of OAIR

One of the items on the interview guide revealed how much the academic staff knew about OAIR. OAIR manager's responses suggested that academic staff had adequate information on OAIR. They emphasized that looking at the abundant knowledge on OA they knew, they sometimes sent emails on it. Concerning how academic staff knew about OAIR, almost all the participants highlighted that awareness was through the library, the Internet and from fellow academic staff.

When probed further, KNUSTP1 and KNUSTP2 shared a similar view by saying that,

Academic staff's awareness is improving. Within the university, we have the teaching and non-teaching staff. The academic staff are very much aware of the repository through many programmes that are being done in the Library. For example, training programmes, sensitization and awareness creation programmes organized by the Library so that the university community may know about it and also contribute their research articles to the repository for dissemination.

KNUSTP1 said:

At the beginning of last year, we started training researchers to self-archive. The reason is that their promotion is tied to their publications; we are giving them an easy way to crosscheck the publications they

present. So one needs to put his work on the repository, just by a click then all works show up. And all your research output is known.

On the contrary, UCCP1 commented:

It is very low here sometimes you talk to academic staff and the responses is that he is not aware, he does not even know what it is, so I think we need to create more awareness on the university campus.

UCCP2 shared his view:

With UCC, I think it is quite low and we will blame ourselves that we need to up our game. We have not done so much on awareness creation or advocacy, on the use of institutional repositories. We are strategizing on how best we can sell the OAIR and the OA concepts to the university public especially to the academic staff who would have to feed the OAIR.

Another UCCP3 participant commented:

Well, I beg to differ if it is well known amongst the faculty members. So for instance, what my department or units seek to do before the semester ends is to highlights the importance of OA to faculty members. We are about putting together some series of lectures that would be held in all the five colleges so that we will educate academic staff on the use of OA. We are planning to host OA week that is held worldwide in every October. This will be the first of the kind in the Library.

AUP1 supported the comment of UCCP1 and UCCP2 by saying:

The level of awareness of OAIR in the university is low, even though we have links on our university website.

Participants from UG (UGP1 and UGP2) said the users are varied, they have faculty, students, and other stakeholders that may be registrars and other administrators. Depending on each of the users, there is a difference in the awareness level when it comes to OAIR usage. For the faculty, they said they are very aware that any

research output they produce must be deposited in the OAIR. AUP2 said it is moderate because they make use of it a lot. All theses are posted there. All faculties are made to publish on the repositories. UGP3 said that,

Within the university, I will say because of the deposits on our platform the awareness is increasing considerably. Basically we decided that it was only postgraduate materials and the academic staff's output that have something to do with academic work.

UCCP1

I heard it during my postgraduate programme in South Africa. It was through a lecture series that I got to know about it.

KNUSTP2

When I went to do my masters at the University of Ghana. There I made enquires and they said making access to information online available and free. The OAIR is the doors where we can have research output free of charge from an institution.

UGP1

There was this library website that I visited and realized there was this new concept coming up that is OA so it started delving into it.

UCCP1 and KNUSTP2 supported the comment of UCCP2 by saying, for him the library has played a key role in making OAIR known to the university community as a whole, especially the academic staff who are supposed to contribute most to the OAIR. Participants from UG interviewees revealed that academic staff got to know about OAIR through the library, Internet, faculty or even colleagues (UGP1). In support of this, UGP3 also maintained that academic staff became aware of OAIR through the library, Internet, faculty or even colleagues.

UGP2

When I came to the university as staff the university through the library had a workshop on electronic resources that I participated in.

AUP2

When I came to Ashesi as a staff in 2010 they had the D space but it was not all that functioning, we are filling now.

UGP2 believed that most academic staff knew about OAIR through the library. AUP2 and UCCP3 supported the comment of KNUSTP1 by saying, the Internet has a lot of information on OA and OAIR.

Some academic staff even publishes many of their research works in OA journals. Participants from UDS revealed that academic staff got to know about OAIR through the library, Internet, faculty or colleagues (UDSP2).

At CARLIGH meetings, I am a member of CARLIGH (AUP1).

This assertion was supported by UGP1. AUP1 believed that academic staff knew OAIR through the Internet and the library.

4.2.4 The perceptions of OAIR

When the different participants were asked about the perceptions of academic staff towards OAIR, academic staff feared people without their permission might copy their works. They also noted that the use of OAIR meant their papers would not go through peer-review. There was the belief that few people would only access their work if they publish them on the OAIR. Participants again said depositing their work on the OAIR platform would be time-consuming. Finally, the interviewees commented on the fact that most publishers will not allow them to deposit thus already published works on the OAIR.

Participants also commented on the fact that if they deposit their work in OAIR they may not be able to publish it elsewhere. They were concerned that their work might not be preserved in the long term and OAIR is not prestigious. Academic staff had some level of understanding when it comes to OAIR. They attributed it to the library organizing various programmes and information available on the Internet. UCCP1, for example, remarked:

Asking for their research work to be deposited is very difficult. They do not see why they should deposit in a repository; they do not see the need for it. Either their perception is negative or they do not know about it. Some have the idea, because there was a time somebody asked that question if I bring my work and you put it online, someone might reproduce it.

UCCP2 shared his view:

Unfortunately, I have not had a personal encounter with academic staff but it is an open belief. But I have heard that thesis when made opened, people will plagiarize. It is not true, but rather other repositories can use it, because it is open and plagiarism will be lowered.

It appears interviewees have the opinion that academic staff have negative perceptions about OAIR, data revealed that academic staff were concerned that their works might not be preserved in the long term and again OAIR was not prestigious.

KNUSTP1 commented:

The education is still on going because few people think it's not credible and has a low standard. But they have forgotten it is the database used for the university rankings and source of accessible research output to whoever is in need. Now that they know they can increase their visibility and can be sponsored if there is a need for it.

AUP1 complained particularly about they feeling their work might be plagiarized.

UCCP3 also affirmed that:

As I have indicated, I do not think it has gone down with them to appreciate the need for it. However, we had some seminars for them to appreciate what it is and that will help us to project the importance of it.

The interviewees said academic staff were particularly concerned about the fact that papers deposited on the OAIR must go through a peer-review process. This kind of perception prevented academic staff from using OAIR. The participants suggested that some of the materials in the repository had not gone through any form of review as far as research is concerned.

With the faculty, I must say the perception is somehow negative because others think their works should not be made available online. Therefore they try as much as possible to be unwilling to share their work publicly. I think the perception at the faculty is not all that good as compared to the students (UGP1).

The interviewees, especially the older ones, rather complained that the process of depositing their works on the OAIR is difficult and time-consuming. They felt that some of the processes were too technical and because they were not IT oriented persons or IT experts, especially when they had not been trained or taken through the processes. They cannot do it without difficulties KNUSTP2, one of those OAIR managers remarked:

With my experience, all I can say is from the little that I have seen. Academic staff also submit their works to the repository as they graduate as students and the university mandate it that their work should appear in the repository so that when you are going for promotion they will look at your work.

According to UGP3, UDSP2 and AUP2 the perception of academic staff about OAIR is increasing.

We have told them that depositing their works there means they are increasing their visibility on the web. Because people do research and they will get to know of your publications but largely because most of them publish with these academic databases, they see the OAIR as a bit lukewarm (UGP3).

Academic staff are using it, some will even call you to come for some papers and upload them on the repositories others too are not bothered. So for me, I state that the university could adopt a policy that will mandate everyone to deposit his work on the repository. That will help because if you do not push people they will not follow (UDSP2).

For the faculty, they are happy for others to read about their work and they bring it. Just a few think anything free is not worthwhile (AUP2).

Another perception of academic staff on OAIR that emerged from the participants was that some of the academic staff had a positive understanding of OAIR. They were interested in the platform. They understood a lot of people would see their research works in OAIR. UGP2, for example, commented:

At UG, some academic staff are interested in the institutional repository. We have some who walk in here to submit their works. They go online to check whether they will see their works. They call us to publish their work online, so the level of awareness can be said to be high.

OAIR managers were further asked about the characteristics of OAIR in university libraries, most of the interviewees noted that OAIR are institutionally based, scholarly materials are in digital formats, OAIR are free to access and OAIR are cumulative and perpetual. The academic staff had some knowledge of these characteristics of OAIR and this was general knowledge. KNUSTP1 for example remarked:

We use the Dspace software. That is the most popular software used by many institutions. We have not done so many configurations but what we did is to set it up in the most efficient manner that we could.

UCCP1 shared this view:

Once we have entered the research works there, it is permanent. You can have access to it any time even if the system goes down, you will still get the files in the system.

Some interviewees said academic staff liked the experience using the OAIR platform, the data revealed that OAIR was easy to use especially downloading documents. UGP1 commented:

It is user-friendly and clearly described, you know when you go on to the platform you realize we have categorized the collections into communities. It is clearly stated so whenever someone needs any of the collections, and he or she moves into the direct community, he or she can easily locate it. We also have the search engine that also helps to retrieve items using some search keywords and it is linked to a goggle search engine so it crawls through the goggle platform. It can

give you the user statistics in terms of who used it and where the person using it is from. That is what I can tell you about the characteristics.

AUP2 added that things there are permanent and it is opened. It has been linked to google search and that is how the software works I mean the Dspace. UCCP2 also affirmed that:

Everything in it is mostly free and some make it available that you can copy but most of the things in it are accessible. You do not need to provide a username or password to access it. That is my little knowledge. The documents are permanent when it is put there.

Most of the interviewees were particularly concerned about documents in the OAIR being permanent. The data suggested that some academic staff were worried their research works might not be there permanently.

We have at the communities and collections in its module in a way that may make the information we want to disseminate easily accessible. It has gotten no specific features that I may talk about except the features on OAIR using a well-known platform like Dspace (KNUSTP2).

AUP2, one of those OAIR managers remarked:

Things there are permanent and contain a lot of information. When you upload something on the AU repository within 24hrs you should be able to find it if you search for it. At most 48hrs you should find it. We grant access to some document and it can be accessed from anywhere.

According to UGP2, we do the uploading of contents onto a database. The unit has a workflow so we move from a step to the other and in the end, we upload the materials onto the repository and then we make them available to the university community. As you may know, a repository has to do with a container containing something and it is there for a lifetime and access to it will be unlimited (UCCP3).

4.2.5 The content archiving of OAIR

This part of the chapter presents the findings from the interview relating to content archiving of OAIR in university libraries. The data suggested that OAIR managers mediate contents uploaded on to the OAIR in all the universities. Documenting research data, storage and backup, training on research data management services, research data management plan and data security, protection and confidentiality are the activities engaged in when it comes to content archiving.

Concerning the theme, all the participants said that content was uploaded by OAIR managers. About the second theme, participants said that they engage in most of the activities. The participants said the mediated deposit was mostly used. One of them remarked:

“For now it only mediated, let me say, the OAIR team are doing the uploads, we want to start the self-archiving but maybe that will be done from next semester where we run training or workshops for academic staff so that they can archive, but now uploading is from the OAIR team” (UCCP1).

Others said:

“Library staff mediates it, undergraduates who had A or B in their project work qualify to have their project works on the platform they are skimmed, corrections editing and then faculty their pre-prints and abstract” (UDSP1).

“You submit your research work to the team and we vet it. After they send it to the library. Then the final upload is made, we have to read through after vetting and correct it before uploading” (AUP1).

Others said they do the mediation; they go for the content from the graduate schools and the academic staff too, they do the submission for them.

However, UGP1 said, “We have self-archiving submission and mediator so we do depend on faculty”. He commented, “They can do self-archiving if the person can do it himself, but it does not come to life, we need to authenticate it. Then we make it available online. If there is enough training on the ground then it would have been

easier for them to submit research work themselves but since there is inadequate training, we think that submitting onto the email platform is the best so that we can do everything for them”.

As pointed out earlier, the participants suggested that currently, the OAIR team mediates most of the things that they have there. In our case, we mediate between the school of graduate studies and us and even when academic staff send their articles. The interview data pointed out that OAIR managers are responsible for the upload of content. They are in charge of that with the support of the library IT department. We are into admitting, processing and uploading the content on the platform. They also support the platform technically and managing any other aspect of user administration.

In our case, we mediate between the school of graduate studies and the library and even when academic staff send their articles, we received them. What we do is that after every graduation we take CDs from the graduates and we copy them, convert them to PDF and we watermark it and upload it. (UCCP2).

UGR2 also confirmed this view:

We determine the kind of materials we want to put on the OAIR. Some of them we have to scan, others we do not touch the content and we put the universities logo on it. Then a quality control personnel looks through and it is uploaded. We have another person who checks the metadata. And we have submitters who submit to the repositories. Metadata officer will check, verify and it is either accepted or rejected.

When a further probing question was asked on how contents are archived into the OAIR, the interviewees said they were involved in uploading of documents. Those involved in the whole archiving process said

“We have two ways of uploading our IR we have that of the thesis and dissertations and also the university publications. Agriculture will go under the College of Agriculture and Natural Sciences so it depends on what we are to send to the system and that will tell us which community to send into” (UCCP3).

“For the articles from faculties we look at the community in which the article belongs to for instance if we have something on religion, it will go under the Faculty of Humanities and Legal Studies” (UDSP2).

The collections are varied. They have theses, articles, collections of heritage materials, newspapers and more. Depending on each collection they have a different process.

So with the public lectures, I deal directly with public affairs. They feed me with that information and every academic staff that delivers, they then deliver it to me (UGP2).

On the other hand, with the research articles they do it in two ways, we use software to pull the public work from one database. They also have research development officers for the various colleges so they can collect the articles and submit to us (UGP1 and UGP2). (Here, they usually received the softcopies directly through our head. We do these and in a while, it comes when we upload we wait till the next one comes before we upload. It goes through some checks though, AUP2).

KNUSTP1 reported that they have the old version that is the one outside for you guys to see but they are trying to change it by upgrading to the new one. They are carefully selecting the research output from postgraduate students currently they are uploading it into the system although we have little challenges.

4.2.6 The level of usage of OAIR

The findings from interview relating to the level of usage of OAIR in university libraries, the types of materials deposited in OAIR, file formats generally used to deposit OAIR, the reasons for the usage of OAIR, the benefits of OAIR to the university and factors that could facilitate the usage of OAIR were presented. With the first item which demanded the level of usage of OAIR in university libraries. The data suggested that all of them had their ways of describing the level of usage, they all said it was increasing.

Most of the interviewees talked about the level of usage of OAIR, whether academic staff had ever used the OAIR and had ever deposited in OAIR. UCCP1, for instance, explained:

For now, let me say it is increasing, at first it was low but now, I have seen increments I checked the site but I am not sure what figure it is now.

UCCP2 added that:

It is quite impressive and sometimes we had issues about the server going down and most often people call. I want to access your institutional repository and it is down I cannot access it and truly we will check and it may be down. We have improved our servers now and they do not go down. So that made me aware that people were accessing it. And it was a positive thing for me.

Another KNUSTP1 commented:

The level of usage of OAIR is high, whenever it is down people alert us. We have the Google metrics, which we use to check, and the ranking also comes in. Unfortunately, we are now no longer adding a new thesis onto the platform because we will be launching the new one.

UCCP3 commented that:

It is well patronized from where I sit because day in day out when you log on onto the system you will realize people are patronizing. I want to say there should be an education on that. On the whole, it is not doing badly. I am sure it will increase by the end of the semester, we recently started using Google analytics.

The data suggested that academic staff did not go for OAIR as a way of publishing their research work. They rather enjoyed publishing in journals from publishers. UGP1, for example, commented: I think it is going up now, the last time I checked. Most especially among faculties, but there is more we can do. AUP2 also said that:

Even yesterday we looked at some analytics on the use. We can view the usage and from where the OAIR is been accessed and the usage is increasing and this is very fantastic.

This is an OAIR of a community of about fifty thousand people made of students and staff so you expect this number of visits to the website but I cannot over the table tell you that this is what it should be or this is what it is. Sometimes too when you check the web graph of the visitors, you see people from different parts of Ghana, Africa and the World. Academic staff also use it (KNUSTP2). UGP2 again added:

As of now, I know it is very good because of a lot of the universities outside and even within Ghana, when they are done with their masters' theses and want to do the PhD here, they want to verify whether their works are uploaded on the repository.

Another source that the interviewees suggested would help them is adequately checking the level of usage of OAIR was using Google analytics. AUP1, for example, commented:

It is low, it has been increasing, checked through Google analytics.

UGP3, for example remarked:

The level of usage is increasing for all types of materials in the OAIR.

The responses of the interviewees emphasized that the level of usage of OAIR is low but the rate of increase was high. In a follow-up question, to examine the various types of materials that is deposited in OAIR in university libraries.

Mainly, theses by masters and PhD students, research articles from faculty. For the faculty research, we usually publish the open research articles, not the closed ones. And we also have heritage materials, some rich old materials that are of African collections, we have reports from the university inaugural lectures and others (UGP2).

UCCP1 added that:

Currently, the most are theses and dissertations, but we have reports that are the vice-chancellors annual report, we have inaugural lectures, that is, the research articles by academic staff, we have I think, It is a lot but the main ones are theses and dissertations and then research articles, where other journals in the institution are included.

Another KNUSTP2 commented:

Speeches, articles from the university journal, research articles from all the staff or anybody who is publishing in the university, graduate thesis and conference proceedings are documents in OAIR.

UGP3 shared this view commented that:

There are only materials of intellectual value in the OAIR such as articles, thesis reports, newspapers and old colonial documents.

UCCP2 also said that:

Currently, we put in theses and dissertations; we also have journal articles of academic staff. They are all text files.

KNUSTP1 added that:

We have theses, research articles and speeches. Basically, these are what we have.

Another UCCP3 commented:

We have theses for postgraduate both masters and PhD and we have articles written by faculty members. Once you are a staff of the university, you write an article anywhere we should have them in the OAIR.

Another set of materials deposits suggested by the interview data was abstracts and pre-prints. The interviewees were of the view that the choice of materials deposited was mainly the decision of library management. AUP1 and AUP2 commented that:

Pre-prints, abstract and students project works. The data suggested that materials deposited by academic staff were post-prints, theses and dissertations, reports, conference proceedings and seminar papers.

With the third theme that demanded the file format generally used in depositing materials into the OAIR, the data suggested that all of them had their documents in PDF formats. UGP1 supported the comment of UCCP1, UCCP2 and UCCP3 by saying, normally we deal with PDF even if it comes in MS word we still convert it to PDF so we have a software that helps us do that.

Participants from AU, (AUP1 and AUP2) said, they upload only PDF. They do a backup of a master copy and we keep it as back up in case there is a breakdown but on the OAIR we upload PDF (UGP2). KNUSTP2 said that primarily PDF, once a while you have a PowerPoint presentation. UGR3 said largely PDF that is what they have adopted.

When OAIR managers were asked about the benefits and reasons for usage of OAIR, most of the interviewees noted that engaging the university community and enhancing scholarly collaborations, visibility status and public value, relevant to the changing needs of society, digital preservation and enhancing the quality of teaching and scholarship were some of the benefits that accounted for academic staff using the OAIR.

They also commented on reasons as such as to communicate research results, work is disseminated more quickly, deposited material is easy to find, work will be permanently archived and available, number of citations of my work gets increased access to work is cheaper to others, OAIR is well-indexed and archived, chances for promotion are increased and one can add multimedia data to my work. UGP1 for example remarked:

For institutional ranking, it is one of the mediums or key indicators. Universities are being ranked now. It helps the university to be ranked higher than others. It also helps the individual faculty to access collaborators. "People want to find out about researchers and what they are reading to build up further research. Find out recommendations and limitations to build upon it. It opens us up to the world. Your rating goes up when people are hitting your repositories. We are not doing too well, because uploads are too low" (UCCP2).

KNUSTP1 added that:

It is used for promotion and as a source of reference and literature. The benefits for both sides are for the institution, it tells the world the kind of research work coming from their side and the calibre of the researcher you have. Then to the individuals, their visibility is enhanced.

Another UGP3 commented:

It projects and enhances the image of the university since we implemented the OAIR, it has raised our rankings when it comes to worldwide university rankings. It has also helped our students in writing their theses by seeing other works.

Another dimension of benefits and reasons for the usage of OAIR in university libraries suggested by the interview data was the visibility of faculty and their works. The OAIR makes the work of the researcher easy. UCCP3 shared the view that:

People can read the articles of other colleagues and to bridge the gap in their level of understanding. It gives you open access to unlimited information especially when you are a scholar. The concept, of the OAIR, is to make things cheap or available for faculties to use.

AUP2 also added:

For faculty, when they are writing an article and want to refer to theses and articles that are related to the research topic they are studying, they need information and would want to know more about what others have published. When the OAIR is not there and you want to start research, you have no clue about the reference or articles to use and it makes your work difficult. The OAIR makes your work easy and helps to market publications.

The interview data suggested that OAIR enhances the visibility of academic staff's research output and is also used for archiving. KNUSTP2. Academic staff use OAIR as a reference for checking what colleague academic staff have uploaded and for the university administration to see what output is coming up especially from their staff, promotion and encourages them. UGP3 also said that:

Some of them have realized that when they search, Goggle points them to our repository and they think it is a good thing. And the whole thing being branded as UG urges them on to know that they are part and a big search engine like Goggle directed them to their work while searching. It increases your exposure, it gives mileage in terms of

ranking. Even in twenty years to come ours will still be running and does not shut down so far as the university exists.

UCCP1 added that:

There are a lot of benefits such as increasing worldwide publicity and researchers will also be known.

UDSP2 commented:

They need information and would want to know more about what others have published. And they want to know and see the best amongst students in their theses. One, it gives easy access to the information. In the past it was locked and under a key, you have to look for the class number and names with the online one you can easily find information.

For factors that could be integrated to facilitate the usage of OAIR in university libraries KNUSTP1 and KNUSTP2 who shared this view that:

The university can relook at it and decide that everybody should contribute any kind of write-up or documents that are useful to the public onto the OAIR and it will expand the kind of documents or collections that exist. For the usage, I think it should come from the users, things they need we provide. The best is for the system to be user-friendly.

UGP3 added that:

There should be a mandate from the top as far as promotion and other things are concerned. Now, it is kind of if you like thing. There are policies. There was one academic staff that wanted his pictures of an activity to be posted on the repositories. I just took the policy and showed to him that it is only intellectual things that can be posted. So your pictures cannot be posted on the repository.

UCCP2 commented:

One advocacy, two advocacy and three advocacy; let push it hard for people to understand. When big people understand (academic staff) and appreciate it, it will work.

Some of the other factors suggested by OAIR manager that can be integrated to enhance the usage of OAIR in university libraries were OAIR policies, advocacy and marketing. UGP1 remarked that:

We are looking at a situation whereby before any faculty member goes for promotion, it should be a requirement for you to place your work online and we have started engaging them in our discussion so that before the person submits his or her promotion to the board, your works must be on the repository that should be very easy.

AUP1 also added:

Market what you have to the university community. Sometimes we send emails, they see and ignore it meanwhile they had the chance to view but they ignore it. Personally, the faculty and the library need to work hand in hand. We are at the library and the faculty deals with academic staff so if the faculty engages academic staff on activities that will help them refer to research works it will force them to search here.

UCCP3 also said that:

I think there should be a policy within the University because elsewhere, there is a law or you are to present your article to the OAIR before you can be promoted. It serves as one-stop shop of all articles gathered by faculty members so these should be put in place.

AUP2 added that:

Market what you have to your academic staff. Sometimes we send emails, they see and ignore it meanwhile they had the chance to view but they ignore it.

Another UGP2 commented:

We have some strategies laid down though not implemented. When it is implemented our plans will be spelt out for the enhancement of the OAIR. It is actually a policy that has not been accepted yet.

Lastly, UCCP1 commented:

One is the policy, for me that is the main aim. If the policy is strong everything you want about OAIR will be very strong. It should be mandatory that all articles or research publications by, the academic staff should be deposited and also the theses should be deposited even the undergraduates should be deposited.

4.2.7 The challenges with the use OAIR

When asked about the major challenges associated with the use of OAIR in university libraries, most of the interviewees noted that inadequate advocacy, inadequate ICT connectivity and infrastructure, insufficient technological skills, copyright issues, lack of knowledge or awareness of OAIR and inadequate funding. They also commented on challenges such as institutional culture and politics, absence of incentives, inadequate power supply and lack of institutional repository policy.

Some of the OAIR managers believed that challenges have to do with personnel, financial, technological know-how and IT staff. UCCP3, for example remarked that:

Challenges have to do with personnel, here we have someone in charge of the technical aspect and I am for managerial aspect. There is a workload and getting the right people for the job is the problem. Not everybody can perceive what is there. Also network issues.

Managing the service to work efficiently is also an issue. Another one has to do with the presentation of theses. Instead of soft copy, they bring hard copies and archiving adds lots of work. AUP1 and AUP2 remarked that:

Financial, technological know-how and IT staff. OAIR was hosted on our server and we had a problem with our server. Continuously we had

tender strikes. We then decided to move to cloud space. It was difficult because most of our files got lost. Now we are using Dspace direct, which we pay for the cloud space. Any changes in terms of the interface the people do for us. This is less stressful compared to the past one. You were not able to upload the document as fast as you want.

UCCP1 commented:

The challenges, sometimes there are power fluctuations and the system will be down and sometimes users do not know how to use it. Maybe how to search for an item in the repository is the problem.

UGP1 complained, particularly, about power, manpower, equipment and technology, unwillingness from the faculty and management commitment. UGP2 also affirmed that:

One is technological change, IT staff to maintain the server and power outages. We also need more staff in our unit, more hands to be at standby. "Our work is tedious. We have a mismatch of staff and work and it's a major challenge not allowing us to get to equilibrium". The issue of power and the Internet from the administration side is also a problem (UCCP2).

Some of the interviewees, especially the technical ones rather complained about colleagues at other universities advancing of them both in software and IT expertise. They felt that some of their colleagues were far advanced when it comes to OAIR management, especially when they have the opportunity to talk to one another. UGP3, one of those OAIR managers remarked:

We are using open software. For those who are to maintain the platform, we need to be abreast of new technological advancements to help maintain it. We wish the academic staff could push their work on the platform without us doing the mediation for them that will shoot up the repository.

UCCP3, again, added that one of their biggest challenges is Internet accessibility because in our sub-region, these are the things we struggle with again the human capital, people who will man the system. Another is awareness creation.

In the beginning, it was infrastructure, functioning there was an issue of support in terms of strong policies that require people to do what they are supposed to do. Though we have a university OA policy, we do not have a policy on OAIR. It was also staffing in the sense of the structure that we run which is a digital library so the transition from the traditional library module into a digital library. Staffing was one of our challenges, especially the training of new staff. Also, the lack of institutional support (KNUSTP2).

4.2.8 The strategies for the usage of OAIR

One of the objectives revealed strategies that can be developed for the usage of OAIR in university libraries. OAIR managers emphasized that looking at the existence of an OAIR institutional guideline, the reasons for OAIR institutional guideline, the existence of an OAIR policy and the reasons for OAIR policy.

The interviewees talked about funding if one want to produce those guidelines and afterward educating people on them will also involve funds. UCCP1, for instance, explained:

The institution can have maybe another backup power system so that the system will run "24/7" and then also training or workshop or seminar for the users, so that publicity can be wide and from time to time when the need arises. The seminar or workshop lets users know what to do when using the platform. The guideline will be in the policy, it will help us to stay focused. We have the policy, should be enforced. Though we have it but not enforced.

UGP3 added that:

We will need continuous education on the management of the platform. We should get a standing budget for this, we should go out there see what other universities outside are doing and add to ours. We need to

be sponsored, go out there to be trained. They should push a lot of money to replace broken down items

UCCP2 commented:

We should integrate this into our orientation programmes for first time academic staff give them training and we are good to go. We have the print policy and the soft copy, it addresses the main fundamentals of the repository and explains some terms in there and deals with copyrights.

Another strategy suggested by the interview data was effective advocacy and marketing. The interviewees were of the view that when OAIR are properly promoted in the university community, it will go a long way to increase its usage and benefits.

AUP1 commented that:

Advocacy, marketing, funding and IT (whether outsourcing) are key. Just the marketing, we can advocate for the faculty to bring their work. Yes we have, IR policy is not formal, still on it. It will help to promote and regulate its use.

The follow-up question was to examine whether interviewees' institutions had OAIR policies that guided the day-to-day running of the repository (administrative and supervisor).

"Our final draft is ready and waiting for approval. The policy will put the staff on their toes. It will help structure the OAIR to conform to an international standard. The guide or manual will help us to know what to do. It will also help other universities to fall on us if they want to have a repository" (UGP2).

UCCP3, for example, commented: I can speak in this way, for UCC we have a policy but it is not functional. What we have as policy and what we do not move in line. So yes there is a policy but it is not operational. KNUSTP1 also said that:

We should train academic staff to do self-archiving and upload. It reduces our workload. For the policy, I am to find out whether we have the policy or not. Everybody to embrace the effort that we are working

so that everyone can play their role well so that we can have a rooster system the servers are house elsewhere but we control it and manage it ourselves.

It emerged from the data that the only way is to create awareness. Just the marketing,

We can advocate for the faculty to bring their work. Yes we have, it helps to improve the usage (AUP2).

The interview data also highlighted the details in the guide. It emerged that how contents are archived were enshrined in it. UGP1, for instance commented,

“Yes, we have for guiding the collection of content, storing content and sharing of content.”

“I think OAIR should be promoted, people do not promote it. There are a lot of schools running institutional repositories but people do not know. And the Universities must highlight the link of the OAIR, do orientations, talk about it to new students. Also, the OAIR should be openly accessible because there are some OAIR which are not opened” (UGP2).

KNUSTP2 again added:

We need a strong policy spelling out how OAIR is important to the university, the roles to be played by staff.

UCCP3, for example, commented:

There will be only one suggestion form me, that is to make it a policy for faculty members to use it for their scholarly work. Compulsorily they should submit their work so that they can be promoted. It will help us to promote the OAIR all the time.

KNUSTP1, for example remarked:

Everybody must embrace the effort that we are working so that everyone can play his or her role well so that we can have a rooster

system. The servers are housed elsewhere, but we control it and manage it ourselves.

The challenges they had, the solution was to go on space. So now all our files are on the cloud. We buy cloud space for anything we want to work on (AUP2). UCCP2 added that:

To get usage we need to get more content into it and to do more advocacy, strengthen and minimize the unfired use of some of the contents. So we can increase our ratings and findings.

AUR1 commented:

Funding, technological know-how and IT experts should be taken seriously, they are the backbone of OAIR. They say they will provide, but when the time comes they say no funds. The awareness is not properly done, we should start creating awareness for people to patronize the platform.

The responses of the interviewees emphasized that the need for librarians in charge of the repositories to come together and drive towards OAIR advocacy. As stakeholders of the OAIR platform we must have discussions and conduct research to gain more knowledge to enhance usage. Experts or specialists must be invited during our workshops and training programmes. They will be of great support to us.

4.3 Chapter Summary

The chapter presented the responses of the research participants to the questionnaire and interviews. The data provided by the questionnaire from respondents and the interviews of participants have been analysed with quantitative and qualitative data analysis techniques viewed in chapter three. The chapter first, analysed the quantitative data on the level of awareness of OAIR, the perceptions of OAIR, the content archiving of OAIR, the level of usage of OAIR, the challenges encountered with the use of OAIR and strategies for the usage of OAIR in university libraries in Ghana. The chapter ends with an analysis of qualitative data. In the next chapter, the findings of the study were discussed.

CHAPTER FIVE

INTERPRETATION AND DISCUSSION OF FINDINGS OF THE STUDY

5.0 Introduction

In the preceding chapter, the qualitative and quantitative data were analysed. The purpose of this section is to interpret and discuss the findings of the preceding section. The purpose of the study was to investigate the usage of Open Access Institutional Repositories (OAIR) in Ghanaian university libraries. This was done by merging the quantitative and qualitative findings in chapter four. The chapter presents the research findings, highlights the major variables and themes to 'make sense' of the data. It interprets and discusses the data critically with reference to relevant literature in an attempt to explore deeper meanings of the responses, to understand the phenomenon of OAIR usage in universities.

In this chapter, the findings of the questionnaire and the interview are re-categorized and discussed, relating each to the themes in chapter four and filling in the details to explain the relationships. Each of these themes is linked to a separate research question; they have been detailed to ensure meaningful, coherent and clear interpretation and discussion. The discussion was based on the following headings:

1. The level of awareness of OAIR in university libraries in Ghana;
2. The perceptions of universities in Ghana on OAIR
3. The content archiving of OAIR in university libraries in Ghana;
4. The level of usage of OAIR in university libraries in Ghana;
5. The challenges encountered with the use of OAIR in university libraries in Ghana;
6. The strategies for the usage of OAIR in university libraries in Ghana.

For a start, the background of the participants was necessary in getting some information about the participants in the study and it was also crucial to determining the level of usage of OAIR.

5.1 Background Information

Although the background of the respondents and participants was not among the specific objectives, it was relevant for determining the level of usage of OAIR and interpreting and discussing the study findings. The background of the respondents and participants improves reliability, validity, trustworthiness and credibility of responses of participants. The background of participants included university, rank, gender, age, years of service and subject area were considered.

Universities of respondents and participants were included to ensure that all universities selected for the study were properly represented. Most of the respondents were from UG, which has the highest number of academic staff in Ghana and most of the participants were from UG and UCC. Respondents were required to indicate their professional ranks to help the researcher to determine the activities conducted by each participant. Ranks of participants were included to ensure that all academic staff positions participated in the study. Most of the academic staff were those who are in the lecturer position.

Gender of respondents and participants was included to ensure that both genders participated in the study, more males participated in the study. Age was considered among the factors that influence the usage of OAIR. Most of the respondents and Half of the participants participated in the survey were aged between 31-40 and 41-50 years, this means most of the participants were part of the younger half of academic staff and library staff.

The years of service were used to indicate the number of years the participant has been working in the university. Years of services of participants were included to know the number of years the participants in the study has been working in the various universities. Participants were also required to indicate their subject area to help a researcher to determine the professional specialization of each participant. The subject area of participants was included to know the subject areas of participants in the study.

The background of participants was included to note the group that is behind the other when it comes to the usage of OAIR in university libraries. This would help such a group to be motivated to use OAIR. Further, the background of participants

may result in different knowledge and ideas about the usage of OAIR in university libraries. Therefore, the use of the background of participants provided a bottom line for investigating the usage of OAIR in university libraries in Ghana.

5.2 The Level of Awareness of Open Access Institutional Repositories

Quantitative and qualitative data were collected on the level of awareness of OAIR in the universities among academic staff and analysed. The findings of both the quantitative and qualitative study revealed that academic staff had adequate information about OA and OAIR. OA awareness among academic staff in the universities is at the medium level (72%) and OAIR awareness among academic staff in the universities is moderate (66.6%) due to various reasons. Kakai (2018:211) was of the view that lack of awareness of OAIR among researchers and academics was part of the reasons why there was low content in the OAIR and therefore less OA.

The study findings observed that the majority of the academic staff found out about OAIR through the library (36.3%) and the Internet (30.5%). OAIR managers' responses confirmed that academic staff had adequate information on OAIR. Almost all the academic staff got to know about OAIR through the library and the Internet. Kakai (2018) argued that the small number of staff involved in advocating and promoting the OAIR had an impact on the visibility and growth of the repository. Otanda et al (2015) considered it important to raise awareness among the university community about the benefits of OAIR and how it could be populated, but the patronage of the research community was appalling.

Library staff have not adopted the practice of developing information websites to guide users on how university OAIR is being implemented and how they can be involved. Dependence on one-on-one, seminars and workshops, e-mails and print marketing materials are not enough to reach the wider university community. For those who may not be able to attend face-to-face workshops, websites on OAIR and how it applied to universities could be a good and permanent source of information and easy point. Dulle (2010) recommended that users access OA sources of information be linked to library websites. This could be an easy way of getting researchers to find information on OAIR from one location.

Giesecke (2011) indicated that OAIR personnel would consist of those directly responsible for the day-to-day operation of the services and those with new responsibilities added to their services (support positions), such as marketing roles, metadata contribution and training. All categories of OAIR stakeholders such as library staff, academic staff, administrators and students, should be involved in the advocacy of OA and OAIR for any success in the institution.

5.3 The Perceptions of Open Access Institutional Repositories

Generally, all of the items on characteristics of OAIR elicited positive responses from academic staff. The characteristics of OAIR such as being institutionally based, scholarly materials in digital formats, free to access, cumulative (successive additions of materials) and perpetual (materials will be permanently there). The questionnaire and interview findings highlighted certain characteristics of OAIR in university libraries. The general mean of means and standard deviation of ($M=3.89$, $SD= .923$) on the characteristics and ($M=2.68$, $SD= .928$) on the level of understanding shows that the majority of the items elicited a positive response from respondents. Academic staff feared people without their permission might copy their works. They also noted that the use of OAIR meant their papers would not go through peer-review. This corroborated the finding of the quantitative study.

The level of understanding of OAIR among academic staff was low. The general mean of means below the test value shows that all of the five items elicited positive responses from academic staff. Few people would see my work in OAIR, difficult and time-consuming to deposit my work in OAIR, prefer to make my work available only on my website, do not know how and what to deposit in OAIR, publishers would not let me put my work in an OAIR, concerned that if I deposit my work in OAIR I may not be able to publish it elsewhere, concerned that my work might not be preserved in the long term and OAIR is not prestigious were all below the test value.

Studies conducted by Abrizah (2009:19) and Okumu (2015:37) revealed that the academic staff cite a variety of reasons for reluctance in contributing to OAIR, such as the learning curve of new technology, copyright issues, doubts about whether contributing to repositories is equal to publishing, suspicions that the reliability of certain OAIR materials influences their work and worries about plagiarism.

'Others may copy my work without my permission' and 'no peer review process for research papers', on the contrary, these two responses proved to be significant. They were the only responses above the test value. The lack of peer review in this format of some of these published articles raises concerns about the reputation of the academic staff and worries of stolen or plagiarized work (Dawson 2016:2; Yang & Li 2015).

Hard-pressed academic staff may view contributing content to user-generated or self-service sites as time-consuming. They may be happy to contribute material but are unwilling to do it on their own which requires mediated deposit services (Jain 2010: 131). It may take time, consistent encouragement and mandatory self-archiving policies to become part of a normal academic system. Permanent, effective mediated deposit services perhaps located in the library may also take time to establish, particularly if staffed by existing library staff performing this function in addition to normal duties. Additionally, policies formed to monitor the quality of submissions hinder OAIR progress. The extent of the university community's contribution to OAIR becomes part of the intellectual infrastructure.

The belief of many is that OAIR does not pass through proper peer review processes and therefore, is usually rejected when submitted for promotion or other research appraisal purposes (Ezema & Onyancha 2016:4). Despite some of these constraints, studies have shown a growing interest in accessing OAIR research materials because of several perceived benefits such as visibility and increased availability of scholarly research outputs (Bjork & Solomon 2012; Ezema 2011), greater citations and impact influence and higher readership penetration (Davis 2011).

Melero et al (2009) have consistently highlighted several important factors promoting the development of OAIR. Increasing the visibility and quotation of the research work, the friendliness and ease of use of the OAIR facilities and additional services that OAIR could offer such as search and citation index services were among the factors. Subsequently, the absence of policies, the lack of national and international integration and the lack of academic community awareness have demotivated the use of OAIR (Abrizah et al 2017:54).

5.4 The Content Archiving of Open Access Institutional Repositories

The researcher sought to find the content archiving of OAIR among universities. All the respondents and participants said contents were uploaded onto the OAIR by the OAIR team. All the 998(100%) academic staff said the OAIR team uploaded contents onto the OAIR. The general mean of means and standard deviation of (M=3.34, SD= .879) shows that most of the items on the activities engaged in by universities elicited positive responses from academic staff. The findings from the interview relating to content archiving validated that OAIR managers uploaded content and the university engages in most of the activities.

Generally, to deposit their refereed journal articles in open electronic archives, academic staff need the tools and assistance. This is where library staff and OAIR managers come into the picture, making the process of self-archiving simpler by providing resources that enable researchers to make their work freely available on the Internet. These resources include not only the expertise of the librarian in mediating research submission to the archive, but also the addition of appropriate metadata so that other researchers can find the research and the infrastructure (software) on which the archive is running (Kakai 2018:210).

The researcher sought to find the content archiving activities of OAIR in universities. Most of the items elicited a positive response from academic staff and OAIR managers. The quantitative and qualitative findings confirmed that universities engaged in activities of documenting research data, storage and back up activities, training on research data management services, research data management plan and data security, protection and confidentiality when it comes to OAIR. Roy et al (2013) study show that several key issues such as quality of content, metadata standards, preservation technique, workflow patterns, software customization and technical specifications, copyright policy and compatibility with OAIPHM need to be properly considered.

A study by Ezema & Onyanacha (2016:5) looked at the archiving software used in the management of OAIR in Africa and found that Dspace and Eprints are the most popular. Most universities in Africa have adopted Dspace technology, which is freely downloadable but not easy to install and maintain, according to Kakai (2018:213). The libraries are mostly dependent on the Information Technology (IT) department of

the university, which is often already overburdened with other IT systems, thus providing divided attention, slowing down the entire process. The inability within the library to build IT capacity to initiate and support OAIR projects limits the process.

More recently, Prost and Schopfel (2014) discussed issues connected to OA policies concerning their level of openness, paying special attention to different information categories in the institutional repositories. The study found that some of the items in the repository metadata were provided without full links to the full-text. This practice tends to defeat the spirit of putting in place OAIR. As a way out, they suggested that institutions should clarify and be explicit about their openness policies. Researchers who are aware of the benefits of self-archiving and the long-term preservation of literature are optimistic about OAIR. (Kakai 2018:210).

5.5 The Level of Usage of Open Access Institutional Repositories

Prior to the use of OAIR in university libraries, the level of use of OAIR among academic staff was considered necessary. On the other hand, most of the academic staff 629(63%) and 606(60.7%) had not used and deposited in the OAIR respectively. This indicated a low level of OAIR usage among academic staff. The findings from the interview relating to the level of usage of OAIR in university libraries substantiated that all of them had their ways of describing the level of usage. They all said it was low but increasing.

All of the participants were willing to consider using OAIR. Self-efficacy on the Internet refers to the ability of the individuals to use the Internet through their skills. In particular, individuals need to access or publish academic content on the Internet and OAIR outlets to have the necessary skills (Dulle 2010:9). Readers must develop their information and computer literacy skills to benefit from OA initiatives.

Similarly, in order to use the electronic media system more efficiently to access and disseminate scholarly material, it is equally important for scholars to become Internet literate. OAIR has no justification for existence without the dedication of university libraries to train academic staff to use OAIR. Also, Makori (2009:11) suggests that university library information professionals can master the use of ICT systems and other skills through encouragement, motivation and additional training.

Analysis findings have indicated that the majority of participants in the senior lecturer and lecturer positions used OAIR. They formed the majority of the younger population in the study. The study findings present evidence that male participants reported using OAIR. Therefore, female academic staff need to be motivated to use OAIR. The study findings presented the indication that most of the participants were within the ages of 31-40 and 41-50 years. This concluded that younger academic staff used OAIR. The findings of the study added that the younger generation is more competent in using OAIR.

The group between 31-40 and 41-50 years of age was more supportive because they were born on and after the onset of computer technology. Thus making them confident in technology use, therefore, they could easily use the OAIR. On the other hand, the other category between 51-60 and over 61 years of age were considered to be decision-makers; thus, they may promote the use of OAIR in university libraries. This category has relatively middle-aged or elderly people who may suggest different ways to integrate and use OAIR in university libraries, as well as choose the measures to be used to enhance OAIR's use in the university community.

The study findings showed that participants within years of service from 1-5 were not using OAIR. This may be because that new academic staff are not motivated to share research outputs with a specific community, compared to recognition of individual (or institutional) and academic award. The study findings revealed that the majority of participants who used OAIR were those in the Humanities and Sciences subject areas. Before the use of OAIR in university libraries, it was considered necessary to establish the level of depositing in OAIR among academic staff. On the other hand, the majority of the participants admitted that they had not deposited in the OAIR in the university. This indicated the low level of deposits in the OAIR among academic staff. All of the academic staff were willing to consider depositing in the OAIR.

Analysis findings have indicated that the majority of participants in the senior lecturer and lecturer position deposited in OAIR. The study findings presented evidence that male participants reported depositing in OAIR. The study findings presented the indication that the majority of participants were within the ages of 31-40 and 41-50

years. This concluded that younger people deposited in the OAIR. The study findings have added that the young generation is more competent in using OAIR. The study findings showed that participants within years of service from 1-5 and 11-15 were not depositing in OAIR.

The study findings have reported the various deposit types and formats in OAIR usage among academic staff. Most of the academic staff chose post-print, conference proceedings and seminar papers as the types of material they have or would like to deposit in OAIR. On the other hand, the majority of the academic staff preferred PDF, MS Word and MS PowerPoint as file formats they would generally use and therefore might wish to deposit in OAIR. Adeyemi et al (2017:298) state that the scope of materials created by an institution and its community members is highly diverse. This includes various forms of grey literature and other unpublished materials such as pre-prints, working papers, theses and dissertations, research and technical articles, conference proceedings, departmental and research centre newsletters and bulletins, grant applications papers, status reports for funding agencies, memoranda and committee statements, analytical reports, technical documentation and surveys.

There are many more item types in the discussion surrounding OAIR book chapters, working and discussion papers, datasets, questionnaires, doctoral theses, conference papers and presentations (Rumsey 2006:183). OAIR offers the means for processing, searching and accessing all forms of research output, these information hubs have an important role to play for producers and consumers of such resources, multimedia and teaching materials can be introduced, and OAIR managers should ensure that metadata for all types of items is provided with high quality and international standards for search and accessibility.

From a different perspective, research is based on a questionnaire and other work that contributes to the final findings, and conference presentation may have preceded the final publication. When depositing into the OAIR, it may be important for the author to be able to link the item to other relevant items in complex digital objects so that such a relationship can be expressed between objects. Knowing the content, subject, files and media type for submission in your OAIR is critical (Nagra 2012:143).

To find out the nature and type of content contained in their research projects, the institution needs to conduct a faculty survey. The type of content in repositories varies from institution to institution, it is advisable to know the content needs of your institution community to prepare guidelines, policies and standards for file formats.

5.5.1 The reasons for OAIR usage

The reasons for OAIR usage in university libraries in Ghana were investigated. The study findings have revealed that to communicate research results, work is disseminated more quickly, published material is easy to find, work will be permanently archived and available, the number of citations of my work gets increased, access to work is cheaper to others, repository is well-indexed and archived, OAIR protects it from plagiarism, chances for promotion are increased and can add multimedia data to my work were the reasons for usage of OAIR among academic staff in the five universities.

5.5.2 The benefits of usage of OAIR

Participants provided various benefits of OAIR usage in university libraries. The majority of the participants reported the following benefits of OAIR usage in university libraries; engaging the university community and enhancing scholarly collaborations, visibility status and public value, relevant to the changing needs of society, digital preservation and enhancing the quality of teaching and scholarship.

Cullen (2010:133) states that university libraries benefit from being involved in OAIR initiatives. This has implications for scholarly communication. Other proposed benefits focus on visibility status and public value, enhancing the quality of teaching and scholarship, engaging the college community and enhancing scholarly collaborations, staying relevant to the changing needs of communities. OAIR has many opportunities that universities and its academic staff can exploit.

JISC (2012) argued that OAIR has great value-added services potential and offers a range of benefits to academic staff, students and institutions. By centralizing the research outputs generated by the institution and researchers, OAIR aims to generate greater impact. It therefore, serves as a much better and simpler way to assess the performance, scholarship and reputation of the academic institutions

(Adeyemi et al 2017:301).

Engaging the university community and enhancing research collaborations the OAIR helps the institution to disseminate the research output to the global research environment, improving community outreach and opening up new environments for national and international research collaboration. Campbell (2011:152) states that part of the need for OAIR has arisen from changes in scholarly communication models and the need to establish a clearinghouse for the academic performance of the university. OAIR helps ensure that the institution's academic activities and research projects are accessible to the public and the global academic and research community.

One major benefit of OAIR is the visibility of African scholarship as a whole and the individual and institution's intellectual output in particular (Okumu 2015:21). The visibility and integrity of each institution are determined by the work reflected in their OAIR hence a network of such causes OAIR not only produce quality research work but also the prestige of the institution. Otondo (2011) explains that OAIR is now current indicators of universities' quality, prestige and global visibility.

Pfister and Zimmerman (2008:15) have established justifications for OAIR to include, increase visibility and impact of research output, a shift in the paradigm of scholarly publishing, and enhancement of internal communication within the institution. Ezema (2011:480) explains that the OAIR is intended to generate greater impact by centralizing research outputs generated by the researchers of the institution, thereby serving as much better and simpler metrics to assess the quality of the academic scholarship, productivity and prestige of the institution.

Hixson and Cracknell (2007:39) noted that if the research engine returns search results that lead to the faculty and institution, the profile of both the authors of the faculty and the institution could be raised. The faculty can therefore, benefit from depositing in the OAIR their copyright-owned material, personal visibility for research projects as well as professional careers. The OAIR platform improves access to otherwise difficult to obtain resources.

The immediate benefit of OAIR is that all research outputs collected and stored in OAIR are unconditionally made available to its faculty and all other members

associated with it. OAIR expresses the potential and performance of the institution by highlighting faculty and student work and other academic activities (Agyen-Gyasi 2010:16). As a result, the OAIR also positions the organization in a strong ranking position (Agyen-Gyasi 2010:16). It appears that the low visibility and ranking of African universities are linked with the inability to adapt and use OAIR (Ezema & Onyancha 2016:3). Consequently, Africa is often regarded as an only consumer of scientific research productivity leading to a low ranking of African universities as revealed in the 2014-2015 World University Rankings for Times Higher Education (2015), powered by Thomson Reuters.

OAIR has the potential to make research outputs more widely available through the Internet (Dlamini & Snyman 2017:536), including storage and access to a wide range of materials (Chawner 2009; Dlamini & Snyman 2017:536; Jain 2011). Given these attributes, OAIR has the potential to play an important role in growth, mainly because it enhances access to and sharing of research-based information generated in specific countries.

As the main producers of primary research and as the centres of intellectual and scholarly content, academic and research institutions (whether in developed or developing countries) are expected to take an interest in the creation, dissemination and preservation of knowledge (Dlamini & Snyman 2017:536; Kapsule & Chawinga 2016). It is also important to engage these institutions in better ways to collect, preserve and disseminate research outputs produced within the institution (Singeh et al 2013).

OAIR concentrates the intellectual output created by the researchers of the university, providing a clearer demonstration of its scientific, educational, social and economic value and thus bringing prestige to both employees and institutions. These archives can integrate local and international research and provide a better picture of the research performance and specialization areas of a country. This will promote future international cooperation, joint research, proposals for funding and even recruitment and retention of faculty members.

Relevant to the changing needs of society, the latest trends in Internet-based e-resources are changing the way that research community patrons seek information.

OAIR is designed to address developments in the creation, distribution, access and use of scholarly materials. Faculty, scholars, and higher education institutions have an important role to play in research and developing scholarly efforts to establish a functioning OAIR. Institutions follow the latest trend in scholarly communication, which increases engagement and involvement in the system of study and interaction as well as visibility and value to the community (Okumu 2015:23).

Digital preservation refers to a series of management activities necessary to ensure continued access to digital materials for as long as necessary (Okumu 2015:24). In sustaining academic research performance, OAIR can also play an important role (Dlamini & Snyman 2017:536). Combined with the tremendous increase in computer power and network capacity, the ease with which digital information can be generated has contributed to the proliferation of a vast amount of digital information. This data overflow has prompted many to address the issue of long-term preservation to ensure that the data generated today will withstand technological change and can be retrieved in the future.

Nevertheless, the broad view of OAIR as a way of efficiently maintaining and preserving the information of an institution based on intellectual property results in the content of OAIR reaches beyond digital prints to include research data, electronic learning materials and other materials and other types of institutional intellectual output that are typically not published or maintained elsewhere. OAIR provides institutions and faculty with the ability to collect and coordinate long-term preservation of digital information. Material type may be in any digital format, but the author should be allowed to post it to OAIR. Essentially, resources may be stored in the OAIR that may be damaged or at risk.

Enhancing the quality of teaching and scholarships, Nagra (2012:139) states that OAIR enables the archiving of institutional research and scholarly activities that enable the university to find and access the institution's previous and current projects at one location. It also enhances the quality of scholarship through sharing and collaboration, and this fundamentally creates the basis for new ideas for the dissemination and sharing of teaching and research in academic institutions.

The goal of OAIR is to act as the institution's intellectual output and to communicate the concrete results of these activities internationally. The success of OAIR depends, therefore, on contributions from the faculty, but not all faculties contribute to it (Casey 2012:2). Especially at the beginning, there may be undeniable difficulties in generating content. Academics also refuse to deposit their work (Jain 2010:130).

Experiences indicate that only when a requirement is in place to fill it will OAIR work to its full potential. Besides, researchers may react negatively to any indication of coercion and may not respond to an invitation to add research output to the OAIR. Also, due to lack of motivation and low priority for faculty members and researchers, low deposit rates are often due to a lack of organizational policies and mandatory provisions.

As academic institutions implement OAIR, the faculty is often reluctant to contribute, as shown in the Association of Research Libraries (ARL) survey of directors. Schonfeld and Housewright (2010) found that less than 30% of university faculty contributed to OAIR. Submission policies describe the policy of submitting digital content to OAIR, although mediated archiving is the most common procedure for depositing content, self-archiving is the future of OAIR. New users wishing to submit content should register on OAIR and then choose the submission set (Shoeb 2010: 206).

Ultimately, the success or failure of OAIR rests on its ability to meet the needs of the members of the institution it serves. OAIR is not attracting the volume of deposits that was originally expected and it has not been adopted as a standard practice in the context of scholarly communication. Carlson (2010:154) noted that researchers have not responded with a great deal of interest to the services OAIR has not yet deposited their materials at the rate initially predicted.

5.5.3 The factors that affect the usage of OAIR

Several factors could be integrated to facilitate the usage of OAIR in university libraries, factors used in the study were accessibility, availability, visibility, intention to reuse satisfaction and usage benefits. The study adopted the Technology Acceptance Model (TAM), which was then modified to fit the study.

A prerequisite for validating the structural model was the estimation of the measurement model through Confirmatory Factor Analysis (CFA) (Hair et al 2010). After submitting the measurement items to CFA, the initial results suggested that all fit statistics showed a good fit for the measurement model; thus, the measurement model was adopted as proposed by Hair et al (2010) for Structural Equation Modeling (SEM). By using three criteria: Reliability (R), Composite Reliability (CR) and Average Variance Extracted (AVE), the measurement model was further evaluated for convergent validity of scale items.

According to Hair et al (2010), reliability is an assessment of the degree of consistency between several factor measurements. R was calculated by evaluating CFA loadings of the Cronbach and factor. Therefore, the coefficient of Cronbach was examined for each aspect. Hair et al (2010) provide that good reliability is suggested by the thumb rule for a reliability estimate of 0.7 or higher. The reliability between 0.6 and 0.7 can also be accepted, however, as long as other indicators of the construct validity of the model are good (Hair et al 2010). In the analysis, the alpha coefficients for Cronbach of all six variables ranged from 0.8 to 0.9, suggesting that the instrument was adopted for the research was highly reliable.

Convergent and discriminant validity has been established accordingly. Evaluating the CFA factor loadings tested convergent reliability. Composite reliability was measured by testing the internal consistency of the measurement model. Therefore, the reliability and convergent validity of all variables in the measurement model were adequate. Using CR and AVE, convergent validity was also evaluated. The CR tested the internal consistency of the measurement model. Recommended CR thresholds are 0.70 or higher and an AVE of more than 0.50, followed by internal consistency construct (Hair et al 2010). The findings showed that CR ranged from 0.6 to 0.9, suggesting that the study model could be viewed as having acceptable convergent validity.

The discriminant validity, on the other hand, measured the degree that a concept and its indicators vary from another concept and its indicators (Bagozzi, Yi & Phillips 1991). Fornell and Larcker (1981) explain that when the square root of the extracted average variance is greater than its correlations with all other variables, it means that it has established discriminant validity. The findings of the study showed that all of

the AVE square roots are greater than the correlations in the model between a variable and any other variable.

This meets the criteria of the discriminant validity of Fornell and Larcker (1981) (Bagozzi et al 1991). Therefore, the Hair et al (2010) AVE should be 0.5 or higher to indicate the correct convergent validity. The entire six variables showed an AVE of 0.5 and 0.6 in the analysis, which indicates that the study's measurement model can also be assumed to have acceptable convergent validity. In other words, both the measuring model and the structural model had adequate reliability convergent validity and discriminant validity in the study.

SEM was conducted to verify whether the variables specified in the study were supported. Hair et al (2010:609) add that SEM is a family of statistical models that seeks to explain the multi-variable relationships. To observe the structural model, the same sets of fit statistics used for the measurement model were also used. The findings revealed no significant difference between CFA and SEM models fit statistics. This means that SEM has an excellent model fit, so the researcher decided to continue with SEM.

Twelve relationships have been proposed by the study. Usage benefits were considered as a dependent variable in the analysis, while the rest of the variables were considered as independent variables, accessibility, availability, visibility, intention to reuse and satisfaction. The standardized path coefficient indicates the strength of the relationship between the independent and the dependent variables. The results suggested significant support for the conceptual framework (OAIR Use Model) to enhance the use of OAIR in university libraries in Ghana. In the analysis, nine of the twelve hypotheses are accepted as explained below:

5.5.3.1 Accessibility

First, there was no significant effect of accessibility on satisfaction. However, the study showed that accessibility had a significant effect on the intention to reuse OAIR and usage benefit. The results of the study showed that accessibility had the strongest direct effect on user satisfaction compared to any other variable within the model. The study finding provides that university libraries, as well as library staff, need to ensure accessibility to improve the use of OAIR to meet the needs of users.

Accessibility, on the other hand, had the strongest positive effect on the intention to reuse the OAIR. Therefore, the study has indicated that, if OAIR will be accessible, it will increase the intention to reuse the system among academic staff.

The findings of the study revealed that accessibility played a key role in driving user intention (H1 and H4). The university should, therefore, work to improve the overall accessibility of OAIR to increase the user's intention to use it. Academic staff are supposed to be the key readers and contributors to the OAIR website. Increasing their intention to use helps enrich the OAIR platform content. Furthermore, university libraries should provide open OAIR, provide timely assistance to user queries and demands, maintain trust and confidence, and give academic staff individual attention to use the platform. University libraries should also identify the IT library staff to manage OAIR. Therefore, academic staff should also take advantage of a wide range of OAIR functions to strengthen the intention of the user.

The findings of the study have also shown that accessibility has no significant effect on usage benefits. The study finding was inconsistent with the results of other TAM studies. Thus, it is confirmed that while the study result did not indicate the direct relationship between accessibility and usage benefits, university libraries need to enhance their accessibility in the context of OAIR. This is because accessibility improves the use of OAIR to provide benefits to use within the university.

5.5.3.2 Availability

Availability had a significant effect on satisfaction and intention to reuse OAIR. Further, availability had a significant effect on usage benefit. The study findings have provided that availability had a significant effect on satisfaction. Therefore, the study finding was inconsistent with the findings obtained in other TAM studies. Accordingly, university libraries must improve the quality of the accumulated information to allow more library clients to use it. Further, the study findings have indicated that availability had a significant effect on the intention to reuse the system. Therefore, university libraries need to ensure availability before it is uploaded onto OAIR, thus, to attract more users to the OAIR. Also, academic staff and library staff need to create and share knowledge to ensure availability to enhance the intention to reuse the OAIR.

However, the study did not provide the direct relationship between availability and intention to reuse the system (H5), library staff should focus on enhancing knowledge availability to raise satisfaction in the OAIR. Relevance, accuracy, timeliness and completeness are the main factors leading to the success of OAIR. Library staff should also develop means to monitor online content to ensure the availability of information including user-generated content. The intention to continue using OAIR can increase due to a high level of satisfaction, and thus be able to account for high investment costs involved in developing and maintaining the OAIR. Lastly, the usage of OAIR can also improve when availability measures are put in place to enhance satisfaction and reuse of OAIR. OAIR managers should also ensure that OAIR are reliable, available and user-friendly to encourage academic staff to reuse the system.

The study findings have indicated that availability had the strongest direct effect on usage benefits. Therefore, the study provides that increased availability would be associated with the usage benefits. In the study, the usage benefit is the outcome the system brings to both an individual and organisation after the full implementation and usage of the model. Researchers, students, staff and institution will require on-going availability of the content within the OAIR (Okumu 2015:25). Therefore, there is a need to ensure availability to have a positive impact on both the staff and the university.

5.5.3.3 Visibility

Visibility had no significant effect on satisfaction. Further, the study findings showed that visibility showed a significant effect on the intention to reuse OAIR and usage benefit. The study findings indicate that visibility had no significant effect on satisfaction. Therefore, there is a need for university libraries to improve visibility to enhance satisfaction in the use of OAIR. The study findings have indicated that visibility had no significant effect on the intention to reuse the system.

However, the study did not indicate the direct relationship between visibility and intention to reuse the system. There is a need for university libraries to increase the effectiveness of OAIR to increase the intention to reuse the system. The study provides the need to employ system administrators to improve visibility in the

platform through customization and updating processes. The study finding also indicates that visibility had the strongest direct effect on usage benefits. It is, therefore, important for accurate and correct knowledge to be used by the right person at the right time and in the right context.

5.5.3.4 Satisfaction

Satisfaction had no significant effect on the intention to reuse OAIR. Satisfaction had a significant effect on usage benefit. Satisfaction is very critical to the use of the model within the institution. This is because a user needs to be satisfied with the system that they are going to use, as well as, the value and benefit that such a system could bring to the institution. After being satisfied, users might increase their intention to reuse the system for the benefit of their institutions and increase their job performance to provide better services to users. Therefore, satisfaction plays a major role in the usage of OAIR. The study has also revealed that satisfaction affects availability. On the other hand, the study findings have indicated that satisfaction had the strongest direct effect on usage benefits.

5.5.3.5 Intention to reuse

Intention to reuse OAIR had a significant effect on usage benefit. The study findings have indicated the relationship between intention to reuse the system and usage benefits. The study, therefore, proposes that intention to reuse the system could lead to the user benefits in terms of good services thus attract more users to use the OAIR available in the library. OAIR can maximise the availability, accessibility, discoverability and functionality of scholarly research outputs at no cost to the user (Dlamini & Snyman 2017:536; Jain 2011).

5.6 Challenges with the Use Open Access Institutional Repositories

The study findings have provided the challenges that hinder OAIR usage in university libraries. The mean of means ($M=4.09$, $SD= .889$) that is greater than the test value of 3.0 gives evidence of challenges of OAIR among respondents in Ghana. Most of the interviewees verified that inadequate advocacy, ICT connectivity, infrastructure, funding, power supply, insufficient technological skills, lack of knowledge or awareness of OAIR, absence of incentives, institutional repository

policy, institutional culture and politics and copyright issues as the major challenges associated with the use of OAIR in university libraries

Scholars have identified the challenges of OAIR in Africa some of which include funding shortages (Ezema 2011; McKay 2011), language barriers (Bowdoin 2011; Chalabi & Dahmane 2012), inadequate ICT infrastructure and highly skilled ICT experts (Ezema 2011; McKay 2011; Nwagwu 2013). The technological challenges suggest low web usage and a lack of access to global scientific information on the web (Nwagwu & Ibitola 2010) resulting in a skewed distribution of knowledge in favour of the West. Other hindrances to OAIR bother on institutional inertia because of doubt of its acceptability by some institutions for promotion, retention of tenure and access to research grants (Singeh et al 2013; Schonfeld & Housewright 2010), creation of awareness (Utulu & Bolarinwa 2009) that reported increasing awareness of OA publication, but its low use as publication channel.

Besides, Jain (2011:133) states that, as a result of challenges for setting up institutional repositories, hitherto the growth of OAIR has been concentrated largely in institutions in the developed world. Wacha and Wisner (2011) agree with the criticisms of OAIR and argue that the problems could be addressed if libraries shift their focus from their own needs to those of the faculty. Academic and research institutions are yet to take full advantage of the benefits provided by institutional repositories (Adeyemi et al 2017:302).

However, inadequate advocacy was a major challenge in university libraries. Similar observations were made on other studies done by Christian (2008:38) who argues that poor advocacy and marketing of OAIR is one of the reasons for the slow uptake of OAIR in Africa, thus resulting in a lack of knowledge or awareness of OA which in turn influence development and use. There is a lack of proper understanding of the role, purpose and working of OAIR. OAIR is comparatively new to most academic staff, particularly, in developing countries. It is difficult to promote the benefits OAIR offer whilst allaying stakeholders' concerns and a relentless promotional and marketing aspect is crucial to successful OAIR implementation (Jain 2010: 132).

The use of advocacy is an efficient method of effecting changes in organisations and the wider society. OAIR is a new approach to research dissemination and many

stakeholders know little or nothing about them. The library as the centre for the dissemination of information should be at the centre of this advocacy (Ezema 2011:482). All stakeholders of OAIR such as academic staff, librarians and students must be involved for such advocacy to be effective. Advocacy attracts contributors as well as, stakeholders. Unfortunately, a high percentage of stakeholders in Africa have little or no knowledge of what OAIR is about to be able to act as advocates. Effective advocacy presupposes that the advocates or stakeholders are very familiar with the concept (Adeyemi et al 2017:303, Agyen-Gyasi 2010:20). One of the best ways to promote the development and use of OAIR in developing countries is through advocacy.

The study findings reported the inadequate ICT connectivity and infrastructure to support the usage of OAIR in university libraries. According to Adeyemi et al (2017:302) the development of OAIR in developing countries is much a capital-intensive project than in developed countries. This is because academic and research institutions in the developed country already have in place a well-established state of the art ICT infrastructure to build on, but in developing countries, this infrastructure or foundation is not in place. Access and maintenance of OAIR will require Internet access and enough bandwidths. Adeyemi et al (2017:302) observed that bandwidth allocation in Africa is so expensive that most universities cannot afford more than 1.544Mbps that is less than many home broadband users in America.

For maximum benefit, OAIR needs a relatively fast and reliable Internet connection. Sadly, in Ghana, this is not the case. Given the increase in Internet use in Ghana, the bandwidth in most universities and research institutions is insufficient. The low availability of Internet bandwidth is an obstacle for OAIR. In developing countries, the high cost of Internet bandwidth makes it very difficult for academic institutions in the field to provide enough bandwidth to host OAIR. Ideally, OAIR needs dedicated Internet access and the cost of such dedicated services exceeds most institutions (Agyen-Gyasi 2010:17).

Bandwidth is the lifeblood of the information economy in the world, but it is scarcest where it is most needed in Africa's developing nations that need low-cost connectivity to accelerate their socio-economic development. While little

infrastructure is needed to set up OAIR, much more is needed to get the full benefit. Accessibility criteria include the entire institution's network coverage, provision of access points, network equipment and other devices that are too large to be implemented by some organizations (Agyen-Gyasi 2010:18).

The most important requirement for electronic networking that affects OAIR is the provision of an effective telecommunications service. Telecommunications infrastructure remains underdeveloped in most African countries. Although the situation in Ghana has changed, more needs to be done to get the situation to the level of developed countries. The main factor responsible for the high cost of Internet bandwidth in Africa is the use of satellite broadband against a much cheaper fibre-optic network. Universities in Ghana are hindered by monopolies and inefficiencies in telecommunications that limit communication and interaction with colleagues at home and abroad, and thus retards research.

Sadly, universities with limited financial resources in developing countries end up paying more for the same bandwidth than their counterparts in the developed world (Agyen-Gyasi 2010:18). Therefore, a well-established OAIR system could facilitate the usage of OAIR. The study has also reported insufficient technological skills, reluctant to change from the traditional way of providing library services to technological means is also among the challenges that hinder the usage of OAIR in university libraries.

Copyright issues in the usage of OAIR were also reported by most of the participants. Lack of reliable control in most of OAIR brings fear to most of the people to add their information. The study has reported that some people can misuse information by editing, rewriting, and deleting, thus, to lose the meaning of the information uploaded by someone. The other issue that affects the development and use of institutional repository is intellectual property rights, the aspect of the law that covers diverse legal rights that exist in creative work. Intellectual property law embraces such exclusive rights in copyright, patent, trademark, industrial design, trade secrets and trade name. (Christian 2008:39).

The author's right to reproduce work includes the right to convert the work from the paper format to digital or electronic format. This right is especially important since the

development of OAIR always entails scanning of previously published work in paper format and converting the same into digital format for uploading in OAIR. Unless this is done with the permission of the copyright holder or under a statutory exception as fair dealing, this amounts to copyright infringement and eventually affects the use of OAIR (Adeyemi et al 2017:303; Agyen-Gyasi 2010:20).

Sometimes researchers are apprehensive about infringing publishers' right and lack adequate awareness about their intellectual property rights (Jain 2010:130). Publishers often see OAIR as a potential obstacle and a threat to their business and misinterpret them. They also have policies at least tending towards complicating if not antagonism towards institutions. Authors may therefore, be undecided making their pre-published work available online before or even after a traditional publisher publishes it. Since scholarly publishing through OAIR is a paradigm shift from traditional publishing, the management of intellectual property issues must also evolve (Jain 2010:130).

Maintaining OAIR comes with cost, it is not free. Factors that impact costs include the number and type of staff, type of technology chosen for the repository, services provided and cost of preservation of data. Technology costs include hardware and software needed for OAIR, charges for backup systems and digital storage (McGovern & McKay 2008). Once the software platform is solved, the institution can determine the staffing needed to run OAIR. Staffing will include those with direct responsibility for the daily operations of the services and those who have new responsibilities added to their positions to support the service. The latter include staff who may take on marketing roles, staff who contribute metadata and staff who provide training.

Operation costs include costs for marketing materials such as brochures, supplies, including costs for software upgrades and hardware replacement costs. With these categories of costs in mind, an institution can determine the additional costs it will incur by adding OAIR to its set of services. Libraries may also need to determine the cost to scan materials for OAIR, particularly, if the institution decides to digitize dissertations and theses for OAIR (Giesecke 2011:534). The initial financial cost for OAIR open-source software opted for by most institutions is not high, but the ongoing maintenance cost may be significant and may prohibit OAIR project from

getting beyond the proposal stage (Jain 2010:130). Funding is another major problem academic and research institutions in developing countries are likely to face in their effort to continue using OAIR. The state of ICT infrastructure in academic and research institutions in developing countries like Ghana is low and requires a complete overhaul to sustain the development of OAIR (Agyen-Gyasi 2010:19).

Lack of awareness of OAIR was related to the low usage of OAIR in university libraries. The study has indicated that lack of awareness is among the reasons for the low usage of OAIR among the majority of the participants. Lack of awareness of OAIR is a major challenge to the development of OAIR in Africa. Christian (2008) posited that there is empirical evidence that the awareness of OAIR is very low among the major stakeholders including academic staff, librarians and students in Africa. He further revealed that most of the participants surveyed during the course of the research are completely unfamiliar with OAIR. Effective advocacy and promotion are crucial for the successful implementation of OAIR.

The full benefits of OAIR can be achieved only if the stakeholders involved are fully aware of its potential roles. Lack of knowledge of OAIR seems to be one major issue to the usage of OAIR in developing countries (Adeyemi et al 2017). The study findings have indicated the institutional culture and politics being among the critical challenges that hinder the usage of OAIR in university libraries. Often, it is difficult to sustain continuous support and commitment to the management and academic staff (Jain 2011:130). Management commitment and support are vital for successful OAIR implementation to ensure preservation and maintenance, information technology infrastructure, digital rights management and institutional mandate (Lagzian et al 2015:198).

Setting up OAIR is a major undertaking for the institution that requires a commitment of financial and staff resources to ensure success in both the establishment and maintenance of OAIR (Lagzian et al 2015:198). A successful OAIR requires institutional commitment, start-up resources are relatively high and there is a necessity for both technical and advocacy skills to be employed to make the OAIR part of everyday working practice of the academics, tireless commitment to marketing and improving the services, as well as reacting to feedback from users is necessary.

The developers of OAIR are likely to face challenges related to the politics and culture of an institution from the stakeholders, namely the library staff, academic staff and IT staff. Any single institutional failure can cause more damage to the viability of OAIR. OAIR can fail over time for many reasons; if the institution chooses to stop funding it), management failure or incompetence. Any of these failures can result in the disruption of access or worse, total and permanent loss of material stored in OAIR (Adeyemi et al 2017:303; Agyen-Gyasi 2010:21). Management support is regarded as an organ that can decide what to do; thus, university libraries need to establish a good relationship with their management to be assisted in OAIR maintenance. Other challenges that are directly avoided through management support include lack of a knowledge-sharing culture, inadequate technologies and ICT infrastructure and lack of motivation to use OAIR.

There was also the absence of incentives. The study has observed the absence of incentives among academic staff. In the absence of any specific or financial incentive, academics can feel little motivation to provide even bibliographic details of their academic work especially when they see incentives are available at other institutions (Jain 2010:131). The author also noted that the academic argument may run that the university's core mission is to advance research and scholarship. It is secondary to archive content and to make research publicly accessible. The non-use of articles submitted to OAIR in assessing and promoting authors makes them reluctant in freely contributing to the OAIR platform. This will consequently affect the content of materials that would be posted to OAIR (Agyen-Gyasi 2010:22).

The study revealed inadequate power supply in the majority of university libraries. The study also revealed the lack of standby generators and other power supply devices in case of a power cut. Similar observations were reported by the studies of Adeyemi et al (2017:302) observed that poor power supply is a major impediment to the operation and growth of ICT in African universities. According to him, only a trickle of daily electricity production dribbles erratically into the institutions rendering ICT systems dysfunctional. Another challenge associated with Internet connectivity in an academic institution is the problem of power supply. OAIR should be openly accessible to every user at all times (24 hours a day within the week). This will therefore, require a sustained and regular electricity supply to power the ICT

facilities. Electricity supply is a major problem in Ghana as in other African countries. This problem makes the development of OAIR in Ghana a difficult and expensive venture as backup generators has to be enlisted and additional funds required to fuel them (Agyen-Gyasi 2010:19).

The study findings have indicated the lack of an OAIR policy to guide the usage of OAIR in university libraries. The study found out few library policies with few or no components of OAIR may not be easily understood by most of the participants. Some of the expressed reasons as to why this was so included the fact that, it was sometimes difficult to get researchers to agree to share their work, especially when no OA policies were operating within the institution. Although some institutions had succeeded in drafting OAIR policies, some of them are stagnated because it was essential to involve all stakeholders but bureaucratic to achieve. The inability to implement the drafted policies was slowing content collection and affecting OAIR. Otanda et al (2015) noted that there was no OA enabling environment to guide institutions on how to proceed. Some of the policies lacked mandatory provisions to deposit content in OAIR rendering the archiving process to remain voluntary.

Kakai (2018) noted that one of the most difficult and time-consuming tasks in populating a repository is ensuring that the appropriate copyright clearances have been sought. The result is adding the metadata and uploading the abstract, which is already part of the metadata. An essential component of repositories is that they are dependent on permissions from others. Before content is deposited in an OAIR, permission should be sought from the copyright owner, and in a university setting, this may include university administration, staff, students and publishers. OAIR in Africa must have policies that guide its operation. OAIR policy documents should cover such matters as what to accept or not accept, copyright issues, self or mediated archiving, submission and withdrawal policies, types of materials to accept and any other issue necessary to govern the operation of OAIR (Adeyemi et al 2017:303).

5.7 The Strategies for the usage of Open Access Institutional Repositories (OAIR)

The questionnaire and interview guide revealed strategies that can be developed for the usage of OAIR in university libraries. Academic staff and OAIR managers suggested some strategies that could enhance the usage of OAIR. A mean of means and standard deviation of ($M=3.71$, $SD= .930$) was obtained when the researcher further looked into the strategies that could be employed by universities to enhance the usage of OAIR through the use of an institutional guideline. Half of the academic staff 512(51.3%) suggested the existence of an institutional guideline. OAIR managers endorsed that looking at the existence of an OAIR institutional guideline, some of the university libraries had an institutional guideline but it was not official.

Further, the strategies that could be employed by universities to enhance the usage of OAIR among academic staff through the use of an institutional guideline were also investigated. Some of these reasons for OAIR institutional guideline include general lack of awareness on the topic, absence of national guidelines or mandate or policies by research funders and/or unclear legal frameworks, unclear distribution of responsibility and lack of institutional coordination among the different stakeholders (researchers, departments, libraries, funders), lack of infrastructure or absence of funds to develop the needed infrastructure, lack of expertise on the topic at institutional level, priority given implementing institutional policy on OA to research publications, novelty of the topic, low interest levels from researchers, technical complexity in implementing OA to research data and complexity of the topic.

This may be because library staff performs most of the OAIR activities, while academic staff participates in the creation and sharing of knowledge through teaching, learning, research and innovation. On the other hand, academic staff and libraries showed the highest level of OAIR usage in most of the visited universities. It was observed that they could lead and facilitate the use of OAIR in the majority of the universities. Thus, it is believed that academic staff and libraries need to be empowered to support the utilization of OAIR in universities worldwide. There was a general lack of awareness on the topic that continues to affect the majority of the universities worldwide. University libraries need to identify knowledge expertise existing within individuals working in universities.

Further, libraries' effectiveness and efficiency, productivity, and profitability could be enhanced through knowledge expertise among employees, and then shared for the benefit of the entire university community. There are many factors to consider in using OAIR. These include software, staffing, advocacy and marketing and policies. There is also the need to have a reliable backup power supply that is a major hitch in most African countries (Agyen-Gyasi 2010:6). The major factors to consider while using an institutional repository are as follows:

5.7.1 Advocacy and marketing

General lack of awareness on the topic (M=3.94, SD= .885), novelty of the topic (M=3.58, SD= .854), low interest levels from researchers (M=3.58, SD= .921) and complexity of the topic (M=3.46, SD= .957) call for advocacy and marketing. Marketing OAIR with faculty is an additional crucial factor. It requires that library staff tirelessly promote the OAIR. Changing the culture of scholarly communications is not an easy job and uptake remains slow in academia. Through developing the infrastructure and encouraging early adopters, a critical mass of content will attract other researchers and illustrate to the administration how OAIR will meet institutional needs (Westwell 2006:217). OAIR is an unfamiliar concept to most researchers. Advocacy, then, becomes a crucial aspect of any OAIR project. At the University of Melbourne, library staff visit department, maintained a promotional website and showed impressive usage statistics on individual papers. They also published in their university newspaper and held related seminars (Kakai 2018:214).

The consensus is that the central challenge for developing OAIR lies not in its technical implementation, but in instilling a change of mind set among researchers, to make self-archiving an integral part of their academic life. There is a need to involve more stakeholders in the advocacy for OAIR. Engaging researchers in sensitizing their colleagues and involving more library staff in the marketing of OAIR could go a long way in reaching a wider community of the university. This worked quite well at the University of Kansas Libraries (Emmett et al 2011), the Grand Valley State University in Michigan (Beaubien et al 2009) and the University of Oregon Libraries (Kakai 2018:214). Kakai (2018:214) suggested that there should be a top-down development of OA policies, beginning with government and funding agencies to smoothen the process that institutions take to develop OAIR policies because

then, OAIR stakeholders would have prior knowledge about OA policies and would easily pass and implement OAIR policies.

5.7.2 Policies

Absence of national guidelines or mandate or policies by research funders and/or unclear legal frameworks (M=3.91, SD= .964), unclear distribution of responsibility and lack of institutional coordination among the different stakeholders (researchers, departments, libraries, funders) (M=3.82, SD= .912) and priority given implementing institutional policy on open access to research publications (M=3.67, SD= .876) show the need for OAIR policies. One OAIR has introduced an incentive plan for adding material to OAIR. Faculty compete for grants, which are then used to develop and add content to OAIR an innovative way to increase funding and interest of researchers in archiving their work. Carlson (2010:153) noted that, approximately one third were no longer active and a further third no longer pointed to information pertinent to the citation. This is a powerful argument to convince researchers that their materials should be housed in OAIR.

As a success factor, this is more difficult to measure; however, it is suggested that researchers who are familiar with OAIR from both the input and searching sides will use it. Perhaps these inducements, combined with an institutional mandate, will encourage scholars to deposit their work. Harnad and McGovern (2009) emphasised the importance of mandates incorporated within policies to ensure deposits are made, ensuring the growth OAIR. Concerning the study findings, most of the respondents and participants were in favour of having university mandates requiring researchers to deposit research output in OAIR. This corroborated with many other studies (Abrizah 2009; Dutta et al 2014; Chilimo 2016; Kakai 2018; Singeh et al 2013; Yang & Li 2015).

The Consortium of Uganda University Libraries (CUUL) has integrated mandatory statements in their OAIR policies. Although mandates are good and highly recommended, Quinn (2010) pointed out that mandates alone would not overcome the researcher's psychological resistance to participation in OAIR and suggested that this should be done together with other strategies of encouraging faculty to deposit in OAIR (Kakai 2018:209). Institutions that initiated repositories did not start

with policies and this affected the implementation of OA. With the training and guidance provided so far, the situation is improving, with universities that have OA policies hoping to yield more content in the repositories (Kakai 2018:212).

5.7.3 Software

Technical complexity in implementing open access to research data (M=3.49, SD=.989) and lack of infrastructure or absence of funds to develop the needed infrastructure (M=3.82, SD=.967) confirm the need for software. Whatever service is selected software will still have to be evaluated in several areas, namely, hardware requirements, user interface, functionalities, the formats of data which is acceptable and can be uploaded onto the platform, ability to accept imports and exports and to integrate into interoperate with existing library management programmes, the standard harvesters which would be able to collect information from the software, the type of data, the quantity or size of the data that can be handled without freezing or hanging the system, the number of queries and traffic that can be handled at one time (Agyen-Gyasi 2010:9). Author further states that the security provided for data from hackers and the needed auxiliary software to support the software used for example PDF, picture managers, are very essential while selecting the software for OAIR. The available software used by most universities with institutional repositories is Dspace and Eprints.

5.7.4 Staffing

Lack of expertise on the topic at an institutional level (M=3.79, SD=.976) corroborates that staffing is important. A growing pool of literature discusses the roles librarians play in developing OAIR. Library staff must be conversant with digital collection management and open archive information system management skills. Library staff and academic staff need to be trained to prepare documents in an acceptable format and to submit content to OAIR using a simple interface. Most libraries in Ghana, such as the UG, KNUST, UCC, UDS and AU emphasize a fully mediated service for their academic staff, where library staff manages the whole submission process from metadata entry, file conversion to uploading.

In terms of defining the collection, library staff need to establish content management policies. Library staff are experienced in selecting, describing, storing, and managing information content. They can negotiate with users on content priorities such as what metadata to store and present, should teaching materials be included, and how to handle successive drafts of the same paper. OAIR managers should evaluate the performance of the collection and make decisions relating to access, conservation, and preservation. A diagrammatic presentation of this strategy is in Figure 5.1.

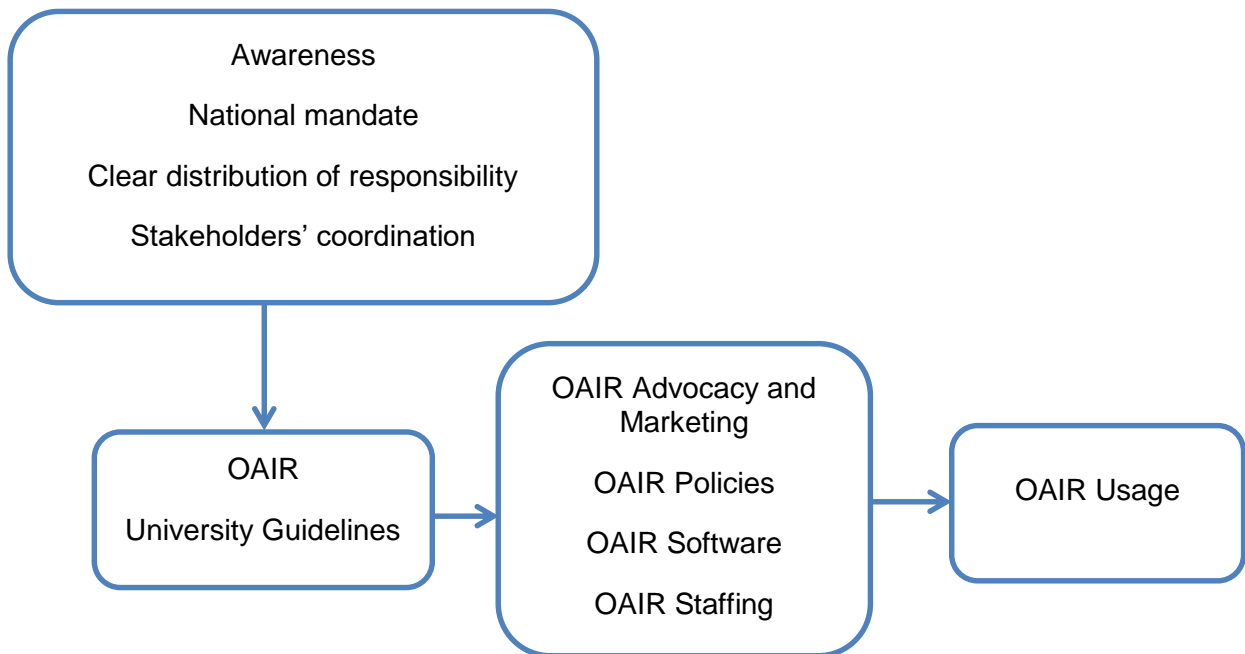


Figure 5.1 OAIR Strategies (2019)

Ideally, voluntary submissions from academic staff will seed OAIR and sustain its growth. Academic staff may support the project in principle, but very few take action voluntarily. Libraries have moved beyond a custodial role to contribute actively to the evolving scholarly communication process. Therefore, library staff have to take a proactive role in garnering content for OAIR and work towards a sustainable approach. The role of library staff is now expanding to include collaborating with IT staff and academic staff to manage and disseminate research output and learning materials coming from their universities.

5.8 Chapter Summary

The data provided by the questionnaire from respondents and the interviews of participants contained in chapter four have been discussed with the findings and literature viewed in chapter four and chapter two respectively. The chapter firstly discussed the research findings on the level of awareness of OAIR, the perceptions of OAIR, the content archiving of OAIR, the level of usage of OAIR, the challenges encountered with the use of OAIR and strategies for the usage of OAIR in university libraries in Ghana. The chapter ends with a presentation of an OAIR guideline that will deal with software, staffing, advocacy and marketing and policy issues to enhance OAIR usage. The next chapter summarises the findings of the study, gives conclusions and recommendations.

CHAPTER SIX

SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

The chapter summarises the major findings of the study. It also gives conclusions and offers recommendations. Areas of further studies have been suggested. Thus, the chapter focuses on the implications of the findings of the study for policy formulation, practices and further research. The goal of the study was to investigate the usage of OAIR in university libraries in Ghana. The study established the achievements of OAIR, the challenges of OAIR and the strategies recommended as prospects.

6.1 Summary of the Study

The study investigated the usage of OAIR in university libraries in Ghana. The main concentration was to determine the level of awareness, examine the perceptions, establish the content archiving, determine the level of usage, identify the challenges encountered with the use and suggest a strategy for the usage of OAIR in university libraries in Ghana. TAM was adopted to understand the study, and was deemed appropriate for the study because it models how users come to accept and use technology.

One thousand and eighty-five (1085) respondents were sampled for the quantitative phase, using a statistical power analysis software package known as Sample Size Calculator of Creative Research System (Creative Research Systems 2003). A total number of nine hundred and ninety-eight (998) respondents completed the questionnaire distributed, but for the qualitative phase twelve (12) OAIR managers were chosen. Simple random sampling, stratified random sampling and purposive sampling techniques were employed.

Questionnaire and interview guides were used as research instruments to gather relevant data for the study. Descriptive statistics (frequencies, percentages, means and standard deviation) and inferential statistics (multinomial logistic regression and CFA using SEM) and thematic analysis were used as statistical tools to analyse quantitative and qualitative data respectively. The study revealed that indeed the academic staff in the university libraries in Ghana had a low level of OAIR usage.

Some of the challenges associated with the OAIR usage in the university libraries in Ghana include inadequate advocacy, ICT connectivity, infrastructure, funding, power supply, insufficient technological skills, lack of knowledge or awareness of the OAIR, institutional repository policy, absence of incentives, institutional culture and politics and copyright issues. However, university libraries in Ghana could also consider numerous strategies in using the OAIR such as software, staffing, advocacy and marketing and policies enshrined in an institutional guidelines on OAIR.

6.2 Key Findings of the Study

The study revealed that there was a low level of OAIR usage among academic staff. Also, the level of understanding of OAIR was high and the contents of research work were uploaded onto the OAIR by the OAIR team. Again, the challenges, benefits and strategies of OAIR usage were shown. However, the study concluded that advocacy, policies, software and staffing enshrined in an institutional guideline on OAIR would enhance OAIR usage in universities.

6.2.1 Findings on the level of awareness of OAIR

The study discovered that academic staff had adequate information about OAIR. The researcher observed that most of them found out about OAIR through the library and the Internet. According to the academic staff, OA is the free availability of information that one is permitted to use without any financial, legal or technical barriers. Most academic staff were of the view that OAIR is storage for the preservation of universities' digital information or knowledge assets, this indicates that the academic staff were aware of OAIR.

6.2.2 Findings on the perception of OAIR

The study showed that the level of understanding of OAIR among academic staff was high. The academic staff demonstrated knowledge in OAIR by identifying its characteristics that include; institutionally based, scholarly materials in digital formats, free to access, OAIR are cumulative (successive additions) and OAIR are perpetual (permanent). Others were of the view that people might copy their work without their permission and there would be no peer-review process for research

papers. These two responses proved to be important among academic staff in the country.

6.2.3 Findings on content archiving of OAIR

The findings of the study also showed that the contents of the research work were uploaded onto the OAIR by the OAIR team. Most of the university libraries in Ghana, like the UG, KNUST, UCC, UDS and AU emphasized a self-deposit service for their academic staff, where academic staff managed the whole submission process from metadata entry, file conversion to uploading. The findings confirmed that universities engaged in activities of documenting research data, storage and backup activities, training on research data management services, research data management plan and data security, protection and confidentiality when it comes to OAIR.

6.2.4 Findings on the level of usage of OAIR

The study equally revealed that most of the academic staff had not used the OAIR. This indicated the low level of OAIR usage among academic staff. They were all willing to consider using OAIR. The senior lecturers and the lecturers, as well as male academic staff, used the OAIR most. Academic staff between the ages of 31-50 years and academic staff in the Humanities and Sciences subject areas used OAIR most. The conclusion therefore, is that young academic staff made use of the OAIR. The findings of the study also showed that academic staff that had taught between one and five years were not using the OAIR.

Again, most academic staff had not deposited their research works in the OAIR in the university. This indicated the low level of deposits in the OAIR among academic staff. However, they were willing to consider depositing their research works in the OAIR. The senior lecturers and lecturers, as well as male academic staff, deposited most. Academic staff between the ages of 31-50 years deposited in the OAIR most. Also, academic staff who had taught between one and five years and 11-15 were not depositing their research works in OAIR. Most of the academic staff chose post-print, conference proceedings and seminar papers as the types of material they had or would like to deposit them in the OAIR. They preferred PDF, MS Word and MS PowerPoint as file formats they would generally use to deposit in the OAIR.

The study findings have revealed that to communicate research results, work is disseminated more quickly, published material is easy to find, work would be permanently archived and available, the number of citations of academic staff work gets increased, access to work is cheaper to others, the repository is well-indexed and archived. Also, OAIR protects it from plagiarism, chances for promotion are increased and can add multimedia data to academic staff work were the reasons for the usage of OAIR among academic staff in the five universities. Engaging the university community and enhancing scholarly collaborations, visibility status and public value, relevant to the changing needs of society, digital preservation and enhancing the quality of teaching and scholarship were the benefits of OAIR usage in the university libraries.

Accessibility, availability, visibility, intention to reuse, satisfaction and usage benefits were the factors used in the study. The study adopted the Technology Acceptance Model (TAM), which was then modified to fit the study. Usage benefits were regarded as a dependent variable, while the rest of the variables such as accessibility, availability, visibility, intention to reuse and satisfaction were regarded as independent variables. The findings supported the conceptual framework (OAIR Usage Model) to enhance the OAIR use in the university libraries in Ghana, nine out of the twelve hypotheses were supported.

6.2.5 Findings on the challenges with the use of OAIR

The findings demonstrated clearly that inadequate advocacy, ICT connectivity, infrastructure, funding, power supply, insufficient technological skills, lack of knowledge or awareness of the OAIR, institutional repository policy, absence of incentives, institutional culture and politics and copyright issues were the challenges facing the university libraries in Ghana. Additionally, the findings of the study revealed that half of the academic staff did not know whether an institutional guideline exists on the OAIR in their universities. Some of these reasons for OAIR institutional guideline include general lack of awareness on the topic, institutional coordination among the different stakeholders, absence of national guidelines or mandate or policies by research sponsors and unclear legal frameworks and distribution of responsibility.

6.2.6 Findings on strategies for the usage of OAIR

Finally, lack of infrastructure or funds to develop the needed infrastructure, expertise on the topic at the institutional level, priority given implementing institutional policy on OA to research publications, novelty of the topic, low interest levels from researchers, technical complexity in implementing OA to research data and complexity of the topic. In using OAIR, these factors must be considered; software, staffing, advocacy and marketing and policies were the factors to consider.

6.3 Proposed OAIR Usage Model for University Libraries in Ghana

The study employed TAM (TAM1, TAM2, TAM3 and UTAUT) to explain the usage of OAIR in university libraries in Ghana. Again, TAM was used to link various activities as identified under TAM1, TAM2, TAM3 and UTAUT and OAIR usage. Furthermore, the study developed a conceptual framework that was adapted, validated and modified to fit the study. The conceptual framework used in the study combined all the factors of the objectives and linked all other factors as explained in TAM (TAM1, TAM2, TAM3 and UTAUT).

6.3.1 Proposed model

One of the strategies was coming out with a model; it was influenced by all the objectives of the study. A model is a more abstracted way of organizing a process, so a strategy could be generalized to solve similar problems. In the study the strategy is a graphic representation of key concepts. It shows the relationship between the independent and dependent variables. The model is based on the findings of the study as presented in Chapters Four and Five as well as the review of the literature as reported in the second chapter of the thesis. The application of TAM (TAM1, TAM2, TAM3 and UTAUT) in the study provided the factors that support the usage of OAIR in university libraries.

The research problem outlined in Chapter one highlights the need to integrate OAIR to enhance the usage of OAIR in university libraries. Further, the objectives of the study point out the basic factors that may help to develop and use OAIR in university libraries. The proposed model aims at assisting universities to enhance the usage of OAIR. The model attempts to establish the link between the research problem and the proposed solution for the study, therefore justifying the need for this

comprehensive and open model for the usage of OAIR in university libraries.

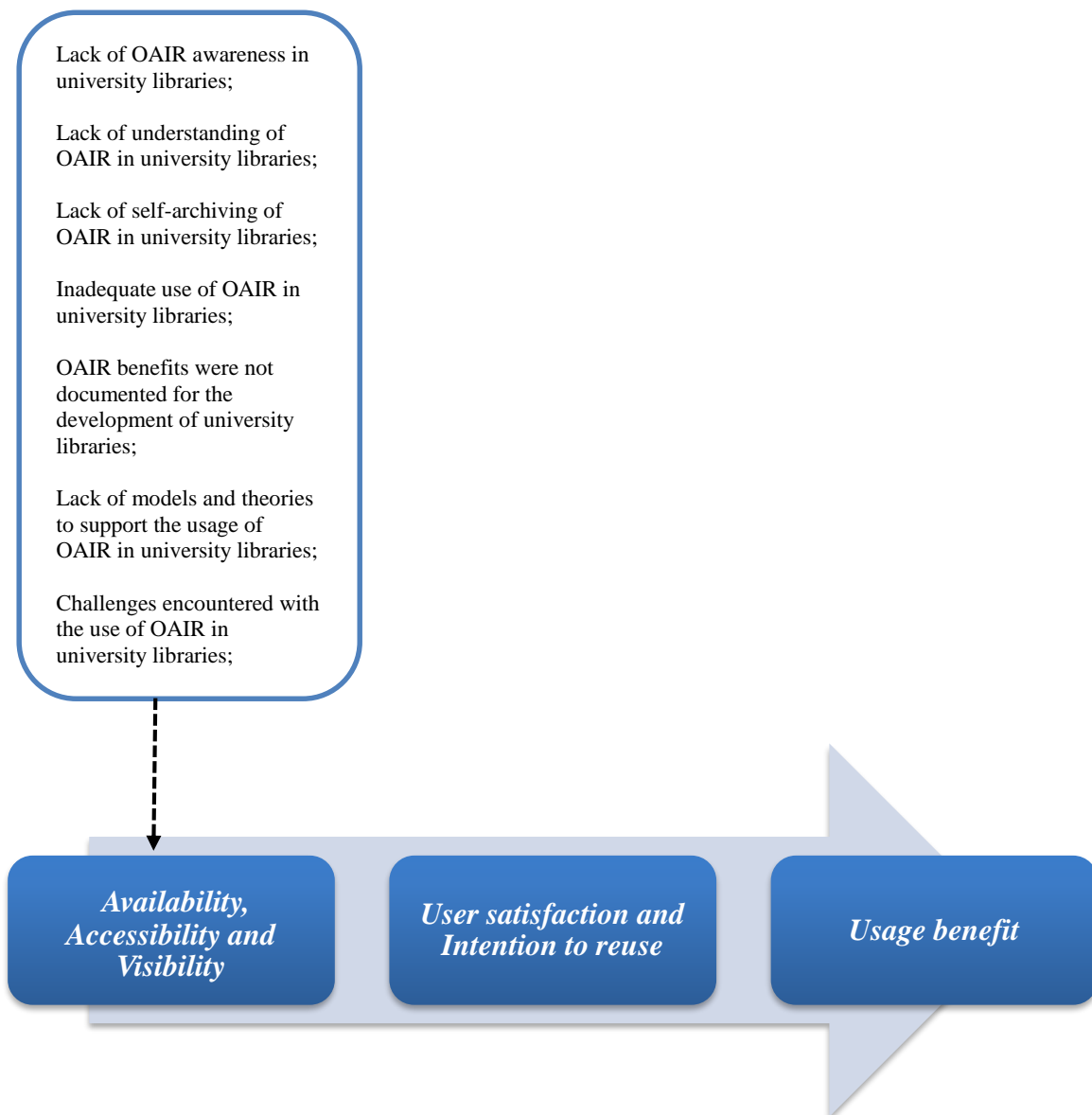


Figure 6.1 OAIR Usage Model (2019)

6.3.2 Justification of the model

The strategy is justifiable due to the following facts:

1. Lack of OAIR awareness in university libraries;
2. Lack of understanding of OAIR in university libraries;
3. Lack of self-archiving of OAIR in university libraries;
4. Inadequate use of OAIR in university libraries;
5. OAIR benefits were not documented for the development of university libraries;

6. Lack of models and theories to support the usage of OAIR in university libraries; and
7. Challenges encountered with the use of OAIR in university libraries.

6.3.3 Explanation of the model

The model attempts to show and link factors that could lead to the efficient and effective usage of OAIR in university libraries. The model can guide university libraries in the development and usage of OAIR in university libraries. It was based on information gathered from the literature review and the findings of the study. Figure 6:1 summarises that there are quite many factors to consider for the efficient and effective usage of OAIR in university libraries. Accessibility, availability, visibility, intention to reuse, satisfaction and usage benefits were the factors used in the study. Usage benefit was regarded as a dependent variable, while the rest of the variables accessibility; availability, visibility, intention to reuse and satisfaction were regarded as independent variables. These factors are explained as follows:

6.3.3.1 Accessibility

Accessibility refers to the amount of labour required of a user to obtain the item after having determined that it is available; thus, accessibility is the number of clicks required for a user to navigate from the results to the full text of the paper itself. Again, accessibility refers to the support provided by the library staff and OAIR manager to facilitate the usage of OAIR in university libraries. The interactive and participatory nature of OAIR can influence academic staff, researchers and students to use them for their research work. On one hand, library staff play important roles in providing support to OAIR users.

6.3.3.2 Availability

Availability refers to the simple presence of an item in a set of search results, an indication that the item exists. Availability ensures that the right information is created and shared for the benefit of the university libraries and their parent institutions. Availability is the ability of search engines to retrieve clear links to an individual paper within the first two pages of results. Availability ensures the right information is captured and available for the right users at the right time. The

availability process looks at organizational processes such as identification of OAIR users and OAIR content capture and reuse. Availability is therefore, significant in investigating the satisfaction and intention to use OAIR.

6.3.3.3 Visibility

Visibility is how well the model performs the functions of knowledge creation, storage and retrieval, transfer and application. Visibility measures the desired characteristics of OAIR and how they could be employed to universities. Visibility is a strong indicator of user satisfaction in the context of OAIR and it is moderately influenced by the perceived net benefits. Therefore, academic staff are more likely to continue reusing the OAIR due to visibility. Thus, visibility increases user satisfaction towards the use of OAIR in university libraries. Academic staff, researchers and students are more likely to continue reusing OAIR services due to better interaction they have with the system.

6.3.3.4 Satisfaction

Satisfaction is the level of fulfilment users feel to have with a system relative to what the user expects upon the first use of the system. Satisfaction is the most applicable as a success measure when the use of a system is required. On the other hand, the effectiveness of use depends on users being satisfied with the system in use. In OAIR setting, satisfaction refers to the feeling of pleasure or displeasure that results from aggregating all the benefits that a person hopes to receive from the interaction with OAIR system. Usage benefits and intention to reuse the system are significant factors of satisfaction.

6.3.3.5 Intention to reuse

Intention to reuse the system refers to the favourable attitude of the user towards the OAIR that results in repeated use behaviour of gathering and sharing of the content. Intention to reuse system is explained as a repeat on applying and using OAIR after being satisfied with the advantages that they bring to the user. Intention to reuse the system is an important factor in determining information system acceptance by users in the field.

6.4 Proposed OAIR User Manual for University Libraries in Ghana

The OAIR User Manual specifies the contents and documents accepted by the OAIR and additionally provide guidance to archiving and ensure the quality of documents archived. The outline of the manual is as follows: contents, document types, document formats, metadata, copyright issues, content use and reuse policy, preservation policy and interoperability (the OAIR User Manual is in Appendix 7).

6.5 Conclusions

University libraries have some challenges they face when it comes to the day-to-day running of the libraries. These challenges vary from university to university, and they affect the usage of OAIR in the university libraries in Ghana. Some of these challenges are inadequate advocacy, inadequate ICT connectivity and infrastructure, insufficient technological skills, copyright issues, lack of knowledge or awareness of OAIR, inadequate funding, institutional culture and politics, absence of incentives, inadequate power supply and lack of institutional repository policy, this explains why the level of usage OAIR is low. However, factors such as software, staffing, advocacy and marketing and policies can be considered in using OAIR.

Moreover, in this age of information and communication, OAIR users are interested in accessing easily full-text information resources. These should be readily available from the OAIR. Emphasis should therefore, be placed on processes that promote depositing in the OAIR. Library staff need to establish content management policies since they are experienced in selecting, describing, storing and managing information content. Library staff can negotiate with academic staff on content priorities, OAIR managers should evaluate the performance of the collection and make decisions relating to access, conservation and preservation.

Institutionally mandated deposits are essentially required if universities in Ghana would like to move beyond the slow and time consuming self-driven and voluntary process of collecting content and increase the accessibility, availability and visibility of scholarly information produced in the university to enhance development in the country. However, accessibility, availability and visibility continue to be big challenges. The feasibility of a model to address all of these elements is seen by

many as the next step to enhance the usage of OAIR; the university libraries and the universities were already working towards it.

Concomitantly, the researcher has identified as an outcome of the study, support for a model into accessibility, availability and visibility, to provide enriched services. Staff participation in OAIR activities and collaboration in self-archiving or providing their scholarly information for mediated archiving are essential. For academic staff research papers, requiring deposit in the OAIR as a condition before one is promoted, would maximize content collection and growth.

6.6 Recommendations

The findings indicated that academic staff usage of OAIR in the university libraries in Ghana is low. For instance, inadequate advocacy, inadequate ICT connectivity and infrastructure, insufficient technological skills, copyright issues, lack of knowledge or awareness of OAIR, inadequate funding, institutional culture and politics, absence of incentives, inadequate power supply and lack of institutional repository policy, among others, need the attention of the university authorities. Based on the major findings of the study, recommendations on the usage of OAIR in university libraries were as follows:

6.6.1 Recommendations on the level of awareness of OAIR

To improve the level of awareness of OAIR in university libraries, it is recommended that:

1. The library should aim to fully shift OAIR towards openness and transparency and facilitate innovative ways to communicate (seminars, conference, emails and office to office) and monitor (monitoring software) research to allow automated reporting.
2. The university should collaborate with one or more universities with established reputations and connections with the higher education learning and teaching sector to implement an awareness and engagement plan for the OAIR.

3. The library should ensure that the content of the OAIR remains freely and readily accessible online for the benefit of the university community at all times.
4. The library should appoint people to champion the dissemination of reports and other information about the OAIR.
5. The library should hold regular face-to-face and online events that invite academic staff to meet and present their work and contribute updated and value-added material for the OAIR.

6.6.2 Recommendations on the perceptions of OAIR

To improve on the perceptions of OAIR in university libraries, it is recommended that:

1. Universities should integrate a system that provides a persistent digital identifier that distinguishes an academic staff from another and supports automated linkages between academic staff and their professional activities ensuring that their work is recognized.
2. The library should maintain recognition of the existing name and brand of the OAIR.

6.6.3 Recommendations on content archiving of OAIR

To ease deposit and ensure long-term archiving of OAIR contents in the university libraries, it is recommended that:

1. Libraries should fully implement the Publications Router, A publications router gathers information from content providers such as publishers and passes it on to institutions to help them capture their research articles on their system.
2. The library should provide strict policies on ownership, OAIR contents, quality standards, copyright issues and provision of incentives for publishing in the OAIR.

6.6.4 Recommendations on the level of usage of OAIR

To improve the level of usage of OAIR in the university libraries, it is recommended that:

1. OAIR platforms should provide machine-readable metadata that includes guideline materials or practices (to give guidance to a user, these may be discretionary or can be modified by the user to meet specific needs) and give readers quick and easy access to the current status of content of an item whether it has been updated, corrected or retracted (article version tags, licensing tags and embargo periods).
2. University libraries should take forward as high priority improvements in the user experience and user interfaces, leveraging relationships with commercial system providers and open source communities.
3. University libraries must provide formal training to the academic staff in OAIR deposit and searching procedures, their self-archiving fears should be properly dealt with.

6.6.5 Recommendations on the challenges with the use of OAIR

To resolve the challenges with the use of OAIR in the university libraries, it is recommended that:

1. The library should be given resources for the marketing (promotion and publicity) of OAIR within the university to highlight their importance and make them understandable for inviting more contributions.
2. Universities should offer incentives and benefits to academic staff for depositing their research output in the OAIR and should be encouraged for more contributions.

6.6.6 Recommendations on strategies for the usage of OAIR

To develop strategies for the usage of OAIR in the university libraries, it is recommended that:

1. Universities should ensure that there is the appropriate capacity for managing and developing repositories, including training and support.
2. University libraries should adopt a strict enforcement policy regarding copyright issues, quality of content and OAIR accessibility.
3. Universities should prepare mandatory policy for the submission of all types of intellectual output of the institution including research articles.

4. Universities, especially the university libraries all over the country, should promote the usage of the OAIR for the global dissemination of their institutional research output.

It is crucial that a meeting of the stakeholders be held under the university's authority, to convene the conversation with major stakeholders (university management, library management, academic staff and OAIR managers). This will find out answers to some key questions (What problems are repositories trying to solve? What repository behaviour would we like to see? Why? How can we work together to incentivize it? How can we attend to different scholarly communication needs across different fields? How can we make everyone accountable; university management, library management, academic staff and OAIR managers? How can we achieve a sustainable, decentralized, networked system while gaining efficiency through higher levels of aggregation? How do we minimize waste and maximize value in the OAIR ecosystem?)

A meeting such as this seems a necessary first step in affecting change within the world of repositories, many of which suffer individually with insufficient resources. But this could in concept create a powerful and efficient worldwide hub of openly accessible, available and visible information. OAIR for the most part were initially set up to meet the needs of their institutions, they are now meeting a broad component of national research infrastructure. OAIR can bridge the quality gaps and bring research papers to life in education.

6.7 Suggestions for Further Studies

Given the findings and based on the conclusion of the study, the following areas have been suggested for further research:

1. The study is limited to the academic staff of UG, KNUST, UCC, UDS and AU. Further studies can be replicated in different universities to compare the results.
2. Studies can be done to compare the usage of OAIR in public and private universities.
3. The study's sample is the university academic staff. Further studies can be done at different educational levels.

4. Similar studies can be done in other countries or cross-cultural studies can be done.
5. University management's influence on the usage of OAIR in the university libraries in Ghana can also be looked into.

6.8 General Conclusion

The purpose of the study was to investigate the usage of OAIR in Ghanaian university libraries. The application of OA to enhance OAIR usage in university libraries is a contemporary issue, particularly, in developing countries like Ghana. However, the use and application of OAIR in universities is now emerging. This calls for the need to put priority on it. There was the need to investigate OAIR usage and identify factors that support the use of OAIR in our university libraries. The difference between the study and the others is that most the studies focused on OAIR itself but the study focused on OAIR usage.

On the other hand, most of the studies used only one theory or model to guide their studies. The study used a 'four in One' TAM that includes TAM1, TAM2, TAM3 and UTAUT. TAM was modified to fit the study, and was used to investigate factors that affect the usage of OAIR in university libraries. Thus, the proposed model and manual is looking at enhancing OAIR usage in university libraries. Most university rankings use five main categories in the following proportions: teaching 30%, research 30%, citations 30%, international outlook 7.5% and industry income 2.5%. Therefore, research output (research plus citations plus a percentage of teaching and international outlook) adds up to 60+%. The question is where we find research outputs by the university community, the answer is journals and OAIR.

Research outputs are spread out among many journals that are not open access and difficult to locate, while the OAIR is open access and contains a pull of all university research outputs. Universities libraries have been applying OAIR in one way or the other without knowing. Advocacy on OAIR must be intensified to make it known and understood by the users and stakeholders in our universities. Academic staff must be motivated to deposit their research papers. Self-archiving is the future of OAIR and all libraries must embrace it. The study concludes with recommendation that will enhance the usage of OAIR in university libraries in Ghana.

6.9 Implications of the Study

The main aim of the study was to investigate the usage of OAIR in university libraries in Ghana. Accordingly, the first major practical conclusion of the study is that it will provide much needed empirical data on the level of usage of OAIR in universities. This information is important, as it will enable university management, library management and OAIR managers to design university-based initiatives, tools and actions on OAIR usage. A second important implication of the study derives from the findings on the specific set of strategies of OAIR usage in universities. These strategies go beyond the remit of the current research, contacts have already been established with universities to explore how these strategies can be achieved collaboratively soon.

Third, the study provides indications to universities regarding several necessary technological skills that OAIR managers and users may need to have to manage and use the OAIR. The ultimate promise of technology is to make us masters of our world by the push of a button and the first rule of any technology is that automation applied to an efficient operation magnifies the efficiency. The study is timely considering we are in the fourth industrial revolution and this calls on universities to become more abreast with current OAIR technologies.

6.10 Chapter Summary

The chapter summarised findings of the study, gives conclusions and offers recommendations on the level of awareness of OAIR, the perceptions of OAIR, the content archiving of OAIR, the level of usage of OAIR, the challenges encountered with the use of OAIR and strategies for the usage of OAIR in university libraries in Ghana. Areas of further studies have also been suggested.

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APPENDICES
Appendix 1
UNIVERSITY OF SOUTH AFRICA
COLLEGE OF HUMAN SCIENCES
DEPARTMENT OF INFORMATION STUDIES
QUESTIONNAIRE FOR RESPONDENTS
Introduction

Dear Participant,

I am Kwame Kodua-Ntim, gathering data for a research project in fulfillment of my PhD at the University of South Africa (UNISA) in the Department of Information Science. This questionnaire is being administered to selected participants to solicit information on the study *“Usage of open access institutional repositories in university libraries in Ghana”*, I would be very grateful if you could respond to all the questions provided as much detailed as required and return the questionnaire to the University Librarian as soon as possible. The answers given will be used for academic purpose only. Please be assured that information provided will be treated with absolute confidentiality. Many thanks for your cooperation.

Questions and persons to contact:

The researcher will answer all questions that you may have to clear your doubts. If you have any questions, please send them to the researcher, Kwame Kodua-Ntim – koduantim@gmail.com Mobile: +233 248376015.

Part 1. Background Information

Q1	Please indicate your institution. Please tick as appropriate as possible.	
1.	University of Ghana	
2.	Kwame Nkrumah University of Science and Technology	
3.	University of Cape Coast	
4.	University of Development Studies	
5.	Ashesi University	
Q2	Please indicate your rank. Please tick as appropriate as possible.	

1.	Professor	
2.	Associate Professor	
3.	Senior Lecturer	
4.	Lecturer	
5.	Assistant Lecturer	
Q3	Please indicate your gender group. Please tick as appropriate as possible.	
1.	Male	
2.	Female	
Q4	Please indicate your age. Please tick as appropriate as possible.	
1.	21 - 30 years	
2.	31 - 40 years	
3.	41 - 50 years	
4.	51 - 60 years	
5.	61 years and above	
Q5	Please indicate the number of years of service with your institution. Please tick as appropriate as possible.	
1.	1 - 5 years	
2.	6 - 10 years	
3.	11 - 15 years	
4.	16 - 20 years	
5.	Over 21 years	
Q6	Please indicate your subject area. Please tick as appropriate as possible.	
1.	Arts	
2.	Humanities	
3.	Sciences	
4.	Business	
5.	Others (Please specify)	

Part 2. Level of awareness of open access Institutional Repositories

Open Access (OA) to information is the free availability of the information on the Internet, permitting use without any financial, legal or technical barriers.

Q7	How much do you know about Open Access (OA)? Please tick as appropriate as possible.	
1.	I had never heard of OA until now	
2.	I have heard of OA but I am not exactly sure of the concept	
3.	I have heard the term OA but it has been a challenge for me to understand	
4.	I have adequate information about OA	
5.	I am an expert when it comes to OA	

In your opinion what do you understand by open access to information?

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Q8	How did you find out about Open Access (OA)? Please tick as appropriate as possible.	
1.	Through Internet	
2.	Faculty	
3.	Friends	
4.	Library	
5.	Others (Please specify)	

Institutional Repository (IR) is a collection of scholarly materials in digital format that is managed at a university level. Academic scholars can deposit their research outputs, subject to copyright agreement.

Q9	How much do you know about Institutional Repositories (IR)? Please tick as many as are appropriate.	
1.	I had never heard of IR until now	
2.	I have heard of IR but I am not exactly sure of the concept	
3.	I have heard the term IR but it has been a challenge for me to understand	
4.	I have adequate information about IR	
5.	I am an expert when it comes to IR	

What other understanding do you have of Institutional Repositories?

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Q10	How did you find out about Institutional Repositories (IR)? Please tick as many as are appropriate.	
1.	Through Internet	
2.	Faculty	
3.	Friends	
4.	Library	
5.	Others (Please specify)	

Part 3. Open access Institutional Repositories perceived in university libraries

Indicate the characteristics of open access Institutional Repositories? Based on a five point pre- coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2 and Strongly Disagree = 1 Please tick the category of the column that best describes your degree of agreement or disagreement.		5 SA	4 A	3 N	2 D	1 SD
Q11	Institutionally based					
Q12	Scholarly materials in digital formats					
Q13	Free to access					
Q14	Cumulative (successive additions)					
Q15	Perpetual (permanent)					

What do you think are some of the characteristics of open access Institutional Repositories?

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How do you agree with the following perceptions of open access Institutional Repositories Based on a five point pre- coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1 Please tick the category of the column that best describes your degree of agreement or disagreement.		5 SA	4 A	3 N	2 D	1 SD
Q16	Prefer to make my work available only on my					

	personal website					
Q17	Open Access Institutional Repositories is not prestigious					
Q18	Others might copy my work without my permission					
Q19	Difficult and time-consuming to deposit my work in IRs					
Q20	Do not know how and what to deposit in IRs					
Q21	Concerned that if I deposit my work in the University's Repository I may not be able to publish it elsewhere					
Q22	Publishers would not let me put my work in an IRs					
Q23	Concerned that my work might not be preserved in the long term					
Q24	No peer-review process for research papers					
Q25	Few people would see my work in IRs					

In your opinion what are some of the perceptions of open access Institutional Repositories?

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Part 5. Level of usage of open access Institutional Repositories

Q3 2	Have you deposited any of your work in open access Institutional Repositories? Please tick as appropriate as possible.	
1.	Yes	
2.	No	
Q3 3	Will you consider depositing your work in open access Institutional Repositories in the future? Please tick as appropriate as possible.	
1.	Yes	
2.	No	
Q3 4	What types of material have you/would you deposit in open access Institutional Repositories? Please tick as appropriate as possible.	
1.	Thesis and Dissertations (Full Text)	
2.	Thesis and Dissertations (Abstract)	
3.	Preprint (research article before peer reviewed)	
4.	Postprint (peer-reviewed research paper)	
5.	Books and Book Chapters	
6.	Reports (technical, research)	
7.	Images, Audio and Video	
8.	Conference Proceedings	
9.	Seminar Paper	
10.	Others (Please specify)	
Q3 5	Which file formats do you generally use and therefore might wish to deposit in open access Institutional Repositories? Please tick as appropriate as possible.	

1.	PDF					
2.	Word processed document (MS Word)					
3.	POSTSCRIPT (peer-reviewed paper format)					
4.	Presentation (MS PowerPoint)					
5.	Spreadsheet (MS Excel)					
6.	Database (MS Access)					
7.	IMAGE (GIF, JPG, PNG, TIFF)					
8.	AUDIO (WAV, MP3, AIFF)					
9.	VIDEO (MP4)					
10.	Others (Please specify)					
<p>What are the reasons for usage of open access Institutional Repositories? Based on a five point pre-coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1 Please tick the category of the column that best describes your degree of agreement or disagreement.</p>		5	4	3	2	1
		S	A	N	D	S
		A				D
Q3	To communicate research results					
6						
Q3	Can add multimedia data to my work					
7						
Q3	Number of citations of my work gets increased					
8						
Q3	Chances for promotion are increased					
9						
Q4	Work is disseminated more quickly					
0						

Q4 1	Work will be permanently archived and available					
Q4 2	Published material is easy to find					
Q4 3	IR protects it from plagiarism					
Q4 4	Access to work is cheaper to others					
Q4 5	Repository is well indexed and archived					
<p>What are the benefits of usage of open access Institutional Repositories to the university? Based on a five point pre-coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1 Please tick the category of the column that best describes your degree of agreement or disagreement.</p>		5	4	3	2	1
		S	A	N	D	S
		A				D
Q4 6	Visibility status and public value					
Q4 7	Enhancing the quality of teaching and scholarship					
Q4 8	Engaging the university community and enhancing scholarly collaborations					
Q4 9	Relevant to the changing needs of society					
Q5 0	Digital preservation					
<p>What are the factors which could be integrated to facilitate the usage of open access Institutional Repositories within university libraries? Based on a five point pre-coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1 Please tick the category of the column that best</p>		5	4	3	2	1
		S	A	N	D	S
		A				D

describes your degree of agreement or disagreement.						
Accessibility						
Q5 1	IRs are easy to use (usability)					
Q5 2	IRs are easy to learn and adapt (adaptability)					
Q5 3	IRs are flexible (flexibility)					
Q5 4	IRs are stable (stability)					
Q5 5	IRs are reliable (reliability)					
Availability						
Q5 6	IRs provide accurate information for research work (accuracy)					
Q5 7	IRs provide reliable information for research work (reliable)					
Q5 8	IRs provide relevant information research work (relevance)					
Q5 9	IRs provide information which is easy to understand (easiness)					
Q6 0	IRs provide complete set of content for research work (completeness)					
Q6 1	IRs provide detailed information					
Q6 2	IRs provide up to date information for research work					
Visibility						
Q6	IRs within the library provide prompt support					

3	(responsiveness) to users					
Q6 4	Users within IRs can easily access their information needs (content or scope and timeliness).					
Q6 5	Library provides reliable Internet connection to use IRs					
Q6 6	Guidelines are available for me to use IRs effectively					
Q6 7	IRs inspires trust and confidence (assurance) to users.					
Q6 8	Library provides reliable technical support and personnel.					
Q6 9	IRs provides what is promised (reliability).					
Intention to reuse						
Q7 0	I will use IRs to help me make decisions					
Q7 1	I will use IRs to help me record my research output					
Q7 2	I will use IRs to communicate research output with colleagues					
Q7 3	I will use IRs to share my research output					
Q7 4	I will use IRs to create my specific research output					
User satisfaction						
Q7 5	I am satisfied with IRs efficiency					
Q7 6	I am satisfied with IRs effectiveness					

Q7 7	I am satisfied that IRs meet my research processing needs					
Q7 8	I am enjoying using IRs (enjoyment)					
Q7 9	I am satisfied with IRs adequacy					
Net benefits						
Q8 0	IRs help me to acquire new knowledge and innovative ideas					
Q8 1	IRs help me effectively manage and store information I need					
Q8 2	IRs enable me to accomplish tasks more efficiently					
Q8 3	My performance on the job is enhanced by IRs					
Q8 4	IRs improve the quality of my work life					

What are the other reasons for usage of open access Institutional Repositories?

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Part 6. Challenges with the use of open access Institutional Repositories

What are the challenges with the use of open access Institutional Repositories in university libraries? Based on a five point pre- coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1 Please tick the category of the column that best describes your degree of agreement or disagreement.		5	4	3	2	1
		S	A	N	D	S
		A				D
Q8 5	Lack of knowledge or awareness of open access Institutional Repositories					
Q8 6	Inadequate ICT connectivity and infrastructure					
Q8 7	Inadequate power supply					
Q8 8	Inadequate funding					
Q8 9	Inadequate advocacy					
Q9 0	Insufficient technological skills					
Q9 1	Copyright issues					
Q9 2	Institutional culture and politics					
Q9 3	Lack of institutional repository policy					
Q9 4	Absence of incentives					

State other challenges with the use of open access Institutional Repositories in university libraries?

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Part 7. Strategy for the usage of open access Institutional Repositories

Q95	Does an institutional guideline exist on open access Institutional Repositories? Please tick as appropriate as possible.					
1.	Yes					
2.	No					
	What are the reasons for institutional guidelines on open access Institutional Repositories? Based on a five point pre- coded scale described as: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1 Please tick the category of the column that best describes your degree of agreement or disagreement.	5	4	3	2	1
		S	A	N	D	S
		A				D
Q96	Novelty of the topic					
Q97	Priority given implementing institutional policy on Open Access to research publications					
Q98	Complexity of the topic					
Q99	Technical complexity in implementing Open Access to research data (e.g. variety of research fields in institution, multiple data formats)					
Q100	Low interest levels from researchers					
Q101	General lack of awareness on the topic					
Q102	Absence of national guidelines or mandate or policies by research funders and/or unclear legal frameworks					

Q10 3	Lack of expertise on the topic at institutional level					
Q10 4	Lack of infrastructure or absence of funds to develop the needed infrastructure					
Q10 5	Unclear distribution of responsibility and lack of institutional coordination among the different stakeholders (researchers, departments, libraries, funders)					

What are the other reasons for institutional guidelines on open access Institutional Repositories?

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Part 8. Recommendations for the usage of open access Institutional Repositories

Q106	What measures are necessary to resolve the challenges that hinder the usage of open access Institutional Repositories in university libraries?
1.	
2.	

Thank you for your cooperation

Appendix 2
UNIVERSITY OF SOUTH AFRICA
COLLEGE OF HUMAN SCIENCES
DEPARTMENT OF INFORMATION STUDIES
INTERVIEW GUIDE FOR PARTICIPANTS

Introduction

Dear Participant,

I am Kwame Kodua-Ntim, gathering data for a research project in fulfillment of my PhD at the University of South Africa (UNISA) in the Department of Information Science. This questionnaire is being administered to selected participants to solicit information on the study *“Usage of open access institutional repositories in university libraries in Ghana”*, I would be very grateful if you could respond to all the questions provided as much detailed as required and return the questionnaire as soon as possible. The answers given will be used for academic purpose only. Please be assured that information provided will be treated with absolute confidentiality. Many thanks for your cooperation.

Questions and persons to contact:

The researcher will answer all questions that you may have to clear your doubts. If you have any questions, please send them to the researcher, Kwame Kodua-Ntim – koduantim@gmail.com Mobile: +233 248376015.

Background Information

Please indicate your institution

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Question Route	Question No.	Question
Opening Question	1	a) Tell us who you are, where you work as a library staff and what you enjoy most when you are NOT working in the library?
Introductory Question	2	a) When you hear the terms open access/Institutional Repositories/open

		access Institutional Repositories what comes to mind?
Transition Question 1 (What is the level of awareness of open access Institutional Repositories in university libraries in Ghana?)	3	<ul style="list-style-type: none"> a) How did you find out about open access Institutional Repositories? b) What is the level of awareness of open access Institutional Repositories in university libraries in Ghana?
Transition Question 2 (How is open access Institutional Repositories perceived in university libraries in Ghana?)	4	<ul style="list-style-type: none"> a) How is open access Institutional Repositories perceived in university libraries in Ghana? b) What are the characteristics of open access Institutional Repositories in university libraries in Ghana?
Key Question 1 (How are contents of open access Institutional Repositories archived in university libraries in Ghana?)	5	<ul style="list-style-type: none"> a) How are contents uploaded onto the open access Institutional Repositories? b) What activities are involved in archiving contents of open access Institutional Repositories in university libraries in Ghana?
Key Question 2 (What is the level of usage of open access Institutional Repositories in university libraries in Ghana?)	6	<ul style="list-style-type: none"> a) What is the level of usage of open access Institutional Repositories in university libraries in Ghana? b) What types of materials are deposited in open access Institutional Repositories? c) Which file formats are generally used to deposit in open access Institutional Repositories? d) What are the reasons for usage of open access Institutional Repositories?

		<p>e) What are the benefits of usage of open access Institutional Repositories to the university?</p> <p>f) What are the factors which could be integrated to facilitate the usage of open access Institutional Repositories within university libraries?</p>
Key Question 3 (What are the challenges with the use of open access Institutional Repositories in university libraries in Ghana?)	7	a) What are the challenges with the use of open access Institutional Repositories in university libraries?
Key Question 4 (What strategy can be developed for the usage of open access Institutional Repositories in university libraries in Ghana?)	8	<p>a) What strategy can be developed for the usage of open access Institutional Repositories in university libraries in Ghana?</p> <p>b) Does an institutional guideline exist on open access Institutional Repositories?</p> <p>c) What are the reasons for institutional guidelines on open access Institutional Repositories?</p>
Ending Question	9	a) What measures are necessary to resolve the challenges that hinder the usage of open access Institutional Repositories in university libraries?

**Appendix 3
ETHICAL CLEARANCE**



DEPARTMENT OF INFORMATION SCIENCE ETHICS REVIEW COMMITTEE

22 November 2018

Dear Mr Kwame Kodua-Ntim

Decision:

**Ethics Approval from 22
November 2018 to 20
November 2023**

LIS Registration #: Rec-221118

References #: 2018-LIS-0004

Name: K Kodua-Ntim

Student #: 58560165

Researcher(s): Mr Kwame Kodua-Ntim

Supervisor(s): Prof MC Fombad

**Usage of open access institutional repositories in university libraries in
Ghana**

Qualifications: PhD



University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Thank you for the application for research ethics clearance by the Unisa Department of Information Science Research Ethics Committee for the above-mentioned research. Ethics approval is granted for five years.

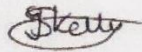
The **low risk application** was reviewed and expedited by the Department of Information Science Research Ethics Committee on 22 November 2018 in compliance with the Unisa Policy on Research Ethics and the Standards Operating Procedure on Research Ethics Risk Assessment. The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy of Research Ethics.
2. Any adverse circumstances arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Department of Information Science Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards the protection of participants' privacy and the confidentiality of the data should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no. 4 of 2013; Children's Act no. 38 of 2005 and the National Health Act, no. 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date of **20 November 2023**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **2018-LIS-0004** should be clearly indicated on all forms of communication with the intended research participants, as well as the Committee.*

Yours sincerely



Dr Isabel Schellnack-Kelly
Department of Information Science: Ethics Committee



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**Appendix 4
PERMISSION LETTERS**



Kwame Kodua-Ntim
C/o Mr. Kofi Ntim
Department of Education and Psychology
University of Cape Coast
Cape Coast
15-02-2019

The Registrar
University of Ghana

Dear Sir/Madam,

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT UNIVERSITY FOR
DEVELOPMENT STUDIES.**

I, Kwame Kodua-Ntim, am conducting a research with Madelein Fombad, a professor in the Department of Information Science towards a PHD at the University of South Africa. We humbly request you to grant us permission to conduct a study entitled “**Usage of open access institutional repositories in university libraries in Ghana**”.

The purpose of the study is to investigate the usage of open access institutional repositories in Ghanaian university libraries. Information provided by the participants will be treated with outmost confidentiality. All the participants will be required to complete the consent form.

The research process is an academic exercise and therefore the findings and recommendations of the research will be made available to you on request.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Kwame Kodua-Ntim', is written over a light grey rectangular background.

Kwame Kodua-Ntim
(PHD Candidate)



University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Kwame Kodua-Ntim
C/o Mr. Kofi Ntim
Department of Education and Psychology
University of Cape Coast
Cape Coast
15-02-2019

The Registrar
Kwame Nkrumah University of Science and Technology

Dear Sir/Madam,

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT UNIVERSITY FOR
DEVELOPMENT STUDIES.**

I, Kwame Kodua-Ntim, am conducting a research with Madelein Fombad, a professor in the Department of Information Science towards a PHD at the University of South Africa. We humbly request you to grant us permission to conduct a study entitled **“Usage of open access institutional repositories in university libraries in Ghana”**.

The purpose of the study is to investigate the usage of open access institutional repositories in Ghanaian university libraries. Information provided by the participants will be treated with outmost confidentiality. All the participants will be required to complete the consent form.

The research process is an academic exercise and therefore the findings and recommendations of the research will be made available to you on request.

Yours sincerely



Kwame Kodua-Ntim
(PHD Candidate)



Kwame Kodua-Ntim
C/o Mr. Kofi Ntim
Department of Education and Psychology
University of Cape Coast
Cape Coast
15-02-2019

The Registrar
University of Cape Coast

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The research process is an academic exercise and therefore the findings and recommendations of the research will be made available to you on request.

Yours sincerely



Kwame Kodua-Ntim
(PHD Candidate)



Kwame Kodua-Ntim
C/o Mr. Kofi Ntim
Department of Education and Psychology
University of Cape Coast
Cape Coast
15-02-2019

The Registrar
University for Development Studies

Dear Sir/Madam,

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT UNIVERSITY FOR
DEVELOPMENT STUDIES.**

I, Kwame Kodua-Ntim, am conducting a research with Madelein Fombad, a professor in the Department of Information Science towards a PHD at the University of South Africa. We humbly request you to grant us permission to conduct a study entitled **“Usage of open access institutional repositories in university libraries in Ghana”**.

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Yours sincerely



Kwame Kodua-Ntim
(PHD Candidate)



Kwame Kodua-Ntim
C/o Mr. Kofi Ntim
Department of Education and Psychology
University of Cape Coast
Cape Coast
15-02-2019

The Registrar

Ashesi University



Dear Sir/Madam,

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT UNIVERSITY FOR
DEVELOPMENT STUDIES.**

I, Kwame Kodua-Ntim, am conducting a research with Madelein Fombad, a professor in the Department of Information Science towards a PHD at the University of South Africa. We humbly request you to grant us permission to conduct a study entitled "**Usage of open access institutional repositories in university libraries in Ghana**".

The purpose of the study is to investigate the usage of open access institutional repositories in Ghanaian university libraries. Information provided by the participants will be treated with outmost confidentiality. All the participants will be required to complete the consent form.

The research process is an academic exercise and therefore the findings and recommendations of the research will be made available to you on request.

Yours sincerely

A handwritten signature in blue ink, appearing to read "Kwame Kodua-Ntim", is written over a light grey rectangular background.

Kwame Kodua-Ntim
(PHD Candidate)



**Appendix 5
ACCEPTANCE LETTERS**



**KWAME NKURUMAH
UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

Private Mail Bag
University Post Office
Kumasi, Ghana

Tel: 233-3220-60331

Fax: 233-3220-60137

E-mail: registrar@knust.edu.gh

Website: www.knust.edu.gh

KNUST/RO/GEN **OFFICE OF THE REGISTRAR**

December 17, 2018

Mr Kwame Kodua-Ntim
Department of Information Science
University of South Africa
SOUTH AFRICA

**RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT
KWAME NKURUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

YOURS of November 22, 2018 on the above refers, please.

I write on behalf of the Registrar to inform you that permission has been granted to enable you conduct a study on the topic "Usage of open access institutional repositories in university libraries in Ghana" in this University. This is in relation to your PhD programme at the University of South Africa.

You may liaise with the University Librarian for assistance, where necessary.

Thank you.

Efa Arku
ASSISTANT REGISTRAR (REGISTRAR'S OFFICE)
For: REGISTRAR

cc: Librarian, KNUST

Prof M C Fombad
Department of Information Science
University of South Africa
SOUTH AFRICA

UNIVERSITY OF CAPE COAST

SAM JONAH LIBRARY

Telephone: +233-(0)3321 32482 / +233(0)3321 30952 / 3
Telegrams: University, Cape Coast
Email: ucclib@libr.ucc.edu.gh



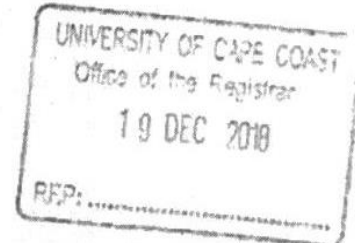
UNIVERSITY POST OFFICE
CAPE COAST, GHANA

Our Ref: LIB/C.8/CR/Vol.1/36

18th December, 2018.

Your Ref:

Please address all correspondence to
THE LIBRARIAN



The Registrar,
University of Cape Coast,
Cape Coast.

Dear Sir,

APPROVAL TO CONDUCT THE RESEARCH

We acknowledge receipt of the letter dated 22nd November, 2018, submitted by Mr. Kwame Kodua-Ntim requesting for permission to conduct research.

We wish to inform you that, permission has been granted to the candidate to conduct the research.

Thank you.

Yours faithfully,

Gladys Ewurama Edumadze (Mrs.)
Assistant Registrar
For: LIBRARIAN

② CAA (OK)

Photocopy per family insurance
researcher has a copy
of approval letter

UNIVERSITY FOR DEVELOPMENT STUDIES

Tel: 03720-93382/26634/22078

Email: registrar@uds.edu.gh

Website: www.uds.edu.gh



P. O. Box TL 1350

Tamale, Ghana

Our Ref: **UDS/REG/RL: 95**

Your Ref:

OFFICE OF THE REGISTRAR

Date: January 14, 2019

Kwame Kodua-Ntim
c/o Mr. Kofi Ntim
Department of Education and Psychology
University for Cape Coast
Cape Coast

Dear Sir,

RE:REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT UNIVERSITY FOR DEVELOPMENT STUDIES

Please, I refer to your letter dated November 11, 2018 on the above subject, and write to convey approval of your request to conduct a study entitled "*Usage of open access institutional repositories in university libraries in Ghana*".

Should you have any question regarding this, please do not hesitate to contact us through registrar@uds.edu.gh.

The delay in our response is very much regretted.

Thank you.

Yours faithfully,

Paul Alhassan Nabila

(Senior Assistant Registrar)

for: Registrar



6th December 2018

Dear Kwame Kodua Ntim,

Project: Usage of open access institutional repositories in university libraries in Ghana
IRB Number:132018

Thank you for your application to Ashesi IRB committee. Upon careful human subject review of the work above, I am pleased to confirm that your project has **full ethical approval**. You can proceed with your study, but please take note of the following:

- Approval is valid till **4th December 2019** After which another review will be required if study is to continue.
- Any substantive modification after review decision must be brought to the attention of the committee by the supervisor or investigator(s) and may warrant further ethical review

Regards
David Sampah
IRB Chair
irb@ashesi.edu.gh



UNIVERSITY OF GHANA
OFFICE OF RESEARCH INNOVATION AND DEVELOPMENT (ORID)

P. O. Box LG 571, Legon, Accra-Ghana

ORID/IRBm-033/12-18

My Ref. No.:

December 17, 2018

Mr. Kodua-Ntim
C/O Mr. Kofi Ntim
Department of Education and Psychology
University of Cape Coast
Cape Coast

Dear Sir,

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT UNIVERSITY OF GHANA, LEGON

I write on behalf of the Registrar to acknowledge receipt of your letter on the above subject.

Based on the University of Ghana's regulations for the conduct of research, you are required to submit your protocol titled "*Usage of Open Access Institutional Repositories in University Libraries in Ghana*" for ethical clearance.

For further guidance on the ethical clearance process, kindly contact the coordinating office of the Human and Animal Research Ethics Services (HARES) Team by email at orid-hares@ug.edu.gh or orid-ethics@ug.edu.gh.

Yours faithfully,

Afua Yeboah (Mrs.)
Senior Assistant Registrar
For: Registrar

cc. Pro Vice-Chancellor (RID)
Team Leader, HARES

Our mission is to promote, coordinate and facilitate research activities in the university,
and also lead the development of the university's strategic plans, including business plans and fund-raising strategies

Tel.: + 233 303930436 /+ 233 302 213850 ext. 2712/2713 | Fax: + 233 302 522860 | Email: orid@ug.edu.gh | Website: <http://orid.ug.edu.gh>
(Location: Ground Floor-LECIAD Building)

Appendix 6
CONSENT TO PARTICIPATE IN THE STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of the study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname.....

Participant Signature.....Date.....

Researcher's Name & Surname.....

Researcher's signature.....Date.....

Appendix 7 OAIR USER MANUAL

Open Access Institutional Repositories (OAIR) is a collection of scholarly materials in digital format that is managed at university level and freely available on the Internet, permitting its usage without any financial, legal or technical barriers. The aim of OAIR is to make scholarly materials available, accessible, visible, satisfying and reusable in the university, the country and the international community as a whole.

Individuals in academia can deposit their research works in the OAIR, subject to copyright agreement. This OAIR User Manual specifies the contents and documents accepted by the OAIR and additionally provides guidance to ensure the quality of documents archived. The outline of the manual is as follows: Contents, Document types, Document formats, Metadata, Copyright issues, Content use and reuse policy, Preservation policy and Interoperability.

Content

1. It must be successfully peer reviewed (scientific journal articles, or other publications published by an institution or a publisher, scientific conference papers accepted in a conference, academic thesis);
2. It must not be laid out in a particular way. However, it must be clean and easily readable; and
3. It must be available in a readable format (pdf, word, ppt, rtf, excel, jpeg, html, mpeg, xml, plain text). Items are individually tagged with their; version type and date, peer-review status and publication status.

Document types

1. Article: An article in a journal, magazine, newspaper, including electronic-only media such as online journals or news websites.
2. Journal: A complete issue of a journal.
3. Conference or Workshop items: A paper, poster, speech, lecture or presentation given at a conference, workshop or other event. If the conference item has been published in a journal or a book then the user must use 'Book Section' or 'Article' instead.
4. Book section: A chapter or section in a book.
5. Book: A book or a monograph. This may be a conference volume, technical report, documentation, manual, working paper or discussion paper.
6. Thesis: A thesis or dissertation (Masters and PhD).
7. Teaching resource: Lecture notes, exercises, exam papers or course syllabuses.
8. Other: Any other type of document, which lies within the subject scope of the repository but is not covered by the above mentioned categories (e.g. Bibliographic references, unpublished reports and working papers, datasets, learning objects, multimedia and audio-visual materials).

Document formats

1. PDF
2. Word Processed Document (MS Word)
3. POSTSCRIPT (Peer-reviewed Paper Format)
4. Presentation (MS PowerPoint)
5. Spreadsheet (MS Excel)
6. Database (MS Access)
7. IMAGE (GIF, JPG, PNG, TIFF)
8. AUDIO (WAV, MP3, AIFF)
9. VIDEO (MP4)

Metadata

Metadata is data about data; it is the bibliographic information about the document which the user is storing in the Archive: title, author, abstract, keywords, journal title, number of pages, etc. It is important to enter accurate metadata so that end-users are able to make accurate searches.

1. Users must register with the system so that the Archive can create an account and identify the user. Once the account has been activated the user can start the submission process.
2. Before depositing, the user must determine if the document is eligible for the OAIR in accordance with the manual in terms of;
 - a. accepted contents,
 - b. accepted document types,
 - c. copyright legislation and,
 - d. the publisher's copyright policy.
3. Users must then prepare the material and the metadata to describe the document. For a more detailed step-by-step guide to the deposit process, also consult the **OAIR Policy**. For a description of what metadata you need to provide for each type of document and the meaning of each metadata field see the OAIR Policy.

Copyright issues

1. The Open Access movement promotes free and unlimited access to scientific production while defending the rights of authors over their articles and publications. It recognizes that authors have intellectual property of their publications and thus they should decide how their publications should be disseminated and used.
2. OAIR respects copyright and all documents deposited remain the property of the author. Before depositing a document, authors must make sure they hold the copyright or are authorized to deposit the document in the OAIR, and that there is no restriction on its electronic distribution. In depositing the files and the associated metadata, the author:
 - a. Grants the OAIR the right to store them and to make them permanently and publicly available online for free,

- b. Declares that the document deposited is his or her own intellectual property,
 - c. Understands that the OAIR does not assume any responsibility if there is a breach of copyright in distributing the documents or metadata.
3. Authors of articles published in commercial scientific journals are advised to check the terms of the contract signed with the publisher, before depositing their articles in the OAIR. Most scientific journals allow authors to publish their articles in Open Access, generally with certain conditions and time constraints. For more information on Publishers' policies see www.sherpa.ac.uk.
4. If someone other than its author deposits research work, this person must declare that he or she has been appointed by the author or the copyright holder to deposit the documents in the repository. In depositing the files and the associated metadata, this person accepts full responsibility for any breach of copyright that distributing these files or metadata may entail.

Content use and reuse policy

Metadata policy for information describing items in the repository:

1. Anyone may access the metadata free of charge.
2. The metadata may be re-used for non-profit purposes in any medium and without permission provided:
 - a. The Open Access Identifier or a link to the original metadata records are given;
 - b. OAIR is clearly mentioned.
3. The metadata must not be re-used in any medium for commercial purposes without formal permission

Data policy for full-text and other full data items:

1. Anyone may access full items free of charge.
2. Single copies of full items can generally be reproduced, displayed or performed, and given to third parties in any format or medium, for personal research or study, educational or non-profit purposes without prior permission or charge, provided that:

- a. The authors, title and full bibliographic details are given; a hyperlink and/or URL are given for the original metadata page
 - b. The content is not changed in any way.
3. Full items must not be sold commercially in any format or medium without formal permission of the copyright holders.
4. Mention of the OAIR is appreciated but not mandatory.

Preservation policy

1. All the materials deposited in the OAIR will be retrievable but it is recommended to deposit files in PDF format.
2. The OAIR will strive to ensure continued availability, accessibility and visibility of deposited documents by retaining deposited documents indefinitely; migrating documents to new formats, where necessary and providing software emulation to access un-migrated formats, where possible.
3. The OAIR regularly backs up its files according to current best practice. The original bit stream is retained for all items, in addition to any upgraded formats.
4. Items may be removed at the request of the author or copyright holder and/or upon unilateral decision of the OAIR manager. Acceptable reasons for withdrawal include:
 - a. Journal publishers' rules,
 - b. Proven copyright violation or plagiarism,
 - c. Legal requirements and proven violations,
 - d. National security,
 - e. Falsified research,
 - f. Insulting, discriminatory and other inappropriate content.
5. Withdrawn items are not deleted as such but are removed from public view. Withdrawn items' identifiers or URLs are retained indefinitely and will continue to point to the citations, to avoid broken links and to retain item histories, with:
 - a. A link to a replacement version, where available,
 - b. A note explaining the reasons for withdrawal.

6. Changes to deposited items are not permitted. If necessary, an updated version may be deposited. There will be links between earlier and later versions, with the most recent version clearly identified.
7. In the event of the OAIR being closed down, the database will be transferred to another appropriate archive.

Interoperability

1. OAIR is based on a system that enables interoperability between existing open access archives, which follow the standards established by the Open Archives Initiative (OAI).
2. OAI promotes interoperability standards that aim to facilitate the efficient dissemination of content. The Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) provides an implementation framework for interoperability based on the exchange and collection of data.

Please contact the OAIR Team if you have any queries: *OAIR Link*

Appendix 8

STUDY CONTEXT

The study context provides a background picture of where the study information came from and what and who are involved in the study. This appendix provides a short description of Ghana and tertiary education as well as an overview of universities. It also discusses university libraries as well their OAIR in Ghana.

Republic of Ghana

Ghana officially the Republic of Ghana is a unitary presidential constitutional democracy, located along the Gulf of Guinea and Atlantic Ocean in the sub region of West Africa. Spanning a landmass of 238, 535 km² (92, 099 sq mi), Ghana share borders with the Ivory Coast in the west, Burkina Faso in the north, Togo in the east and the Gulf of Guinea and Atlantic Ocean in the south. Ghana means “Warrior King” in the Soninke language.

The first permanent state in the territory of present-day Ghana dates back to the 11th century. Numerous kingdoms and empires emerged over the centuries, of which the most powerful was the Kingdom of Ashanti. Beginning in the 15th century, numerous European powers contested the area for trading rights, with the British ultimately establishing control of the coast by the late 19th century. Following over a century of native resistance, Ghana’s current borders were established by the 1900s as the British Gold Coast.

Ghana became independent of the United Kingdom on 6 March 1957. Its population of approximately twenty-eight (28) million spans a variety of ethnic, linguistic and religious groups. Traditional faiths is practiced by 5% of the population, 67.2% are Christians and 23.6% are Muslim. Its diverse geography and ecology ranges from coastal savannahs to tropical rain forests. Ghana is a democratic country led by a president who is both head of state and head of the government.

Ghana’s growing economic prosperity and democratic political system have made it a regional power in West Africa. It is a member of the Non-Aligned Movement, the African Union, the Economic Community of West African States (ECOWAS), Group of 24 (G24) and the Commonwealth of Nations. Figure 2.1 presents the map of Ghana.

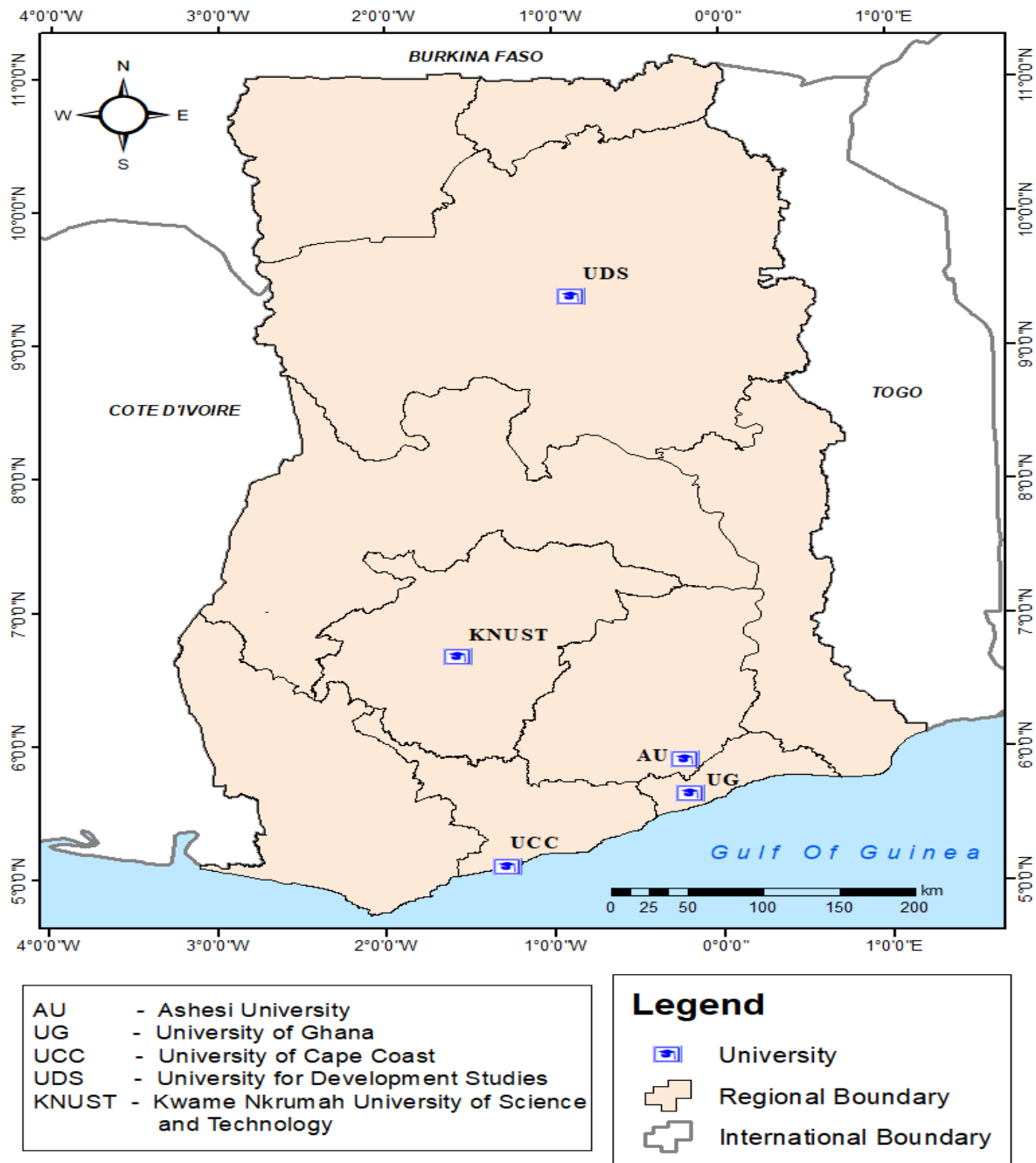


Figure 2.1 Map of Ghana and the Universities (Source: UCC Cartographers, 2019.)

Tertiary Education in Ghana

Tertiary education in Ghana consists of universities, polytechnics and other institutions like specialised colleges. While all of the ten existing polytechnics are public, only eight out of 33 universities are. The public institutions are all under the responsibility of the National Council for Tertiary Education (NCTE). The vision and

mission NCTE is leading tertiary education to new heights and devoted to providing leadership in the direction, functions, role and relevance of tertiary education in Ghana.

At the time of this research, information from the *National Accreditations Board, Ghana (2018)* indicates that Ghana comprises ninety-two Higher Educational Institutions (HEI). These are categorized into nine national public universities, eight technical universities, ten professional institutions and sixty-five private universities and university colleges. Out of the ninety-two HEI, four public university libraries and one private university library were selected for the study. The four public university libraries are University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Cape Coast (UCC), University for Development Studies (UDS), while the private university library is Ashesi University (AU).

The background and profile of the universities selected in the study

This section discusses the background and profile of the five university libraries located in five universities in Ghana that were selected for the study. These include UG, KNUST, UCC, UDS and AU. The purpose of this section is to provide historical background of the universities and an overview of the university libraries that were selected for the study. The Chapter also presents information on OAIR, as well as the current state of OAIR of university libraries selected for the study.

The study will focus on these five university libraries on the understanding that they were the only universities on the DOAR and ROAR, authoritative global registries of repositories that provide data on the number of registered institutional repositories all over the world (DOAR 2018; ROAR 2018). Therefore, they are obligated to meet certain operational criteria. Further criteria for selection included; infrastructure and resources, the number of qualified and permanent staff, the notion of well equipped libraries, postgraduate programmes and the operational status of their Institutional Repositories. These university libraries are in registered universities located in various regions in Ghana.

The five universities and libraries that were studied have a number of things in common. The governance and management structures are almost the same across the universities. The libraries are independent departments which receive inadequate funding especially for OAIR. The libraries have their own vision and

mission statements for its development but linked to that of the university's development plan.

University of Ghana (UG)

UG was founded in 1948 as the University College of Gold Coast on the recommendation of the Asquith Commission on Higher Education in the British Colonies. The University College was affiliated to the University of London. The University College of the Gold Coast was founded for the purpose of providing and promoting university education, learning and research. In 1960-61 academic year UG was established by an Act of Parliament (Act 79) and gained full university status in 1961.

The then president Dr. Kwame Nkrumah became the first Chancellor of the University. The original emphasis was on the liberal arts, social sciences, basic science, agriculture, and medicine, but (partly as the result of a national educational reform programme) the curriculum was expanded to provide more technology-based and vocational courses and postgraduate training. UG is the oldest and largest of the nine public or state owned universities in Ghana.

UG library

The University library started as a 'College Library' when the parent institution, the then University College of the Gold Coast was set up in 1948 as a College of the University of London, located at Achimota College, about 8 kilometres from the present Legon campus. In 1959, the "College library" moved into its new building on Legon campus with its parent institution and was named after the first Principal of the University College, David Mowbray Balme, a British expatriate (UG Balme Library Guide 2014).

Balme Library is the main library of UG and coordinates a large number of libraries attached to the various colleges, schools, institutes, faculties, departments, halls of residence and the Accra city campus which form UG library system. The central location of the library, its facilities and the scope of coverage of collections makes it a important and vital part of academic life on campus (UG Balme Library Guide 2014).

The Balme Library established in 1948 is located on the main campus of UG. The Balme Library was named after David Mowbray Balme the first Principal of UG. The Balme Library in addition to various libraries in Schools, Institutes, Faculties, Departments and Halls of Residence of the University, most of which are autonomous forms the University's Library System.

UG Institutional Repository

UGSpace is the institutional repository of the UG, public university which is an open access electronic archive for the collection, preservation and distribution of digital materials. UGSpace was developed to enable the deposit of digital contents of a scholarly or heritage nature to disseminate, preserve and promote the intellectual output of the university in a managed environment (UG 2018).

Kwame Nkrumah University of Science and Technology (KNUST)

KNUST is the public university established in the country, as well as the largest university in Kumasi Metropolis and Ashanti. The Kumasi College of Technology offered admission to its first students to the engineering faculty in 1951 (they entered in 1952), and an Act of Parliament gave the university its legal basis as the Kumasi College of Technology in 1952. The nucleus of the college was formed from 200 teacher training students transferred from Achimota in the Greater Accra Region. The college was affiliated to the University of London. In 1961, the college was granted full university status.

KNUST library

In January 1952, the library collection of the Teacher Training Department of Achimota College, numbering about 4,000 volumes, was transferred to the newly established Kumasi College of Technology, Science and Arts to form the nucleus of its library. That library was housed in a prefabricated building. In November 1961, when the Kumasi College of Technology, Science and Arts was elevated to the status of a full-fledge University and became known as the KNUST, its library automatically became the University Library. Within that same year, the University Library moved into a new permanent building with a stock of 24,362 volumes. The new University Library, which was built to cater for 100,000 volumes and to provide

seating for 250 readers, had been stretched to its elastic limit by the 1976/77 academic year.

KNUST Institutional Repository

KNUST is a public university credited as having been the first university in Ghana and in West Africa to establish an Institutional Repository in 2008 known as the knustspace. The OAIR currently hosts theses, dissertations, conference papers and course materials of the university (KNUST 2018).

University of Cape Coast (UCC)

UCC was established in October 1962 as a University College and placed in special relationship with the UG, Legon. The college attained the status of full and independent university with the authority to confer its own degrees, diplomas and certificates by an Act of Parliament (Act 390) in 1971. It subsequently became UCC by (PNDC Law 278) in 1992. The UCC is a university in Ghana. The university was established in 1962 out of a dire need for highly qualified and skilled manpower in education and was affiliated to the University of Ghana.

It was established to train graduate teachers for second cycle institutions such as teacher training colleges and technical institutions, a mission that the two existing universities were unequipped to fulfill. Since its establishment, the university has added to its functions the training of education planners, administrators, agriculturalists and health care professionals. Today, with the expansion of some of its faculties and the diversifications of programmes the university has the capacity to meet the manpower needs of ministries and industries in the country, besides the Ministry of Education.

UCC Library

The UCC Library forms an integral part of the UCC. It was formed in 1962 with an initial collection of 650 books mainly on English Literature, Economics, History and Geography transferred from the erstwhile Kumasi College of Arts and Education, now KNUST (KNUST 1963). The UCC library is one of the largest academic libraries in Ghana. The collections are housed in a five storey library complex. It has the capacity for holding seven hundred and fifty thousand (750,000) volumes excluding pamphlets and journals. The library can seat two thousand (2000) users at a time. It

is the most frequently utilised facility in the University with approximately five thousand visits per day (UCC Library Guide 2014).

UCC Institutional Repository

UCC Institutional Repository is the institutional repository of UCC which is also a public university. University of Cape Coast Institutional Repository preserves and enables easy and open access to online collection of student achievement and faculty research. The interface is in English (UCC, 2018).

University for Development Studies (UDS)

Established in May 1992 by the government of Ghana to “blend the academic world with that of the community in order to provide constructive interaction between the two for the total development of Northern Ghana, in particular and the country as a whole” (PNDC Law 279, Section 279). The UDS was borne out of the new thinking in higher education which emphasizes the need for universities to play a more active role in addressing problems of the society, particularly in the rural areas (UDS, 2018).

The university by its mandate and constituency has a pro-poor focus. This is reflected in its methodology of teaching, research and outreach services. The specific emphasis on practically oriented, research and field-based training is aimed at contributing towards poverty reduction in order to accelerate national development. It began academic work in September 1993 with the admission of forty (40) students into the Faculty of Agriculture, Nyankpala.

UDS Library

The UDS Library complex provides information and bibliographic support for the four campuses (Nyankpala, Wa, Navrongo, Tamale) and the Graduate School. The collection of books and other information materials facilitates teaching, learning, research and knowledge dissemination in the university. In addition, users gain wider knowledge of the world around them, as it provides informal reading materials on a wide range of subjects.

UDS Institutional Repository

UDS is a public university that owns the UDSspace which preserves and enables easy and open access to online collection of student achievement, faculty research and the university archival materials. The UDSspace consists of all digital contents including; text, images, moving images, mpegs and data sets. The purpose of UDSspace is to make the university's digital scholarship available to global audience and to serve as a reliable digital storage. UDSspace has a dual function of a publication platform and a digital archive (UDS, 2018).

Ashesi University (AU)

AU was established as an independent, public benefit education institution operating on a not-for-profit basis. The university obtained accreditation from NAB in September 2001 to operate under the mentorship of UCC, with degrees conferred by UCC. AU began instruction on 4th March 2002. AU received a Presidential Charter from the President of Ghana, effective January 2018, making it an independent university that confers its own degrees.

AU started in a rented home in 2002, with 30 pioneer students. Today, AU operates from one of Africa's most beautiful campuses, has nearly 900 students, and over 1,000 alumni. Set on 100 acres in Berekuso overlooking Ghana's capital city of Accra, AU campus unites traditional design, modern technology and environmental best practices, creating an inspiring base for young Africans from diverse backgrounds to live, collaborate and study together for generations to come.

AU library

AU library is primarily digital, with subscriptions to a number of electronic information resources, including the PERI databases which give access to over 30,000 scholarly journals. AU library is not limited to the library building; it reaches out, with cutting edge information, into faculty and administrative offices, classrooms, cafeterias, and even outdoor gathering spaces. The electronic library is supplemented by a physical collection that is currently 27,000 volumes, as well as a variety of international and local magazines, newspapers, and research publications.

AU Institutional Repository

AIR is the OAIR of AU, a private university. It is an archive for preserving and sharing AU scholarly work. Contributors to the repository ensure that their scholarly and creative work is preserved, indexed and showcased for a global audience. Students who do good work get the privilege of getting their work published on AIR. The repository is organized in 'Collections' that group publications by department and/or subject (AU 2018).

Table 2.1 Statistics on the universities and their repositories in Ghana

University	Technology Used	Content	Number of items (Size)	URL
UG	Dspace	Books, specials	8538	ugspace.ug.edu.gh
KNUST	Dspace	Articles, references, conferences, theses	5916	ir.knust.edu.gh
UCC	Dspace	Theses, unpublished, learning objects	1391	erl.ucc.edu.gh
UDS	Dspace	Articles, conferences, theses, unpublished	844	udsspace.uds.edu.gh
AU	Dspace	Articles, references, theses, unpublished, books	318	air.ashesi.edu.gh

Source: Field data, 2019