MANAGING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) AT

ACADEMIC LIBRARIES IN SELECTED PUBLIC UNIVERSITIES IN GHANA

BY

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DECLARATION

I declare that, **Managing Information and Communication Technologies (ICTs) At Academic Libraries in Selected Public Universities in Ghana,** 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.

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SIGNATURE DATE

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ABSTRACT

This study investigated the management of information and communication technologies (ICTs) at academic libraries in selected public universities in Ghana. The purpose for this study was to investigate the managerial processes and challenges in terms of conceptualization, policies, planning, implementation and strategies involved in ICTs adoption in order to formulate strategies for their management in Ghanaian academic libraries.

Specifically, the objectives of the study were to review and explore the status and level of ICT diffusion in Ghanaian university; audit the procedures, processes and factors that influence ICT adoption and implementation in Ghanaian university libraries; establish the institutional policies, strategies and human resource that is in place and available for the adoption; determine the factors that hinder the adoption and management of ICTs in Ghanaian university libraries; and design a framework for effective and efficient management of ICTs in Ghanaian public university libraries.

The study adopted mixed-method research design approach combining both quantitative and qualitative approaches through the pragmatic worldview to achieve the main purpose of the study. Adopting a survey study design, data was collected from five selected Ghanaian public universities by interviewing the five university librarians/directors, using questionnaires on 313 library staff and making observations within the five libraries.

The findings of the study established that the managerial tools/instruments required for effective ICTs management in Ghanaian university libraries include the availability of library ICT policies, a library ICT strategic plan, library ICT installation and maintenance manuals, library ICT integration plans, and standard operations manuals. In addition, adequate funds, skilled manpower, adequate and standard ICT infrastructures among others. However, the study also revealed that

there are absence of library ICT policies, lack of processes and procedure guidelines, inadequate funds, lack of management support, inadequate ICT skills among libraries and staff ICT training policies in the academic libraries in Ghana.

The study recommends the formulation of ICT policies and strategic plans purposely for the comprehensive management of library ICT systems. Furthermore, the university top management should support their libraries by providing the required resources and motivation for the library managers including the development of stakeholder partnership and collaboration. To galvanise these recommendations, the study proposes a framework for the ICTs adoption and management in Ghanaian university libraries.

KEY TERMS

Library Information Technology Management, Technologies Management in university libraries, Library ICT Management, University Library ICT Policy, Academic Libraries, Academic Library ICT, Academic Library Management, System Theory Model

LIST OF ABBREVIATION AND ACRONYMS

ACRL	-Association of College and Research Libraries
AL	-Academic Library
AU	- African Union
CARLIGH	-Consortium of Academic and Research Libraries in Ghana
CSIR	- Council for Scientific and Industrial Research, Ghana
DANIDA	-Danish International Development Agency
ECOWAS	- Economic Community of West African States
EFA	- Education For All
GHASTINET	-Ghana Scientific and Technological Information Network
GILLDNET	-Ghana Inter-Library Lending and Document Delivery Network
GIMPA	- Ghana Institute of Management and Public Administration
HEI	- Higher Educational Institutions
ICT(s)	- Information and Communication Technologies
KNUST	- Kwame Nkrumah University of Science and Technology
NAB	-National Accreditation Board, Ghana
NCTE	- National Council for Tertiary Educational
PERI	- Enhancement of Research Information
REN	- Research and Educational Network
SDGs	- Sustainable Development Goals
UCC	- University of Cape Coast
UEW	- University of Education, Winneba
UG	- University of Ghana
UHAS	-University of Health and Allied Sciences
UMAT	- University of Mines and Technology
UENR	University of Energy and Natural Resources
UNESCO	-The United Nations Educational, Scientific and Cultural Organisation
UNISA	- University of South Africa

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

Information and Communication Technologies (ICTs) continue to have a profound and tremendous impact on all facets of human life and society. They have shaped and transformed the way humans carry out their daily activities. ICT is an umbrella term, which refers mostly to communication devices including radio, television, cellular phones, computers and their networks such as the Internet and satellite system used to create, preserve, communicate, disseminate and manage information (Atiso & Adkins, 2015). ICTs, therefore facilitate the collection, processing, storage, retrieval, and transmission of information. Through ICTs, there is now what is called the Internet of Things, a situation whereby, everything done is embedded and dictated by the Internet. ICTs are often spoken of in a context, such as ICTs in education, ICTs in health care, or ICTs in libraries. Examples include video conferencing, tele-reporting, telemedicine, digital/virtual libraries, distance learning, and management information system (Enakire & Onyanania, 2012).

The concept of ICTs refers to all those technologies that enable the handling of information to facilitate different forms of communication among humans and electronic systems (Samaradiwakra, 2010). It is imperative that these ICTs need to be carefully managed before all or most of the benefits may be realized. Consequently, when it comes to managing anything, often challenges abound and hence the need to interrogate how best to manage the ICTs. This study endeavours to put a spotlight on one such set of challenges, nonetheless with the recognition that the changes that ICTs have brought are prevalent in our everyday lives such as the use of e-mail, cellular phones, ATMs, CD-ROMs and DVDs (UNESCO, 2006), and they also link all facets of

society such as business, military, recreation, transportation, communication, scientific exploration, knowledge management, and education.

1.2 Conceptual background for the study

Within the Education sector, ICTs have become prominent because of the many opportunities that these technologies offer, not only for administrative purposes but also for pedagogical processes. With the help of ICT, e-learning is more flexible than traditional face-to-face classroom learning (Shee, 2015). Students who are physically separated from their tutors but can participate and contribute to class activities through various ICT tools. This study focuses on the aspect of the ICTs in libraries within Higher Education.

1.2.1 ICTs in the Context of Higher Education

Higher Educational Institutions (HEIs) are one of the human organisations that have been impacted greatly by ICTs. Tan (2011) opined that the prevalence of information and communication technology and the impact it has made in all aspects of our lives are compelling reasons for HEIs to capitalize on 21st-Century tools and technologies to address 21st-Century educational challenges. Over time, the number of universities embracing new technologies to conduct the business of education is expected to soar. To expand Education For All (EFA) and achieve the Sustainable Development Goals (MDGs), the use of new technologies (i.e. ICTs) in education has been identified as a crucial area for policymakers in all levels of education.

Anwar (2013) opines that ICTs support the strategic management of university administration by empowering long–term decision making and also providing a platform for collaboration and communication between partners. And empowering internal processes, coordinating partners, as well as by interacting with prospective students and the public.

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HEIs are leveraging on the benefits of ICTs to expand their services to hinterlands where a formal and face-to-face (traditional) types of education are out of reach for many of the citizens. ICT facilities such as telephone, video conferencing, the Internet, electronic mail available in universities have made it possible for students to access high-quality education through distance and online learning.

In universities, ICTs have created the opportunity for faculty and students to do a lot of research using the Internet and various tools to collaborate with other researchers all over the globe (Opati, 2013). Again, in academia ICTs have made it possible and convenient to evaluate the legitimacy and accuracy of online content which is a central part of 21st-century education. Pyla (2012) suggested that increasing the student's population in higher education accelerated the need for ICTs to process, store, and retrieve data in a fast, systematic, and accurate fashion. Through the ICTs, prospective university students now apply for admissions online and the offer of admission is also provided by the university online, thereby eliminating physical contact between the applicants and the university.

In Ghana, for example, the introduction of online distance education has provided learning and educational opportunities to rural people, who due to geographical locations to the centres of education or for lack of financial resources, would otherwise have been excluded from the educational system (Alemna & Sam, 2006, p.237). The indication is that ICTs have made it possible for rural dwellers to access higher education, with radio, television (tele – education) and video in education. ICTs, especially the Internet, have enabled university students, lecturers, researchers, and the entire academic community to have access to a plethora of information through digital library resources (UNESCO, 2014).

1.2.2 ICTs in the Context of Academic Libraries

Recently, libraries more especially academic libraries, have adopted information and communication technologies (ICTs) in their operations through automation of their core functions to improve their operations and services efficiently and effectively. This requires librarians and other information professionals to acquire managerial skills to manage the ICT resources they deploy in their libraries. An academic library is a library attached to an academic institution which serves as an institution of higher learning such as polytechnic, college, specialized institutions and universities (Murugan, 2013)

Traditionally, academic libraries provide information in print format for the academic pursuit of their users. However, the advent of computers and ICT has changed and impacted significantly on the kind of services libraries and librarians provide their users. This situation has necessitated the allocation of funds to the acquisition of computers, telecommunication equipment for easy access to the Internet, e-books, and online databases. The scope and magnitude of changes occurring in libraries, especially ALs today are exciting and daunting. Edem & Afebene (2011) state that development and innovation brought by ICTs in library and information service have revolutionised the capacity to collect, organize, store, transmit and use information. These changes have transformed the nature of information through the application of new technologies, ICTs, the mass media, and the Internet. Presently ICTs have significantly and tremendously influenced information generation, organization, access, retrieval, and dissemination to users of ALs (Ogar et al, 2015).

Academic libraries use ICTs to maintain housekeeping operations, services, uniformity, and extension of library facilities (Tiwari and Sahoo, 2013). The digital revolution which has led to

virtual and digital libraries is profound in academic libraries in the developed countries due to huge financial investments in ICT and training of manpower to effectively and efficiently manage them.

According to Shali-Ullah, and Roberts (2009), the concept of ICTs in libraries relates to the development of work done by the machines and usage of computers and telecommunications in libraries. Mondal and Bandyopadhyay (2010) found that ICTs have improved control over collections, increased the volume of library activities or workload, improved control over operations, improved quality services to users, ensure user-friendliness; ICTs have also prevented duplication of efforts for cooperation and shared utilisation of information. ICTs have ensured that academic libraries can now provide services to and for their users wherever they find themselves outside the library, especially for distance and online students. For academic libraries to provide services efficiently in this digital era through Information Technology (IT) applications, libraries and librarians should be able to provide ICT infrastructure, manage and maintain them professionally and technically.

According to Foo, et al, (2002), academic libraries have become more involved with information infrastructure building especially ICT infrastructure, and it is, therefore, appropriate to iterate the four main components of information organisations in the information age: software, hardware, human resources, and data or information. They posit that new organizational structures that see the merger of the academic libraries and computer centre in the university are clear indications of the fusion of these components to provide new and better products and services, and sound administrative policies and guidelines are needed to shape the human resource requirements and expectations of libraries.

Suffice it to say that the current information delivery environment has changed significantly due to the advent of new technologies. According to Asamoah-Hassan (2012), today's information environment cannot be complete without the use of ICTs. She posits that ICTs have come to the "information provision business" to provide access everywhere, some "authoritative and others irrelevant", and that the libraries must redefine their activities, take advantage of ICTs and provide "authoritative information to users" (2012, p217). ICT adoption requires policies and strategy plans to be formulated for its integration and management to provide cost-effective library services. Advances in telecommunications, new techniques in information and knowledge management have facilitated the rapid transformation of data, information, and knowledge into digital form, while tremendous proliferation in fiber optical communication, wireless technology, and software development has resulted in the provision of powerful new methods of information sharing in academic libraries (Gichohi, 2015). Information and communication technologies have been recognized and are spreading rapidly not only in developed countries but developing countries as a vital tool to aid academic libraries to meet the demands placed on them by providing information timeously to their users. In HEIs, ICT has shaped the way academic institutions are governed. It provides the opportunity to deploy innovative methods of education delivery in the areas of teaching, learning, examination, assessments, research, and scholarly publishing and communication (Emmanuel & Sife, 2008).

Similarly, in academic libraries, ICTs have reduced the challenges libraries go through in the provision of information materials to the growing numbers of students as well as the diverse nature of students such as distance learners. According to Emmanuel and Sife (2008), ICTs have "transformed and improved provision of library and information services by overcoming time, distance and other barriers". Against this background, academic libraries globally, especially those

in Sub-Saharan Africa, including Ghana have adopted and integrated ICTs in their operations and services. HEIs libraries in Ghana are using ICT tools to automate their routine functions and services. ICTs in Ghanaian ALs are used in the selection, storage, dissemination, and management of information resources (Asamoah-Hassan, 2012). Further to this, a study by Owusu-Ansah and Adjei (2015) revealed that there are adequate ICT facilities in the Ghanaian Polytechnic libraries. These include computers, computer laboratories, internet connections, alongside the traditional mode of telecommunication like telephone and facsimile. Availability of ICTs in Ghanaian academic libraries have necessitated the subscription to electronic journal databases such as Emerald, Taylor and Francis, World Bank and IMF e-library, EBSCOhost, Wiley online, BioOne Cambridge journals through the Consortium of Academic and Research Libraries in Ghana (CARLIGH) as well as free and open access journals.

1.3 Contextual Setting

Academic libraries in Ghana, as in the case in Africa are late adopters of ICTs and other technologies for their operations (Roseroka & Mutula, 2012), since technology adoption are mostly come under the umbrella of benevolent foreign donors. Most ICT projects in Africa academic libraries are implemented under the auspices of Western donors such as DANIDA, IFLA, UNESCO and Carnegie Foundation (Dzandu & Dadzie, 2012; Armah, 2003 and Asamoah-Hassan, 2003). Hence, such projects do face implementation, sustainability, and managerial challenges especially at the end of the donor programmes more so since they are not homegrown projects.

Historically, academic libraries globally, have for centuries always looked for more effective ways of providing current and reliable sources and forms of information for their users. The academic libraries do this through various innovative means by adopting and using all forms of technological

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developments and tools (RIN and CURL, 2007). Academic libraries in Ghana have not remained aloof from these developments. HEIs in Ghana have embarked on computerization and automation of their operations from as far back as the mid-1980s. Some of them have been successful in providing services like the use of CD-ROM, internet connectivity and access to databases of full-text journal articles and abstracts (Asamoah-Hassan, 2001). This has necessitated the need for the adoption, deployment and maintenance of reliable ICT infrastructure. ICT tools presents academic libraries with the opportunity to ensure that their users get the information they need for teaching, learning and research at their convenience.

However, Ghana academic libraries have been faced with the challenge of making available to faculty, students, and researchers current, relevant and timely information resources due to lack of a more effective and efficient information technology system to connect them online seamlessly. This situation persisted until the early 1990s when various information technology-based sponsored projects were introduced into the Ghanaian academic and research libraries. The deployment of some forms of ICT facilities in libraries in some universities and research institutions provided the platform for the introduction of these projects by international organizations such as IFLA, DANIDA, and INASP, for the provision of electronic information in the libraries (Dzandu, 2009). These projects include the Ghana Scientific and Technological Information Network (GHASTINET) project in 1991, the Information Development/Ghana National Committee on Internet Connectivity (InfoDev/GNCIC) project in 1996, the Ghana Inter-Library Lending and Document Delivery Network (GILLDNET) project in 1996, the Programme for the Enhancement of Research Information (PERI) in 1999, and the Research and Educational Network (REN) project in 2000. The objectives of these projects were to develop databases that

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would manage all aspects of scientific information in Ghana and to facilitate the acquisition of internationally produced information and knowledge, as well as training in the use of ICTs and improving the production and dissemination of national and regional research outputs. These projects made available computers and their accessories to all the participating libraries. The PERI project for instance made available about 7000 online journal titles to the academic and research community in Ghana (Armah, 2003). Participating institutions in the project were the libraries of five state-owned universities in Ghana. They are the University of Ghana, Kwame Nkrumah University of Science and Technology, University of Cape Coast, University of Education, University for Development Studies, and the Council for Scientific and Industrial Research, Ghana (CSIR).

It was therefore anticipated that with all these sponsored projects and the availability of some form of ICT facilities in place, the libraries and institutions concerned were going to take advantage of the new information technologies to provide a wide range of services and products, which were not possible a few decades ago and before the emergence of the projects. Unfortunately, these projects could not be sustained due to numerous challenges that bedeviled their implementation and management. Some of the challenges that crippled the projects included lack of efficient internet connectivity due to low internet bandwidth, frequent breakdowns of the ICT systems; lack of trained librarians with requisite skills to manage the ICT infrastructure and lack of ICT policies for implementation, maintenance, and management of ICT infrastructure (Armah, 2003; Dzandu, 2009; Dzandu & Dadzie, 2012).

Over the past few years, there has been an influx of various ICT resources and computer applications for library and information work in Ghana (Owusu-Ansah & Adjei, 2015), which

academic libraries have taken advantage of in automating their operations to provide more efficient library services to make information in all formats available to their users.

Not to suffer the fate of the previous ICT projects in academic libraries and in the light of the challenges ICT deployments in Ghana have encountered, this study aims to establish and explore managerial strategies and policies that need to be put in place for the adoption, maintenance and management of ICTs in Ghanaian academic libraries in a sustainable manner for the users to enjoy the benefit therein. This study focuses on ICT facilities adoption and management in Ghanaian academic libraries. In particular, the study seeks to establish the availability of strategic plans, policies, and standard operating procedures for the application, maintenance and management of ICT in academic libraries in Ghana to ensure their sustainability.

As academic libraries embrace ICTs, managing them has become imperative due to the critical role these new technologies play as the remedies to most of the challenges that confront academic libraries in Ghana in their quest to provide current and relevant information materials to their academic communities. Globally, HEIs have integrated ICTs into the operations of their libraries to provide efficient and reliable services to faculty, researchers and students. Libraries in higher educational institutions are seen as the "heart" and the "nerve centres" of academic activities. As a requirement for accreditation, in Ghana, institutions of higher learning are mandated to have properly planned and a well-resourced library system manned by well-qualified staff (National Accreditation Board, 2015). For this reason, academic institutions without proper library system in terms of collections, facilities and qualified personnel are denied accreditation to operate. It is also a an accreditation requirement for academic libraries in Ghana to integrate ICTs into their operations and services delivery (NAB, 2015).

1.3.1 Highlights in the development of the Academic Library

Though a lot of studies have been conducted on several aspects of academic libraries, very few writers have researched into the history of Academic Libraries comprehensively and especially in the Africa. Oyegunle (2013) reveals that for hundreds of years, academic institutions and libraries originally existed outside of each other. Again, Oyegunle indicates that at the early stages, the teaching methodology employed was mostly students' recitation and the lecture method by professionals. In some instances, a whole lecture copied and given to students at a cost became expensive regarding time and availability of funds. It then became necessary to build a storehouse to keep these lecture materials as more lectures were copied and more copies of older lectures were reproduced.

By 1338, Budd, (1998 cited in Adebayo & Adekunjo 2013) suggested that the library at Sorbonne at the University of Paris, which evolved and contained over 1700 volumes of lecture notes, is considered to be the first academic library. With time more copies of lectures and those reproduced, as well as other writers' documents available increased in number and academic institutions, especially the tertiary institutions, realised the essence or value in gathering books that were relevant to the various fields of studies in one building.

Due to this development, Sir Thomas Bodley, an alumnus of the Oxford University decided to raise adequate financial resources to cater for the collection of library books and where necessary, travel around the world to search for and buy relevant books on many subjects (Budd, 1998 cited in Adebayo & Adekunjo, 2013). Budd adds that after injecting this money in 1338, by 1605 the number of manuscripts and books increased to more than 5000. This development served as an example for other universities. By increasing this practice of printing more books, researching to publish, and add additional books, the universities gained much interest in building complex

structures to store them for studies and references. As this trend continued to grow, Harvard University was established. John Harvard, in 1638 offered 300 books and £800 to build the 'first state-side academic library' and in 1667, the first librarian then appointed for Harvard University started his work to ensure proper management of the library.

Throughout these early years, one major challenge to academic library development was that only senior members of the University used the library. According to Budd (1998), another challenge was the opening hours which were from 11 am to 1 pm. It was difficult to have access to it, especially by students. Also, the University did not put in place any cataloguing system until the year 1723. Even as of that time, the size of books or donors was usually an indication of how the books arranged to fit the purpose of the library.

Yale University in 1766 had about 4,000 books and materials. Similarly, access to the library was limited to senior members of the University and a few students. Interestingly, in the year 1849, the library at the University of Virginia was opened for nine hours a week, Columbia University four, Yale University opened only for thirty hours a week; and three hours per week for Bowdoin College. Oyegunle (2013) concluded from these developments that the main objective of the academic library at that time was not to allow patrons to use them but to protect the books. A shift in the collection and preservation function of the academic library to utility commenced at the beginning of the 20th century. The academic library managers then developed strategies to grant access to many students, which required more services, more staff, and extension of hours.

Against this backdrop, universities were engaged in raising more financial resources to support the expansion programme of the academic libraries. By this action, more books were gathered, and complex buildings constructed to give additional comfort to users helped to enhance the performance of the library. According to Adebayo and Adekunjo (2013), the introduction of

information communication technology led to the development of a digital library that has significantly changed the librarian's work schedule, and the need to hire ICT personnel, with new demands and expectations from librarians and users.

Currently, academic libraries throughout the world have adopted and are still implementing various kinds of ICT tools in various fields of operation. Academic libraries are adopting and utilising electronic means of providing information services, initially powered by analog means of retrieving and assessing information. This change is crucial, due to the change in demands of users and the change in social trend and globalisation (Omekwu & Echezona, 2008), an era where the expectations of users must be met, without interrupting the closing and the time required to open the library (Ajogboye, 2010). This phase of academic library development requires staff with skills and knowledge in technology to ensure a successful transition to a modern university library services provision.

1.3.2 Academic Libraries in Ghana

Academic libraries in Ghana are those libraries found in tertiary institutions both public and private. These comprise libraries of universities, polytechnics, university colleges, theological institutes, tutorial institutes, professional institutes and colleges of education. These libraries are part of their parent institutions and they are supposed to be established alongside the academic institutions they serve (NAB, 2015). The first academic library to be established in Ghana is the Balme Library of the University of Ghana, which was opened in 1948, the year the university started its operations. Since then, there have been several academic libraries due to the rampant establishment and opening of private university colleges (Asamoa-Hassan, 2012; NAB, 2015).

Academic libraries are described as the "nerve centre" or the "hub" around which academic activities revolve, and the crucial role they play in the academic success of students cannot be

discounted. Historically, libraries in HEIs are the destinations where students, faculty and researchers seek information in their academic pursuit (Murugan, 2013). Therefore, National Accreditation Board, Ghana, expect all institutions applying for accreditation to have proper library infrastructure, resources, and qualified staff before they are allowed to commence recruitment of students (NAB, 2015).

The main role of an academic library is to support the mission, vision, objectives and goals of an institution of higher learning by providing the needed information materials in the areas of teaching, learning, training, research, and community service. Jubb and Green (2007) posit that academic libraries have over the years played important and critical roles in providing information in supporting teaching, learning and research in their parent institutions, such as polytechnics, colleges and universities (Owusu-Ansah & Adjei, 2015). The importance of academic libraries in higher educational institutions cannot be overemphasized. The size of the stock, the calibre of staff and available facilities in university libraries serve as the thermometer to gauge the health and temperature of the nature of the university concerned. Kwapong (1970 cited in Asamoah-Hassan, 2012), on this, he avers that the university library should be the heart if not aorta of any university and that a university's academic health, intellectual vitality and effectiveness, therefore closely depend on the state of health and excellence of its library, which indeed is its lifeblood. He opined that an inert and the moribund library invariably means an inert and moribund university. In contemporary world large institutions or universities may have several libraries spread on their campuses to serve a particular school, college, facility, or department.

Modern academic libraries are designing their facilities to create learning spaces to collaborate with the faculty and support students' group work (Lippincott, 2015), in line with recent trends in

higher education reforms that emphasize active learning and learning as a social process, which supports the development of students' collaborative skills. Again, the application and integration of ICTs in academic libraries have innovated and changed provision and access to information in the academic environment. In Ghana, academic libraries in public universities which are under study are funded through government subvention (Lamptey & Agyen-Gyasi, 2010). It is, therefore, presumed that the libraries in public universities are well-resourced and richer in terms of human resources, financial resources than private universities which are mostly one-person's business. Again, academic libraries in Ghana are the well-developed libraries due to the government subsidizes and the requirement of the National Accreditation Board. They have become main sources of information materials for academic communities and the general public especially policymakers, government official, politicians such as parliamentarians (Lamptey & Agyen-Gyasi, 2010; Asamoah-Hassan, 2012; NAB, 2015). Recently, academic libraries in Ghana have seen tremendous changes due to the deployment and application of ICTs in their operations. This has resulted in libraries like KNUST Library, UG Library (Balme Library), UCC Library automating their routine operations and establishing Institutional Repositories (IRs) (Dadzie, 2013; Opoku, 2013; Asamoah-Hassan, 2012; Lamptey & Agyen-Gyasi, 2010).

Furthermore, academic libraries in Ghana subscribed to peer- review electronic (journals) resources from publishers like Emerald, EBSCOhost, Taylor and Francis, Wiley Online and a lot more through the Consortium of Academic and Research Libraries in Ghana (CARLIGH) which negotiates and acquires these resources on behalf of the academic and research libraries in Ghana (Dadzie & Walt, 2015a; Dadzie, 2013; Dzandza & Alemna, 2011). The indication is that there is an appreciable level of ICT application in Ghanaian academic libraries (Dadzie & Walt, 2015b). Despite these developments, academic libraries in Ghana still face a lot of challenges, especially

on how to manage the available ICT tools and other technologies effectively. This necessitated this study to research into how the ICT facilities deployed Ghanaian academic libraries could be managed effectively and sustainably.

1.3.3 Challenges faced by Ghanaian Academic Libraries

In Ghana, libraries in the universities and some tertiary institutions have improved, regarding their collections, professional staff, buildings, equipment and services. For years, these libraries in higher institutions form the primary sources of information in their academic communities (Lamptey & Agyen-Gyasi, 2010). The library staff search for information, acquire, process, and disseminate relevant documents to support decision-makers in trade and commerce, industry and government in addition to supporting lecturers and students in their studies. Again, academic libraries in the country provide technological facilities for research information, in the areas of technical reports, dissertations, theses, and assignments for students. Despite the numerous benefits of academic libraries in Ghana provide, their developments have been neglected, with only little support from the government and their parent institutions, which has affected the general performance of the library system (Kisiedu, 2009). Kisiedu further identifies the challenges facing academic libraries in Ghana to include:

- inadequate financial resources;
- insufficient access to information materials;
- inadequate skilled manpower; and
- inadequate ICT infrastructure for effective information management.

Other challenges include a rapid increase in students' enrolment due to educational reforms that shorten the number of years to get to tertiary institutions. Some of the reforms were implemented without a corresponding increase in infrastructure system universities. For instance, Badu (1997),

states that the academic libraries that were built for a student population of fewer than 2,000 in the middle of the twentieth century now cater for over 7,000 students. Presently the situation is worse, with the University of Ghana alone having a student population of over 45, 000, yet the library's infrastructure remains the same with few additional extensions, which are woefully inadequate. This situation is not different in other tertiary institutions in Ghana, both public and private. ICTs are therefore the last resort to deliver information to the growing number of the student population and other members of the academic communities in Ghana. Prudent measures are needed to provide enough financial resources for the procurement of ICT tools and manage them efficiently to ensure their smooth integration into Ghana academic library system.

1.3.4 Higher Education Institutions (HEI) in Ghana

HEIs in Ghana consists of Universities, Polytechnics, Colleges of Education, Nursing Training Colleges and other specialized institutions such as Military Colleges/Universities (National Council for Tertiary Education, 2015). These institutions offer programmes that lead to the award of certificates, diplomas, higher national diploma, bachelors and postgraduate degrees. The public HEIs are under the supervision of the National Council for Tertiary Educational (NCTE). NAB provides regulations for acceptable standards for operating tertiary institutions in Ghana. NAB regularly makes available a list of public and private HEIs registered with it and ensures that these institutions meet minimum academic standards (NCTE, 2015).

The history of higher education in Ghana dates back to the time the University College of the Gold Coast was established in 1948, which was later changed to the University of Ghana after Ghana's independence in 1957. At Independence, Ghana had only two public higher educational institutions, they were the University of the Gold Coast now, the University of Ghana and the College of Science and Technology, currently known as the Kwame Nkrumah University of

Science and Technology. Since then, higher educational institutions have expanded. There are ten (10) public/traditional universities, sixty-three (63) private tertiary institutions, eight (8) technical universities, two (2) Polytechnics, thirty-eight (38) colleges of education, eleven (11) nursing training institutions, three (3) Colleges of Agriculture, two (2) specialized institutions, three (3) regulatory bodies and three (3) other publicly-supported organizations (NCTE, 2017). All these categories of HEIs have libraries that provide information materials to support teaching, learning and research. These libraries are referred to in this study as academic libraries or university libraries.

Academic libraries in Ghana are the libraries found in the institutions of higher learning. They include libraries in the universities both public and private, polytechnics, nursing training colleges, colleges of education and specialized tertiary institutions (Asamoah-Hassan, 2012). Academic libraries in Ghana are set up to support the information needs of students, lecturers, researchers and other administrative staff of the academic communities. Librarians and libraries are expected to explore all means possible, especially the application of ICTs and other technologies, to ensure that the faculty and students get access to current and relevant information materials in the pursuit of their academic endeavours (NAB, 2015). Currently, there are about one hundred and eighteen higher educational institutions in Ghana (NCTE, 2015). Each of these institutions has an academic library, and some with a branch, college, faculty and departmental libraries.

The University of Ghana's main library, known as the Balme Library named after the first Principal of the then University College of the Gold Coast is believed to be the oldest and the largest academic library in Ghana in terms of collection, facilities, and staff. It is followed closely by the Kwame Nkrumah University of Science and Technology library. Academic libraries in Ghana

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provide traditional library services to their university communities such as circulations, reference services, referrals, interlibrary loans, reprographic services and library orientation for the freshmen and women (Thompson, Amuda & Akeriwe, 2015). These services are carried out to provide information materials in anticipation of the information needs of lecturers, students and researchers to support teaching, learning, and research.

With the advent of computers and modern technologies, Ghanaian academic libraries are providing information in electronic formats such as online databases, CD-ROMs, electronic books and electronic journals as well as offering information literacy skills courses to help make teaching and learning materials available all year round(Kumah, 2015). Library materials can now be made available outside the library building to their students, lecturers and researchers (Bhoi, 2017). ICTs have enabled the creation of institutional repositories through which research reports, masters and doctoral theses and dissertations are being digitized to make them available globally for easy access. This new development in the Ghanaian academic libraries' environment demands a change of focus in terms of staff training to equip them with modern ICT literacy and managerial skills to manage the available ICT resources and infrastructure in the libraries.

This study, therefore, focused on how ICT facilities managed in public university libraries in Ghana. Other academic institutions' libraries such as colleges of education, nursing training colleges, polytechnics, other specialized institutions and that of the private universities in Ghana were not covered in this study.

The public universities in Ghana currently stand at ten (10). They include University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Cape Coast (UCC), University of Education, Winneba (UEW), University for Development Studies (UDS), University of Mines and Technology (UMAT), Ghana Institute of Management and Public

Administration (GIMPA), the University of Professional Studies, Accra (UPSA), the University of Health and Allied Sciences (UHAS) and the University of Energy and Natural Resources (UENR).

Besides these ten public universities, there are eight (8) technical universities which are also in public categories but were not captured in this study. These libraries in public universities have embarked on automation of their core functions and routine operations using various ICT tools and assets as far back as the mid-1980s such as the use of CD-ROM, deployment of the Internet and access to full-text electronic journals (Owusu-Ansah &Adjei, 2015). The deployment of ICT has brought changes to the way and manner these libraries operate, as they have taken advantage of these new technologies to provide library services in better ways.

1.4 Statement of the Problem

Due to the tremendous potential benefits of ICTs in academic libraries, large amounts of money are allocated in the budgets of university libraries every year for the acquisition and maintenance of ICT resources. As academic libraries spend a substantial amount of money to procure, install and maintain ICT facilities, it is only appropriate and economical that these ICT facilities are optimally utilised to contribute to information services delivery. Yet adoption and integration of ICTs in Ghanaian academic libraries are faced with a lot of challenges due to haphazard ways in which the ICTs are deployed. Asamoah-Hassan (2012), identifies some of the challenges associated with the deployment of ICTs in Ghanaian university libraries to include:

- lack of trained and skilled manpower to implement and manage ICTs in libraries;
- inadequate funding for procuring appropriate ICT hardware and software;
- poor technological infrastructure;

- the absence of clear ICT strategies, plans, goals, policies, procedures and processes for the adoption, implementation and management of ICTs.

This is indication that ICT application in Ghanaian academic libraries has been fragmented, unregulated and uncoordinated due to lack of effective and efficient managerial practices such as a well-documented library ICT policy, strategic plans, maintenance systems, monitoring and evaluation system for their adoption, implementation and management (Armah, 2003; Dzandu & Dadzies, 2012; Asamoah-Hassan, 2012; Dadzie &Walt, 2015). Among these challenges, lack of ICT policies and other managerial practices is at the core of all problems hampering effective and efficient exploitation of ICTs in Ghanaian academic libraries. The lack of policy guidelines indicates that there is no mission, vision as well as a set of objectives and goals to work along or accomplish (Kihwaga, 2013).

According to Del Guidice, et al. (2010), technology, that is, ICTs management refers to the formulation and availability of policies and procedures to guide the use of technologies to optimise the tools in enhancing the capacity of a particular entity adopting them. Batane and Motshegwe (2012) opine that in developing countries, one of the challenges in technology application is how to manage it to meet the specific needs of adoption. A preliminary investigation by the researcher revealed that some university libraries in Ghana do not have ICT policy framework as a guide for the adoption and management of ICTs; and also, to regulate, monitor and enhance the library's ICT based projects for effective operations and service delivery. Kamba (2011) states that a lack of policies, planning, implementation and managerial strategies to guide the ICT deployment have prevented libraries from enjoying the potential benefits therein.

Furthermore, there has been little systematic and empirical research focusing on how academic libraries should strategically respond to remain relevant in the face of several challenges related to

ICTs adoption and their sustainable management. It is against this background that this study seeks to investigate how ICTs in Ghanaian academic libraries are adopted and managed as well as make detailed recommendations on how ICTs should be managed. The study, therefore, examined ICT tools available in academic libraries in Ghana; and whether or not there are library ICT policies for the acquisition, implementation, maintenance and the sustainable management of the ICT resources. Questions such as the following arise regarding the adoption and management of ICTs:

- How are ICTs in academic libraries in Ghana currently being managed?
- What plans, policies and strategies are in place for the adoption and management of ICTs in academic libraries in Ghana?
- Are these policies and strategies if any, appropriate for the management of ICTs in Ghanaian academic libraries?

These questions therefore require answers through in-depth academic research. Hence, the researcher's motivation to conduct this study to investigate the situation in Ghanaian university libraries to document as well as provide lessons for the better management of ICTs to optimise benefits therein.

1.5 Aims and Objectives of the Study

This study aimed to investigate the managerial processes and challenges in terms of conception, policies, planning, implementation and strategies involved in ICTs adoption, so as to formulate strategies for their management in Ghanaian academic libraries.

1.5.1 Objectives of the Study

In this context, and based on the problem statement as discussed above the study is intended to address the following specific objectives:

1.5.1.1 To review and explore the status and level of ICT diffusion in Academic Libraries in Ghana;

1.5.1.2 To audit the procedures, processes and factors that influence ICT adoption and implementation in Academic Libraries in Ghana;

1.5.1.3 To establish the institutional policies, strategies and human resource that are in place and available for the adoption, implementation and management of ICTs in Academic Libraries in Ghana;

1.5.1.4 To investigate factors that hinder the adoption and management of ICTs in Academic Libraries in Ghana;

1.5.1.5 To suggest solutions for adoption and managing ICTs in Academic Libraries in Ghana.

1.5.2 Research Questions

Research questions in mixed-method studies, according to Onwuegbuzie and Leech (2006) play several roles: "they provide a framework for conducting the study, help the researcher to organize the research and give relevance, direction and coherence, thereby helping to keep the researcher focused during the investigation." Again, they dictate the type of research design, sample size and sampling method to be used as well as the type of data collection instruments to be employed (Onwuegbuzie & Leech, 2006).

To facilitate arrival at sound findings to achieve the objectives set out above, the following research questions were formulated to guide the study:

1.5.2.1 To guide the achievement of objective **1.5.1.1** the following research questions were designed to guide the enquiry: (a) what types of ICT infrastructure is available in Academic

Libraries in Ghana? (b) what kind of services do Academic Libraries provide to their community through the use of ICTs? (c) what kind of ICT facilities/resources are available in Ghanaian Academic Libraries?

1.5.2.2 To meet the achievement of the objective **1.5.1.2** of the study, the following research questions have been formulated: (a) what reasons or factors influence ICT adoption and use in Academic Libraries in Ghana? (b) What are the procedures and the processes involved in the adoption and implementation of ICTs in Academic Libraries in Ghana? (c)how has the use of ICTs influenced Academic Libraries' operations and service delivery?

1.5.2.3 To answer objective **1.5.1.3** these questions were formulated: (a) what plans, and strategies are in place for managing ICTs in academic libraries in Ghana? (b) Do Academic Libraries in Ghana have codified ICT adoption and management policy? (c) Are these policies followed in the implementation and management of ICT resources? (d) Do Academic Libraries need written ICT policy and strategy for integration of ICTs into the Academic Library system? (e)Are there in place ICT implementation and management teams in Academic Libraries in Ghana? (f) What is the composition of the ICT implementation and management team?

1.5.2.4 The objective **1.5.1.4** was achieved through the following questions: (a) what are the problems encountered by the Academic Libraries in the application of ICTs? (b)What deficiencies and challenges hinder effective and efficient ICTs management in Academic Libraries in Ghana?

1.5.2.5 What policy framework can be employed in the management of ICTs in academic libraries?

1.6 Significance and Justification of the Study

In Ghana, academic libraries have embarked on the automation of their operations and services delivery using different types of Library Management Systems owing to the availability of ICTs.

The literature on ICTs in academic libraries in Ghana show that much has not been researched with respect to the relationship between ICTs deployment and their management in academic libraries. This study is very significant because huge financial investments have been made by university authorities into academic libraries in the acquisitions of ICTs, yet users are not enjoying the needed benefits therein due to a lack of proper implementation and management policies and strategies. It is the opinion of this researcher that such financial, human and technical investments must be managed properly.

The study is, therefore, significant in that it intended to;(a) inform the development of policies and strategies in the adoption of ICTs in ALs in Ghana, (b)help evaluate and provide insight into the level of ICTs diffusion in ALs in Ghana as well as proper usage of the available ICT resources, (c) help assess manpower needs of the ALs in Ghana in terms of adoption and management of ICT tools in the libraries, (d) help gather information to formulate policy and strategies for managing ICTs in ALs in Ghana and (e) help bridge the existing gap in the literature on how ICTs are managed in ALs in Ghana.

1.7 Scope of the Study

The current study focuses on the issues of ICT management and therefore did not delve into specific applications or type of ICT such as the use of social media in academic libraries. Though it is an emerging area in the application of ICTs in libraries at tertiary education level in offering services to users. Again, the study is limited to public universities in Ghana due to the limited resources to study the huge number of private universities as well as other academic institutions.

1.8 Definition of Terms

Higher Education Institutions (HEIs) refer to institutions offering tertiary education that follows basic education and secondary school education. Tertiary education normally includes undergraduate and postgraduate education, as well as vocational education and training colleges, universities, and institutes of technology. These are the main institutions that provide tertiary education. (Sometimes known collectively as tertiary institutions).

An Academic Library is a library that is attached to a higher education institution which serves two complementary purposes: to support the school's curriculum and to support the research of the university, faculty and students.

ICT (information and communications technology - or technologies) is an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. ICT also involves the various kinds of technologies used in the organization and processing of information such as the creation, storage, coding, retrieval, manipulation and dissemination.

Information Technology (IT) is a general term that covers all forms of technology used to create, store, exchange, and use information in various forms, especially in libraries.

Management: In the context of this study management involves the strategic planning, formulation of policies, processes and procedures for the implementation, operation, and maintenance of ICT resources. It also includes recruitment and training technical personnel to support maintenance and operation of ICT systems, information providers to ensure information

availability and integrity to the end-users. Establishing technical requirements such as hardware and networks on which library ICT systems run, applications and operating systems, the security of information and disaster recovery plans.

1.9 A Brief Overview of the Research Methodology

The study collected and analysed both qualitative and quantitative data. Hence, the research adopted the mixed-method approach based on a pragmatic paradigm as the research philosophy. Again, the study adopted the survey method as the research design. Data collection instruments used in this study include questionnaire, observation, interview both structured and semi-structured and document analysis. Document analysis involved critically analysing the contents of documentary materials such as books, journal articles, newspapers, and magazines. Other material documents such as library policies, strategic plans, library manuals and brochures, library guides, university statutes, official reports and online databases were examined to provide evidential data to support clarified and verified data gathered from other sources. The Statistical Package for Social Sciences (SPSS) software was used to analyse the data from the questionnaires. The entire methodology and data analysis tools are described comprehensively in Chapter Four of this study.

1.10 Thesis Structure

Chapter 1   Chapter one covers the following; introduction and background, conceptual setting, contextual setting, statement of the problem, aim and objectives of the study, research questions, motivation and significance of the study, scope and delimitation of the study, a brief overview of the research methodology and tentative thesis structure.

Chapter 2   This chapter reviewed related literature in the following areas, ICTs in Tertiary and Higher Education; factors that influence ICTs adoption and implementation in Academic Libraries; Issues of managing ICTs in Academic Libraries; Factors that hinder ICTs adoption and management in Academic libraries; Mapping strategies for adoption and management of ICTs in ALs in Ghana.

Chapter 3   This chapter focuses on the Theoretical/Conceptual framework that underpinned the study.

Chapter 4   Chapter four discusses the methodology indicating detailed description and explanation of research design and methods, target population, research techniques and instruments, data collection procedures and problems, ethical considerations.

Chapter 5   Chapter five reports on quantitative data analysis and presentation using tabulations, tables, figures, and description.

Chapter 6   Chapter six presents the qualitative and analysis in themes based on the research objectives and questions

Chapter 7   Chapter seven is devoted to findings and discussion of the data analysis

Chapter 8   Chapter eight includes the summary of findings, conclusions and recommendations and possible areas for further studies.

1.11 Summary of the chapter

The chapter introduced the research topic with the highlights of the concept of information and communication technologies (ICTs) and how academic libraries have changed as a result of the

advent and application of ICTs. The potentials of ICT in education and libraries to provide access to information for teaching, learning, and research have been noted in the chapter. The study is then placed in context by examining ICTs projects in academic libraries in Ghana and the associated problems that hindered their smooth implementation and sustainability.

It has been noted that despite the importance of ICT in academic libraries, lack of proper managerial processes to ensure their sustainability has become a major challenge in exploiting the potential benefits therein. Furthermore, it was noted that there are very few studies in Ghana who are into addressing the issue of ICTs management in Ghanaian academic libraries. The next chapter presents the literature of the study to help identify the gaps which this study intends to fill.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

A literature review is fundamental for establishing what has been written or researched and published on a topic under study to shape the scope of the research being carried out. This chapter presents a review of relevant and related literature on the topic of managing information and communication technologies (ICTs) at academic libraries. The chapter commences with reviewing some of the literature regarding ICTs in tertiary and higher education, and the factors that influence ICTs adoption and implementation in academic libraries. It further examines issues in managing ICTs in academic libraries; challenges in strategic information management; factors that hinder ICTs adoption and management in academic libraries; strategies for effective adoption and management of ICTs in ALs, the history of the academic library and some challenges that academic libraries face in Ghana. In a research study, literature is reviewed for several reasons. The most important of these reasons is to bring together whatever has been written about and on the problem under study as well as to focus on areas to highlight the significance of the current study in the context of existing literature.

2.2 ICTs in Libraries and Education

Several studies both empirical and theoretical, have revealed and identified application, deployment and use of ICTs in libraries and education. In a study, Vaishyak and Patel (2009), state ICTs denote information and communication technologies and are defined, for this study, as a diverse set of technological tools and resources used to communicate, to create, disseminate, store, and manage information. Khan et al. (2012), on the other hand, consider ICTs to include radio and

television, as well as newer digital technologies such as computers and the Internet. They emphasis that ICTs have potentially powerful enabling tools for education and information sharing in academic libraries. ICT, therefore, could be viewed as a combination of technological devices such as computers and other technologies for the acquisition, gathering, processing, storage, retrieval, and transmission of information in digital form. ICTs have impacted all aspects of human life, especially in a higher education environment and its associated systems such as libraries. The impact and the associated benefits of ICTs in education have been recognized globally and reported in several research works and other studies (Yusuf, 2005; Jhurreev, 2005; Al-Ansari, 2006; Twining, 2007; Adu and Olatundun, 2013; Patel and Brahmbhatt, 2014; Al harbi, 2014).

From the literature, different kinds of ICT tools such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audio cassettes and CD-ROMs are available in educational institutions. And they have been deployed for different purposes such as management of administrative systems, teaching, learning and research (Bhattacharya and Sharma, 2007; Sharma, 2003; Sanyal, 2001).

Al harbi (2014) reports in his article '*towards successful implementation of ICT in education'* that the use of ICT for educational delivery and instructions helps to actively engage students in their learning process rather than the traditional method where students were only passive observers and listeners. Al Harbi sums up, by saying that the benefits of incorporating ICTs in education will not just occur unless it is deployed, used and managed effectively and efficiently through properly laid down management structures.

Kyalo and Nzuki (2014) in their study also opine that notwithstanding the benefits of ICT application in education and libraries, and the policies developed by many countries over the world, ICT adoption and implementation are still bedeviled with a lot of challenges. They suggest the need to have managerial structures to ensure effective ICT deployment. The purpose of this study is to investigate whether academic libraries which are part of the educational system have management policies, strategic plans, procedures and structures for successful ICT integration.

2.2.1 ICT in Academic Libraries

Several studies have investigated ICT facilities, their impact and challenges in libraries of universities and other institutions of higher learning. One of the chief advantages of ICTs in academic libraries is seen in the rapid processing and dissemination of information(Bhoi, 2017). ICTs in an academic library are appreciated based on their applications. Some scholars see that ICTs applications make routine library operations simpler, faster, easier and convenient in daily functions carried out by the various types of libraries (Saleem et al, 2013; Bhoi, 2017), on the other hand, ICT application could be seen as a better way of providing new and better ways of providing library services which could not be possible without technologies.

Enakire and Ocholla (2017) identified reasons for ICTs in libraries to include easier, faster handling and efficient management of volumes of information; creation of library portals and institutional repositories for the marketing of library resources and services. Others include all-year round access to library resource by users outside the library; and the improvement and effective operations and performance of library functions and services.

Although a lot of studies have shown the availability of ICTs in academic libraries (Islam & Islam, 2007; Mairaj & El-Hadi, 2012; Garg, 2013; Husain & Nazim, 2015; Onuoha & Obialor, 2015; Bhoi, 2017; Mittal, 2017), little is known about the processes through which ICTs are deployed and managed in academic libraries especially in developing countries such as Ghana.

In a study, Ridwan (2015) surveyed various computers and ICT devices available and adopted in the management of the library and information centres academic institutions. The study concentrated on the various functions' ICTs have been applied to as well as highlighting the challenges the Nigerian Universities libraries encounter in ICT applications. The study found out that ICTs have helped the libraries to provide innovated services such as the establishment of institutional repositories and access to electronic resources, even though the study identified challenges like lack of ICT skills among the library staff and the usual lack of funds. However, the critical issues of policies to guide ICTs' adoption and management were not considered in the study. This is the gap this study sort to fill in the field of ICTs in academic libraries.

Several studies have surveyed and measured the level, status and extent of ICTs diffusion in academic libraries (Onoriode, 2012; Lau et al, 2013; Ridwan, 2015; Al-Fadhli et al, 2016; and Enakrire & Ocholla, 2017). Nkanu et al, (2011) studied the availability of ICT facilities in selected Nigerian academic libraries using questionnaires as a data collection tool. The study revealed that ICT facilities include microfilms, microfiche, computers, audio-tapes, CD-ROM databases, photocopiers and others. In this digital an age where many libraries depend on modern technologies, and such, ICTs have transformed traditional libraries into virtual libraries (Bradley, 2010).

However, the need to manage these ICT facilities effectively and efficiently has become imperative. Presently, ICT in libraries like other technological inventions and innovations represents modern and future image of library operations and service delivery.

While there is a paucity of literature on the issues of ICTs management especially on issues such as library ICT policies, strategic plans for ICT application, lack of properly developed maintenance schedule (Onoriedo, 2012), studies on ICT facilities and devices available in universities and other HEIs libraries are many (Onoriedo et al, 2012; Mingle, 2014; Owusu-Ansah &Adjei, 2015; Ridwan, 2015; Al-Fadhli et al, 2016; Enakrire & Ocholla, 2017).

Most of these studies identify ICTs in academic libraries to include computers, projectors, smart boards, scanners, telephones, photocopiers, modems, routers, switches, smartphones, mobile phones, and tablets, printers among others and their use as well as benefits to library operations. Yet none of the studies dealt with the procedures, processes and guidelines for the ICTs application and management.

Vaishyak and Patel (2009) in their paper talk about the critical role ICTs play in the provision of better library and information services to their user communities. They indicate that academic libraries are using modern technologies and other web-based tools to make core library functions easier, faster and more convenient. The study, however, identified ICT management as the most difficult challenge modern librarians and information professionals faced. They therefore suggest the need to train and equip librarians with technological skills to manage library ICT system.

Academic libraries are now leveraging the benefits of ICTs to provide different formats of information, educational and instructional materials for students, especially distance and online students. One critical sector of HEIs that has been transformed by ICT is the academic library.

This transformation by ICTs has resulted in a shift from traditional library services to digital, electronic and virtual library services by tapping from the vast advantages of ICTs (Awour, 2013).

2.2.2 Processes, Procedures and Guidelines for ICTs Adoption and Management

The concept of ICT in academic libraries is the application of a technological system used for collecting information, processing the information, storing, manipulating, accessing and disseminating information in various formats (Ismail, et al., 2013). Islam and Islam (2007) are of the view that ICTs are made up of different ranges of technological tools libraries use to generate and communicate information seamlessly. They intimated the ICT technologies include networks and applications such as satellite and wireless telecommunications, radio and television broadcasting tools, the Internet and multimedia tools. Islam and Islam further highlighted that to manage ICT holistically, there be formulation of ICT policies and strategic plans which must include telecommunication, infrastructure and human capital policies.

Garg (2013) categorizes ICTs into their usage to include ICT-based resources, such as computers connected to the Internet, CD-ROM, audio cassettes, video-cassettes, photocopiers, printers, software used by librarians and users. Again, ICT-based on operations, functions and activities such as data processing, circulation, cataloguing, bibliography, serial control, in-house database. And finally, ICT-based on information delivery which includes CD-ROM and database searches, online and virtual information services, reprographic service, virtual circulation and online library materials reservation services.

Zulu (2011) opines that the term ICT involves the various kinds of technologies used in the organization and processing of information such as the creation, storage, coding, retrieval, manipulation and dissemination. However, for these technological tools to operate efficiently, they

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must underpin by well-drafted library ICT policies to ensure that its adoption and management in academic libraries successful and sustainable. These are some of the processes and procedures that will guide and ensure successful ICT integration and management in academic libraries.

Enakrire and Ocholla (2017), stated strongly that ICTs in academic libraries have shaped information and knowledge packaging and transmission which has influenced planning and decision-making processes. The Commission on Higher Education of Kenya (CHE) (2007) describes academic libraries as the libraries found in higher learning institutions such as colleges and universities, which aim at serving the faculty and students with their information needs. Academic libraries have the core mandate of providing the required information resources in support of teaching and learning and research agenda. In a modern academic environment, according to Omosor (2014), this core mandate of university libraries would be difficult to achieve without the support and reliance of ICTs and other modern technological tools/devices.

A study by Omosor (2014) on the effect of ICT and other technologies on academic librarians in Nigeria revealed that increase in the speed and accuracy by which library operations and services are executed is one of the main benefits of ICTs in university libraries. Omosor's study further revealed that ICTs have increased the responsibilities of librarians as they are expected to accomplish tasks timeously. The process of transforming information into knowledge with speed of light is the main reason behind the deployment of ICTs in academic libraries. Men and Isreal (2017) argue that academic libraries, known as fountains of knowledge, assist users in the process of research and learning activities. Traditionally, academic libraries collect materials such as all kinds of print materials including manuscripts, maps, textbooks, handbooks, reference materials like dictionaries, yearbooks, encyclopedias in print formats to support the academic community.

However, lately, the acquisition of printed materials has reduced in most academic libraries in Ghana (Owusu-Ansah and Adjei, 2015), as more funds are now devoted to the acquisition of ICT based resources, computers, telecommunication equipment for access to the internet and online databases. Ayeh (2008) states that through ICTs use in academic libraries, one can share information to help eliminate societal illness such as ignorance, poverty, and diseases.

The adoption and application of ICTs in academic libraries have several benefits. For example, ICTs applications in academic libraries facilitate the achievement of the library's goals and objectives, such as, ease in information dissemination and knowledge sharing, proper and efficient marketing of library resources and services, provision of library services outside the library, provision of all year round library services and access to library resources (Issa et al, 2011; Alzghoul, 2013; Qutab et al, 2014; Zhou et al, 2014; Ola, 2018; Baada, 2018).

Different kinds of ICT tools and resources like social media tools and platforms have improved information services delivery in academic libraries (Omeluzor et al, 2016). For instance, the use of ICT tools such as Facebook, Skype, Wikis, WhatsApp, E-mail, SMS Text Messaging, RSS Feed have helped libraries and librarians to serve their users better by reaching them with the required information outside the library (Ayiah & Kumah, 2011; Akeriwa et al, 2015).

Abba (2009) explains that ICT deployment in the various academic libraries has provided better and efficient ways of carrying out traditional library operations such as acquisition, cataloguing, reference services and marketing using Web 2.0 and other social media platforms. Similarly, Owusu-Ansah and Adjei (2015) affirm that ICT has provided a platform for academic libraries to reach out to their patrons outside the library building.

Hellen (2007) also specifies that the evolution of academic libraries to overcome numerous problems has been improved by relatively independent and countless managerial decisions to implement ICTs in their operations.

Nowadays, academic libraries have become the centre of innovative ideas by applying technological interventions to improve their service effectiveness (Hellen, 2007; Makori, 2009). As a result of the inherent benefits they provide, ICTs are now being employed to automate all library functions to speed up operations and services delivery to patrons, and their application have helped to remove repetitive works in academic libraries. Onoriode and Iwhiwhu (2012) opine that automating library processes involves the use of ICT to collect, process, organize and disseminate information in an effective, efficient and sustainable manner. They further revealed that automation speeds up library services.

Application of ICTs, especially in universities has enhanced library service delivery and provided independent and unmediated access to information to their users online. ICTs and new technologies according to Adomi (2009) enable libraries to offer better and improved services to users all year round outside the library. This kind of technology based-service must be guided by a set of policies, plans, rules and regulations to ensure sustainable library services.

Mirza and Arif, (2016), admitted that ICTs and modern technological tools have become imperative in the library profession as library managers cannot ignore their significance in providing seamless services to their patrons. Omoniwa (2001) suggests that globalization of information in the twenty-first century and the implementation of ICT will largely have a significant impact on library management, as well as on the performance of the libray staff. On these impacts, Orolunsola (2009) adds that manual methods or process of information, acquisition and organisation should give way to the application of ICTs if libraries are to function effectively

in the present globally competitive information age. Therefore, at all levels of operational activities, university libraries must be ready to make effective planning and develop appropriate policies to embrace the potentials of these new technological developments.

Due to globalization, academic libraries have no other option but to adopt and implement ICTs in their operations and services. A study conducted by Abdelrahman (2009) reveals that ICT has a significant effect on academic libraries in the global world. Information centres and academic libraries employ ICT to disseminate information resources via electronic media to meet the needs of their users (Haneefa, 2007). The current intensification of efforts to adopt and implement ICT by academic libraries is to simplify the process of information delivery and to meet the needs of users. As a result, librarians and information professionals in academic institutions have invested time and energies to advocacy for enough budget for the acquisition of ICTs and training of the library staff to implement and manage library technologies.

Al-Fadhli et al. (2016) explored factors underlying technology adoption in Kuwait academic libraries. Their study revealed that the majority of the respondents (80%) indicated that technology has been accepted as a solution to problems confronting their academic libraries. Osawele and Uzairue (2013) also of the firm belief that, ICT can help impact positively on routine library operations by reducing delays in the information services delivery process. They further assert that proper deployment of ICT backed by well-formulated library policies and guidelines will facilitate successful ICT integrate into the library system.

In academic libraries and their communities, ICTs have transformed how researchers and scholars conduct activities and access scholarly information and other research outputs. Challenges researchers encounter in accessing scholarly information have reduced through the application of ICT (Delle, 2010). With the advancement in ICT and availability of the Internet, researchers are

able to access research output and other scholarly information from the comfort of their homes and offices which hitherto were not possible.

Application of ICT in academic libraries has brought changes and tremendous impact on the library profession and changed the role of librarians. For example, Garg (2013), argues that ICT has impacted academic libraries in the following ways:

- speeding up library operation and services as well as providing accurate information to users
- helping manage information explosion, thus information generated across the world would be made available through the Internet.
- providing storage capacity for world accumulated knowledge as computers can store entire library information.
- services such as SDI and CAS, cataloguing, indexing and abstracting, bibliographic control, reports, and statistics are made easier and services like electronic document delivery, social networking services, Web-OPAC are incorporated into the existing services.

These services, therefore, come with additional responsibilities to the librarian to manage these facilities and services as cheaply and effectively as possible to ensure uninterrupted information provision to better serve their patrons.

Notwithstanding the benefits ICT provides for academic libraries, one key constraint that managers of academic libraries encounter is the effective and efficient management of the paperless or digital libraries which have resulted from the rapid ICT integration in libraries making information

available to users in digital format (Abbas, 2014; Khan and Bhatti, 2012; Krubu and Osawaru, 2011).

This challenge, therefore, has necessitated the need to equip library staff with the requisite skills to manage and incorporate technology into the production of information in the mainstream Ghanaian academic libraries. This study, therefore, sought to investigate how academic libraries in Ghana adopt and manage ICT facilities successfully and sustainably. The study further advances the argument that, though different types of ICTs deployed in the academic library have impacted positively on the smooth operations of library, what matters most is not the number of ICT facilities adopted but how efficiently these ICT tools are adopted, integrated, maintained and managed.

2.2.3 Types of ICTs in Academic Libraries

In this era of the information economy, it will be difficult, if not impossible for an academic library to provide sustainable services without the application of ICTs. ICTs have become an integral component in all academic libraries globally, leading to effective and efficient information services delivery. The adoption and integration of ICTs and modern technologies have become a basic necessity for libraries in academic institutions and other institutions of higher learning (Arokyamary & Ramasesh, 2012); hence the deployment of various kinds of ICT tools to provide timely access to information, enhance library operations and management.

The impact of ICT adoption in academic libraries, especially library automation, is numerous including some of the following: It increases access to information in various formats; it enhances the value of librarians in the academic community; it creates an avenue for new library services. Others are the acquisition of new skills by library staff, remote access of information resources, and transforming the library into a collaborative learning environment (Mutula, 2012). Jibia, et al.

(2013), conducted a study to examine threats and challenges of using ICTs in reference services of Polytechnic libraries in Nigeria. The study revealed that ICT facilities used in reference services of the Polytechnic libraries are CD-ROM, facsimile, the internet, printer, computer, scanner, and telephone.

Otubelu and Ume (2015) state that ICT tools specifically related to the academic libraries include all online and digital information materials available through the Internet such as digital scholarly publication resources like electronic books, journals and magazines, and the use of DVD, CD-ROM for searches, telecommunication network systems such as Local Area Networks and Wide Area Networks. Islam and Islam, (2007) also identified reproduction technologies as some of the ICT tools found in libraries. These include:

- Reprographic Technology: these are technological equipment for the reproduction of documents, like photocopiers, scanners, and others.
- Micrographic Technology: they are technologies used for creating and making use of microforms.
- Printing Technology: they include all forms and types of printers that are used to print out text and images from computers. An example is a LaserJet printer.

They further grouped ICT facilities per their operations and functions as well as use in academic libraries. The operations and functions of the ICT technologies according to Islam and Islam are:

- ICT tools for capturing information which includes digital cameras, remote resources sensing satellite, radar system, VCR system, videos disks, audio and video recorders and others;

- Transportation technologies: ICT facilities used to transport information from one destination to another (from sender to receiver). These tools are coaxial cable, optical fiber cable, microwave link, communication satellite, smartphones, cellular mobile radio, modem, facsimile, video conferencing equipment, broadcasting networks;

- Technologies for storage of data and information such as hard disks, memory chips, magnetic tape, floppy disk, laser emulsion, microfilm and microfiche, CD-ROM, DVD.

- ICT tools used to process data and information. Processing technologies include microprocessors, integrated circuits, operation and application software, computer systems and their peripherals like keyboard, mouse; and

- Retrieval technologies that include printers, monitors, high definition television, videotext, online databases (Islam and Islam, 2007).

These are a heterogeneous collection of ICT resources and equipment available to academic libraries used for acquisition, processing, storage, retrieval, transmission and dissemination of information and scholarly communication. These tools require huge capital investments for their acquisition and therefore require a high caliber staff with the requisite expertise to manage them. Ghuloum and Ahmed (2011) observe that ICT facilities in academic libraries provide platform for a lot of applications and services including microcomputer labs, digital online archives, retrieval networks, library online databases, wide-area network applications, online reference services, and local area networks making device-sharing possible.

Iwu, (2003) cited by Afolabi and Abidoye (2013) grouped ICTs in libraries according to their characteristics and the functions they perform as follows:

- those for data capturing such as scanners, mouse, keyboard, touchpads and boards, barcode scanners and readers are classified as sensing technologies;

- those that display captured and processed data and information such as computer monitors, display screens, television, printers, projectors and so forth are described as display technologies;

- ICT tools like telephones, smartphone, tablets, e-mail, facsimile machines, telecommunication networks and systems for transmitting and disseminating information are called communication technologies and;

- storage technologies are ICT facilities used for the storage and safekeeping of generated and processed information for future use. These are hard disks both internal and external, CD and DVD-ROMs, magnetic tapes, optical as well as floppy disks and cassette tapes.

ICT tools in Ghanaian academic libraries are numerous and of different kinds. Studies by Owusu-Ansah and Adjei, (2015), Dzandu and Dadzie (2012), identify the following as some of the ICTs in academic libraries in Ghana. They are hardware technologies such as computers (PCs), Laptops, CCTV cameras, CD/DVD players, Digital cameras and Fax machines. They also include Multimedia projectors, Photocopiers, Printers, Scanners, and Television sets, UPS, USB pen drives, UCR/VCP, Wireless LAN, LCD/Overhead projectors. Others are software technologies such as email, Internal OPAC, Internet, Intranet, Library Management Software, library websites, Telnet, Web OPAC.

These studies further indicate that through the adoption of ICTs facilities such as Audio-visuals, CD-ROMs, E-books, E-journals, and online databases were found to be available in Ghanaian academic libraries (Dzandu & Dadzie, 2012; Ayeh, 2008; Alemna & Sam, 2006).

Other studies by (Moorthy & Karisiddappa, 2000; Arora, 2009; Shahani et al., 2009 and Khan & Khan, 2016) have looked at the various forms of discs available in the academic libraries such as

DVD, CD-ROM, floppy discs and external hard discs/drives, USB-drives, as well as tapes, are used for recording and storage of data and information.

Similarly, Owusu-Ansah (2013) and Afolabi & Abidoye, (2011) in their studies identify display ICT devices deployed in academic libraries to include computer monitor, television sets, printer, multimedia projectors among others. These devices serve as a feedback system that allows the user to see input, analysis, and output and the evaluated result.

Other studies by (Onoriode, et al., 2012; Adelabu & Adu, 2016; Ani et al., 2016; Enakrire & Ocholla, 2017; Osuchukwu et al., 2017), also identified ICT facilities in academic libraries such as different types of networks, telecommunication tools and the Internet provide the platform to transmit, disseminate and share information, and provide opportunities for video conferencing, distance learning materials and remote access to library materials. These ICT tools are the intangible parts of the ICT systems. Other ICT facilities including the reprographic equipment in academic libraries such as photocopiers, scanners, and digital cameras are used to duplicate and make multiple copies of library and information materials (Owusu-Ansah & Adjei, 2015).

The ICT facilities in academic libraries have resulted in the availability of full-text digital documents such as e-books, e-journals, OPAC, bibliographic databases and other digital library resources (Ruan & Qiang, 2013). Academic libraries, therefore, are expected to formulate policies, recruit and train competent personnel to manage properly these delicate and expensive ICT facilities and resource in the library system.

The impact of ICT facilities on academic libraries is firmly established in the creation of Institutional Repositories, development of Online Public Access Catalogues(OPAC), creation of

online bibliographic databases, electronic journals and electronic books (Nebeolise, 2013), with the sole motive of satisfying the information needs of library users.

Ibrahim, Asiedu & Aikins (2017) in their study about the promotion of ICT use in academic and public libraries in Ghana found out that the ICT tools in Ghanaian academic libraries include the various technologies and devices for the delivery of media and the transmission systems, technological mechanisms and platforms for facilitating information dissemination.

In his report about ICT facilities in Africa universities, Dzidonu (2010) also identifies some of the common ICT tools/facilities in academic institutions as: radio and television broadcast technologies, internet-based technologies and resources, wireless and satellite-based data/voice transmission as well as other networking tools like videoconferencing.

Contrary to the fear that ICT will cut jobs in academic libraries, it has rather created more job opportunities such as digital preservationists, institutional repository managers, the web and social media managers, digital librarians, system librarians and so forth, in addition to traditional roles like cataloguers, reference librarians with enhanced skills and competencies (Adzobu, 2013; Cox & Corrall, 2013; Mabweazara, 2018), than anticipated.

Available literature has shown the significant role ICTs play in daily function, operations and service delivery of academic libraries. It is therefore unfortunate that attention has not been paid to the management aspect of ICTs in academic libraries particularly in developing countries (Onuoha & Obialor, 2015 and Adebayo, 2018). The result is the absence of certain managerial elements or factors such as library ICT policy, strategic plans, staff development plans, operations and procedure manuals among others which affect the smooth implementation of ICTs in university libraries.

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In their study, Owusu-Ansah and Adjei (2015) found that lack of funding has been the biggest hindrance for academic libraries in Ghana especially the Polytechnic libraries to venture into computerization and automation of their library functions. These are some of the managerial issues required to be in placed in an attempt by academic libraries to adopt ICT. Hence, it is imperative ICT facilities be considered in the holistic management of academic libraries. This study was conducted to find out how ICT facilities in Ghanaian academic libraries are being managed, taking into consideration inadequate funding, lack of qualified and professional staff as well as the absence of required policies.

2.2.4 Managing ICT facilities in Academic Libraries

Studies have revealed that different kinds of ICT tools have been deployed in academic libraries for library and information services delivery (Islam and Islam, 2007; Nebeolise, 2013; Radniecki, 2013; Owusu-Ansah and Adjei, 2015; Al-Fadhli, 2016; Enakrire and Ocholla, 2017; Osuchukwu et al, 2017; Adebayo, 2018). These ICT facilities are platforms on which modern academic libraries run and therefore must be managed effectively and efficiently to ensure their sustainability.

Onoriode et al. (2012) report that managing ICTs in academic libraries demands planning which involves policy development, implementation procedures as well as strategic planning. According to Zakaria et al. (2010), managing ICT involves planning, policy development, resource mobilization like technologies, financial and human resources to achieve vision and goals of any ICT integration project, particularly in academic libraries.

Kamba (2011) points out that the management of library technologies must be proceeded by planning and implementation strategies as well as proper identification and allocation of resources.

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Kamba further states strategic plans and policy serve as a framework to guide ICT adoption and deployment in academic libraries.

According to McNamara (2009), to manage is to have a vision, mission, forecast, plan, organize, command, coordinate and control (monitoring and evaluation). ICT management, therefore, involves the process of planning, organizing, leading and controlling the available human, financial and technological resources to achieve the objectives of ICT application. Management, therefore, is very crucial for the sustainability and effective use of the range of ICT tools available in libraries in general and academic libraries specifically.

ICT management is defined by Asgarkhani (2012) as the discipline of managing all the technological resources of an organization which includes hardware, software, data networks, and data centre facilities and all the technical staff to maintain and supply the facilities and services.

Managing academic library ICT, therefore, entails the management of all the resources involved in the deployment of ICT resources including human resources, financial resources, infrastructure and institutional management support. The issue of ICTs' management in terms of policies, strategic plans, and procedures have been identified as critical to the effective and efficient adoption of ICT tools as well as their maintenance and sustainability in academic libraries (Ani et al., 2015, Lasa, 2004, Albugami and Ahmed 2015). Similarly, the absence of the managerial ingredients identified will affect sustainable management of ICT tools deployed in academic libraries.

On the account of proper management library ICT facilities, Farmer & McPhee (2010), indicate that managing ICT or library technology is daunting, complex and involves a lot of different but critical activities to be carried out. The crucial activities include the following tasks;

- Decision to acquire ICT resources which requires a person with the experience and expertise to procure the equipment to be used for the library automation/digitization project.

- Maintenance of the ICT equipment or facilities to keep them in good condition such as regular servicing, upgrading, and updating.

- Management and maintenance of 'physical and virtual spaces' for library ICTs.

- Providing effective, smooth and seamless remote access to ICT resources, thus the availability of internet and network facilities.

- Management of internet and other virtual communication channels for information dissemination and interaction; for example, management of library websites, portals, online databases, e-books, e-journals and telecommunication networks.

- Developing and implementing policies and procedures relating to ICT adoption, usage, and maintenance (Farmer and McPhee, 2010).

Aina (2003) cautions that application of ICT for academic libraries' automation should not be a sudden decision to be taken by a library whether small or complex, as this requires strategic planning because ICTs adoption can be very expensive in terms of equipment, staff, and training.

Odhiambo (2004) discusses the need for ICT policy for institutions whether it is public or private. He explains further that managing thus planning, development, implementation, operation, and maintenance of ICT resource involves technical personnel to support maintenance and operation of ICT systems; information providers to ensure information availability and integrity; and end-users procedures, technical facilities and reports such as hardware and software security of information and disaster recovery plans for continuity. He further states that managing ICT resources is a daunting task due to the varying and complex nature of ICTs and therefore requires

clearly defined vision and objectives, strategic guidelines, procedures and rules and regulations thus ICT policy to guide the implementation process.

Osondu &Solomon – Uwakwe (2011) report of some of the threats and challenges to effective and efficient adoption and usage of ICTs in developing countries especially Sub- Saharan Africa to include inadequate facilities, irregular power supply, frequent computer breakdown, digital illiteracy, high cost of procurement of computers, lack of information policy and funding. They attribute these challenges mostly to lack of or absence of ICT policy both at national and institutional levels.

 Also, the absence of library ICT policy to guide ICT implementation could make it impossible for the library to reap the enormous benefits of ICTs in service delivery (Boateng et al., 2014). They see ICT policy as indispensable for user satisfaction in libraries and that a well-defined library ICT policy will set out standards to regulate ICT application, user conduct, access, manpower requirement, maintenance and security. This affirmed the view expressed by Ani and Edem (2011), that poor or lack of access to relevant ICT resources in academic libraries in Nigeria is attributed to dysfunctional or lack of library ICT policies. ICT policies are therefore very crucial for ICTs adoption and management as they serve as a guide in terms of planning, implementation, and maintenance processes. At the end ICT policy will guide university librarians to navigate their way during ICT adoption, application, deployment, implementation, maintenance and management.

Asamoah- Hassan (2012), discusses issues in ICTs adoption and use in Ghanaian academic institutions. She observes that strategic planning, maintenance and equipment upgrading, staff training and technical skills, rules, guidelines, and policies to guide the adoption and usage of ICTs should be taken into consideration in integrating ICTs in academic libraries.

It can probably be deduced that policies, staff training, funding and strategic plans are at the heart of successful academic library ICTs adoption and management. From the above discussions issues such as strategic plans, policies, procedures, skilled staff and funds are at the heart of successful ICT integration in academic libraries as well as its management. Therefore, it is instructive for librarians to set out clear management structures in place to go in tandem with ICT's adoption, integration, and implementation in academic libraries.

2.2.5 Issues in the Management of ICTs in Academic Libraries

One of the issues of ICT management is the capacity of the libraries to formulate appropriate ICT policy in line with the general library objectives and that of the university's technology integration to support library ICT applications. According to Pearce & Robinson (2007), there is the need to adopt proper management practices to make relevant policies, recruit and select employees via appropriate selection procedure to equip the industrious ones for successful adoption and implementation of ICT in academic libraries. The critical issues in managing academic library ICTs are to ensure that the elements, inputs and ingredients required are made available in an adequate manner. The success of academic library ICT applications and management is attributed to the availability of these inputs (Mutula, 2012). Mutula identifies these inputs to include strategic plans and policies, library and university vision and mission, management buy-in, stakeholders' involvement and collaboration, fitting the library automation and ICT application into the overall goals of the university and capacity building of the library staff with requisite ICT skills. Effective university library ICTs management must therefore, address the issues identified at all levels in the university library system.

Management of these issues in the academic library's attempt to deploy ICTs, require adequate financial support, high-quality technological infrastructure and staff with expertise in information systems management.

Adopting and implementing a strategic approach to ICT management and its operational activities is a panacea for increasing the efficiency of academic library management in a competitive environment. ICTs implementation in academic libraries also brings about new roles and new kind of library services (Mutula, 2012). The demand is that librarians acquire new skills and knowledge to ensure efficient technology management, and thus provides an opportunity for top managers and directors to adapt to changes in a competitive environment and provide appropriate decisions when necessary to achieve the library's set goals (Strickland & Thompson, 2001).

Due to globalisation, change in technology and a dynamic social trend the world is experiencing, Pearce and Robinson (2007) suggest that the nature of management has been diverted from focusing on the analysis and future anticipations to control, coordination and communication via information technology. The evolution of academic libraries has, however, required the development of strategies for the effective adoption and implementation of ICT. The effect of lack of the application of managerial strategies by most of the academic libraries may lead to under performance of deployed technologies.

However, on the contrary, Riggs (2005) suggests that librarians are adopting strategic management practices in the application of new technologies in the various functions of academic libraries, while Beinhocker and Kaplan (2006) think otherwise. They believe that many academic libraries are not prepared for this shift. Others also of the believe that strategic management activities should be applied to revive the academic library system to enhance performance and sustain the library system in this era of competition from other information providers.

Tenopir (2003) also points out that, on the issues of management, many academic libraries in developing countries lack clear developmental goals and objectives, which makes the practicability of new interventions for a successful ICT project difficult. Also, budget and well-developed plan for the acquisition new computers of higher standard is lacking in most academic libraries.

Studies on electronic resources have shown that a higher percentage of electronic library resources used by students occurs outside the library (Mwantimwa et al., 2017). Tenopir (2003) again, establishes that students usually would not go to the academic library to use computers but rather rely on computers and other mobile devices which are faster in assisting them to complete assignments and to meet deadlines. This requires proper management structures by the authorities of universities to make relevant decisions, implementation, monitoring and evaluation to ensure that the objective of having a proper library system is accomplished, for instance, in the procurement of hardware and software for academic libraries.

Pearce and Robinson (2007) suggest that all stakeholders should take part in the development managerial interventions to improve the library sector. They proposed the involvement the employees of the library system would help them to comprehend and accept the need to change the usual ways of doing things. The commitment of staff increases when they feel part of the decision-making processes. Pearce and Robinson again reiterate the essence of introducing new policies and making changes where appropriate, by having discussions with employees to avoid potential challenges during the application phase.

The lack of stakeholders' consultation and participation in the planning phase, and especially in the strategic management process of the academic library ICT projects will invariably affect the overall attitude and performance of the library staff (Mutula, 2012). Such situations are sometimes

attributed to the nature of the organizational culture, structure, and system of practice that has become an acceptable behaviour in the university system whereby decision-making is a top-down approach.

Thompson, (1990) cited by Allio (2008) contends that a management style of a higher academic institution affects its operational culture and can inhibit or support the improvement of the library system towards the implementation of successful ICT projects. Many authors describe various kinds of management structures, organisational culture systems, and leadership models applicable in the library system. Allio (2008) states that corporate organizations in a competitive environment compare their products with their competitors but are not able to identify the model being applied by the individual managers, and this gives a highly competitive advantage. Allio further affirms the fact that, innovation such as the implementation of technologies assist institutions to become competitive especially in the academic library system. He again emphasis that such innovation is spearheaded by managers with vision, therefore effective technology management are underpinned by leadership style.

Lee et al. (2007), Goold (2006), and Harvard Business Essentials (2003) give relevant approaches that managers can employ to nurture collaboration; 1) build an atmosphere of trust, 2) encourage idea generation and sharing, and 3) emphasize appropriate leadership towards building a culture of innovation and creativity in academic libraries.

Njaji and Oboko (2013) in their study about monitoring and evaluation framework for ICT integration in Kenya Academic Institutions reveal that one important aspect management of ICT facilities in educational institutions is the regular and constant monitoring and evaluation of the implementation process. For effective adoption and implementation of ICT tools in academic libraries, it is pivotal to perform effective monitoring and evaluation exercise to ensure a successful

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ICT project (WHO, 2014). Therefore, managers of academic libraries must develop an evaluation strategy which provides the opportunity to examine how effective the plans and schemes are implemented, to ensure accountability and improved performance. For instance, monitoring and evaluation helps managers to ensure that decisions made are in the right direction.

The evaluation of the performance of the library ICT objectives enable the institution to identify whether they are failing so that it will quickly develop techniques to reverse any risky action or business activities; hence, there is a need to regularly monitor and evaluate the operational performance of the firm. Pearson and Robinson, (2007), add that sometimes, it will be necessary for the institution to abandon existing policies, adjust or develop new strategies.

Furthermore, as stated by Gichohi (2015), library ICT management issues which comprise of policies, funds, user support, library staff skills and attitude, institutional goals and technological infrastructure are crucial in the achievement of the academic library's mission of technology integration. Hence the need to incorporate the above issues during the strategic plan development process by library managers. More especially, the literature on the management issues have identified ICT as a strategic tool with the biggest impact on the academic library development and therefore their management must be given the priority (Farmer & McPhee, 2010; Emmanuel & Sife, 2008; Badu, 1997).

ICTs adoption and implementation in academic libraries must first be proceeded by the formulation of the requisite library ICT policy and strategic plan to serve as a guide for effective integration of ICT and the achievement of the set goals of the library ICT system (Mutula, 2012), and to ensure value for money in ICT application. The fact is the cost of investment in software development and other online systems are increasing at a high pace due to changes in technological innovations. Indeed, the cost of technologies is going up and it must be captured appropriately in

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the library budget. Budgeting for academic libraries, therefore, is a serious management issue that requires the attention not only of the library managers but all stakeholders in the universities concerned.

The worrying aspect is that most academic libraries on embarking automation in developing countries still faced the of issues inadequate funding, lack of technological infrastructure, irregular power supply, absence of library ICTs policies and unskilled staff, and these challenges require strategic planning to overcome them. The issues of ICTs management in academic libraries such as library staff skills and knowledge, technological infrastructure, planning and policies, funding and stakeholders support must therefore be addressed comprehensively to ensure effective technology integration.

2.2.6 Managing ICT Implementation in Academic Libraries in Africa

Academic libraries in Africa are still grappling with the implementation of ICT challenges, despite its obvious advantages. In a study Ani, Esin & Edem (2005) investigated the extent of ICTs adoption in the Nigeria University libraries. The findings of the study revealed that six university libraries are fully computerized, nine are about to be computerized while seven of the surveyed libraries have installed local area networks, five have online public access catalogue and only four libraries provide internet services. The study identified major obstacles confronting the effective adoption of ICT in university libraries as inadequate funds and the poor state of electricity in Nigeria (Ani, Esin & Edem, 2005). Apart from these challenges, often the inability of libraries to implement ICT has been attributed to an issue of lack of planning and policy formulation.

In a study, Anie & Achugbue (2009) opine that most Nigerian universities have not developed library ICT policies, and in some cases where the policies have been developed and implemented,

the libraries are still faced with some constraints. These constraints sometimes result in haphazard adoption of technologies, and lack of proper maintenance schedule to guide library ICT technicians in their regular upgrade and servicing of academic library ICT system. Sarka De (2005) shares in this view and suggests that academic libraries that have not developed and implemented ICTs are challenged in terms of the slow growth of technology and consequently lessening the support for economic and social development. Staffing and staff with requisite skills, competences and knowledge in ICTs are pivotal to successful ICT application and management.

Oyedokun et al. (2018) assess ICT competencies among Nigeria university librarians. They observed that notwithstanding the availability of ICT infrastructure in the university libraries, the absence of staff with requisite ICT skills results in the underutilization of the ICT facilities deployed in the academic libraries. The study finally suggests the need to organize regular training in modern technological know-how for the university library to manage ICT systems.

The selection and implementation ICTs in an academic library are a difficult and complex task which needs planning. However, for successful planning and policy formulation there must be a collaborative partnership among all the stakeholders in the academic communities' concern. The collaborative partnership ensures that all divergent views are taken on board to better develop far-reaching policies and strategies towards academic library's ICT management system.

Akpan and Madu, (2014) suggest that planning is crucial for all libraries intended to implement automation to avoid waste of the scarce financial resources especially in developing countries like Sub-Saharan Africa. They further state planning help identify all resources such as ICT infrastructure both hardware and software required for automation procured and deployed. Again, they believe that most ICT implementation and automation in academic libraries have failed due

to lack of planning strategies and policies (Akpan and Madu, 2014). Planning, therefore, must include the library and university vision, mission and objectives, the library areas in need of ICT application, hardware and software requirements, ICT project finances and budget, maintenance schedule and skilled professionals to deploy and manage the library ICT system.

2.2.7 Issues in ICT Management in Ghanaian Academic Libraries

The aim of any ICT project integration and management in an academic library is to make a useful impact in the life of the users of the library by providing easier and convenient means of accessing information in a timely and hassle-free manner. However, there have been stumbling blocks to successful implementation of ICT projects in academic libraries in developing and transitional nations such as Ghana (Atiso & Adkins, 2015). Some of these barriers to ICT project implementation and management include the following: lack of teams to plan and implement strategies for ICT integration in academic libraries, financial resources, ICT infrastructure, internet bandwidth, human resources, ICT skills and expertise among librarians and the unavailability of ICT policies.

Manu et al. (2007) reported that the main challenge of ICTs adoption and implementation in university libraries is that major projects are mostly foreign donor assisted and they are implemented without the requisite human resource, proper management systems, local involvement in the design and development of the projects as well as policies to guide the implementation process. These create the problem of sustainability after the donor support comes to an end (Manu et al, 2007).

The lack of financial resources invariably have a greater influence on all kinds of ICT projects in academic libraries. Funds are needed to procure required hardware and software, acquire enough

Internet bandwidth as well as train the needed human resources to implement, maintain and manage the library ICT projects (Otando, 2014; Womboh &Abba, 2008; Dadzie &Walt, 2015).

Strategic planning and policy formulation have been identified as central to any ICT project in libraries. Without them, the project implementation team has no direction and control. Strategic plans and policies have been recognized as very crucial for successful ICT projects in academic libraries in Ghana (Adzobu, 2014; Dadzie &Walt, 2015).

Atiso & Adkins (2015) reported that scientists in Ghana have revealed that inadequate funding, inadequate Internet bandwidth and lack of training opportunities in ICT as the problems hindering ICT adoption by librarians and research scientists. They suggest adequate funding, periodic training, and high Internet bandwidth as the immediate solution to challenges faced academic and research libraries in Ghana. In addition, Asamoah- Hassan (2012), states that in planning to deploy ICT in libraries, issues like strategic planning, maintenance and equipment upgrading, staff training and technical skills, rules, guidelines, and policies should be given the needed consideration, as their absence could marred the implementation process.

 Moreover, Boateng et al. (2014) found that policies are an indispensable guide to regulate ICT application and standardization, user conduct and access, manpower requirement, infrastructure requirements, maintenance, and information security. From the literature and the above discussions, policies and strategic planning are critical for effective application and management of ICTs in academic libraries. Ayeh (2008) observes that the adoption and implementation of ICTs in education and academic libraries in Ghana are faced with 'politico-socio-economic' challenges. However, some institutions have taken the initiative in deploying ICT resources to help close the gap of the digital divide and deliver learning resources to their communities. One critical issue in

ICT adoption in academic libraries is planning. Asamoah-Hassan (2012) identifies some issues to consider in planning for ICT integration in academic libraries to include these:

i) the need for technology integration

ii) planning by setting up a committee for the ICT adoption

iii) source of funding and budget for the ICT project

iv) cost for maintenance, update and upgrading of the equipment

v) policies and rules to guide the adoption and use of the technology

vi) IT training and technical skills for implementation and usage

These are the fundamental principles and strategies for academic libraries especially those in developing countries like Ghana to consider in their attempt to implement ICTs to ensure that the deployed technologies are managed effectively and efficiently.

2.3 Factors that Influence ICT Adoption and Implementation in Academic Libraries

Several factors influence ICTs adoption, deployment, and implementation in academic libraries. In this study, these factors have been grouped into success factors and failure factors.

2.3.1 Factors for ICT Success and Failure

Factors that influence the adoption and implementation of information technology are classified under those that lead to the success of ICT projects and those that can lead to failure. These are imperative when discussing the "opposite" impact of most of the variables. This implies that while the existence of one variable promotes the success of ICT, its absence results in failure, for instance, a good office environment or infrastructure and staff motivation facilitate the success of technology adoption. On the other hand poor project management, change management, and bureaucracy lead to failure of ICT implementation process.

2.3.2 Factors for **Success**

The variables required are those whose absence or presence affects a successful ICT project, usually referred to as the factors for success. They can be 'enablers' or 'drivers 'as described by (Heeks 2004, Mugonyi, 2003, Khaled, 2003, Heeks, 2003b). Their presence can cause success and their absence can cause failure. Khaled (2003), states, 'drivers' are the variables that promote a successful adoption and utilization of information communication technology. These factors include the following:

- Modernization, globalization and technological change

- Rising consumer expectations

- External pressure and donor support

- Government support

- Vision and strategy

While 'Enablers' constitute the main factors existing in a society that helps to curb potential challenges. These includes but not limited to the following;

- Good practice such as standardisation of maintenance schedules as well as communication among team members;

- Effective management of ICT projects change, management and coordination of activities.

Moreover, for successful ICT adoption and implementation, Khan (2005) and Kalema, Olugbara & Kekwaletswe (2014) examines various critical factors and classified them into the following areas:

- Ethical factors consisting of the digital divide, geographical diversity, bias, diversity, cultural, social and political influence learner diversity, etiquette and legal issues

- Interface design factors including navigation, accessibility, content design, page and site design, usability

- Pedagogical factors including medium for analysis, design approach, audience analysis, content analysis, goal analysis, organization and learning strategies

- Technological factors covering planning, hardware, and software,

- Management factors comprising managing delivery and maintenance, managing the content development process and management team.

- Institutional factors comprising infrastructure readiness, financial readiness, assessment, cultural readiness and content readiness (Tarhini, Tarhini and Masa'deh, 2015).

Scalability is considered as one critical factor to the success of ICT management. Laudon and Laudon (2013), refer to scalability as the ability of a computer or information system or ICT system to accept more data without breaking or shutting down. To overcome this situation, new applications, acquisitions of new ICT devices, resources and changes in work schedules must be incorporated into plans to introduce ICTs in academic libraries. There is, therefore, the need for new policies and procedures or revision of the existing ones for managing new technologies in academic libraries.

2.3.3 Failure Factors

Failure factors on the other constitute the major challenges that limit the adoption and successful implementation of information communication technology in academic libraries. Some of these factors identified by (Heeks, 2003a; Khaled, 2003; Aineruhanga, 2004, Gakunu, 2004) are;

- Skilled personnel: lack of skilled human resources have a negative impact on the efficient deployment and management of ICT facilities.

- Finance: irregular and inadequate financial support for ICT projects will affect the management of academic library ICTs.

- Infrastructure: improper installation and inferior hardware and software will cause management problems.

- Attitudes: negative staff attitude especially that of senior members in the library as well as top management will impact on the implementation and management of ICTs.

- Leadership styles, culture, and bureaucracy may also impact negatively on the implementation and management of ICTs.

Barriers or failure factors prevent advancement and restrict the successful implementation of the ICT projects even though they do not necessarily prevent the utilization of the project. According to Ndou (2004) these barriers include lack of library ICT policy for the implementation, management and maintenance processes; improper coordination of resources by projects team leaders, and sub-standard technology (IT) infrastructure in terms of hardware. Again, improper developed software and poorly designed network will become a barrier to successful ICT projects. Also, any library ICT project designed that does not take into account the view of the beneficiary community is a candidate for failure. At the end of the donors' support programme or withdrawal of donor supports, these projects fail to continue as beneficiary communities appear not own these projects. Therefore, the sustainability of such library ICT projects, becomes a concern to the academic libraries and the university communities.

2.4 Challenges University Libraries Face in the Adoption and Utilization of ICTs

The adoption and management of ICTs comes with a lot of challenges. These challenges include platform and technology change, ICT governance issues as well as investment decisions on hardware and software acquisition and implementation (Laudon & Laudon, 2013).

As stated by Emmanuel and Sife (2008) ICTs application have introduced new challenges, even though such an innovative technology increases the performance of academic libraries by presenting new modes of providing information, retrieving, storing, and collecting data.

Furthermore, some human, technological factors and financial factors may hinder the effective utilisation of ICT at the library (Ghuloum & Ahmed, 2011). Ani (2005) and Starr (2001) add that factors such as lack of motivation among librarians to adopt ICTs, the lack of qualified library professionals and inadequate funds to support the acquisition of technologies hinder the utilization of ICT in academic libraries.

2.4.1 Financial Factors

The availability of adequate funds are required to procure modern ICT equipment like photocopiers, scanners, servers, computers, software, as well as to subscribe to online/offline resources such as digital books, e-books, e-journals, and other electronic resources. Another cause of agreement is that due to the downward trend observed in donor financial support, it is unlikely to conclude that things will improve significantly (Amutabi, 2009). The lack of adequate financial resources affects the smooth and efficient management of academic library ICTs in so many directions.

Earlier studies on ICT deployment in academic libraries identified inadequate funding as a major problem militating against ICT adoption (Mulimila, 2000; Engstrom, 2001; 2003; Khaled, 2003;

Gakunu, 2004; Badu, 2004; Ani, Esin and Edem, 2005), yet in recent studies, financial challenges still remained a hindrance (Asamoah-Hassan, 2012; Otando, 2014; Qutab, Bhatti & Ullah, 2014; Atiso & Adkins, 2015; Dadzie and Walt, 2015; Owusu-Ansah & Adjei, 2015; Mirza & Arif, 2016). This underscores the importance to plan for financial sustainability towards implement ICTs in academic libraries, especially in developing countries such as Ghana.

Kamba (2011), indicates that unless academic libraries are provided with enough financial resources to migrate onto new technologies, the old technologies could be a disadvantage to the institution, if new software could not fully integrated into the system to update information due to increasing diverse ways of doing things in the global world.

2.4.2 Technological Factors

Researchers have identified that, one major challenge that academic libraries face is the insufficient technological infrastructure to support the integration of ICTs in the library system. Limited access to ICT hardware, poor communication networks, and inappropriate software do would be barrier to expeditious upgrade to the library ICT system.

Kamba (2011) opines that ICT is not very well-spread and utilized in African institutions of higher learning due to limited technological infrastructure. Moropa (2010) claims that this development is attributed to issues such as the inadequate number of PCs, inadequate supply of electricity, low internet connectivity, lack of ICT policy and others. Rosenberg (2005), revealed that 85 percent of the academic libraries made available only one computer device per 100 learners and 36% offers fewer than four computers per 500 learners. Despite the poor computer and learner ratio, students are compelled to use out-dated ICT resources and this increases the difficulty of efficient management of ICT resources (Kamba, 2011).

A study conducted by Chisenga (2006) cited in Siddike et al. (2011) on the adoption and implementation of ICTs in academic libraries, found that even though most of the academic libraries have internet connectivity, almost none provided web-based information services to their users. The implication is that lack of telecommunication services may constitute the main cause of this challenge owing to network configuration problems, technical faults and low bandwidth (Minishi-Majanja, 2005). The erratic power supply has also been linked to these challenges (Magara, 2002; Ani et al., 2005) as hindering the smooth ICT adoption and implementation activities.

2.4.3 Human Resources Factors

The culture of the academic institution, the human resource, and the top managers support are vital in ensuring a successful utilisation of ICT in academic libraries. Many writers (Odero-Musakali & Mutual, 2007; Minishi-Majanja, 2007; Sife, 2008) have found that the negative attitude of university management towards information technology and lack of skilled personnel are the major factors that hinder the success of ICT projects in the university libraries. The challenge has been that most libraries have insufficient and unskilled personnel conversant with ICT application knowledge to handle such a technological environment (Emanuel & Sife, 2008).

Training and development programmes for the library staff, therefore, become imperative in ensuring that individual employees are well equipped with the needed skill set to enhance their performance, both technically and practically in the ICT environment (Kamba, 2011). Strategic steps must be adopted to select and recruit appropriate staff with good ICT background to manage the library ICT system effectively, else providing otherwise quality information services would be a miraged.

2.4.4 Cultural Factors

Socio-cultural aspects like educational background, political dynamics, institutional relations, regional priorities and cultural values, can influence the perception of potential user groups, influencing the acceptance and utilization of ICT (Hagenaars, 2007). The lacks of computer culture in higher institutions hinders the adoption of ICT (Amutabi, 2009). Amutabi further states that officials in many universities began in their early days with the typewriter, before upgrading themselves with ICT due to changes in social trends and innovative information technologies in universities. These can adversely affect their adjustment to ICT usage, consequently resulting in their lackadaisical attitude towards ICT deployment. Therefore ICTs adoption is affected either positively or negatively by the individual and organisational culture of the leadership of the institutions implementing the ICT and other modern technologies.

2.5 Strategies for Effective Adoption and Management of ICTs in Academic Libraries

Managing ICT has become a daunting task for organisational and institutional leaders including managers of higher educational institutions of which library directors or librarians are not exempted. The LASA (2004) in their publication guide to managing ICT reports of at least six reasons why organisations should manage ICT. The reasons are that:

- ICTs are very essential and that modern-day organisation both small and big depends on ICT tools for their operations and survival;
- ICT is a capital investment and very much expensive. The cost of hardware, software, and yearly upgrade, as well as training of staff to operate the equipment, is huge which can take a considerable amount of the institution's budget or capital available;
- ICT is technically a complex technology; it, therefore, requires specialised skills to manage its awkward technicalities;

- ICT is a modern technology for efficient information management. We are in an information age and information is the lifeblood of modern organisations; hence successful management of an organisations information will determine the quality of service it delivers to its customers; and

- ICT is a communication tool for organisations. Technologies in companies have evolved from the use of typewriters to emails, websites, and VOIP, and ICT has shaped how institutions communicate with its staff internally and its publics externally (LASA, 2004)

LASA therefore, maintains the view that ICTs in any institution is worthless on their own unless appropriate time, effort, resources, and energy are devoted to managing ICT efficiently.

From the business field, Gelinas et al. (2005) see ICT, Management Information Systems (MIS) and Accounting Information Systems (AIS) application in organisations as project management, and therefore, they are of the opinion that inefficient and poor project management is the main cause of IT project failures, which they associated with these issues:

- Inadequate attention and support by leadership or senior management;

- Underestimation of the needed resources such as finance, human and technological infrastructure;

- Underestimation of project size and scope;

- Inadequate and inappropriate control mechanisms such as lack of monitoring and evaluation systems, and

- Inadequate planning in terms of policy development, strategic planning.

They further proposed that for an effective project management, an institutions must adopt and implement a management framework that includes the following:

- User participation in defining and authorising the project;

- Assigning of appropriate staff to the project, along with specific definitions of their responsibilities and authorities;

- A clear written statement of the ICT project nature, size, and scope;

- A pilot study that will guide management to the viability of the project to warrant support and approval; and

- A project policy, strategy, and plans which must include timelines, cost estimates and control measures such as monitoring and evaluation tools (Gelinas et al, 2005).

This reinforces the idea that in adopting ICT there should be management structures and documentations such as policies, strategic plan, and maintenance procedures as well as competent project implementation teams to oversee the successful execution and integration of ICTs into the academic library systems.

LASA (2004), therefore recommended the implementation of 'ICT Strategy' often referred to as Technology Plan. The 'ICT Strategy' sets out and document the broad policy guidelines and principles as a guide to ensure that staff apply them effectively for ICT adoption and management. Again, it also sets out the project goals to achieve in the ICT integration and management process.

Additionally, Atsu et al. (2009) suggest that training, especially in project management, is one important factor in ensuring the library ICT projects management. They further maintain that improper planning is the major failure factor in technology project implementation. Planning in this context involves putting in place the needed policies and procedures, logistics, manpower and the required training for the staff. Lack of policies, strategic plans, and adequate funding are not the only barriers to the successful integration of ICTs and other technologies into institutions like academic libraries, but other issues such as skilled manpower, managerial styles, management

support and advocacy have also been identified as critical to a successful ICT implementation and management in academic libraries (Abdul, 2017).

Al-Fadhli et al. (2016), note that managerial and leadership style can constitute hindrances in ICT adoption and management. They observe that managerial style among library directors in Kuwait academic libraries is the top-down approach where other library staff are not consulted in the planning, deployment and implementation of library ICT technologies. The resultant effect is apathy and uncooperative attitude from the other staff who are mostly the end-users of ICTs applications.

Similarly, Oyedule &Oladele, (2014), maintain that the main challenge facing ICT adoption in African libraries is leadership style. They observe that leadership style, which is top-down and uncooperative, serves as a demotivation factor on the part of up and coming library staff who are ICT savvy on the effective application of ICTs. Further, Oyedule & Oladele indicate that to overcome these challenges, library leaders must adopt team building as a leadership style where both old and young will come together to execute library ICT projects successfully to the benefit of their patrons. Teamwork therefore, ensures that all staff from the lowest level to the top management own the ICT implementation projects, and the success of such collaboration is to the benefit of all, while failure goes against all.

For effective adoption and management of ICT projects, all the success factors discussed above should be of priority devoid of the failure factors. However, due to globalization and innovative technologies, it is difficult to have all the factors of success without the occurrence of failure factors. This calls for efficient managerial strategies to maximize the chances of success factors while reducing the failure factors drastically.

Amutabi (2009) proposes efficient managerial strategic framework required for effective adoption and management of ICTs in academic libraries. He suggested a framework that consists of these stages:

- develop a program of action;

- assess institutional e-readiness;

- identify relevant themes and prioritize;

- identify the target population;

- apply development of appropriate ICT policies and strategic documents; and

- implement solutions - the last step of this framework is to apply the solutions or the action program.

The main concern is readiness of academic institutions to put in place the necessary infrastructure with the technical team or human resource for effective adoption and management of the ICT initiatives in their library. In line with this, Omekwu and Adediji (2008), recommend that the academic library's vision and objective of the integration of ICTs should be in line with and contribute to the achievement of the overall vision and mission of the parent institution. Thus, there must be synchronisation of the library ICT policy and that of the mother university's policy for ICT application. In the way the academic library's ICT policy would be in sync with that of the general university ICT policy to achieve the same purpose of teaching, learning and research.

For example, Adekunmisi & Odunewu (2016) suggest that for a successful application of Web2.0 technologies in libraries, the librarians should be trained to develop core competencies and skills in ICT. Similarly, Oyelude & Oladele (2014) propose training and retraining of library staff through any means possible. For instance, workshops, conferences mentorship and seminars are

some of desirable means of equipping library staff with required skills for the adoption and management of ICTs in libraries.

2.5.1 Strategic Planning and Policy Direction for Managing Library ICTs

Strategic plan and policy underpin every ICT adoption, implementation and management endeavour. Policies and strategic plans are crucial to the survival of every ICT project as they are guide to implementers of the any ICT project. The success of library ICT implementation depends on the availability of properly developed policies , and strategic plans to ensure its sustainability. Library ICT strategic plan, according to McGee (2006), dictates the strategic direction for technology use, and it states ICT project plans to implement in the short, medium and long term as well as a budget to support and sustain the technology. Library ICT strategic plans and policies must be institutionally approved or endorsed documents that captures actionable statements such as the aims, objectives, and goals of the ICT project. This applies to ICT integration and management in all types of libraries (Onoriode et al., 2012), as plans and policies help identify various required resources and milestones for ICT projects.

According to Abba (2009), plans are a road map through which ICTs are adopted and implemented. Planning provides library managers with the needed strategies to implement change management due to ICT deployment in the libraries (Onoriode et al., 2012). Plans and policies are drafted as a precursor to the commencement of projects while in some situations plans are developed along the project implementation process. In fact, strategic plans and policies form integral part of the initial project proposal to help solicit the management support and raise funds from the university management as well as donors for the ICT implementation in libraries. Strategic plans are proactive action anticipating and forecasting what will happen in the future

instead of being reactive towards the unexpected (Onoriode, et al., 2012). In deed they are the only vehicle the takes librarians to their desired destination in terms of technology adoption and management.

Kamba (2011) states that lack of planning and implementation strategies have impeded the application of ICT in Nigeria academic libraries. Planning provides the platform for the selection and training of the required manpower for the selection of software and hardware, installation, maintenance, integration and management of various ICT tools in academic libraries.

The innovation in technologies has scaled up a lot of opportunities for the deployments ICTs in academic libraries which has speed up operations and services (Groff, 2013; Obinyan & Unuabor, 2013; Susan, 2011; Nkanu & Okon, 2010). However, there is the need to put in place strategies, and plans that ensure the sustainability of these ICT facilities.

Policies and strategic plans are geared towards providing long-term access to resources; maintenance of library visibility and community awareness, and providing ongoing access to content and services that are valuable to the users. Again policies ensures regular and continuous funding and strategies for recovering investments, and actions towards this goal may include ongoing business planning, determining user needs and services delivery. Furthermore, policies provide for provision equitable services to users especially disabled and distance learners by making available information remotely. Finally, they at the same time uphold the rights of content producers and creators through policies and plans (Calhoun 2014).

Strategic plans and policies are formulated to ensure that library ICT are properly managed according to the accepted standard by the library to staff with aimed at enhancing library services (Onoriode et al., 2012), however, these strategic plans and policies must receive the support of all

stakeholders through a collaborative partnership. In this study, the researcher investigated the availability of policies and strategic plans for the adoption, management and sustainability of ICTs in Ghanaian academic libraries.

2.6 Summary of the Chapter

Chapter Two reviewed the literature on the Information and Communication Technologies (ICTs). The purpose of this literature review was to identify, evaluate and analyse research studies that have been carried out on the topic 'managing ICTs in academic libraries with particular reference to libraries in Ghanaian public universities' to establish gaps to be filled by the study and support the findings of the study. The chapter surveyed the literature on ICTs in academic libraries as well as ICT tools found in academic libraries. There has been a lot of challenges that serve as barriers in ICT application in academic libraries. Based on this assumption the literature review highlighted the factors that influence ICTs adoption and implementation in academic libraries with emphasis on success and failure factors in ICT deployment in libraries. It was revealed through the literature that most of the studies adopted a survey method using instruments like interviews and questionnaires to establish the availability of ICT in academic libraries and the factors that prevent the smooth integration of ICTs in the academic library system. From the literature, it was clear that besides issues such as inadequate funding, lack of technical skills or expertise among librarians to exploit ICT, issues of management on the part of library managers were critical successful ICT application in libraries.

The study also discusses financial, technological, human and cultural factors that influenced ICT adoption. These factors should be adequately catered for to ensure successful ICTs management in academic libraries. Finally, the review of the literature looked at academic libraries in general

and limited itself to the Ghanaian academic libraries, their challenges, and the need for ICTs application and management. The next chapter discusses theoretical frameworks and models that have been proposed and adopted to the studies of ICTs and other technologies in education and academic libraries.

CHAPTER THREE

THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1 Introduction

The previous chapter reviewed the relevant literature on ICT application and management in education, libraries in general and academic libraries.

Research conducted in social sciences require relevant models or theoretical frameworks to assist the researcher to make correct inferences while carrying out the study. The theoretical framework of a study is a structure or frame that holds firmly the various components of research work together. Creswell (2014) postulates that theoretical framework consists of "a set of principles or statements developed to give details about a phenomenon or group of facts". The study investigated the deployment of ICTs in academic libraries in Ghana and management strategies suitable for sustaining these ICT facilities. In other words, the purpose of this study was to establish the processes appropriate for ICTs adoption, implementation, and maintenance in the context of policy guidelines, strategic planning and managerial strategies as well as human and technological resources required in managing ICTs in Ghanaian academic libraries.

In this chapter, the theoretical frameworks and models underpinning the complex and dynamic subject of ICT management in academic libraries were explored. System Theory (ST) was adopted as the appropriate theoretical framework for the study which was further explored and discussed in detail in explaining the challenges of managing ICTs in academic libraries. The ST theory support by the Diffusion of Innovation (DoI) in investigating the extent of ICTs diffusion in Ghanaian academic libraries. ICT is a valuable tool that needs careful management to aid

accelerated information access, retrieval and delivery in academic communities especially from the library systems.

The academic library ICT facilities such as computers, printers, scanners, photocopiers, databases, network systems are expected to be used and managed judiciously and prudently always because they are fragile and capital intensive. Due to increase in the adoption and utilisation of ICTs in academic libraries, providing a better perspective of their adoption, acceptance, and implementation is relevant, and therefore, demands an appropriate pragmatic framework for their management. The chapter discusses the Systems Theory as the best theoretical model for the study. The chapter concludes with an empirical section of relevant literature that help shape this study. In this study, the Systems theory is used to consider how ICT infrastructure and other ICT resources in academic libraries are managed to ensure effectiveness, efficiency and sustainability. This study adopted Systems Theory as the model or theoretical framework, because the key elements, components and concepts of the study are accommodated within the Systems theory. While DoI help examined the extent of ICTs application in the university libraries studied. The Systems theory is explained and its application to organizations and academic library ICT system is discussed in this section.

3.2 The Systems Theory

Systems Theory (ST) was adopted as the theoretical framework for this study. The ST was propounded by the biophysicist Ludwig von Bertalanffy in the 1946s and it has exerted its influence on many fields of academic disciplines such as sociology, biology, physics, education and currently management studies. The rationale for adopting ST is to study how elements within a system or an organisation interact to achieve its goals and sustain the system using inputs from both the internal and external environments (Mele, Pels & Polese, 2010).

This study therefore presents ST as one of the most important frameworks for managing ICT facilities in academic libraries. ICT facilities, library staff and resources available in academic libraries are hereby referred to as "Academic Library ICT System" in this current study.

A system is defined by Von Bertalanffy as a set of dynamic factors required to maintain integrity through mutual interactions, and an organised entity made up of interrelated and interdependent parts that interact with each to achieve organisational goals (Von Bertalanffy, 1968). A system, therefore, could be described as a set of interconnected and interrelated parts that work together harmoniously and coherently to achieve the set goals and objectives of the organitaion (Ng, Maull and Yip, 2009).

A system is distinguished from others by clear cut boundaries through which it establishes internal and external environments (Mele, Pels & Polese, 2010). Heylighen &Joslyn (1992) cited in Batane & Motshegwe (2012) defined the ST as a transdisciplinary study of the abstract organization of phenomena, independent of their temporal or spatial scale of existence type and substance.

There are two main types of systems: open and closed systems. While the open system has boundaries, which are difficult to identify, and interacts with its environment, the closed system does not receive and exchange information with its environment (Amagoh, 2008).

A system has set of goals and objectives to achieve, and these goals and objectives indicate the reason for the existence of the system. The ST as postulated by Von Bertalanffy sees an organisation as a system that has a set of goals and objectives to accomplish within a specific time period. This theory specifies that a system consists of 'two or more interrelated' elements that fulfill the following conditions:

- all sub-systems influence the behaviour of the system, but none has a sole independent effect on it;

- the behaviour of the elements, and their effects overall are interdependent, as determined by the state or type of activity in at least one other part of the system;

- the behaviour of each of the elements influences the behaviour of the whole (Ceric 2015).

ST has been developed as a set of "systematically theoretical model" to study and enquire about the world empirically (Lai and Lin, 2017). ST model, in the view of Nevo and Wade (2010), proposes that a system is developed, created and dictated by the interactions among the system's elements. These elements or components of the system are the inputs, process (throughput), outputs and the feedback. The ST as a theoretical framework helps in the study of the characteristics of a system which includes inputs, process, output, feedback, environment, hierarchy or structure, information, goal-oriented that are common to all organisations. The theory indeed, provides an opportunity for an organisation to be investigated holistically instead of its subunits and the sub-component parts (Von Bertalanffy, 1972).

Chun et al. (2008), maintain that a system's environment comprises elements that are extraneous to it. Thus, they are peripheral but any change in the environment affects the entire system. ST is a scientific approach and a set of concepts for the transdisciplinary study of complex phenomena such as technologies (Heylighen & Joslyn 1992), and it coherently brings organisations or system elements together comprehensively and holistically to the system goals. Similarly, Ackoff (1971) opines that ST provides a platform for the study of organisations holistically, and it is therefore fundamental for the study of academic institutions and their component parts such as the library systems (Lee, 2017). For a system to be successful and sustainable, it must be able to adapt, adjust

and change to all influences from the environment such as technological, economic, political and social changes (Cerna, 2013).

Studies have revealed the complexity and multi-faceted nature of ICT management in organisations including those in academic libraries, and therefore requires holistic and the systematic approach in managing the ICT resources (Bakari, 2007; Omona et al, 2010; Von Faber and Behnsen, 2012; Borgiel et al., 2014; and Sergis et al., 2015). The above characteristics of system theory underpin this current study and the researcher believes that ICT in academic libraries must be managed systematically and holistically to achieve the goals of their adoption (Haliso, 2011). This study discusses academic library ICT facilities and resources as a complete system and situated it as part of other sub-systems within the library systems and academic community in general (Lee, 2017).

Lee, (2017) maintains that it may be difficult to understand the academic library ICT system without the context of internal and external variables that influence the successful management of the technological infrastructure. The internal and external variables do exert strong influences on the successful and efficient management of the ICT facilities. In library and information science research, ST approach provides a holistic paradigm that enhances the study of library ICT systems and their interactions with systems within the library (Poole, 2014). In this study, ICT system in academic libraries is "a complete system" that has subunits which are made up of elements that interact to achieve the aim of the library as a whole; hence, the provision and access to information to their users (Aina, et al., 2014: Chun, et al, 2008).

The focus of this study is on the academic libraries and their technological (ICT) facilities and how these facilities are being managed to ensure effective utilisation of the information resources available in them. The identifiable variables or elements within the academic library ICT system (ALIS) are technology, people, policies and procedures as well as financial resources and other stakeholders as the elements (Ceric, 2015; Batane & Motshegwe 2012). These elements interact to ensure the viability and sustainability of the academic library ICT system. The malfunctioning or absences of one of these variables will negatively affect the successful management of the ICTs.

Management of ICT therefore is an interdisciplinary process involving taking into consideration diverse set of variables, elements and concepts such as human resources, financial resources as well as technological infrastructure that interreact harmoniously to achieve the organisational goals. The ST is therefore concerned with the proper functioning of the various components of the system through their mutual interaction and relationships as a whole rather than on their own (Chun, et al., 2008). It also provides the platform to examine organisational environment boundaries and feedback as a control measure. ST is therefore employed in this research to focus on the relationship and interactions between the elements of the ICT systems in academic libraries and how they could be managed efficiently to achieve the objectives of the libraries.

The study focused on the identification of appropriate ways for integrating and managing ICT facilities in the academic libraries in Ghana. The study therefore adopted ST as already indicate as the theoretical model to explore at how the elements in academic library ICT system could be coordinated for effective operations. The ST Model provides the framework for proper integration and management of all the components of the library ICT system. According to Ceric (2015), a

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system has multi-layer elements or components which are interrelated and interdependent in their functions and operations. Alternatively, Kinicki &Williams (2016) describe a system as a set of interrelated parts that operate together to achieve a common purpose. These parts or components identified by Kinicki and Williams (2016) as the components of the systems theory include:

1. Input
2. Process or Transformational Process or Throughput
3. Output
4. Feedback

These elements are subunits on their own within systems which are interrelated and interdependent on each either to ensure the effective and efficient functioning of the entire system of an organization (Lee, 2017; Geraldi, 2007; Kanungo & Jain, 2007). Based on the ST as a framework, this study aimed at identifying and defining the various components or elements in ALIS to manage them successfully.

As clearly stated in previous studies, a system is made up of independent but interrelated elements or components that are organized effectively and efficiently to accomplish the overall goals and objectives (Geraldi, 2007; Kanungo & Jain, 2007; Mele et al., 2010; Batane & Motshegwe, 2015; Lee, 2017). The core function of a system or any organization is not only to convert or process the system inputs into some desirable outputs for use but also to ensure that the system's elements are coordinated and work effectively. These identifiable variables, components or elements in the ST as identified above are discussed in the next section.
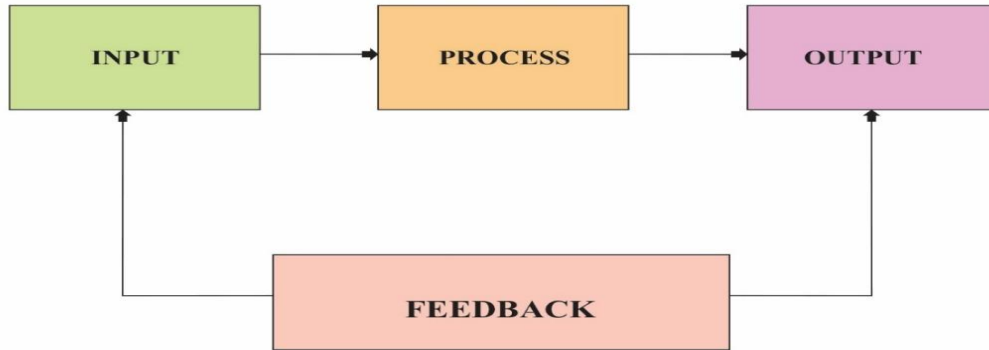
Figure 1.0: System Theory Model or Framework (Batane and Motshegwe, 2015)

3.2.1 System ICT Inputs

Inputs comprise elements that make up the entire system and they are parts or substances that interact within the system to achieve the system goals. These parts may be humans, material, equipment and financial (Ceric, 2015a). Kinicki &Williams (2016) are of the view that inputs are the resources required to produce an organization's products or services to serve its consumers, and they include people, money, information and equipment. System inputs also include materials and other resources required to produce the needed outputs of an organization.

System inputs have attributes that can be measured or described; for example, size, colour, volume, value, temperature and mass. For instance, Academic Library ICT System(ALIS) inputs include technological infrastructure and devices, human resources, financial resources, and any raw material of some kind required to make information materials available to the academic community (Jabeen, 2016; Ceric, 2015a; Ceric, 2015b; Mwawasi, 2014; Qutab, et al., 2014; 2006).

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Inputs are the material resources that fuel the running of any system, organization or institution such as academic libraries and their subsystem. Inputs are the resources received from the external environment of the System (Thien & Razak, 2012).

Library ICT system or Library Information system is considered or conceptualized as a complete system that has technological infrastructure elements such as hardware devices, software, and personnel which interact to help achieve the set goals of the library (Kanungo & Jain, 2007). These inputs must be properly and carefully managed through planning, organizing, and controlling to achieve the intended purposes (Batane & Motshegwe, 2015). Strategic plans and policies must therefore be developed to guide the selection and acquisition of high standard ICT inputs for their effective application and management.

3.2.1.1 ICT Infrastructure or Technological Equipment

Information technologies, such as hardware, software and network connectivity in modern day organizations ensure fast productivity and delivery of products and services. Mwawasi (2014) and Vaishyak &Patel (2009) enumerate some ICT or Information Technology facilities such as computers: desktops, laptops and tablets, audio-visual systems. Others include television, video and audio tapes and cassette players, projectors, wearable smart devices, smart-boards and other digital media tools as some of the technological inputs available to organizations like academic libraries for them to perform their functions.

Additionally, ICT infrastructure also includes the provision of networking and connectivity systems such as Local Area Network (LAN), Metropolitan Area Network (MAN), Wi-Fi Network and Wide Area Network (WAN) using modern fiber optic cable to deliver high speed Internet connection (Mwawasi, 2014). Technological devices and other ICT infrastructure play a crucial

role in the success of any organization, social system especially academic institutions and their subunits including libraries (Ani, et al., 2016; Perera and Chandra, 2010). Technology infrastructure is a platform for proper mechanization of production lines, operations and improves service delivery of organizations. For efficient functioning of the system, critical thinking and strategic planning, as well as the required investments must be put into the acquisition, deployment and management of the automation of an organization (Ani et al., 2016). The quality and adequacy of the ICT infrastructure are of importance to successful application, implementation and management since ALIS depends on the technological infrastructure for operations and functioning. The absence of an appropriate, inadequate and substandard technical infrastructure is therefore hindrance to the management of ALIS.

3.2.1.2 Human Resource or People

Management of ICTs in organizations like academic libraries require personnel of high quality, integrity, requisite skills, knowledge and competencies in IT and project management (Bawden & Robinson, 2012: 155). In systems theory, human resource or personnel is one of the pivotal inputs that ensure effective operations, coordination of other inputs and the sustenance of the system or the organization (Batane & Motshegwe, 20012; Linabary, 2016; Lee, 2017). Thus, staff with the right attitudes, skills and experience are therefore required in managing ICTs implementation in academic libraries. In the era of ICT and the Internet of Things, technological tools deployed in libraries needed librarians with the expertise to manage them (Ani et al., 2016).

Similarly, ICT literacy has become essential and professional requirements for modern librarians in their day-to-day performances of their duties. ICT projects implementation and management in libraries are diverse, which involve people with different qualifications and background who form

a team for the efficient deployment and management of the system (Schwalbe, 2016). Therefore, good human resources and staff management on the part of library authorities are highly imperative and expected. The staff training and retraining in ICT skills is paramount in managing the ICT facilities successfully. The staff recruitment may not necessarily be in librarianship but other areas like computer science such as programmers, system analyst, the network specialist, hardware and software engineers as well as project management experts (Schwalbe, 2016). Batane and Motshegwe (2012) are of the opinion a lack of technological know-how among staff is a major barrier to the effective exploitation and management of ICTs in academic communities in Africa. The introduction of technologies in university libraries must therefore proceed with the recruitment and training existing staff who are competent to manage technological infrastructure and its innovation.

The Information Technology (IT) or the ICT departments of the universities should be mandated to train personnel who will be in charge of managing and maintaining the ICT resources in the university library (Mwawasi, 2014; Qutab, 2014). The ICT departments or units within the universities must provide technical support to the libraries in their attempt to integrate ICTs into their system. The challenge, however, is that the ICT departments have shortcomings in understanding technicalities of academic library systems. This has necessitated the need to develop appropriate training programmes through seminars, conferences, workshops and curriculum development (Majanja, 2007). Such programmes will help the library to acquire computer literacy skills such as programming and hardware maintenance so as to manage ALIS efficiently.

3.2.1.3 Financial Resources

Organizations need financial resources to survive in order to perform successfully as per its mandate. For instance, financial investments in infrastructure are one of the key elements every librarian must consider when embarking on ICT application and management in higher education libraries (Ponelis & Adoma, 2018; Husain & Nazim, 2015; Groff, 2013; Hennessy et al., 2010; Ingutia-Oyieke, 2008). The cost of acquiring ICT infrastructure and other technologies does not come cheap, and it has huge implications on the institution as a whole and the library's budget allocation in particular. EDUCAUSE (2003), points out that generally, technology costs are increasing at a rate that exceeds universities' ability to pay. Therefore, university management must be committed to raising enough funds to finance technology-related needs of their institutions both in terms of human and physical infrastructure.

Similarly, Arkorful (2007), also states that library automation is capital-intensive enterprise, though its numerous benefits outweigh the cost involved. However, current studies have revealed that cost of technology is reducing drastically, but the initial set up of academic library ICT system requires huge capital outlay and that ICT management cannot thrive without the needed financial support (Bloom et al., 2010; Frempong, 2012; Patel & Patel, 2012; Osawele & Uzairue, 2013; Singh & Rana, 2015).

Inadequate funding has been identified as a major hindrance to ICT deployment and management in academic libraries (Omekwu & Echezona, 2008; Okiy, 2010; Halliso, 2011; and Asogwa, 2014). The decision to deploy ICTs in academic libraries must be backed by regular budget lines for updating, maintenance and replacement of ICT infrastructure and outdated technological devices. In Ghana for instance, funding has become an uphill task for academic institutions, which has

affected budget allocation to the libraries, with its rippling effects on library ICT projects (Thompson & Pawdura, 2014).

Arkorful (2007) identifies two sources of academic library finances to include Internally Generated Funds (IGF) and 10% of the Academic Facility User Fees (AFUF) paid by students which are woefully inadequate to support collection development and ICT infrastructure projects in the libraries. In Ghana annual budget for ICT equipment update and maintenance in academic institutions are so huge that they quickly drain the entire budget of university libraries (Thompson & Pawdura, 2014; Arkorful, 2007).

The sustainability of ICT infrastructure funding in academic libraries remain uncertain, and therefore require planning and strategies to raise the needed funds to support library systems. Academic library automation is capital intensive, hence requires huge investments to procure networking equipment, hardware and software as well as the cost of infrastructure maintenance, training of staff, software renewing and licensing and technical support (Thompson & Pwadura, 2013).

Finally, it is important note that successful management of ALIS will largely depend on the availability of adequate financial resources. Therefore, conscious efforts must be made to raise the needed funds in support of deploy and manage effectively library ICT facilities.

3.2.2 Systems Processes or Throughput

The process or transformational process is the system's ability in managing internal resources such as technology, procedures, guidelines and converting these inputs into outputs (Kinicki & Williams, 2016). The transformation process is made up of a mixture of materials, information, instructions, standard documents, technology and the personnel which combined to create the

expected outputs (Armstrong, 2006:51). To ensure quality process in the system the quality of the inputs such as the technologies and library staff cannot be compromised in the conversion of the inputs into the desirable output (Omotayo, 2015). For instance, knowledge and skills in IT applications or instructions such as skills in computer software programming must be a basic requirement for the staff to be able to convert the inputs into the expected outputs. Thus, the main activity in the transformation process is the generation of outputs out of the inputs in feed into the system in the form of products or services.

The process stage depend on the rule and procedure guidelines to carried out the system activities to achieve the organizational goals as spelled out in the strategic plan. Policies, strategic plans, and standards operation procedures form a major part of the transformation process without which there will be chaos, abuse of resources and subsequent failure of the organization in achieving its intended objectives. Management principles such as planning, leading, coordinating and controlling are pivotal in the processes of the system inputs into the final product or services.

Kinicki &Williams (2016) declared that at the process phase, beside managerial principles the training of staff to imbibe the ethics and tenet of the organization culture then becomes imperative. Al-Hajri (2016) opines that the process of technology transfer sometimes fails due to a lack of the right attitudes, motivation, and technology skills of the adopter to manage the technology application effectively. Again, the success of technology transformation is dependent on some factors, for example quality, standard and compatibility of the technology with the existing system, the personnel expectations and their commitment (Larsson et al., n.d.).

Management techniques such as goal-setting, development of strategic plan, training of employees and assessing performance and making adjustment are crucial on the part of the library leadership

in guiding inputs the processing into an acceptable output. At the process phase, technology management skills are required to ensures that technological capabilities are exploited fully to achieve the organizational goals (Batane & Motshegwe, 2012). Policies, standards, strategies, rules and regulations are also outlined and integrated into the system to guide the transformation process (Kinicki & Williams, 2016). Academic libraries in this context would be expected to devise clear strategies such as the development of policies, strategic plans, standards operating procedures and guidelines as well as rules and regulations to regulate the processes of transforming the inputs into outcomes. The transformational process is therefore a key element within the system to ensure that the inputs received from the system environment are appropriately translated into acceptable outputs.

The process is at the centre of system elements that interconnect the inputs and the outputs from the system, and it is important for the transformation process to be carried out perfectly. It is at this stage that library staff required to have basic computer skills, competencies and knowledge in operating systems such as Linux, Windows and system maintenance to apply them in processing inputs to the required system outputs (Arokyamary & Ramasesh, 2011). Outputs refer to the final product or services offered by the organization which comes out as the processed inputs received from the internal and external environment of the system.

3.2.3 Systems Outputs

Organizations whether for profit or not for profit, are set up to produce products or services to satisfy needs of a target market/customers. The products or services the system or the organization produces are the outputs, and they are generated out of the inputs feed into the system from the environment (Kinicki & Williams, 2016; Ceric 2015; Batane & Motshegwe 2012). According to Kinicki & Williams, (2016), all functional and open systems receive inputs from the environment

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and transform them into outputs that are beneficial to the system. The quality of the inputs and the transformation processes therefore, affects the quality of the system's outputs. The academic library ICT system like any other system also generates outputs from the inputs it receives from both the internal and external environments of the library system and other systems within the academic community. These inputs are process and the outputs are the various form of information products and services provided to the academic community.

Essays, UK (2013) highlights some ICT based outputs in academic libraries to include products and services such as institutional repositories, digital or electronic libraries, mobile phone services to library users, library 2.0 and OPAC, reference and circulation services that are carried out through the application of ICTs.

Universities are set up to train graduates to fit into the world of work and as a vehicle for improving the living standards of the citizenry as well as eliminating ignorance and poverty through education, research and innovation (Ananga et al., 2016; Mok & Jiang, 2016; Deloitte, 2015; Di Pietro, 2014; Elias & Purcell, 2013; Xia et al., 2012; Kett, 2012).

In the context of academic institutions, students form an integral part of inputs and outputs of the university system premised on the requisite knowledge, skills and expertise required for societal development. Academic libraries support this enterprise of universities through the provision of information needs of students, lecturers and researchers (Khan, et al., 2014; Hart & Kleinveldt, 2011; Rasul & Singh, 2011), and this mandate of academic libraries is carried out successfully through the efficient application and management of the library ICT facilities.

In the era of information explosion, academic libraries achieve their mandate through the adoption of different kinds of ICT tools and technological infrastructure for information gathering, storing,

processing and dissemination (Krubu & Osawaru, 2011). The outputs of the ICT in academic libraries are manifested in the form of hybrid, virtual and digital library systems in which information is provided and delivered through computers and other digital devices such as mobile technologies (Thompson & Pwadura, 2014; Essays, UK, 2013; Krubu & Osawaru, 2011; Haliso, 2011; Rasul & Sahu, 2011; Agyen-Gyasi et al., 2010).

The goal of ALIS, therefore, is to provide the library staff with the opportunity to use technology to enhance and improve their operations and services. As a result deliver excellent work outputs and support graduates to adopt ICT tools in their research works and academic pursuits, as well as to equip the students with the knowledge and skills to enhance their research outputs.

The quality of outputs reflects the positive relationship between the inputs and the quality of the transformation process conducted (Ceric, 2015). Some of these outputs of academic library ICT system include but not limited to CD-ROM, Online databases, access to the Internet, electronic-mail services, electronic books, electronic journals, data and file sharing, research and scholarly collaboration, video conferencing and others (Krubu, 2011).

Radniecki (2013) reports that the ALIS outputs provide the following benefits to the library users. They are seamless access to information, easy information retrieval, research collaboration, information resources sharing, inter-library loans, research commons and document delivery services. The outputs are a feedback mechanism to measure how efficient the system is operating and provide the impetus to assess the inputs and processes that go into generating the outputs.

The quality of the output helps in the achievement of the strategic objective of the library and to sustain competitive advantage by preserving what is unique about the library over its competitors (Mutongi & Chiwanza, 2016). The lack of qualified staff in terms of skills and qualifications, poor

ICT infrastructure, lack of finance and managerial competencies largely have adverse effects on the system outputs. Academic libraries and librarians must develop policies and plans that have key performance indicators that will help monitor and evaluate the effectiveness of their outputs.

3.2.4 Systems Feedback

Any dynamic, healthy and results-oriented system or organization receives and exchanges feedback with its environments, evaluates and analyses the feedback to adjust the system for the achievement the goals of the system. Any organization that aims to achieve its goals and objectives designs a functioning feedback system and gathers opinions from the users. Feedback is the information about the input that measures the acceptability and satisfactory level of both output and goals of the system by its customers.

McLeod (1995) postulates that feedback is a mechanism that guides organizations to assess their achievements based on the set goals. Price et al. (2010) also indicated that there should be clarity of purpose in the feedback to use as an evaluative tool. Feedback is used to facilitate the adjustment and improve the existing system and future actions and goals of an organization. Juwah et al. (2004) posits that the impact of feedback as a tool for correcting mistakes, recognizing an accomplishment and for motivation, encouragement and support for institution managers. An open and dynamic system like ALIS exchanges feedbacks regularly and consistently with its environment to assess the relationship between the inputs and outcomes of the library system.

Feedback offers library managers the chance to ascertain whether the ICT system objectives are being achieved and its alignment with the set goals as well as meeting the demands from the system environment. Besides, it has been found that feedback drives the growth and the continuous

development of the organization and for the future enhancement of organizational vision, goals and objectives (Kuzek, 2004).

By its nature feedback is described as purposive because it is not just part of the system with roles to play, but rather the purpose the system serves. Thus, to keep sensed values in conformity with the standard that is put in place as a reference point. Feedbacks are closed-loop systems because there is an endless cycle among functions, with output having an impact on subsequent input. Porat (2016) maintains that feedback is one of the important tools in academic library management. In juxtaposing this in the context of the academic library system, the feedback ensures that the library ICT system offers the opportunity to assess the services provided to the academic community especially to the lecturers and students whether they meet an acceptable standard (World Economic Forum, 2012).

The feedback comes in the different forms such as employee surveys, suggestion box, and quarterly evaluation report, complaints from staff and users, performance appraisal and evaluation training. Feedback in academic library in this context focuses on the compatibility of the IT infrastructure, interoperability of the technological devices and friendliness of the user interface of the ICT system as well as assessing the policies, strategies, standards and operating procedures. In the academic library ICT system, the feedback of library staff, end-users and other stakeholders help to inform current and future design, development and management process (Krubu & Osawaru, 2011).

3.3 Proposed Model for Managing Academic Library ICT System (SIPO MODEL), by the Researcher (2018)

Based on the Systems Theory (ST) adopted for the study, a new model is developed for managing ICT systems in academic libraries. The proposed model contains the four main elements of the

ST; thus inputs, process, outputs and feedback. And two new elements being **strategic policy direction** and **collaborative partnership** are added to make six elements in the new model representing "Academic Library ICT System" (ALIS) which comprises of ICT facilities and resources deployed in academic libraries.

These elements or concepts in the new model are imperative to contribute to the efficient and effective management of academic library ICT systems (ALIS). These are the key elements or variables that influence smooth operations, and the management of ICT facilities and resources deployed in academic libraries. These elements are interdependent, though they exist independently. They interact with each other to ensure the sustainable operations of the academic library. The inadequacy or absence of one of the elements invariably affects the holistic implementation and management of the library ICT system.

These elements are discussed in detail below:
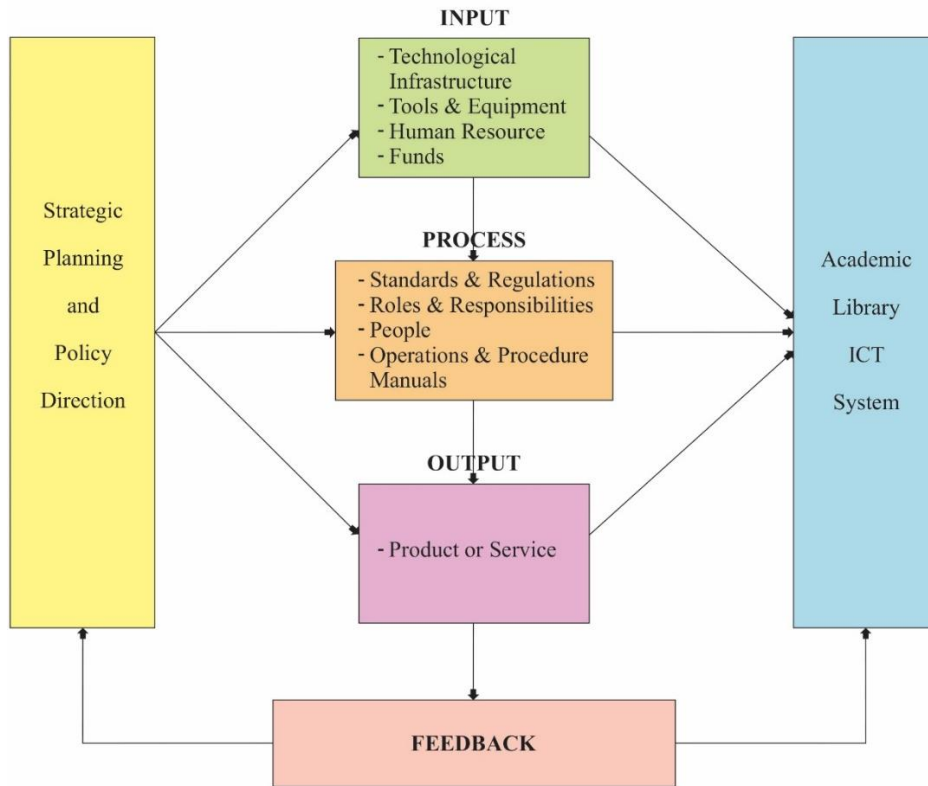
Figure 2.0: Proposed Model for Managing Academic Library ICT System is known as _SIPO Model_. This Model is conceptualized by the Researcher for the current study (2018).

3.3.1 Strategic Policy Direction

Strategic management involves the formulation and implementation of the major goals and initiatives taken by the top management of the library based on the available resources. In academic libraries, ICT strategic plan and policy defines the library's policy and strategic direction of the library in terms of ICTs application and management (McGee, 2006). Strategic planning consists of all activities involved in identifying the broad objectives and purpose of the ICT system (Cobblah, 2011). Osten & Kanter (2007) submit that managing ICT begins with 'ICT initiative'. That is, the formulation of library ICT policies and strategic plans, documentation processes and

procedures manuals, updating, and upgrading schedules, staff recruitment and training. It also involve arrangements to identify sources of funds to improve library ICTs projects. 'ICT initiative' must be backed by clearly structured policy direction. Effective management of Academic Library ICT System (ALIS) must be in tandem with well-defined and structured policy framework (IFLA/UNESCO, 2002), with clearly developed strategic planning to ensure success. The strategic objectives for managing ALIS is to provide a secured and reliable ICT networked-based facilities to ensure that the library users have unhindered access to ICT-based library resources (Prakashe & Lengure, 2015). These laudable objectives could only be achieved through strategic planning and well-crafted policy guidelines.

Strategic planning and policies documents contain medium term and long-term vision, objectives and goals of ICT deployment and management in libraries (Hannessy et al., 2010), while at the same time codifying the expected outcomes of the ICT application in academic libraries. Strategic planning and policy direction in their nature form a major part feature of institutional sustainability plans(Coblentz, 2002). Strategic planning and policies aimed at policy credibility, financial sustainability, and information services sustainability as part of ALIS in order to achieve the objectives and goals of the library system.

According to Amkpa & Abba, (2009) integration of ICTs in academic libraries must be guided by well-developed policies. The integration of ICTs into the educational system especially academic libraries is a complex and complicated process that could result in a lot of challenges such as loss of resources, lack of focus and direction, and apathy on the part of the staff. Strategic plan and policies are, therefore, required to ensure that academic libraries ICTs are not implemented haphazardly. The absence of basic managerial strategies and planning create a barrier to a successful management of ICTs in libraries (Tiwari & Sahoo, 2013).

With the strategic plan and policies, academic library managers can put in place rules and regulations to control the ICT infrastructure development, practices and processes to distribution responsibilities (de Paula et al., 2015). Tait, Martzoukuo & Reid, (2016) pointed out that efficient and successful management of ICT tools in academic libraries, are dependent on policies and strategic plans. They further claim that strategic plans and policies reflect management's intention for the medium and long-term vision for the organization. In this study, strategic planning and policy direction establish the library's long-term vision, mission, policies and procedures towards the role of ICT in supporting the operations and services of the library.

The policies and procedures dictate how activities are carried out in functional areas of the library subsystems in their interaction with the ICT system. Often ICT infrastructure adoption academic libraries has been in ad-hoc manner d without a well-designed plan and policies to guide their management (Owusu-Ansah & Adjei, 2015). Mostly the concentration is largely on the acquisition and implementation of ICT facilities.

However, strategic planning and policies are necessary to guide the acquisition, deployment, maintenance and management of an academic library ICT system as well as to ensure that the purpose of ICT integration in libraries is achieved. Several studies have identified hindrances to ICT implementation and management to include, lack of ICT skills, inadequate funds, lack of appropriate technological devices, lack of power to operate the ICT tools (Ani et al., 2005; Ingutia-Oyieke, 2008; Krubu & Osawaru, 2011; Siddike et al., 2011; Tiwari & Sahoo, 2013; Nebeolise, 2013; Okon & Ogbodo, 2014; Kasalu & Ojiambo, 2015).

Notwithstanding the above challenges, lack of the development and implementation of library ICT strategic planning and policy-making has been identified as a barrier to successful adoption and management of ICTs in libraries (Owusu-Ansah & Adjei, 2015).

Managing ICTs effectively depends on the librarians and managers' ability to understand the critical elements involved in the middle and long-term planning and policy development for the integration of ICTs into the library system (Newhouse, 2010). These include the ability to align the ICTs with the overall vision and mission of the library as well as that of the entire academic institution.

According to Rothaermel, (2015), a strategic plan is a set of self-directed action an organization takes to gain stakeholder support and sustain superior performance relative to its competitors. Rothaermel further intimates that a good strategic plan consists of three key elements which are a diagnosis of the competitive challenge; a guiding policy to address the competitive challenge and a set of coherent actions to implement the firm's guiding policy. The three elements help to understand system analysis both internal and external as well as policy development and implementations, which emanate from strategic plans (Rothaermel, 2015). Horwath (2012) claims that planning is the process required to establish the scope of the ALIS implementation and management, refine the objectives and define the course of action required to attain the objectives that the library ICT was undertaken to achieve.

Strategic plans and policies guide in the identification of the resources required for the implementation, maintenance and management of the ALIS. For instance, they help in sourcing for funding, technological infrastructure needs and staff requirement as well as recruitment (McGee, 2006). In terms of the financial resources for ICTs management, there must be a well-structured plan and policies to identify a sustainable and regular stream of funding sources to fund the procurement of ICT infrastructure and facilities, to recruit, train and retrain the library staff to manage the ICT system. ICT strategic plans and policy documents for academic libraries must be approved and endorsed by appropriate authorities.

Formulation of strategic plans and policies for an academic library ICT system, the economic, social-cultural and ethical aspects must be considered to ensure sustainability (Calhoun, 2014), as well as the views of all stakeholders especially when they are drafted in bottom-up approach. Bottom-up strategic planning and policy development addresses the concerns of operational staff; thus, it starts with their inputs and concerns and builds on known risks.

Strategic plans and policies are key to the successful management of the library ICT system. Policies and planning are a precursor to the development of a compelling business case for an academic library ICT project with the aim of eliciting authority support and raising the needed funds for resources acquisition and for implementation and management (Adzobu, 2012).

Strategic plans and policies are oxygen for navigating, administering and managing an academic library ICT system. Holistically, ICT essentially contains a consideration of human resource development policies, information policies and technological infrastructure policies. Policies give impetus for connecting the various inputs in the library ICT system to produce the needed outputs. Policies serving as bolts and nuts hold firmly the various units within the library ICT system. Technology has accelerated the capabilities and possibilities for libraries, yet it has been difficult to keep up and sustain it. Hence, most academic libraries in Africa including those in Ghana have failed to exploit the benefits ICTs and other modern technologies are associated with due to the absence of strategic plans and policies (Amkpa & Abba, 2009). Therefore, the need to manage ICT and the associated technologies in academic libraries to ensure their sustainability, efficiency, effectiveness and regular operations cannot be discounted.

The strategic plans and policies are dynamic documents that need constant reviews because they are living documents. Without them institutions' libraries lack direction, control, monitoring and evaluation (Cronin, 2011). Finally, academic library ICT strategic planning and policy direction

define the vision, mission, objectives, goals and strategies as well as performance measurements, indicators, monitoring and actionable items to determine the progress of the ALIS (Hofman, 1995; McGee, 2006).

3.3.2 Academic Library ICT System Inputs

ALIS is made up of different types of technological resources that are interrelated and integrated to ensure successful operations and services delivery. The ALIS is a set-up comprising technological infrastructure (hardware, software, networks, the Internet and other technological devices), funds (financial resources for acquiring equipment, digital resources, training and development of staff), personnel or human resources to operationalize and manage the system (Prakashe & Lengure, 2015). Inputs also refer to all raw materials, money, different technologies and people. These inputs go through processes where they are planned, organized, controlled and motivated ultimately to meet the institution's set goals.

3.3.2.1 Academic Library Technological Infrastructure

The ICT infrastructure is the technological facilities resources that are used by academic libraries to collect, organize and disseminate information to their users in order to achieve their mandate in the academic environment (Awidi, 2013). Information Technological infrastructure and devices are the backbones and essential ingredients of ALIS. The ICT infrastructure is needed for the integration of various sub-units and systems within academic institutions especially in academic libraries (Ogbomo, 2010; Osuchukwu, et at., 2017).

The effective management of ALIS hinges on the quantity and quality of ICT infrastructure available at the academic libraries. However, Owusu-Ansah & Adjei (2015) found in their study that most academic libraries in Ghana do not have adequate ICT facilities and infrastructure. This

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therefore affects the effective delivery of ICT based library services and management of the ICT facilities.

IT infrastructure implemented in academic libraries include but not limited to computer networks, the Internet, hardware and software, television, radio, smart and cellular phones, satellite system and other associated video conferencing equipment (Enang et al., 2016; Osuchukwu et al., 2017). ICTs in academic libraries consist of computers of all types, various computer network systems, telephones, both digital and analogue, fax machines and other handheld portable devices as well as software that aid the libraries to organize, manage and disseminate information for their clientele (Iwhiwhu & Olorodudu, 2012).

A study by Walmiki & Ramakrishnegowda (2009) reveals some of the ICT infrastructure challenges in university libraries to include inadequate hardware and software, insufficient internet nodes and low internet bandwidth. Insufficient ICT infrastructure has been identified to negatively impact managing academic libraries in their attempt to automate the library operations. Mairaj & El-Hadi (2012) support this view by indicating that the availability of high quality and standardized library hardware and software helps ensure sustainable ICT adoption and management in libraries.

Chisita (2010) states that ICT infrastructure is an omnibus term that embraces overall technologies that are deployed for the collection, storage, organization, and communication of kinds and forms of information. ICT infrastructure and devices, therefore, include all kinds of technological tools such as computers, television sets, audio-visuals, radio, telephone, mobile/smartphones, CD ROMs, digital cameras, CCTV, Video conferencing, among others that have capacity and capabilities to disseminate information to users of libraries seamlessly (Arokyamary and

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Ramasesh, 2012). The importance of technologies in libraries has been recognized for eliminating challenges faced by librarians in their information gathering and communication. Mishra et al. (2015) declare that ICTs have transformed and changed the operations and service delivery in academic libraries through the automation of the core functional areas.

Prakashe & Lengure (2015) observe that ICT tools popular in academic libraries include the following, scanner, smart Card, printer, computers, the Internet, CDROM, DVD, Digital Camera, RFID technologies, fax machine and multi-media equipment among others. The technological facilities have now become the bedrock of academic library operations and services. Adelabu & Adu (2016) in a study identify ICT inputs available in academic institutions and their libraries to include computer, online electronic library, the Internet, telephone, video recorder, multimedia CDROMs, MP3, television among others. Technological infrastructure is therefore, pivotal in ICT deployment and implementation in academic libraries. Indeed, technological devices have become the backbone of academic library services delivery (Tiwari and Sahoo, 2013).

ICT Infrastructure comprises both applications software and networks. Omeluzor & Oyovwe-Tinuoye (2016) consider software as one of the most important components of the library automation process. The challenge is that most ICT software packages for various applications in the field of library and information services that are commercially made are very expensive to acquire. However, there are free and open-source software available to academic libraries, yet lack of technical expertise and overall knowledge among librarians to select, deploy and use appropriate ones presents a problem.

The application systems available in academic libraries include library management systems, database management systems and the Internet-based discovery tools as well as networks which

consist of satellite and telecommunication, fixed and wireless communications (Obajemu et al 2013). As important tools in facilitating information gathering, processing, storage, preservation and dissemination in academic libraries, ICT tools must be managed effectively and efficiently (Amakpa & Abba, 2009; Ismail et al., 2013). Technological infrastructure provides a platform for the development and deployment integrated library management system (ILMS) for the coordination of a range of library functions for managing the library resources.

In this study, technological infrastructure and tools include old and new technological facilities such as films, facsimile, telephone, radio and television; CD-ROMs, DVD, Digital cameras, computers of all kinds, smartphones, tablets, videoconferencing; the Internet, the network systems and their connectivity. They also consist of different types of system and application software as well as the interoperability and interaction of the various library sub-systems deployed to make the library ICT system functional.

Most of the libraries studied have deployed ICTs and technological infrastructure for management of their functions, operations and collections. Academic library premier product OPAC and other electronic resources depend on ICT infrastructure to function and operate. Other ICT infrastructure available in the study site also include Local Area Networks (LANs), Wide Area Network, Wireless, hardware and software. Appropriate and standard technological infrastructure is crucial in ensuring seamless integration of the different subsystems within the academic library system (Osinulu & Amusa 2010). Technological infrastructure and devices must not only be of high quality, but they should be interoperable with the existing ICT hardware and software system in the library and the university in general.

Osinulu & Amusa (2010) observe that it will be difficult if not impossible for academic libraries to function and operate effectively and efficiently without deployment and use of appropriate IT

infrastructure. These ICT facilities, therefore, should be able to interface with the other sub-systems in the university seamlessly without much hindrance. ICT infrastructure and devices are the pipelines through which information resources are collected, stored and disseminated to the users. ICTs, when managed effectively and efficiently have the advantage to transform library services and sustain their operations. It is there imperative that libraries provide high-quality standard of ICT infrastructure and tools and management that will withstand rigorous usage by the library staff and users. In this study, human resource was identified as one of the variables that influenced the management of academic library ICT system. Husain & Nazim (2015) remark that the installation of a high standard and appropriate ICT infrastructure, the library operations and services will be enhanced thereby eliminating repetitive tasks associated with manual library systems. The application of ICTs must therefore be managed efficiently, effectively and sustainably to enable the library users to benefit from the huge investments in ICTs implementation.

3.3.2.2 Human Resources for Managing Academic ICT Facilities

Management of ALIS depends on the quality expertise and caliber of staff available at the library. The element of human resources is very pivotal in the process of managing ALIS. An academic library's staff is as fundamentally crucial as its collection, equipment and other physical facilities (Osinulu & Amusa, 2010). Kidombo et al. (n.d) are of the view that effective ICT management and outcome of technological changes in libraries are highly dependent on the attitude of staff and the manner they respond, adjust and adapt to the changes and influence the outcome of the ICT implementation.

ICTs in academic libraries are implemented by skilled personnel; therefore, the library staff should acquire the requisite expertise and competencies to manage them. The skills, knowledge and competencies of library professionals have far-reaching consequences on the management of the library ICT facilities (IFLA, 2012). Careful analysis of knowledge, competencies, and organizational needs are of great importance in the recruitment of library staff; while attitude, work ethics, the potential to growth and adaptation are of equal significance in managing library ICT systems (Rees & Smith, 2017). Sharing a similar view, Rodriguez (2016) posits that in managing library technologies, it is appropriate to recruit staff with specialized technical expertise than to rely on jack-of-all-trades. The skills, qualifications and competencies in ICTs, management and pedagogical skills as well as financial management skills are significant importance in managing ALIS (Kumar, 2018). These qualities distinguish modern library staff who operate in the digital environment from those who worked in the manual library environment.

Staff with requisite technical and professional skills are a catalyst for effective and efficient ICT adoption and management in libraries, such personnel would be a position to manage the library ICT system sustainably. Mani and Suryanarayana (2010) point out that the introduction of ICTs in libraries amount to the re-engineering of library operations and services, and therefore staff should be re-skilled, re-organized and re-trained to be in tandem with the change of information systems deployed. A study by Anyaoku (2012) reports that academic library professionals need skills in software installation, Web 2.0 and Lib 2.0, repair and maintenance of ICT equipment. In ICT management competent, firm and efficient leadership is imperative on the part of library managers so as to commandeer the staff along the vision of the library and that of the mother institution.

Leadership with the required knowledge, expertise and authority set standards and benchmarks for the staff to achieve in terms of managing ICT facilities (Oyelude & Oladele, 2014).

ICT infrastructure and other elements such as financial resources are important in ICT management, yet the leadership and the personnel to ensure effective integration of the technologies are of utmost importance (Kidombo et al. (n.d), since they will coordinate all the resources. Knowledgeable and experience leadership is vital in managing academic facilities and staff. The attitude of the library managers have an impact on the work output of the staff. Brannigan (2010) posits that skillful, quality and competent leadership is a very crucial variable in the efficient and successful ICT management. Library managers are therefore responsible for recruiting, training, guiding and supervising the activities and operations of the library personnel to achieve the institution's goals and objectives.

Oyelude & Oladele (2014) opined that leadership style of the library staff is key impetus in the library ICT infrastructure management. In fact, to exploit the full benefits ICT systems, staff must possess requisite professional and technical training in both librarianship and ICTs. The absence of technological expertise among library staff have been identified as a major barrier to ICT management in libraries (Lamptey, 2016). The academic libraries' ability and capacity to successfully plan, implement, maintain and sustain ICT integration and management depends on the leadership capabilities, attitude and influence of the university librarians.

The university librarians must poseses ICT management skills, human resources management skills, budgeting, ICT literacy skills and project management in order to manage the library ICT projects professionally and sustainably. ICT knowledge and technical skills deficiency among

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library staff often results in ICT staff taking over the duties of managing library ICT systems (Waiganjo, 2006; Amkpa & Abba, 2009; Haliso, 2011; Tiwari & Sahoo, 2013), instead of professional librarians. Unfortunately, these ICT staff do not have knowledge and experience in library operations and services. The university library leadership therefore must find appropriate means of developing the library staff to acquire technical ICT skills in addition to librarianship for purpose of managing the ICT facilities. Seminars, workshops and conferences could provide avenues to educate the library about the need to acquire expertise in management ICTs. Nodeson et al. (2012) see ICT adoption as a change management in organization including academic libraries. Therefore, leadership must allay the fears of staff who will be affected by the change so as to avoid any resistance. The staff with a negative attitude can thwart effort of the ICT management in academic libraries. The strategic plans, policies, job processes and procedures are developed and reviewed by library staff and other personnel with managerial professional and technical competency in modern technologies (Berna-Martinez & Macia-Perez, 2012).

The library managers leadership style has a major role to play in managing change in an academic library, especially with the introduction of modern technologies, yet other stakeholders such library staff do have considerable influence on the management of ALIS (Sucozhanay et al, 2014). The staff involvement at all stages of ICT adoption, implementation and management is crucial, as they are expected to own the entire library project ICT system. Again, besides experience and skills, motivation plays a pivotal role in the management of academic library ICT system. Staff motivation comes in various forms such as financial rewards and compensation, appropriate working tools, career progression as well as continuous professional development. Availability of

such motivations to ginger the staff to put in their best in managing library ICT facilities is pivotal, especially in a developing country like Ghana.

Singh & Pinki (2009 cited in Kumar (2018) identify three main skills library and information professionals should possess. These are general managerial skills, technical know-how and professional skills in the era of ICTs. Regarding the managerial skills they identify these as the most important ones leadership skills, planning and organization skills, financial management skills, global and local thinking skills, project management skills, team-building skills, training skills, resources management skills as well as time management skills. These skills are pivotal in managing ALIS in the era of library budget cuts and inadequate funding ICT projects in a developing country like Ghana. According to Sharma (2014), staff are the biggest beneficiary of the library ICT system as it will speed up the information gathering process and help remove tedious manual processing of library materials. In this era of information technology many new features of technology devices are being implemented in university libraries to improve on the services to the library users (Garg, 2013).

Managing library ICTs requires staff who understand the ICT infrastructure and the objectives of their deployment in the libraries. The staff should be able to imbibe and interpret the vision and objectives for the application of ICTs as well as to manage ICT facilities so as to achieve the set objectives (Ismail, 2014). Forging closer working relationship with other departments, especially ICT directorate, libraries in academic institutions have adopted many technologies that link patrons closer to the services provision by the libraries (Hussain, 2018). It is expected that the staff from other departments would be trained in library operations and services so as to equip them with

skills in managing library ICT systems. In an attempt to transform from manual library to digital or electronic library due to ICT integration, the management may differ in so many ways. It is, therefore requires new skill-set such as computer literacy, information literacy knowledge in technologies maintenance and management (Vyas & Trivedi, 2013) but does not depart from the core function of making information available to users. More importantly, academic library staff would expected to possess requisite knowledge, competencies and skills in ICTs to adopt and manage library technologies. Staff should therefore be prepared for changes that will be inevitably present in the current ICT and other technological environments (Omotunde, 2017). Finally, to serve the patrons well, all library staff must be trained and re-trained regularly for them to become proficient in ICTs (Kumar, 2018).

As academic libraries increasingly adopt ICTs, it therefore imperative that librarians develop the needed skill-set and competencies such as technology literacy, project management and software development that would enable them to provide better services to their users (Obinyan & Unuabor, 2013). Failure of the university authorities to adequately train, retrain and equip the library professional with required skills in ICTs and managerial skills could pose a serious challenge in managing technological infrastructure in academic libraries.

3.3.2.3 Financial Resources to Support Adoption and Management Academic Library ICTs

Academic libraries like other organizations need adequate funds to procure ICT infrastructure and facilities. One of the most important elements in the management of ICTs in academic library is financial resources. Funds is the oil that lubricates the library ICT system. Funds are needed to procure ICT tools, recruit and trained personnel to deploy, maintain and manage the library ICT systems (Enakrire & Ocholla, 2017).

Inadequate funds and budgetary allocation have been a major challenge that face libraries in developing countries. Despite the numerous benefits ICT application offers academic libraries, high cost of ICT infrastructure and other technological equipment have limited the deployment, utilization and management of ICTs (Mikre, 2011). This invariably affects ICT application and management in academic libraries. As a result, Owusu-Ansah & Adjei (2015), suggest that university administrators in Africa, especially in Ghana, should consider making sustained and substantial investments in their libraries toward ICT facilities acquisition and management. Bamidele et al. (2013) emphasize the need to raise enough financial resources to invest in staff training and development to equip them with the requisite experiences and expertise to manage the library ICT system.

Rodriguez (2016) revealed that most academic libraries have been starved of funds making it difficult to fund technology projects and recruit specialists to manage these technologies. Advancement in technologies means a huge budget must be allocated to the library for regular and constant upgrading of the technologies to reflect current changes and development in a digital environment.

In Ghana, government subvention to universities has reduced drastically over the years making them self-financing institutions. As a result, they depend on Internally Generated Funds (IGF) through students' fees (Arkorful, 2007; Thompson & Akeriwe, 2014). The IGF is insufficient to finance ICTs acquisition and management. University libraries depend on their parent institutions for their funding. The universities are expected to allocate 10% of their recurrent expenditure to fund their libraries, however the allocation hardly come to the libraries (Thompson & Akeriwe, 2014), even though the 10% it is woefully inadequate. Sharma (2012) affirms that some university libraries in Ghana receive as low as 2% of recurrent expenditure from the overall budget of their

mother institutions. To overcome this challenge, academic librarians should be trained with the requisite skills in fund raising and financial management skills to be able to raise adequate funds to support application and management of ICTs in their libraries (Singh & Pinki, 2009; Kumar, 2018).

Even though the cost of ICT infrastructure is reducing, the challenge is that technologies keep changing rapidly, which calls for constant and regular updating and upgrading of ICT facilities (Mingaine, 2013). The main objective of managing ALIS is to ensure that the available ICT budget is maximized and invested in a cost-effective manner. Thus, the library managers must be knowledgeable in financial management such as use financial resources prudently. All in all, managing ICT effectively requires adequate financial resources to procure, maintain and upgrade the library ICT system as new technological tools emerge and the old technologies become obsolete. Money is needed to purchase, deploy and manage ICT facilities in libraries else nothing meaningful could be done. Library managers must be resourceful in raising adequate financial resources through fundraising activities such as grants and proposal writings, sourcing for donation and sponsorship to managing academic library ICT facilities.

3.3.2.4 Process or Transformational process of Academic Library ICT System

A process is a set of interrelated actions and activities performed to create a pre-specified product or service. A process therefore is characterized by inputs: the tools and techniques that are employed, and the resulting outputs. Planning is the processes carried out to establish the scope of the academic library ICT system implementation and management, refine the objectives and define the course of action required to attain the objectives that library ICT was undertaken to achieve. The ICT throughput involves the definition of work processes, procedures to be followed, the

information needed, tools and relevant technologies in the process (Parmo, 2009). Parm (2009) avers that the main responsibilities of the ICT process are to:

- Identify, establish and codify work activities and processes

- Ensure that the necessary requirements and authorities are comprehensively included in work process

- Ensure that work processes are followed correctly and verified

- Ensure that correct tools and information are enabled in the processes

The process therefore ensures that standards, procedures, rules and regulations are followed in converting the system inputs into the required outputs for the satisfaction of the users. ALIS process comes in a form of documentation that contains and captures the standard operating procedures, rules and regulations and work ethics of the library system.

These documents form part of the policies for managing the ICT system. Ngoepe (2014) suggests that process activities and documentation must receive the approval of the highest governing bodies of the library. In this current situation, the highest governing bodies are the library committees and the academic boards of the universities involved in the study. Therefore, when developed the library ICT strategic documents must be reviewed and approval by the various academic boards of the individual universities

The process documentation must be of high quality in terms of content and language used in formulating them, and must be comprehensive. Some of the identifiable process documentation include the procured ICT equipment, infrastructure and devices as well as software. They guide the installation, operations and maintenance of the system (Moi Teaching and Referral Hospital, 2016). Transformation processes documents must be error-proof as any error or omission will

affect or lead to an error by the end-user as well as subsequent library ICT system failures. Dadzie & Walt, (2015) claim that librarians and ICT system developers, implementers, and managers must therefore devote much time and attention to the library ICT system documentation generation. Finally, the transformational process involves having documented and approved library ICT policies, strategies, processes and standard operating procedures in place that are available and accessible to staff and other stakeholders to use and guide them in their daily operations (Government of Australia, 2016).

3.3.3 Academic Library ICT System Output

The outputs come out the process of the inputs received from the system environment. An output therefore refers to whatever comes out of the system after the conversion of the inputs. In ALIS, the output is the processed information and services that students, lecturers and stakeholders use in their teaching, scholarly and other research works. The output of the processed inputs from the information system could be in any of the following forms: text, images, video, sound or both audio-visual. The success of a system is measured by the quality of outputs it churns out.

Academic libraries provide different formats and types of information resources through the available ICT inputs and facilities (Gama, 2013). Some of these resources include e-books, institutional repositories, OPAC, CD-ROM databases, online journals, online and offline databases, e-referencing, online cataloguing, e-procurement of library information resources (Enakrire & Ocholla, 2017). The Internet is one of the biggest ICT outputs available in academic libraries. The Internet becomes accessible to libraries and their users after the deployment of the various ICT inputs or facilities in the libraries. Library webpages, email, listserv, group forum/discussion platforms are all output of ALIS.

According to Boopalan, Sasireka and Arumugam (2015), ICT in academic libraries includes computers of all kinds and types, the Internet, the web, CD-ROM, DVDs, fax, intranet, video conference and mobile phones. They further indicate that academic library ICT outputs are seen in the form of library automation, library networking, library management systems and digital or virtual libraries (Boopalan, Sasireka & Arumugam, 2015).

The quality of the outputs largely depends on the quality of inputs. Thus, the nature and quality of the technological infrastructure and devices; the adequacy and regularity of financial resources to procure quality and adequate ICT facilities; the knowledge and skills of the library staff in implementing, maintaining and managing the ALIS will impact on the quality of information delivered to the library users. Deficient and substandard technological infrastructure will invariably affect the output. The inadequate staff, as well as lack of ICT skill among the library staff, will also negatively impact the output.

3.3.4 Feedback into and from the Academic Library ICT System

Firms and institutions such as universities develop a system for monitoring and controlling the performance, progress or otherwise of the organization. Systems such as libraries have feedback, and the feedback allows them to change the direction and focus of their systems. For a successful, effective and efficient management, ALIS needs feedback mechanisms that can measure and assess whether the outputs of the ALIS is anticipated.

Feedback from within or outside the organization is the best way to monitor and control the progress of an organization. A feedback therefore should have the capacity to regulate and modify the system inputs or the processes in order to improve the outputs of the system. In an academic library, feedback provides a framework for assessing the library's observance and understanding

users of the ICT system and its effectiveness in meeting the needs of the stakeholders (Islam, Agarwal & Ikeda, 2015b).

Karim (2011) suggests that feedback can be a process of continuous collection, gathering, analysis, and utilization of information from both the internal and external environment of a system or organization with the aim of improving its services to the stakeholders. Feedback occurs in the information system when the outputs or information from the system is sent back to the system as an input to help improve the outputs from the system (Laudon and Laudon, 20017). Modern dynamic organizations that are forward-looking and client-focused collect all kinds of information from the stakeholders within and outside the organization on a continuous basis through different media. These kinds of information are required to assess the system to ensure that strategic objectives are achieved. If not, the needed changes are affected in the system structure or the products or the services it offers.

In organizations, feedback helps to improve and adjust the system to achieve its objectives and set goals. It therefore becomes imperative to have feedback in an academic library ICT system (Karim, 2011). The feedback from the ALIS provides three benefits to library managers. First, it provides a clear indication of how the system is functioning in relation to the expected outcomes. Secondly, it gives guidance and directions about how the library ICT system could be improved. Finally, it helps identify things that are worth doing well and continuing. By nature feedback helps reduces errors between the reference input and the system output (Golnaraghi & Kuo, 2017). Again, there are two main forms of gathering information for feedback: formal and informal data gathering. In the formal feedback system, data is collected through the use of suggestion boxes, questionnaire and surveys, case studies, focus group discussions, workshops and seminars, observation and monitoring. Informal feedback data, on the other hand, is gathered through face-to-face

interactions with staff and line officers, staff durbars and meetings, professional views from experts. An organization that does not utilize its feedback may end up paralyzing its operation and may be unaware of the concerns of its stakeholders, and in the end lose its competitive value. It is therefore, imperative for library managers to develop strategies on how to gather feedback about the ICT facilities performance from the stakeholders to improve the use and operations of ALIS.

Active and proper engagement with all forms of feedback is very key in improving the system's operations and performance. Finally, feedback serves as a meaningful measurement tool to help set the best path forward to future ALIS improvements. It is therefore important to identify and use all appropriate methods to gather the required feedback purposes to help better the ALIS. Feedback provides a platform for the comprehensive assessment of the ICT facility and system to ensure that they meet the set objectives of their application and their efficient management.

3.3.5 Academic Library ICT System Environments

A system such as ALIS operates within an environment both internal and external components and interacts with the elements in the environments. Changes in the environments do have a significant impact either positively or negatively on the system. The internal environment of a system is the part in which the system and its managers have control. In ALIS, for instance library managers have control over staff and their training needs, the strategic and policy directions of the library, budget preparation and how the inputs available are processed through the established procedure, work ethics, norms and acceptable standards. The external environment of a system is that which the system and its managers cannot control, but it has effects on the system requirements. For instance, in ALIS, library managements do not have control over the cost of technological infrastructure such as computers, internet cost, and cost of bandwidth as well as government policies such as tax laws.

Changes in government policies affect the system and these changes especially, copyright policies must be accommodated in the system. It is, therefore, important when embarking on ICT adoption and management. Library managers must develop policies and strategic plans that will take into consideration the analysis of both the external and internal environment the ALIS will operate. Finally, the system environment, both internal and external, do have a significant impact on the type of inputs that go into the ALIS which invariably impact on the system outputs thereby influencing the management of the ICT facilities.

3.4 Conceptual Framework

The literature includes relevant constructs that demonstrate a theoretical framework to be used in this study. This framework is ideal for this study as it offers the different characteristics that describe ICT adoption, implementation and management. Onen & Oso (2009) noted that a conceptual framework consists of the diagrammatic presentation of a theory and that it is presented as a model when research variables and the relationship between them are translated into a visual the picture to illustrate the interconnections between the independent and dependent variables.

This study aims to establish how ICT tools (inputs) are managed through the various policies, procedures, and strategies (processes) to achieve the objectives and goals of its adoption in Ghanaian academic libraries. That is making information and research outputs easily available and accessible to users (output), and users' satisfaction research will provide feedback to improve the processes of ICTs adoption and management. Library ICT system or an information system is of interrelated elements (technology, personnel, information materials or resources and others), or components that collect, process, preserve and disseminate information and provide a feedback of the mechanism to enable the library to achieve its set objectives (Stair & Reynolds, 2016). The

efficient management of the components of library ICT or Information system helps the library achieve its goals and set objectives.

3.5 Justification for adopting Ludwig von Bertalanffy's Systems Theory for this study

The main purpose of the management of ICTs in academic libraries is to ensure that both software and hardware components work effectively for the library users to enjoy the benefits therein as well as to achieve the set goals and objectives of integrating them into the library operations and service delivery. Due to the interdisciplinary perspective of the Systems Theory, it has been applied in numerous fields comprising economics, psychotherapy, and management. Again, many authors have used this theory as a framework for technology (ICT) use and management (Ceric, 2015, Zaytseva, 2012; Batane & Motshegwe, 2012). The key concepts of the proposed study are like the major elements of the systems theory which are inputs (ICT tools), processes (policies, guidelines, procedures and strategic planning), output (service delivery), and feedback (user comments). The theory is suitable for explaining the various processes involved in ICTs management because it prompts librarians to look at their library systems from a broader perspective in terms of technology adoption and management (Batane & Motshegwe, 2012). The researcher believes the System Theory helps in the understanding of interdependent relationships between variables that are inherent in the study.

3.6 Diffusion of Innovation Theory

The study as part of its elements of effective ICTs management, investigated ICT diffusion in Ghanaian academic libraries. In particular five university libraries were sampled for study. The main theoretical framework adopted for the study was the System Theory (ST) by Ludwig von Bertalanffy which elements supports holistic technology adoption and management. In addition,

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Roger's diffusion of innovation theory (DOI) was also adopted to support System Theory to comprehensively investigate the level of ICTs diffusion in academic libraries in Ghana. While ST helps to identify, structure and model effective management of academic's library ICTs, DOI on the other hand was employed to examine the status of ICT diffusion in Ghanaian university libraries comprehensively.

Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments. In fact, much diffusion research involves technological innovations so Rogers (2003) usually used the word "technology" and "innovation" as synonyms. For Rogers, "a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome" (p. 13). It is composed of two parts: hardware and software. While hardware is "the tool that embodies the technology in the form of a material or physical object," software is "the information base for the tool" (Rogers, 2003, p. 259). Since software (as a technological innovation) has a low level of observability, its rate of adoption is quite slow.

The attributes of DOI supported and complemented ST of the study. As clearly stated in Chapter One of this study and as a major strand in this study, academic libraries adopt ICT haphazardly, usually based on the advice and opinions, recommendation or suggestion of their colleagues in the academic libraries social system without in-depth research to find the viability, and applicability of ICTs. There is also lack of local environments scan or feasibility studies to analysis their situation. As a result, ICTs adoption and application are faced with a lot of implementation and managerial challenges. DOI theory relates the specific to the objective of the study which aimed at investigating how ICTs have diffuse in the academic libraries' studies. The adoption and diffusion of ICTs as an innovation in any organization depends on certain attributes. These

attributes are the Relative Advantage, Compatibility, Complexity, Observability and Trialability of the ICT as an innovation in academic libraries. Librarians and libraries adopt ICTs taking into perspective the attributes of the DOI theory. These attributes have influence on the diffusion of ICT in university libraries in Ghana. This is because libraries in Ghana. This is because librarian's adoption of technologies especially ICTS (the benefit) of the technology, complexity (how easy technology has been used elsewhere and the opportunity to experiment it). Again, the availability of funds, skilled-manpower, and the support from the university leadership.

3.6.1 Relative Advantage of ICTs in Academic Libraries

The desire for a university library to deploy ICTs are motivated by the advantages the library and users stand to benefit from ICT as an innovative technology. Relative Advantage is the extent to which an innovation (i.e. ICT) is "perceived as better than the existing innovation that superseded it" (Nazari et al, 2013). In this context ICTs in it all forms i.e. hardware and software are innovations that are deemed to improve and enhance library operations and services delivery. The relative advantage ensures that the adopted ICTs are managed efficiently for the benefits therein. The benefits of ICTs to academic libraries have been identified (Lusigi, 2019; Van Wyk and Kadzenga, 2017). Eve (2010) emphasize the significant role ICT plays in academic libraries in terms of efficient collection of information and effective processing, preservation and dissemination of information. Some of the relative advantage of ICT adoption and management in University Libraries include all-round access to the library material outside the library building, access to full-text materials in portable format and every communication with the library users.

3.6.2 Compatibility of ICTs in Academic Libraries

On the issue of compatibility, the ICTs adoption in Library have been necessary by the urge to provide seamless access to information and cooperative resources shared among libraries. As a result, Chisenga (2003), posits that libraries in African have leveraged ICTs to modernize their operation and services delivery. The ICT applications in African Libraries have been in the areas of automation which covers digitization of core functions of the libraries. This gives to the credence that libraries and librarians recognize ICTs as an efficient tool for operation and compatible with their traditional service delivery. Therefore, libraries have accepted ICT as a tool for collaborative research, development of institutional repositories and internal library cooperation and it must be deployed evenly in all academic libraries in Ghana.

3.6.3 The Complexity of ICT in Academic Libraries

Libraries in academic institutions are confronted with several hindrances that inhibit the adoption and management of ICTs (Kavulye, 2007). Some of these barriers include the lack of policies and strategic plans, cost of acquiring ICT tools as well as training and equipping staff with requisite skills. These hindrances constitute the complexities on ICTS adoption and management in the university libraries. As a result, ICT application projects in Ghanaian University Libraries often suffer from the sustainability challenges (Bachman et al, 2018) some of the complexities that inhibit ICT management in Ghanaian University Library include lack of expertise among staff, inadequate funding and technological equipment. Afolabi and Abidoye (2011), allude to barriers to ICTs adoption among libraries to include poor infrastructure facilities, loss of equipment, lack of expertise, and low level of ICT compliance and poor maintenance of ICT equipment. Others are lack of policies, frequent technology change and technophobia among others. The successful

management of ICTs will ensure overcoming these complexities (Awour, Rabah and Maake, 2013).

3.6.4 Observability of ICTs in Academic Libraries.

The benefits of ICT application in university libraries are driven by many considerations that are observable and manifest in the form of several services that are supported by technologies. Some of the observable elements of ICTs adoption and management in academic libraries include all but not limited full-text electronic books and electronic journals, i.e. electronic mail, the availability of institutional repositories, online reference, service and the OPAC.

3.6.5 Trialability of ICT as an innovation in Academic Libraries

ICT just like any new technological innovation has the capability of being tested and used on a limited basis before its full acceptance and complete adoption. In this study, trialability refers to the degree to which libraries and librarians giving an opportunity can test ICT before deciding to either adopt it for application or reject it. Trialability has the potential of allowing the adopters of ICT to do so at their own pace to have several trials and testing.

Studies have revealed how library users and staff have adopted ICT as an innovative tool in information researching and sharing (Ajegbomogun & Diyaolu, 2018). However, libraries and librarians must have to assume that ICTs once deployed will be used by library users. There must be conscious efforts and strategies to ensure the adoption and use of ICT smoothly. Some of these methods to encourage and improve the trialability of ICTs diffusion in academic libraries involve regular training and re-training of staff and users. This could be done through workshops, seminars, orientations, short courses and conferences. Despite the importance of the identified methods, Kelvinet et al, (2012) suggest going beyond the enumerated earlier for ICTs management. For

instance, the development of policies, and planning can assist academic libraries to successfully outline steps that could be taken for trialability of the adopted ICT systems. In the nutshell, trialability involves the ICTs resources deployed in the libraries requiring continuous trials and skills for effective usage, explanation and manipulation of the library ICT system.

The study considered DOI theory as an appropriate framework to support ST investigation of ICT adoption and management as an innovation in the university libraries based on the discussed attributes. This theory is a fundamental social process in which information about a new idea or innovation is communicated. Minishi-Majanja & Kiplang'at (2005) posited that the DOI is built on the assumption that any innovation, a new idea, has perceivable channels, time and mode of adoption in an organization. Investigating the status and level of ICTs diffusion in Ghanaian university libraries, DOI was adopted as a supporting theoretical framework in this study in assessing the variables that influence ICT adoption libraries. It emerged from the findings of the study that the attributes of DOI either affect ICTs adoption and management negatively or positively, for instance, trialability provides the ICTs adopters' opportunity to test and trial its implementation and usages until they become conversant with it.

3.6.6 Application of Diffusion of Innovation Theory in the Study

Compatibility is the degree to which the innovation is perceived to be consistent with socio-cultural values, previous ideas and /or perceived needs. An innovation that is incompatible with a potential user's values, norms, or practices will not be adopted as rapidly as an innovation that is compatible. In this context, the university libraries must ensure the library staff and users have the requisite ICT skills to explore and appreciate the potential value and benefit they stand to gain. The library staff without ICT skills and other technological know-how should give the required training in ICT to them to be compatible.

Complexity as an element in DOI is about the degree to which an innovation is perceived as difficult to adopt, use and comprehend. This is proposed to be negatively related to the rate at which innovation is adopted (Rogers, 1995). It, therefore, means that innovations that appear easier and simpler to understand and use are adopted more rapidly than those that are difficult to understand. What it means is that adopters ICTs skills levels must be assessed and those with challenges given the needed training to enable one to overcome the innovation complexities. Again, some these complexities in the ICTs adoption, diffusion and management in academic libraries are inadequate funds, lack of policies and strategic plans, requisite skills requirement of the library staff. The study investigated the ICTs skills and competencies among the library staff and its impact of ICTs adoption and management. The need for systematic processes and procedures for ICTs diffusion and management is therefore imperative. The processes and procedures in this context include the formulation of library ICT policy, availability of adequate funding and the training of library staff in modern technologies and ICTs.

Trialability also refers to the degree to which the innovation can be experienced on a try and limited basis. It is a process of encouraging the adoption and innovation by allowing the potential user to experience the innovation through itself experiment. The user is provided with the real opportunity of trying the innovation without necessarily committing to adopt it. In the context of the library's ICT adoption and management, it is expected that the library managers have the real opportunity of examining and using the intended ICT facilities in analogous institution to know its potential benefits and its interoperability. The vendors or suppliers must give the library staff ample time to experiment especially in phases before it is rolled out fully. During the trying and testing period, reinvention may occur. That is, the innovation may undergo modification to better the ICT facilities for potential adoption.

Observability is a process whereby adopter of innovation is provided with the opportunity to physically and visibly examine the innovation for adoption or rejection. This will enable the adapter to know the potential benefit of the innovation based on the results it produces. The ability to visually observer the innovation lower uncertainty and also stimulate peer discussion of a new idea, as friends and neighbours of an adopter often request information about it.

According to Rogers, the above characteristics determine between 49 and 87 percent of the variation in the adoption of any new product. These characteristics have also been used by researchers in different fields and have been discovered to predict the adoption of innovation among the affected social system. This study proposed that to efficiently and effectively adopt and manage ICTs in Ghanaian academic libraries, all the above attributes must be holistically examined and applied in all stages of its application.

3.7 Hypothesis

This section tested hypothesis to find out about the availability of academic library ICT policies in Ghanaian public university libraries for ICTs adoption, implementation and management.

H_0: There are no institutional policies, strategies and human resource in place for the adoption, and effective implementation and management of ICTs in ALs in Ghana

H_1: Institutional policies, strategies, and human resource exist for the adoption, effective implementation and management of ICTs in ALs in Ghana

3.8 Empirical Section

This section reviews some key relevant literature that shapes this study. These are the works of Odongo (2011) and Abul et al. (2011), two important works on ICTs adoption in the academic library context.

The first review is on a study conducted by Odongo (2011) on the 'Assessment of ICT Adoption in Kenyan Academic Libraries using the University of Nairobi Libraries as a case study. With the advent of the information age, globalization and changes in social trends, the environment in which libraries operate has changed significantly. Innovative technologies have forced academic library managers to accept and implement digital library systems to increase their performance and to be able to gain a competitive edge in this sector due to the information-seeking behaviour of the readers and the need to adapt to changes in society.

On the other hand, the diffusion of new technological innovations introduces new barriers for academic libraries in universities and this consists of inadequate skills, inadequate infrastructure, and insufficient financial resources among other factors. The Kenya Commission for Higher Education (CHE) suggests that in Kenya, academic libraries should implement and maintain new information technology as they expand so that academic libraries will increase their performance in this era of ICT.

The research design employed for the study was a descriptive survey. The data gathered from eleven academic libraries of the University of Nairobi (UoN) and its environs has been very significant in achieving the objectives of the research. The participants selected included library professionals working at the UoN libraries. The researcher used questionnaires to gather relevant data from the respondents. The questionnaire was subdivided into four main sections consisting of the background of participants, adoption benefits, adoption challenges and ICT adoption. The researcher analysed the data using STATA, SPSS, and Excel. The findings revealed that the majority of the academic libraries surveyed are employing ICT in their Library systems. ICT services employed include internet services, electronic books, and journals, OPAC services and

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circulation, among others. Some of the major challenges encountered in the adoption and implementation of ICT included the high cost of computer software and hardware.

In spite of these constraints, the majority of the participants agreed strongly that incorporating ICTs into the library system advances the provision and accessibility of current information. The linear regression model showed that training and developing the human resource required for effective management of the library improve the adoption process. Furthermore, the results show that awareness among the UoN librarians about the prospects of implementing ICTs is high. The authors recommended that more training and development programs should be organised for librarians to increase their performance. In addition, managers should develop strategies to increase digitization facilities and services.

Similarly, Abul et al. (2011) conducted a research on the adoption of information and communication technology (ICT) in the university libraries of Bangladesh. The study objective was to assess the degree of adoption of ICT in university libraries in Bangladesh. The study researched the existing practices of utilizing ICT by the public and private university libraries in Bangladesh. The study also examined the systems and services offered by the academic library. The authors gathered data from Postal and electronic sources. Finally, the study assessed the challenges encountered by managers in the implementation of such technologies. In the university libraries in Bangladesh, the research results show that the following factors affect efficient adoption and implementation of ICT:

i) Administrative factors: The study revealed that government executives, policy makers, and administrators are not fully aware of the relevance of incorporating ICT into the academic library system.

ii) Lack of support from the higher authorities: Lack of reliable supports (administrative, policy, technical, financial, institutional, and infrastructural, etc.) from the state authorities and effective managerial practices hinder a successful implementation of ICT in the private and public university libraries of Bangladesh.

iii) Lack of computer literate professionals: The study reveals that even though computer usage is increasing in Bangladesh, there is a need to get personnel that are more skilled.

iv) Uninterruptible internet connection: Due to technological disruptions from the service provider, the dial-up connection, as well as the broadband connection frequently goes off. The other factors are the high cost of infrastructure development, lack of skilled manpower, lack of ICT related knowledge, lack of infrastructure, psychological problems, lack of proper planning and lack of ICT training programs

3.9 Summary of Chapter

Chapter Three outlined the theoretical model or framework that guides the current study. The researcher then adopted the System Theory (ST) Ludwig von Bertalanffy which has components of the other discussed theories to the theoretical model and the framework for the study. The various elements within the ST which influence successful management of organisational system were discussed in this chapter. The chapter also presented the researcher's proposed model as a theoretical framework for managing academic library ICT facilities/systems and continued to discuss the various components of the proposed model. Finally, the chapter discussed the justification for the selection of the ST model and presented some empirical studies that adopted the framework discussed. Finally, this chapter also considered the DOI theory as additional theoretical framework to investigate ICT diffusion in Ghanaian academic libraries.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The previous chapter discussed the theoretical framework and model adopted for the study. This chapter discusses the philosophy underpinning this research study. General and familiar philosophical postulations were reviewed and presented; the pragmatism paradigm was adopted for the study. To achieve the objectives of the study, it is important to foreground the following aspects of the methodology of the study, research philosophy or paradigm, research approach, research design, target population, sampling, data collection instruments, validity and reliability, and ethical considerations.

4.2 Research Philosophy, Paradigm or Worldview

A research paradigm or worldview according to Creswell, (2014), is a perspective held by a community of researchers based on a set of shared assumptions, concepts, values, beliefs, techniques, propositions, and practices that guide and orient their thinking in research. Creswell (2014:6) sees worldview as "philosophical orientation about the world and the nature of research that the researcher brings to a study and it arises based on the discipline orientations, the students' advisor, and past research experience".

Research philosophy is a belief on how data occurrence is gathered, examined and used (Galliers, 1991). The first step in establishing a research methodology is to choose a philosophy that is in line with the authors' perception of the development of the thesis. The various philosophies of research are covered by epistemology (what is known to be true) as opposed by a doxology (what is believed to be true). Therefore, the goal of science is to transform ideas believed to be true to things that are known to be true.

The philosophy or worldview has been named differently by other researchers such as paradigm Mertens, (2010) cited in Creswell, (2014), epistemology and ontology Crotty, (1998) cited in Creswell, (2014) and broadly conceived research methodology (Neuman, 2009 cited in Creswell, 2014:6). Research "philosophy", "paradigm", "epistemology" or "worldview" is a framework of thought or a set of concepts and beliefs through which researchers interpret reality Christensen, et al, (2015); Neuman, (2014); Creswell, (2014) and Cohen, et al, (2011), and these are used interchangeably in this study. Research philosophy or worldview, therefore reflects the researcher's aims and objectives, ambition, values proposition, personal interests, abilities and a set of assumptions he or she holds. The philosophy influences the researcher's approach to research, research design, and choice of methodology to conduct the study. Creswell (2014) therefore identifies four widely accepted research paradigm or worldviews that influence social science research as positivist/post-positivism, constructivism, transformative and pragmatism. These are discussed below.

4.2.1 Post-positivism or Positivist

Post-positivism also is known as positivist/post-positivist research philosophy or paradigm is a traditional form of carrying out scientific or empirical research (Creswell, 2014). Its assumptions are generally underpinning quantitative research. It holds the view that every outcome has its causes and looks at the phenomenon from general to specific.

Levin (1988), states that positivists believe that reality is stable and as a result can be studied and interpreted from an objective standpoint. Balarabe-Kura (2012) avers that positivists believe the researcher should be isolated from the occurrence understudy to avoid interference with it. Balarabe-Kura further posits that positivists emphasize more on an objective approach to studying social phenomena rather than a subjective approach. It must, be understood that researchers who

hold the post-positivist view start their research with theory and collect data to either support or refute the theory (Creswell, 2014). The post-positivist paradigm supports the collection and conversion of data into the statistical or numerical form and concludes it and ensures that research methods and conclusions are objective and not bias.

4.2.2 Constructivism or Interpretivism

Constructivism or social constructivist are known as interpretivism Hayes, (2000) and Creswell, (2014), and it is also referred to as the naturalistic inquiry Lincoln & Guba, (1985) cited in Creswell, (2014), aims at understanding the deeper meaning of human emotions, feelings, experiences and behaviors.

Interpretivism is anti-positivism which argues that reality can be fully understood only through interfering with the phenomena. A vital point to the anti-positivist philosophy is the study of phenomena in their natural environment and hence people aligned with this philosophy stress a subjective approach to studying social phenomena (Scotland, 2012). It also gathers data or information from a sample that can be generalized to a larger population. The social constructivist worldview is generally associated with qualitative research. Constructivist holds the view that human beings interpret, construct meaning and develop knowledge to engage and interact with the world around them (Creswell, 2014). In this study, qualitative data was gathered based on interpretivism, where an interview was used to elicit the views of the University Librarians on issues of funding, policies, strategic planning, and human resources development required for ICTs management in academic libraries.

4.2.3 Transformative Paradigm

Transformative paradigm is a research philosophy that studies issues such as oppression, social injustice, and discrimination to transform the society for the betterment of all. It arises out of the opposition to a post-positivist paradigm which appears to impose well-structured laws and theories without taking into consideration the views and needs of the marginalized in society. Creswell (2014) opines that there is no coherent uniform body of literature describing this worldview, and research that applies the transformative approach links political and social action to inequalities in society.

4.2.4 Pragmatism worldview or paradigm

Pragmatism arises out of the need to find solutions to problems without necessarily following strictly structured laid down rules and procedures. Pragmatists look at actions, situations, and consequences of research rather than an antecedent condition or past experiences (Creswell, 2014). Pragmatism worldview approach to research involves the use of any available method that best suits to answer research questions or problem without getting entangled in the philosophical or methodical debate on which approach is the best or not (Creswell, 2014). The pragmatic worldview gives the researcher the freedom to use or combine research methods, techniques, designs, strategies and procedures to collect data that are both quantitative and qualitative.

Pragmatism is typically associated with mixed-method research in which researchers are granted the opportunity to use different types of methods and techniques to research at the same time in a single study (Creswell, 2014). Based on the research objectives and the type of data the researcher collected to answer the research questions (which require both quantitative and qualitative data), the study adopted pragmatism or pragmatic worldview as the research philosophy. A pragmatism research paradigm as stated above, provides an opportunity for the use of multiple methods,

different types of philosophies and assumptions as well as different forms of data collection instruments and analysis tools in a mixed-methods study (Creswell, 2014). The pragmatic approach to research is based on the purpose and objectives of the study, the type of research question and the type of data collected to address the phenomenon under study (Matthews & Ross, 2010). Johnson and Onwuegbuzie (2004) submit that pragmatism offers a practical and result oriented approaches to research, which action is based on and leads to further action that eliminates doubts and provides avenues for researchers to select methods that allow the use of more than one method that provides better ways of answering research questions.

The principles and values inherent in the pragmatism philosophy allowed this researcher the freedom to use multiple methods together in the collection of data used to answer the research questions. These principles and values also influenced the approach to the study. In this study, both quantitative and qualitative data were collected through the use of questionnaires, interviews, observations and document analysis. The study, therefore, combined several research philosophies such as post-positivist, social-constructivism, transformative which broaden perspectives of looking at the research problem. Pragmatism served as a lens through which this study was carried and influenced the selection of a mixed-method approach as a research approach for the study.

4.3 Research Approach

Creswell (2014:17) defines the research approach as "plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation". Creswell further states that research paradigms or worldviews, research designs and research methods all influence the research approach employed in a particular study. He goes further to identify three basic approaches to research: quantitative, qualitative and mixed-method research approaches and research studies are conducted using one of the three approaches. To

identify ICT adoption challenges in academic libraries and to explore how to manage these ICT facilities effectively and efficiently for sustainability, and to find answers to the research questions, the study combined quantitative and qualitative research approaches. Thus, a mixed-method approach was the research approach used in this study.

4.3.1 Quantitative and Qualitative Research.

Quantitative research is the systematic investigation of quantifiable properties, phenomena, and their relationships by specifying a hypothesis or asking questions and collecting data that can be analysed statistically (Creswell, 2014). Quantitative research involves the use of close-ended questionnaires to collect data such as measurement of attitudes, behaviours and performance, such as rating scales, observation checklists. Christensen, Burke Johnson & Turner, (2015), state that quantitative research aims at 'testing hypotheses', confirming or rejecting theories, and generalizing results from findings. Quantitative research also involves experiments and surveys in control environments in which data are rigidly collected using a closed-ended questionnaire (Christensen, Burke & Turner, 2015).

Characteristics of the quantitative research method include the following; it is numerical, non-descriptive, applies statistics or mathematics and uses numbers, an iterative process whereby evidence is evaluated, results are often presented in tables and graphs, investigates the what, where and when of decision making and conclusions (Neuman, 2014). In using statistical methods, quantitative research often begins with the collection of data based on a theory or hypothesis or experiment followed by the application of descriptive or inferential statistical methods (Pandey &

Pandey, 2015). In this study, the researcher collected data quantitatively in numerical form and evaluated them statistically and findings presented in tables and graphs. The quantitative component of this study drew on the use of a questionnaire that was self-administered to the staff of the libraries involved in the study.

Qualitative research, on the other hand, is a research approach that uses open-ended data collection tools such as interviews, observation and focus group discussions (Patton, 2002). Again, Babbie (2010) postulates that qualitative research involves the subjective assessment of attitudes, opinions, and behavior and it is the researcher's insights, opinions and impressions. This type of research generates results that cannot be subjected to numeric and statistical rigorous analysis. Kothari, (2004) suggests that the techniques used to collect data in qualitative research are focus group interviews, projective techniques and in-depth interviews. The qualitative research approach, therefore, involves face-to-face interaction between the researcher(s) and the population under study. Its prime focus is to understand the attitude and behaviour pattern of the population under study.

Qualitative research uses open-ended questionnaire, observations and interviews guide to collect data or information that is numeric such as words, pictures, images, audio-video tapes, physical artifacts and photos (Christensen, Johnson, & Turner, 2015; Neuman, 2014). These scholars aver that qualitative research focuses on human behaviour and study individuals or groups intensively, and therefore has no interest in generalizing findings of the research, but a proof of reality.

In this study, the researcher visited the various study sites and observed the availability of ICT equipment and recorded them using observational notes by taking notice of physical objects like computers and various types of networks. Thus, the university librarians of the various academic libraries under study were interviewed. In the context of stakeholder analysis, the face-to-face

interviews with the University Librarians of the various academic libraries studied was critical to understanding their perspective of the ICT deployment and management to satisfy their views about the role of ICT policies on effective and sustainable ICT management. Patton (2013) cited in Christensen, Burke & Turner, (2015:365), explicitly captured characteristics of qualitative research as "natural inquiry, non-manipulative and non-controlling; openness to whatever emerges" in the research process. It is a type of research approach that allows the participants to express their emotions about issues being studied.

Data collected were analysed systematically by organizing, integrating and examining patterns and relationships among the various ICT resources available in the libraries. The analysis of data collected through qualitative research followed the path of aggregating them into themes of data and presenting the diversity of ideas gathered during the data collection process. The researcher collected qualitative data through interviews with the University Librarians, which were analysed descriptively using descriptive analysis tools.

Quantitative (positivist) approach to research is premised on scientific, objectivist ontologies and epistemologies, while qualitative (interpretive) approaches to research is premised on humanistic, subjectivist and existential ontologies and epistemologies; and by direct opposite or contrast, mixed-methods approach to research is premised on pragmatism ontologies and epistemologies (Cohen, et al. 2011). None of these two opposing poles to research approach is sacrosanct. It is against this background that it has emerged an approach to combine the two approaches to overcome the inherent weakness of both while taking their advantages to research finding valid. What it means, therefore, is that while quantitative and qualitative approaches to research follow strict laid down rules and procedures for design, methods, and data collection techniques, mixed-methods research is essentially practical oriented, rather than idealistic, and it is results or

outcome-oriented (Guetterman, Fetters & Creswell, 2015). This study collected and used quantitative data from the participants to assess the contribution of the development of library ICT policies to the management, the availability of ICT facilities in academic libraries and staff ICT skills, knowledge and competency levels. Again, in this study, qualitative data was collected to get an in-depth understanding of the issues involved in ICT management in academic libraries.

Issues such as the availability of ICT policies, human resources, funding as well as strategic planning were interrogated through interviews with the university librarians of the institutions studied. In general, both quantitative and qualitative research approaches were combined to collect data in this single study which at the end resulted in a mixed-method research approach.

4.3.2 Mixed Methods Research

Based on the objectives and the philosophical underpinning of the study which is to collect both qualitative and quantitative data to establish managerial processes in the management of ICTs, and the relationship between variables that influence library ICT management, the mixed-method research approach was adopted. Mixed-method research provided the researcher with the chance of combining philosophical and theoretical assumptions inherent in both quantitative and qualitative research approaches. In mixed-method research, qualitative and quantitative data are collected and analysed separately to understand the research problem or it can be done simultaneously (Creswell, 2014). Scholars and researchers of mixed research such as Creswell (2014); Cameron, (2009) and Johnson, Onwuegbuzie & Bazeley, (2003) have associated mixed methods research with a pragmatism worldview.

Leech and Onwuegbuzie (2006) define a mixed-method research approach as "research that involves collecting, analyzing and interpreting quantitative and qualitative data in a single study or in a series of studies that investigate the same underlying phenomenon". Cameron and Miller

(2007) also argue that mixed methods research emerged out of the 'paradigm war' between quantitative and qualitative approaches to research to become the third forces in research methodological movements. Creswell and Plano Clark (2007) cited in Creamer & Tendhar, (2015) maintain that "the central premise of mixed methods research is that the use of quantitative and qualitative approaches, in combination provides a better understanding of research problems than either the approach alone".

A researcher who adopts a mixed-methods approach to research uses ideas, principles, philosophies, assumptions, methods, and strategies distilled from quantitative and qualitative research approaches to carry out research studies (Fetters, Curry & Creswell, 2013). This research approach helps to overcome weaknesses inherent in both quantitative and qualitative research while making use of the advantages of both approaches to give the study validity. The mixed methods research has been applied in several studies in library and information science discipline (Fidel, 2008; Ma, 2012; Ngulube, 2013; & Chu, 2015). Mixed methods research was suitable for this study because of one important characteristic for adopting mixed method research is triangulation, which helps in testing the validity and accuracy of a study (Fidel, 2008).

Triangulation is a process or a view that quantitative and qualitative research are combined to triangulate the data so that the findings are mutually corroborated. The inherent triangulation and iterative in the mixed-method research approach of data collection and analysis helped establish a wider and thorough examination of the research problem under study, Tashakkori & Creswell, (2007) while setting up a database that converted the results to address questions more fully.

The study of more than one organization or more entities comes with challenges due to different characteristics such as culture, environment, communication and business practices of the participants of the research which influenced data to be collected. The mixed-methods, therefore, helps to overcome such challenges by combining both quantitative and qualitative approaches (Okpara and Wynn, 2008). Mixed methods approach of qualitative and quantitative data collection and their analysis offer the robustness that comes from drawing the strength of both methods while minimizing their weaknesses within such a study (Johnson & Onwuegbuzie, 2005).

The strength in the mixed methods approach which is data triangulation, investigator triangulation, theory triangulation and methodology triangulation (Patton, 2002; Yin, 2009) is necessary to conduct this study as it aimed at collecting information from multiple sources and also corroborating the findings from different investigations to be compared to ensure consistency. Denscombe (2008:272) identifies some reasons for the use of mixed-method approaches in modern social science research. These reasons are:

- it increases the accuracy of data;

- it gives a complete picture of the phenomenon under study than the use of a single approach or method;

- it enables the researcher to develop the analysis and build on the original data; and

- it aids sampling (it directs where a questionnaire might be used to screen potential participants for study (Cohen, et al. 2011).

Mixed methods research is premised on the notion that one single method or approach to research cannot fully describe or examine a phenomenon, and the only way to study a population is to look at it holistically from different angles and perspectives in terms of philosophy, methods, design,

data collection, analysis, and interpretation of the results. In this way, an entire picture of the study could be realized.

In investigating the managerial processes and challenges in terms of conception, policies, strategic planning, and implementation processes involved in ICTs adoption and management in Ghanaian academic libraries, quantitative data was required, especially in areas of staff numbers, skills, competencies levels and educational background and qualifications. Again, ICT facilities in terms of their adequacies or otherwise were assessed numerically using surveys, observation checklists, rating scales and closed-ended questionnaires. Quantitative data were collected to examine the effect of funds, skilled manpower and availability of ICT policies on effective and efficient ICTs management (Creswell, 2014; Creswell & Plano Clark, 2011). Qualitative data was collected to provide more explanations to support quantitative analysis conducted from the quantitative data (Creswell, 2014:133; Creswell & Plano Clark, 2011).

4.4 Survey Research Design

A research design is a plan connecting the conceptual research problem to the pertinent empirical research; thus, a logical sequence that connects empirical data to a researcher's initial research questions and its conclusions (Creswell, 2014). The study used concurrent mixed method design which allowed the researcher to combine both quantitative and qualitative data to provide a detailed analysis of the research problem and to find answers to the research questions (Christensen, Johnson & Turner, 2015; Creswell, 2014).

The study employed a survey as a research design to collect both qualitative and quantitative data across the various university libraries studied. The survey involves any measurement procedures that ask questions to elicit answers from the participants of the study. It provides a quantitative or numeric description of trends, attitudes or opinions of a population by studying a sample of the

population (Creswell, 2014). Christensen, Johnson, and Turner (2015:334) opine that a survey research method involves "individuals filling out a questionnaire or being interviewed about their attitudes, activities, opinions and beliefs". Neuman, (2014:49) further defines survey research as a research design that uses a written questionnaire or interview to collect data on the participants in the research "backgrounds, behaviors, beliefs, or attitudes", and it usually involves many populations where the sample is selected.

The survey was used to collect data from the sample population of the study with a questionnaire and interviews as the two instruments of data collection even though observation was employed alongside. The questionnaire was used to collect quantitative data from the entire library staff except for the university libraries who were engaged in face to face interviews for the qualitative data. Surveys are conducted to answer the question about "how many" and "how much" (Christensen, et al, 2015), and answers to this type of question are always expressed in numerical terms. The current study surveyed ICT facilities in academic libraries in numerical terms such as adequacy of computers and other ICT facilities available for students and staff to use and operate efficiently as well as easy access to information for academic work.

A survey produces information that is numerical and statistical and is quantitative bias Neuman, (2014:317), and many questions are asked simultaneously where variables are measured at the same time which allows the testing of multiple hypotheses in a single study. This study collected data to measure staff skills and competencies, funding, policies, planning and their effects on the management of ICT facilities in academic libraries using survey research. Surveys are useful in describing the characteristics of a large population and can be administered from remote locations using email or telephone. The survey design was, therefore, the most appropriate for this study as

it helps in gathering both quantitative and qualitative information because it enabled the researcher to use both questionnaire and interview to collect data, and it is relatively inexpensive, especially self-administered surveys, and it is regarded as one of the most efficient tools for social science research.

Questionnaires or interviews used in the survey are usually standardized to present each research respondent with the stimulus, thus directions (Christensen, et al, 2015; Neuman, 2014:49; Creswell, 2014; Cohen, et al, 2011). In this study, the survey helped in standardizing the research questions and provided standardized responses from the participants of the study. The selected participants were, however, considered as one unit for analysis, and therefore covered the entire population which includes library staff of the university libraries.

4.5 Population and Sampling

Matthews and Ross (2010) refer to the study population "as the total number of cases that can be included as research subjects" in a study. The population for this study were the staff of the Ten (10) public universities libraries in Ghana. They include the staff of the following universities libraries at the University of Ghana, Library (UG); Kwame Nkrumah University of Science & Technology (KNUST), Library; University of Cape Coast (UCC), Library; University of Education, Winneba (UEW), Library; University for Development Studies (UDS), Library; University of Mines & Technology (UMAT), Library; University of Professional Studies, Accra, Library; Ghana Institute of Management and Public Administration, (GIMPA), Library; the University of Health and Allied Sciences(UHAS), Library; and the University of Energy and Natural Resources, Library.

Table 4.0 below shows public universities libraries in Ghana and their staff which constitute the population for the study.

Table 4.0: Public Universities Libraries in Ghana and their Staff

S/N	UNIVERSITY LIBRARY	SM	SS	JS	TOTAL
1	University of Ghana, Library	23	51	34	108
2	Kwame Nkrumah University of Science & Technology, Library	18	56	33	107
3	University of Cape Coast, Library	16	62	56	134
4	University of Education, Winneba, Library	7	34	25	66
5	University for Development Studies, Library	12	29	17	58
6	University of Mines & Technology, Library	4	7	2	13
7	University of Professional Studies, Accra, Library	3	10	4	17
8	Ghana Institute of Management and Public Administration, Library	2	10	3	15
9	University of Health and Allied Sciences, Library	3	5	1	09
10	University of Energy and Natural Resources, Library	1	3	-	04
TOTAL		89	267	215	**531**

Source: Field Survey 2018

4.5.1 Selection of Universities and their Libraries for the study

The researcher selected library staff both professionals and paraprofessionals from five public university libraries in Ghana for study based on certain parameters. These five university libraries were purposively selected based largely on the following parameters or criteria enumerated below:

(a) the university library must have been in existence for more than 15 years and above;

(b) the university library is being managed by professionally qualified librarians;

(c) the university library is fully funded from the public purse and

(d) the university library has adopted and implement ICT application at the varying and mature stage of its operation for over ten (10) years.

However, the following five (5) public universities libraries were not included in the study because they did not meet the above-stated parameters or criteria. They are Ghana Institute of Management and Public Administration, Library which does not receive government subvention while University of Health and Allied Science, Library; University of Energy and Natural Resources, Library; University of Professional Studies, Library and University of Mines and Technology, Library. These universities were established as a full-fledged university after 2011 and therefore their ICT implementation may still be ongoing and not yet mature for an investigations.

Within the selected university libraries, it was found that the staff could be placed into these groups:

(i)   Senior members (SM) in the academic libraries of the selected universities. They include the designated the University Librarians i.e. the overall in charge of the entire university library service; the Chartered Librarians who are library staff with Master's degrees or Doctoral degrees in library and information science and other related courses and who work permanently in the libraries in positions such as the University Librarians, Deputy University Librarians, Senior Assistant Librarians, Assistant Librarians and Junior Assistant Librarian.

(ii)   Senior staff (SS) of the selected universities libraries, who are typically library staff with Bachelor's or Diploma degrees in librarianship or library information science otherwise known as paraprofessionals.

(iii)   Junior staff (JS) in the selected university libraries, who are largely library with senior high school qualifications/certificates but without a qualification in LIS.

The study was based on the complete census of the entire library staff complement within the categories outlined above, in the five selected university libraries covered in the study. This census approach ensured that a detailed and comprehensive coverage could be achieved in fulfilling the overall goal of the study. Altogether the entire library staff complement of the five universities was 473 at the time of the study, which represents 89% of the entire 531 population of library staff in all Ghanaian public universities as depicted in Table 4.0.

Table 4.1 below gives the breakdown of the sample population of 473 library staff in the selected five university libraries for the study.

Table 4.1: Breakdown of the Sample Population of the Selected University Libraries.

S/N	UNIVERSITY LIBRARY	SM	SS	JS	Total
1	University of Ghana, Library	23	51	34	108
2	Kwame Nkrumah University of Science & Technology, Library	18	56	33	107
3	University of Cape Coast, Library	16	62	56	134
4	University of Education, Winneba, Library	7	34	25	66
5	University for Development Studies, Library	12	29	17	58
Total		76	232	165	**473**

Source: Field Survey 2018

4.5.2 Justifications for selecting the study population

The University Librarians were purposefully targeted as they are in a better position to provide information about the development policies, strategic plans and guidelines for ICTs adoption and management. Senior members in the libraries were selected because they oversee governance, administration and day-to-day management of these libraries. They are ultimately responsible for the development of the libraries, and therefore take critical decisions on the introduction of ICTs and other innovations to improve library operations and service delivery. IT personnel in the academic libraries were also selected for this study because they are responsible for the installation, upgrading, maintenance and day-to-day management of the ICT facilities to ensure their sustainability. The views of the senior staff and junior staff in the libraries were also considered as very important in assessing the challenges they face in their daily operations in using the ICT facilities. The population of the five sampled or selected public universities in Ghana were used for the study.

4.6 Data Collection Instruments

The study was carried out using primary and secondary data collection techniques. The primary data collection techniques employed included the use of a questionnaire. The secondary sources of data/information were the review of relevant literature, policies, procedures, manuals reports, statutes, library guides, library strategic plans and so forth were consulted. According to Neuman (2003, p. 8), "data are the empirical evidence or information that one gathers carefully according to rules or procedures". In supporting Neuman's view, Creswell and Plano Clark (2011, p.171), indicate that "the basic idea of data collection in any research study is to gather information to address the research questions". Based on (In synchrony with) the objectives of the study and the research method adopted, which required that both qualitative and quantitative data, several data

collection instruments were used. They included questionnaires, interviews, observation and document analysis. A cross-sectional survey allows the use of a questionnaire to collect quantitative data and observation, document analysis and interview to collect qualitative data (Matthews & Ross, 2010).

Quantitative data were collected through self-administered questionnaires that provided an overall statistical picture on ICTs diffusion in the academic libraries in Ghana from the respondents. Neuman (2003) opines that questionnaires are very effective for data collection, and response rates are very high when the target population is well-educated and has an interest in the topic under study. The questionnaire was administered to all the staff of the libraries in the five (5) selected universities in Ghana and followed up with an interview with each of the five university librarians.

Qualitative data were also collected through semi-structured face-to-face interviews which allowed an in-depth investigation into the views and experiences of the university librarians with regards to its management. The interview was appropriate to this category of respondents who provided detailed information for the clarification to support the surveyed data and views collected.

In addition to the questionnaire and the interview, observational method and document analysis were also employed to gather data. The researcher visited the selected universities libraries to observe the status of ICT facilities available in academic libraries studied. Observation is the collection of data that does not rely on what the respondents say or think, and it helps the researcher draw on the direct evidence of the events first hand (Denscombe, 2007: 206). Document analysis involves critically analyzing the contents of documentary materials such as books, journal articles, newspapers, and magazines. Documents such as library policies, strategic plans, library manuals

and brochures, library guides, university statutes, official reports and online databases were examined to provide evidential data to support, clarify, verify and validate data gathered from other sources.

Table 4.2: Research Matrix: Relationship between Research Objectives, Research Questions and Possible Sources of Data

Research Objective	Research Question	Data Collection Tools/ Sources of Information
To review and explore the status and level of ICT diffusion in Academic Libraries in Ghana.	What types of ICT infrastructure are available in Academic Libraries in Ghana? What kinds of services Academic do Libraries in Ghana provide to their communities through the use of ICTs?	-Observation -Interview -Document Analysis -Questionnaire
To audit the procedures, processes, and factors that influence ICT adoption and implementation in Academic Libraries in Ghana.	What factors influence ICT adoption and use in Ghanaian Academic Libraries? How has the use of ICTs influenced operations and service delivery of Academic Libraries?	-Literature Review -Interview -Questionnaire
To establish institutional policies, strategies and human resources that are in place for the adoption, implementation, and management of ICTs in Academic Libraries in Ghana.	What are the procedures and the processes involved in the adoption and implementation of ICTs in Academic Libraries in Ghana? What plans, and strategies are in place for managing ICTs in Academic Libraries in Ghana?	-Content Analysis -Interviews -Questionnaire -Literature Review
To investigate factors that hinder the adoption and management of ICTs in Ghanaian Academic Libraries.	What are the problems encountered by the Academic Libraries in the application of ICTs? What factors hinder effective and efficient ICT adoption and management in Academic Libraries in Ghana?	-Interviews -Questionnaire -Literature Review

4.7 Data Collection Methods

Data collection instruments are techniques for physically or remotely obtaining data to be analysed in a research study. Christensen, Johnson, and Turner (2015:70) identify six methods of data collection instruments as follows: test, questionnaire, interviews, focus groups, observation, and existing or secondary data (i.e. literature or documents review). In this study, the researcher employed the following data collection methods, questionnaires, interviews, observations and document analysis.

4.7.1 Questionnaire Methods

A questionnaire for this study (Appendix: A) was developed based on the research objectives and theoretical framework. The questions were mostly closed-ended with few open-ended ones and were prepared to gather data from the entire study population on the following areas or variables such as biodata and demographic information of the respondents, availability of ICT facilities, staff strength and competencies, availability of ICT policies and strategic plans, adequacy of library ICT budget and their impact on the management of ICT facilities to ensure their sustainability. The research participants were allowed to select from either multiple of a pre-existing set of a rigid dichotomy answer, such as YES or NO, or a multiple-choice with an option for ranking their responses in a scaled response using a Likert scale. The Likert scale is considered as one of the most commonly used ranking scales in social research (Park et al., 2014). Likert scale refers to questionnaire items that usually use a 5-point response scale (Christensen, Johnson, and Turner, 2015). The questionnaire was analysed with Statistical Package for the Social Sciences (SPSS) software.

4.7.2 Interview Methods

The study used a structured interview guide in which a list of questions was prepared and sent to the interviewees in advance (interview schedule). The interview schedule was used because it allowed the University Librarians ample time to go through the questions before the interview was conducted. It also enabled the researcher to conduct a well-organised interview and helped to avoid the repetition of questions. The interviews were tape-recorded, while notes were taken throughout the interviewing process. The notes were compared to what was tape-recorded and this helped to guard against possible omissions of parts of the interview process. The interview was conducted on the University Librarians on issues about ICT policies, strategic plans and procedures, ICT implementation strategies, maintenance, availability of skilled staff, training and development of staff and budgetary allocations for ICT development and management.

4.7.2.1 Pre-testing the Questionnaire and the Interview Methods

In this study, the questionnaire and the structured interview schedule was pre-tested on ten (10) library staff at Kumasi Technical University, which is not part of the selected institutions for the study. Kumasi Technical University is a public university that has facilities and conditions similar to the study institutions. Pre-testing data collection instruments, in this case, the questionnaire and interview schedule were done to ensure the process of gathering accurate and valid data for a research study. It involves processes needed to critically examine the understanding of all the questions and whether they would be comprehensible to the research participants (Kumar, 2004). It also entails testing the respondent understanding of the questions with a few samples of the population before carrying out the interview or administering the questionnaire to the entire research population. As suggested by Kumar (2004), 'the pre-test should be carried out under actual field conditions on a group of people similar to the study population'.

According to Hilton, (2015), the purpose of the pre-test was not to collect the actual data for the study, but it was to identify problems that respondents may encounter in interpreting the questions to fine-tune them. Again, pre-testing helped in identifying problems associated with the wording of the questions, appropriateness of the meaning they communicate, and how different respondents interpret the questions (Kumar, 2004), to re-examine the entire questions to eliminate any form of ambiguity.

4.7.2.2 Administration of the Questionnaire

The researcher personally administered the questionnaire for two months from September 2018 to November 2018. The researcher visited all the five (5) study sites to administer the questionnaire from KNUST in Kumasi in the Ashanti Region of Ghana to as far as the Northern Region of Ghana where UDS is located. Then UG in Greater Accra Region, Ghana, UCC in Cape Coast, Central Region of and UEW which has four satellite campuses spread across Ghana from Central Region to Ashanti Region. In all, the researcher visited five (5) regions the academic libraries/institutions studies are located. The researcher was assisted by some library staff of the studied institutions in administering and collecting the answered questionnaires. Three round of questionnaire that was administered for the various categories or levels of library staff.

4.7.2.3 Conducting Interviews with University Librarians

The study adopted face to face interviews to collect qualitative data from the five University Librarians. The interview aimed at establishing the extent of ICT diffusion, areas of the university libraries operations supported by ICTs, ICT-based resources, processes and procedures for ICTs adoption, availability of policies and strategic plans for library ICT management. others include availability of funds to support ICTs adoption and management, and

strategies for successful academic library ICTs management. A soft copy of the interview guide in the form of fill-in questions was sent to each participant in advance via email preceding the date of the scheduled interview. Each of the interviews, which lasted for a minimum of forty-five minutes, were semi-structured and conducted in cordial and conversational manner. During the interview the researcher verbally asked other questions based on the original schedule of questions where some clarifications were needed. The verbal conversational part of the interviews was audio-taped, in addition to notes-taking, and later transcribed for analysis.

4.7.2.4. Conducting observations

Observation is described as one of the oldest and the commonest data gathering method in both scientific and social science research. It is a systematic way of watching a phenomenon as it interacts and behaves in its natural environment (Kawulich, 2005). According to Kumar (2004), it is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place. Cohen, Manion, and Morrison (2011) observe that observation as a data collection tool offers a researcher the chance to gather 'live' data from naturally occurring social situations. There are two types of observation: participant observation and non-participant observation. In participant observation, the researcher takes part or participate in the activities of the population being observed in the same way as the group members with or without their knowledge that they are being studied, while in non-participant observation the researcher does not take part in the activities of the population being studied, but only observes, watches and listens to the activities of the population to conclude from his observation (Kumar, 2014).

Observation is a cause-effect relationship that allows the researcher to study events in its natural or original form. In using observation as a data collection tool, a researcher seeks to ascertain and

evaluate what a study population or sample (people) think and do by watching them in action as they express themselves naturally in various situations and activities. It is the most direct means of studying people when one is interested in their overt behaviour (Pandey & Pandey, 2015).

In questionnaires and interviews, people may write an answer as they think. They do but this is often different from what they do as in the case of observation. Unlike questionnaire, there are no restrictions in observation, so observation is a more natural way of gathering data. Artificiality and formality of questionnaires and interviews are replaced by reality and informality in observation. Data obtained through observation are more natural than the data collected by any other method (Pandey & Pandey, 2015; Christensen, Johnson & Turner, 2015).

However, observation brings legal and ethical issues when the population is not aware that they are being observed. It is, therefore, significant for the researcher to consider these ethical and legal issues before using the observation instrument. It is also argued that the presence of the observer might influence behaviour in one way or another which may affect the observed situation negatively or positively. The five research sites were visited by the researcher using observation data gathering techniques. This was a direct means of understanding how library staff operate and interact with ICT facilities available in academic libraries. Again, it provided the researcher with the opportunity to assess the availability and adequacy of ICT facilities in the libraries studied, which has an impact on the information service delivery.

Robson (2002) argues that what people say differs from what they practice, and observation provides the researcher with an opportunity to see what happens on the ground which he refers to as the 'the reality check'.

Observation in this study enabled the researcher to gather from the real situation to confirm or debunk the information gathered through the questionnaire and interviews. The researcher was granted permission from the University librarians to carry out the observation. The researcher took notes and recorded events during the observations to increase the accuracy of the data. Audio-visual equipment was used to record observations as accurately as possible. Using audiovisual equipment is useful for providing an overall view of some behaviour and it permits the researcher to analyse the behaviour more closely.

4.7.2.5 Documentary Analysis

Bowen (2009) describes 'documentary analysis as a systematic procedure for reviewing or evaluating documents both print and electronic material'. It is a process of examining, interpreting and analyzing existing data in documents, be it private or public to gather enough information for research work. Documents for research studies may include statutes, policies, minutes of meetings, manuals, annual reports, books and brochures, maps, journals, newspapers, government publications, an annuals budgets, statistical reports, letters, diaries, memoranda among others. These documents contain information in the form of text and images which have been gathered and documented without the researcher's involvement (Bowen, 2009).

The study examined, evaluated and analysed documents which include library policies and manuals, ICT management processes, strategic plans, library ICT policies and procedure manuals, an annual budget for ICTs, ICT maintenance schedule manuals, flyers, brochures, library guides, policy documents on electronic resources and institutional repositories. These documents were used to obtain information on the history of ICT adoption and deployment in Ghanaian academic libraries. They again provided a wealth of information about how ICTs are being managed in the

institutions studied. The document analysis helped in collecting qualitative data and also aided in data triangulation process providing validity in confirming and supporting quantitative data.

4.8 Data Analysis

One major component of every research method is data analysis and reporting. Data collected through the various instruments must be examined and analysed for themes, patterns and meanings, to be able to make sense and interpretations from the volumes of information collected (Christensen, Johnson, and Turner, 2015:376). Data analysis and organisation involves working with data to describe, discuss, interpret, evaluate and explain the data in terms of the research questions or hypothesis of the research study (Matthews & Ross, 2010). It is a process through which the researcher examines and extracts meaning from the collected data to answer the research questions.

As indicated in the research design, this study was carried out by collecting and analyzing both quantitative and qualitative data concurrently. The data presentation and analysis included editing, coding, data entry, cleaning and modification (Singleton, Straits, & Straits, 1993). The study adopted multiple analytical techniques and tools for analyzing quantitative data. Data obtained from observations, documents analysis and interviews were analysed and interpreted with the use of the thematic content analysis. Nvivo software version 10 was used in analyzing the qualitative data, and it involves transcribing the transcripts from the interview, reading and highlighting the quotes from respondents and coding them. The Nvivo software allowed recalling the ideas for coding and grouping them into thematic areas (themes) and concepts out of the gathered data.

Both descriptive together with a detailed analysis which includes One sample mean t-test, Chi-square goodness of fit test and Binomial test was employed to analyse various questions from the

administered to achieve the research objectives involving the effects of ICT policies, adequate funding, skills and competency of personnel on sustainable ICT management.

Through the utilization of the aforementioned statistical tools, data from the survey questionnaire were quantitatively analyzed with the help of the Statistical Package for Social Sciences (SPSS) software version 22. Data and frequencies generated from the questionnaire were presented in the form of tables, charts, and graphs. Brief theoretical details of the One sample mean t-test, Chi-square goodness of fit test and Binomial test are given as follows.

4.8.1 One-Sample T-Test

The one-sample t-test is used to compare a sample mean to a specific mean also known as the hypothesized mean. A researcher can use a one-sample t-test to compare the mean of one sample with a hypothesized population mean to see if the sample is significantly different. One sample t-test is used for instance to compare the sample mean and the sample midpoint of the test variable and also to determine whether a sample of observation could have been generated by a process with a specific mean.

This type of t-test assumes that the dependent variable is normally distributed within the population and data is independent. For single-sample t-test, the hypothesis is set as $H_o: U = U_O$ and $H_A: U \neq U_O$ respectively. With H_O representing the null hypothesis indicating there is no significant difference between the means and H_A representing the alternative hypothesis indicating there is a significant difference between the means and Uo representing the hypothesized mean. A statistical test of the mean is done to decide whether the population considered a particular variable to be important or not.

For each variable or item, the null hypothesis is that a particular variable was not significant (Ho: U=Uo) indicating there is no significant difference between the means. The U_O is the critical rating above which the variable is considered important.

The test statistic based on the one-sample test is given by the relation;

$$t = \frac{\bar{X} - \mu}{\frac{\hat{\sigma}}{\sqrt{n}}}$$

(1)

where n is the sample size of the study, $\hat{\sigma}$ is the estimated population standard deviation of the mean, and μ is the population mean or the hypothesized value and $\bar{X}$ is the sample mean of the scores and can be expressed as;

$$\bar{X} = \frac{\sum_{i=1}^{n} x_i}{n}$$

(2)

Large values of the test statistics lead to the rejection of the null hypothesis only if the test statistic is greater than the critical value obtained from the t-test table and vice versa.

4.8.2 Chi-Square Goodness of Fit Test

The Chi-square goodness of fit test begins by hypothesizing that the distribution of a variable behaves in a particular manner. Suppose that a variable has a frequency distribution with k categories into which the data has been grouped, the frequencies of occurrences of the variable for each category of the variable are known to be the observed values. How the chi-square goodness of fit works is to determine how many cases there would be in each category if the sample data were distributed exactly to the claim. These are therefore termed as the expected number of cases

for each category. The sum of the expected number of cases is always made to be equal to the sum of the observed number of cases. The null hypothesis is that the observed number of cases in each category is exactly equal to the expected number of cases in each category while the alternative hypothesis is that the observed and expected number of cases differs sufficiently.

Let O_i be be the observed number of cases in category i and E_i be the expected number of cases in each category, for each of the k categories $i = 1,2,3, ... , k$ into which the data has been grouped. The hypotheses are statistically formulated as;

$$H_o: O_i = E_i \qquad\qquad (3a)$$

$$H_o: O_i \neq E_i \qquad\qquad (3b)$$

and the test statistic is also given as;

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$$

(4)

where the summation proceeds across all k categories and there are $k - 1$ degrees of freedom. Large values of this statistic lead researcher to reject the null hypothesis. Smaller values, on the other hand, mean the null hypothesis cannot be rejected.

4.8.3. Binomial Test Approach

Different from the other statistical methods employed in the study (one-sample t-test and Chi-square goodness of fit test), the binomial test approach requires that any even number be classified into one of two categories. For instance, the significance of a given path included in a model can be classified as either being supported or not supported by the data. Thus, the first step in

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implementing the binomial test is to determine the criterion that will be used to judge whether a given path is supported by the data.

After the criterion of whether a given path is supported by the data is determined, the next step in the binomial approach requires testing the actual number of paths supported by the data. The probability of obtaining at least the number of paths the researcher found supported by the data is computed using the binomial test. If according to the binomial test, the probability of finding the given number of supported paths is less than the alpha level, then it can be concluded that the data are supportive of the variable within the model. To determine the probability value of the binomial test, the following equation is used:

$$p(x) = \frac{x!}{x!\,(n-x)!}(0.5)^{x!}(0.5)^{(n-x)!}$$

(5)

where p is equal to the probability of obtaining the x paths supported by the data out of n number of paths, x is equal to series of numbers ranging in the value from the number of paths supported by the data to the total number of paths represented by a model inclusive and n is equal to the number of paths in the model. The binomial test provides a conservative and robust probability estimate of obtaining the number of paths identified as being supported by the data. It is important to note that the binomial test involves the number of paths supported by the data; therefore, it does not matter whether the variables are observed or not.

4.9 Validity and Reliability

The quality of any research is determined by the adequacy of the research design and quality of the measuring instrument. The reliability of a measuring instrument is a measurement of the

consistency of the results any time the instrument is applied to the same person or phenomena (Salkind, 2010). To ensure reliability, the study pre-tested the data collection instrument after which it was reviewed. Furthermore, a statistical test of reliability was undertaken using the Cronbach Alpha statistical approach (Streiner & Norman, 1989), to determine whether each of the variables met the criteria for analysis, and those that did not meet the criteria were excluded (Yin, 2009). According to Chioncel et al, (2003) reliability test in qualitative research refers primarily to the data the methods used, whiles validity refers mainly to the interpretation is given to the results of the study. Validity and reliability in mixed-method research lies in its ability to ensure accuracy and its replication (Bailey, 2008).

In this study, the ability and the capacity of the respondents and the participants of both the questionnaire survey and interviews were not in doubt, which invariably provided the reliability and validity of the information gathered. This was due to the fact the participants in the interviews were the University librarians in the institutions studied and the questionnaire respondents were permanent library staff with long-standing experiences with ICT usage and management.

What this therefore means is that the information gathered from the respondents might not be different wherever and whenever they are collected in similar or analogous institutions (Chioncel et at, 2003). Further, the validity of the data collection instruments was ensured through the rigorous review of the literature which adequately informed the definitions and meanings of issues, terminologies and concepts in the study of ICTs management in academic libraries. The researcher ensured that the meanings were communicated to the participants of study of the exact definition of ICTs adoption and management in the study. Again, the experts in the field and the supervisor, of the study, assessed the appropriateness instruments whether it covered comprehensively the content of the subject under study. Finally, the validity of the study was

achieved through almost the same views expressed by respondents and participants of the study elicited through the questionnaire survey and the interviews.

4.10 Ethical Considerations

The Economic and Social Research Council (2009 cited in Matthews & Ross, 2010) states that research ethics refers to the moral principles guiding research, from its inception through to completion and publication of results and beyond. For example, the curation of data and physical samples after the research has been published. According to Aina (2002), lack of protection of the rights of participants in research; fabrication and falsification of data, copyright violation and plagiarism and double publishing and submissions are some of the unethical issues in research. In this study, the researcher sought the consent and permission of all the relevant institutions and participants using formal introductory letters to the questionnaire and the structured interview explaining the aim and the importance of the study as well as that of the participants. The respondents were also assured of the confidentiality of the information they would provide since it was not going to be used for any other purpose but the research only. All materials that were used for the study were appropriately acknowledged. Finally, the research codes of conduct for research within the University of South Africa for Masters and Doctoral Research were strictly followed.

4.11 Summary of Chapter four

This chapter looked at the methodology and methods that guided the entire enquiry into managing ICT facilities and systems in academic libraries in Ghana. Generally, the chapter discussed the research philosophy or worldview and the research design and approach which involved, the data collection instruments and tools such as, questionnaires, observations, content analysis and interviews, methods of data analysis, measurement of reliability and validity. It also discussed the

mixed methods: a combination of quantitative and qualitative research approaches with the sole aim of arriving at a comprehensive response to unravel an unexpected development to elucidate idiosyncratic situations in the study.

CHAPTER FIVE

PRESENTATION, ANALYSIS AND FINDINGS OF THE QUANTITATIVE DATA

5.1 Introduction

The previous chapter discussed the methodology and methods that guided the study. This chapter presents the data findings from the analysed data gathered through the two main data collection instruments used: questionnaire and interview, and their analysis. The findings are presented in frequency tables, chi-square test of independence, binomial test and one sample t-test of means to complement the interpretation of the data collected. Analysis in this section of the research work is based on the set of objectives that focus on managing information and communication technologies (ICTs) in academic libraries in selected public universities in Ghana.

The purpose of this study was therefore to investigate managerial processes and challenges involved in the adoption and management of ICT facilities in Ghanaian academic libraries. The study has the following as its research objectives:

- To review and explore the status and level of ICT diffusion in Academic Libraries in Ghana;

- To audit the procedures, processes and factors that influence ICT adoption and implementation in Academic Libraries in Ghana;

- To establish the institutional policies, strategies and human resource that are in place and available for the adoption, implementation and management of ICTs in Academic Libraries in Ghana;

- To investigate factors that hinder the adoption and management of ICTs in Academic Libraries in Ghana;

- To suggest solutions for adoption and managing ICTs in Academic Libraries in Ghana.

The above objectives serve as a guide for the formulation of research questions and the collection of data to answer those questions. The study adopted mixed method data collection approach by collecting and making use of both quantitative and qualitative data. The analysis of the quantitative data is presented in this section as the empirical findings of the study for further discussion.

5.2 Response Rate

Summarily, Table 5.0 together with Figure 5.0 depict that 313 out of 473 sampled respondents representing 66.2% responded to the administered questionnaires. Some 155 targeted library staff, representing 32.7% of the total sample were not able to respond to the questionnaire because the questionnaires were not delivered. Among the sample of respondents randomly selected from the study subjects (university libraries), 1.1% representing 5 respondents were interviewed. Analytically, it can be deduced that, the response rate regarding complete questionnaires is quite adequate since more than half of the total sample provided gave complete and accurate responses to the administered questionnaires. This commendable response rate from the participants can be attributed to the technique used by the researcher in collecting data. The researcher therefore considered only the received completed questionnaires for analysis which as stated already accounted for 66.2% response rate which was ideal for the study analysis to progress.

Table 5.0: Rate of responses from respondents

Response	Frequency	Percentage
Number responded (valid)	313	66.2
Number not responded	155	32.7

Number interviewed	5	1.1
Total sample	**473**	**100.0**
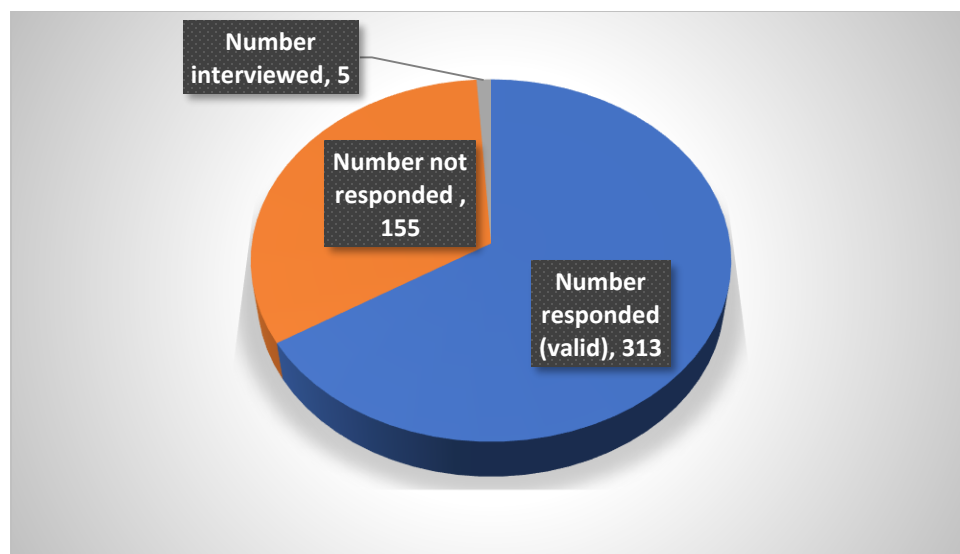
Figure 5.0 Rate of responses from respondents

5.3 Demographic Representation of Respondents

The study used variables such as gender, age, and educational level, an affiliation of university library, academic qualification of respondents, the position of respondents and years of working experience in the library profession in the questionnaire in order to know the demographic and professional profile of the respondents. Creating a profile of the respondents will help better understand and address the issues with respect to managing information and communication technologies (ICTs) in academic libraries in selected public universities in Ghana. The demographic composition of the respondents showed the following picture:

5.3.1 Gender of Respondents

The gender distribution of the respondents involved in the research work is presented in this section. Table 5.1, illustrates the results in the study with respect to gender. It can be deduced from the Table that, one-hundred and seventy-one (171) representing the majority (54.6%) of the respondents were male whilst one hundred and forty-two (142) representing 45.4% were female. The result from the analysis with respect to the gender distribution of respondents gives a general impression that male is normally employed as library staff in various public university libraries in Ghana than female.

Table 5.1: Gender of Respondents

Gender	Frequency	Percentage
Male	171	54.6
Female	142	45.4
Total	313	100.

Source: Fieldwork, 2018
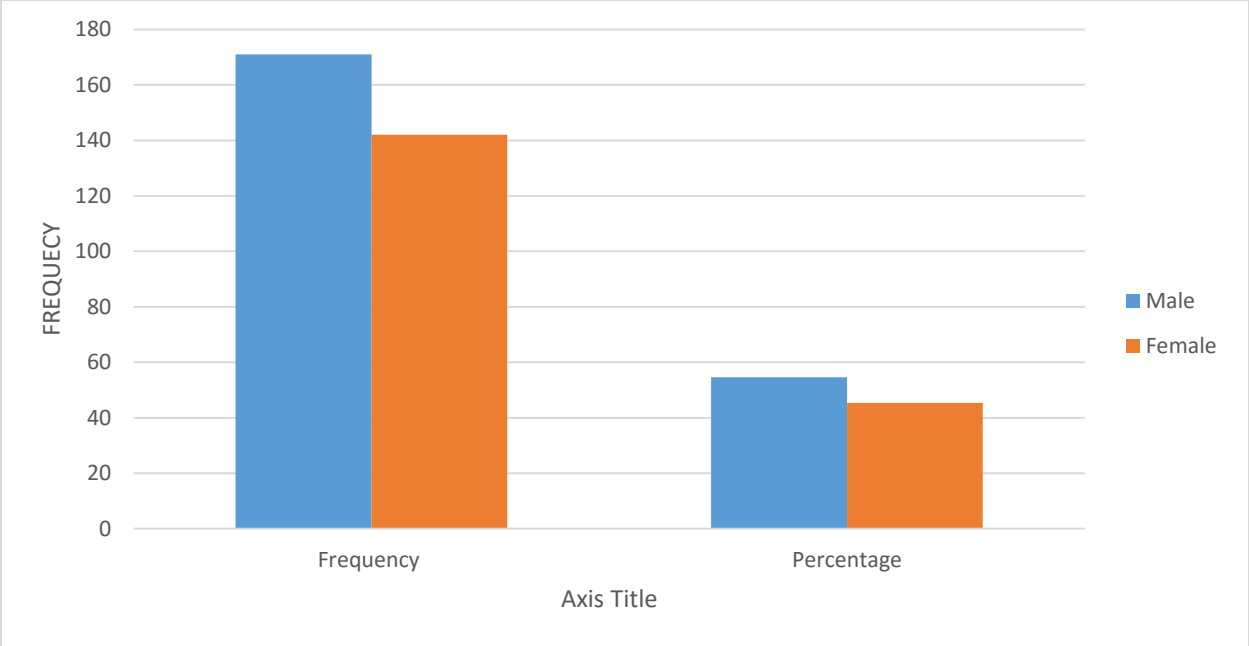
Figure 5.1: Gender Distribution of Respondents

5.3.2 Age Distribution of Respondents

The age of respondents on the other hand is presented in this section. Table 5.2, depicts the results on the distribution of respondents based on their age. The results from the Table point out that, fifty-seven (57) respondents representing 18.2% of the total number of respondents involved in the research were within the age group of 15-30 years while one hundred and eighty-five (185) respondents representing the majority (59.1%) were from 31 to 45 years. Seventy (70) respondents also representing 22.4% were found to be in the age group 46-60 years while only one (1) respondent representing the minority (0.3%) was reported to be above 60. This analysis concerning the age group of respondents generally gives the impression that most of the staff working in the various public university libraries are relatively young, i.e. within the age group of 15-45 years.

5.3.3 Distribution of Respondents with Respect to University Affiliation

University affiliation of respective respondents involved in the study were further analysed. Among the five main public universities selected for the study, eighty-one (81) respondents representing 25.9% were staff of the University of Ghana library, followed by seventy-five (75) respondents representing 24.0% were staff at the University of Cape Coast, sixty-three (63) respondents representing 20.1% of the sample used in the study were noted to be working at University of Education. Exactly forty (40) respondents were from the University for Development Studies in the Northern part of Ghana representing 12.8% of participants in the survey of the study whereas the remaining fifty-four (54) representing 17.3% of the sample were affiliated to the Kwame Nkrumah University of Science and Technology.

It can therefore be deduced from the aforementioned statistics that the majority of the library staff used in the study were from the University of Ghana. This may be because the University of Ghana is noted to have the largest library among or tertiary institutions in Ghana. And it is also the premier University in Ghana and therefore has the resources to recruit the required number of personnel.

Table 5.2: Age Distribution of Respondents

Age	Frequency	Percentage
15-30 years	57	18.2
31-45 years	185	59.1
46-60 years	70	22.4
60 years and above	1	0.3
Total	313	100.0

Source: Field work, 2018
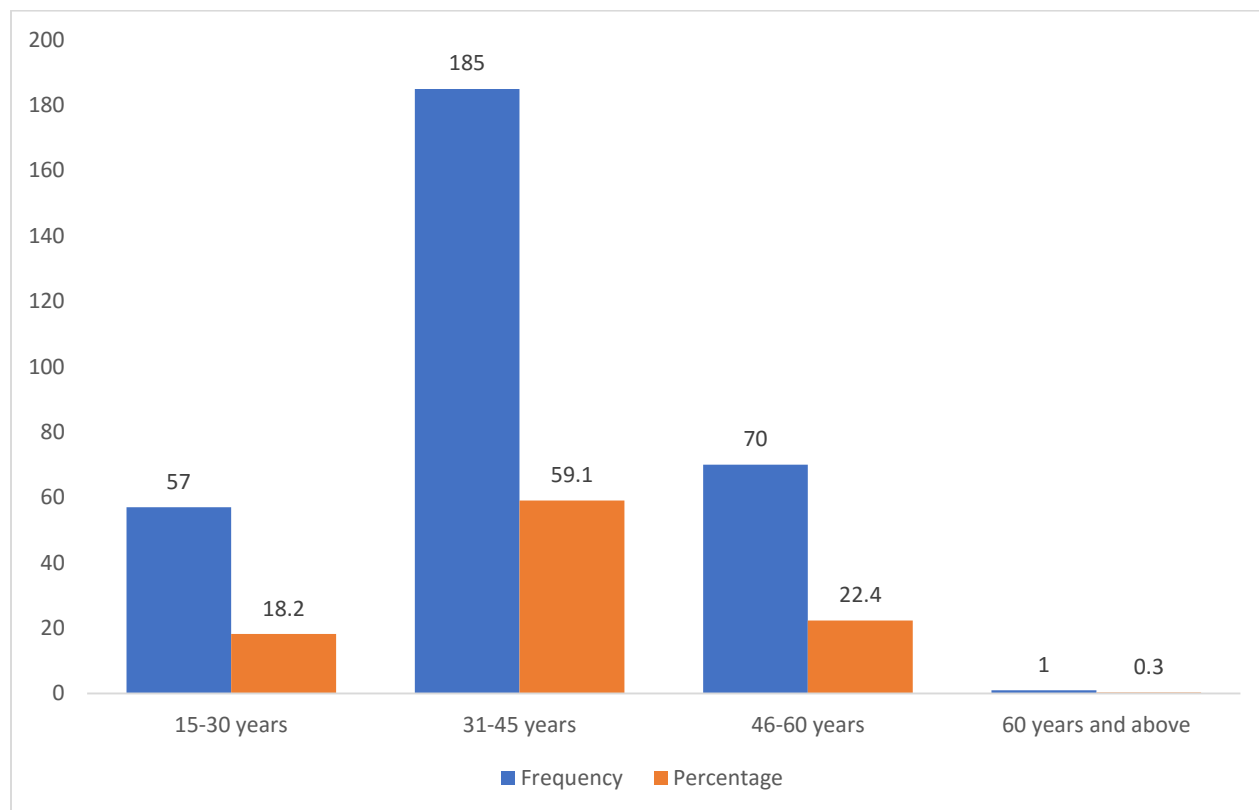
Figure 5.2: Age Distribution of Respondents

Table 5.3: Distribution of Respondents in terms of University Affiliation

University affiliation	Frequency	Percentage
University of Ghana	81	25.9
University of Cape Coast	75	24.0
University of Education Winneba	63	20.1
University for Development studies	40	12.8

Kwame Nkrumah University of Science and Technology	54	17.3
Total	313	100.0

Source: Field work, 2018
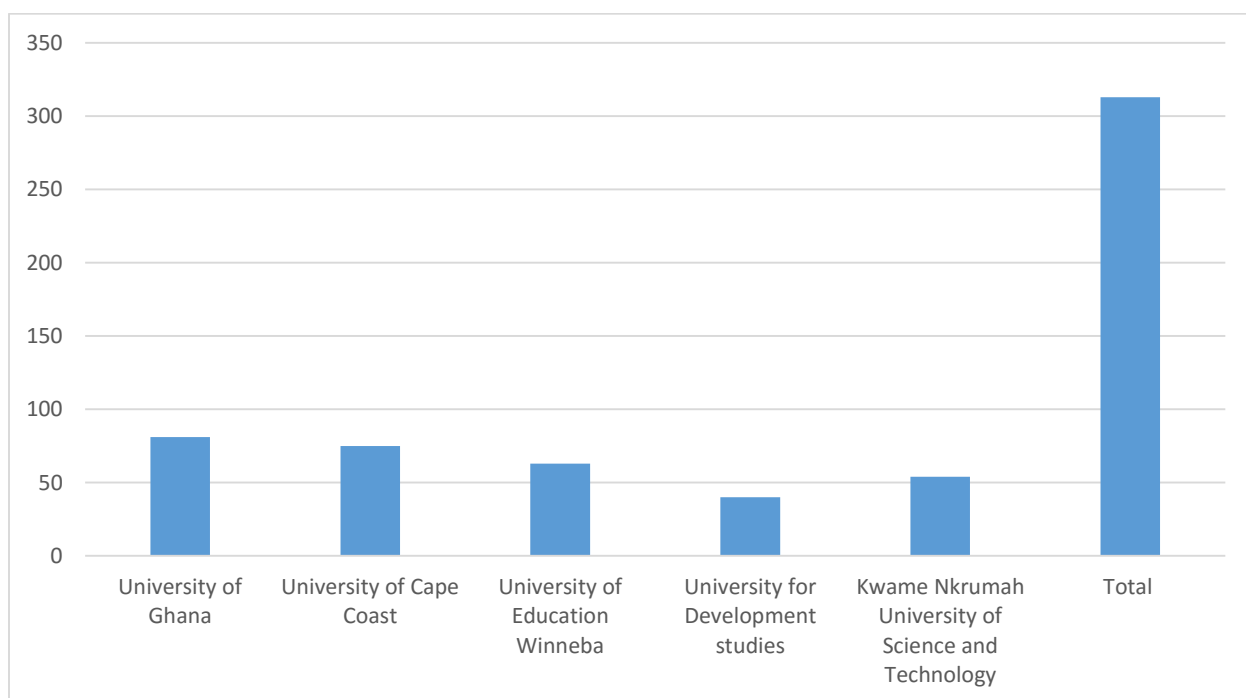
Figure 5.3: Distribution of Respondents in terms of University Affiliations

5.3.4 Academic Qualifications of Respondents

Respondents' level of education was also assessed. Analysis on respondents' educational level illustrated in the Table 5.4 revealed that out of the three hundred and thirteen (313) respondents, the majority representing 46.6% (146 respondents) have bachelor's degree in library and information science while one hundred and forty-one (141) respondents representing 45.0% attained Master's degree in library and information science. Only ten (10) respondents representing

3.2% were found to be Ph.D. holders with the remaining sixteen (16) respondents (5.1%) being Postgraduates or Master of Philosophy (M. Phil). Generally, these findings indicate that most of the staff employed in various public university libraries have requisite experience and education in library and information science to work in their respective libraries, and hence will be able to contribute to get accurate information for the study.

Table 5.4: Academic Qualification of Respondents

Academic qualification	Frequency	Percentage
Bachelor's Degree in Library and Information Science	146	46.6
Masters in Library and Information Science	141	45.0
M.Phil. in Library and Information Science	16	5.1
Ph.D. in Library and Information Science	10	3.2
Total	313	100.0

Source: Field work, 2018
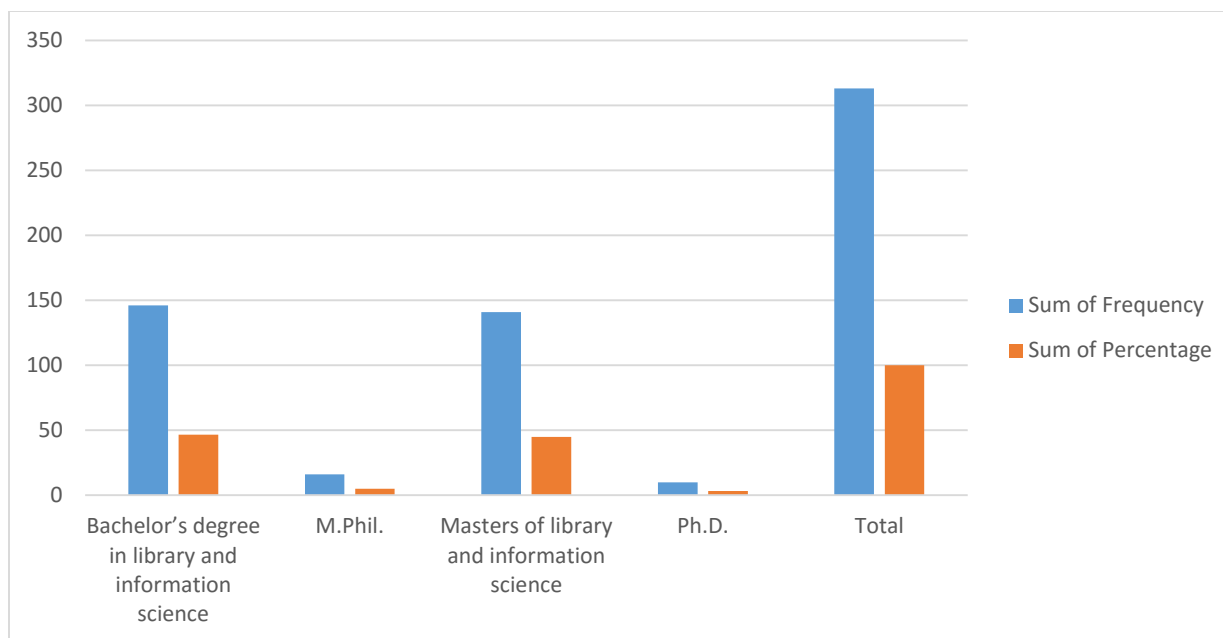
Figure 5.4: Distribution of Respondents in terms of Academic Qualification

5.3.5 Position of Respondents as Library Staff

Analysis of this question of the research work gives information on the position of the respondents surveyed in the various university libraries selected for the study. Table 5.5 depicts that, among the respondents, one-hundred and thirty-three (133) representing the majority (42.5%) are the Senior Assistant Librarians. Only eleven (11) respondents representing the minority (3.5%) were Chief Library Assistants whilst thirty-six (36) respondents representing 11.5% are Principal Librarian Assistants. Thirty-four (34) respondents representing 10.9% were Junior Library Assistants whereas the remaining ninety-nine (99) respondents representing 31.6% were employed as Assistant Librarians. This data with respect to the position of respondents in their respective libraries gives a general impression that the majority of people employed as library staff occupy the positions of Senior Assistants Librarians and Assistants Librarians in various public university libraries in Ghana. This finding excludes the University Librarians. University Librarians were

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interviewed to provide further information to either confirm or debunk the findings from the quantitative analysis.

Table 5.5: Position of Respondents as Library Staff

Position	Frequency	Percentage
Senior Librarian Assistant	133	42.5
Chief Librarian Assistant	11	3.5
Principal Library Assistant	36	11.5
Junior Library Assistant	34	10.9
Library Assistant	99	31.6
Total	313	100.0

Source: Field work, 2018
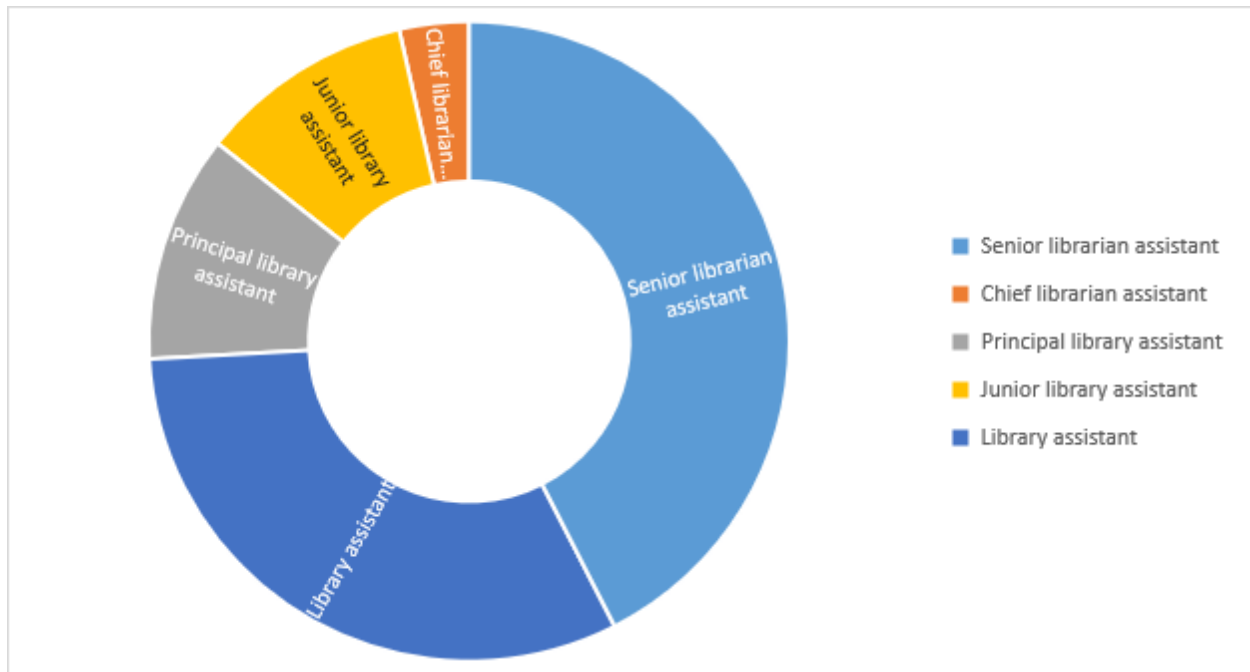
Figure 5.5: Distribution of Respondents Positions in their Libraries

5.3.6 Working Experience of Respondents in the Library

The respondents were asked to indicate the number of years they have been serving their respective university libraries. Table 5.6 depicts the frequency with respect to the number of years respondents have been serving the university as librarian staff. The Table reveals that only seven (7) out of the three hundred and thirteen (313) respondents representing the minority (2.2%) had served their respective university libraries for about 31 years and above. Seventy-three (73) respondents representing (23.3%) were library staff who had been with their university libraries for about 16-30 years while sixty-nine (69) respondents representing (22.0%) were staff who have been with the university library also for about 11-20 years. The analysis further revealed one hundred and sixty-four (164) respondents representing the majority (52.4%) who had been

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working with their respective university library for 6-15 years now. These results give the indication that public university libraries in Ghana have staff with good working experience.

Table 5.6: Years of Working Experience of Respondents in the University Library

Years	Frequency	Percentage
1-5 years	69	22.0
6-15 years	164	52.4
16-30 years	73	23.3
31 years and above	7	2.2
Total	313	100.0

Source: Field work, 2018
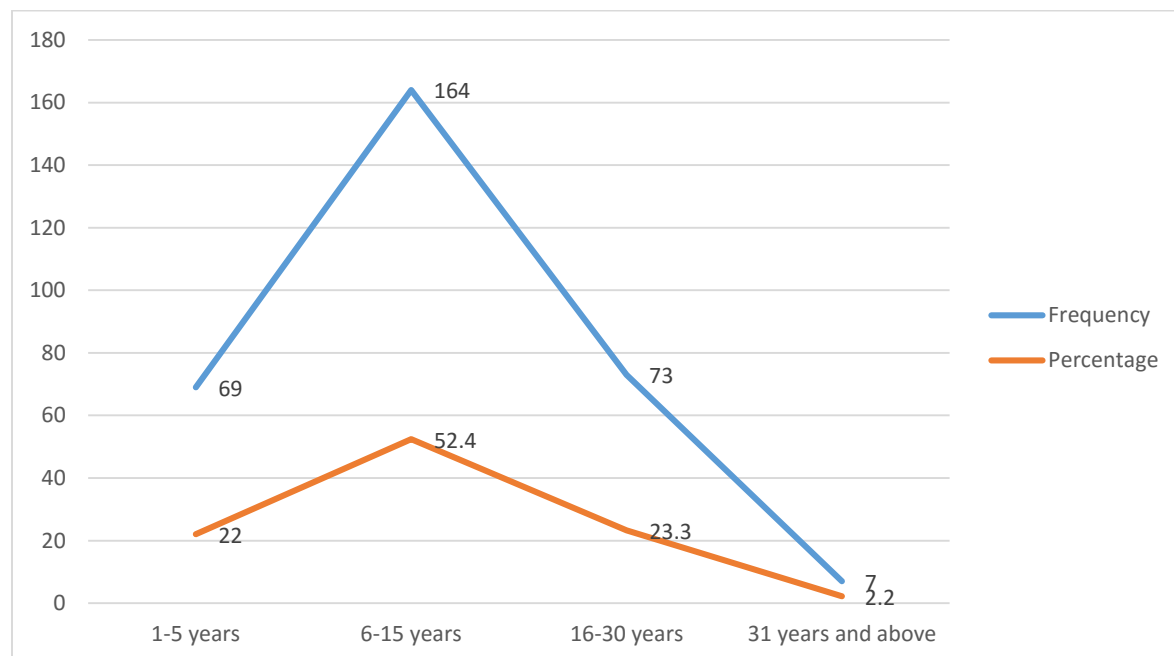
Figure 5.6: Distribution of Respondents in terms of Working of Experience

5.4 The Use of ICTs for the Support of Library Operations and Services Delivery.

ICT facilities deployed in academic libraries are used to support the core functions of the library concerned in order to speed up operations to ensure effectiveness and efficiency thereby serving library users satisfactorily. This part of the questionnaire therefore investigated the library operations and services supported by ICTs.

5.4.1 Academic Library Functions Supported by ICTs

A one sample t-test was conducted in this section of the study to find out the library functions that are supported by ICTs in the various public university libraries. The results are depicted in Table 5.7.

Table 5.7: Academic Library Functions Supported by ICTs.

Functions	Test value=2.0			
	t-value	df	p-value	Mean difference
Processing of library materials	-9.966	312	.000	-.267
Web-based reference services	.802	312	.423	.030
Communication and Information Sharing	3.819	312	.000	.155
Circulation of Library Materials and Serial Control	3.207	312	.001	.129

Library Security System	6.628	312	.000	.318
Budgeting and Acquisition of Library Materials	7.846	312	.000	.347
Selective Dissemination of Information	7.425	312	.000	.289
Reprographic Services	5.688	312	.000	.222
Collection Development	8.217	312	.000	.315
General Administration	6.908	312	.000	.308

Source: Field work, 2018

The test revealed that all the variables accounted for library functions are supported by ICTs in public university libraries. In all, ten (10) variables were assumed to constitute library functions that are supported by ICT in Ghanaian public university libraries. The one sample t-test statistic value for only one function "processing of library material" was negative indicating this function included in the test had a mean below the hypothesized mean of 2.0 where all the remaining functions had their t-test statistic to be positive also indicating their respective mean values were above the hypothesized mean. Out of the ten (10) variables assumed to be functions supported by ICT in public university libraries, nine comprises of processing of library materials, communication and sharing of information, circulation of library materials and serial control, library security system, budgeting and acquisition of information materials. Others are selective dissemination of information, reprographic services, collection development and web-based

reference services were statistically significant since the p-values of their respective mean differences are less than the level of significance (0.05), while only one function that is "general administration" was statistically not significant with its p-value of the mean difference being greater than 0.05 significance level.

The result indicates that the variables which include processing of library materials, communication and sharing of information, circulation of library materials and serial control, library security system budgeting and acquisition of information materials, selective dissemination of information, reprographic, collection development and web-based reference services are the main library functions which can be supported by ICTs in public university libraries in Ghana.

5.4.2 Availability of ICT Facilities in Public University Libraries

The study investigated whether some selected common ICT facilities that are usually adopted for routine library operations and services delivery are available in public university libraries in Ghana. The analysis was carried out using the Chi-square goodness of fit test. The Chi-square goodness of fit test, tests the null hypothesis that all categories (availability and non-availability of facilities) are equal. Considering the p-value of all library ICT facilities given in Table 5.8

Table 5.8: Availability or Non-Availability ICT Facilities in Public University Libraries

ICT Facilities	Observed values		Expected values	Chi-square value	p-value
	AV	NA			
Computer	308	5	156.5	293.319	0.000
CD/DVD-ROM	268	45	156.5	158.879	0.000
Scanner	270	43	156.5	140.137	0.000
Projector	266	47	156.5	118.463	0.000
Television	207	106	156.5	110.399	0.000
Telephone	246	67	156.5	250.217	0.000
Printer	285	28	156.5	215.511	0.000
Smartboards	164	149	156.5	259.639	0.000
Fax machine	141	172	156.5	291.639	0.000
Internet	286	27	156.5	99.741	0.026
Cellular technology	188	125	156.5	140.326	0.000
Multi-media tools	198	115	156.5	318.323	0.000
Library management software	261	52	156.5	318.329	0.000

CCTV	151	162	156.5	201.032	0.000
RFID	128	175	156.5	120.236	0.000
Radio	110	203	156.5	318.706	0.000
Pen drive	238	75	156.5	271.367	0.000
Digital camera	174	139	156.5	133.157	0.000
Video/audio recorder	196	117	156.5	119.939	0.000
Photocopy	293	20	156.5	238.112	0.000
Laptop	252	61	156.5	116.553	0.000

Source: Field work, 2018

The null hypothesis of equality among the categories is rejected since the p-value for each facility is less the 0.05 level of significance. This therefore gives the indication that there is significant difference between the observed frequency of responses and expected frequency of responses from respondents for each facility; thus, what the majority say as to whether a facility is available or not can be supported. With a significant evidence from the Chi-square test as well as what the majority said per the observed values, it can be deduced from Table 5.8 that with the exception of the ICT facilities which include a Fax machine, radio and RFID, all the other ICT facilities can be found in public university libraries in the country. This interpretation is affirmed from the responses of the majority of the respondents which is supported by the significant p-values from the Chi-square test.

5.4.3 Availability of ICT-Based Resources in Public University Libraries

The study further examined whether some selected ICT based resources are available in public university libraries in Ghana. The analysis concerning the availability as well as the non-availability of these resources was also carried out using the Chi-square goodness of fit test with respect to the p-value of all the ICT-based resources given in the Table 5.9.

Table 5.9: Availability or Non-Availability of ICT Based Resources in Academic Libraries

ICT-Based Resources	Observed val.		Expected val.	Chi-square value	p-value
	AV	NA			
E-journals	301	12	156.5	266.840	0.000
E-books	266	27	156.5	153.230	0.000
Electronic thesis and dissertation	283	30	156.5	204.502	0.000
Institutional repository	292	21	156.5	234.636	0.000
OPAC	288	25	156.5	220.987	0.000
RFID	161	152	156.5	79.661	0.000
e-QUERY	146	167	156.5	91.409	0.000
E-lists	193	120	156.5	80.824	0.000
Social networking	242	71	156.5	93.422	0.000
Audio-visual services	222	91	156.5	54.827	0.000

Reprographic services	249	64	156.5	109.345	0.000
Online searching	291	22	156.5	231.185	0.000
Email	282	31	156.5	201.281	0.000
Extranet	193	120	156.5	101.026	0.000
Web portals	244	69	156.5	97.843	0.000
World wide web	262	51	156.5	142.240	0.000
Web publishing	206	107	156.5	103.313	0.000
File sharing	209	104	156.5	136.013	0.000

Source: Field work, 2018

The null hypothesis of equality among the categories is rejected since the p-value for each facility is less the 0.05 level of significance. This therefore indicates that there is significant difference between the observed frequency of responses and expected frequency of responses from respondents for each ICT-based resource. Thus, what the majority say as to whether an ICT-based resource is available or not can be supported. With significant evidence from the Chi-square test as well as what the majority said per the observed values, we can make deductions from the Table 5.9 that except for E-query all the other ICT-based resources included in the analysis can be found in public university libraries in the country. Hence, the E-query can therefore be considered as ICT-based resource not available in most Ghanaian public university libraries. These findings suggest that the majority of the responses are supported by the significant p-values from the Chi-square test.

5.4.4 ICT-Based Facilities and Resources used most in University Libraries

Respondents were asked to indicate the ICT-based facilities and resources that are mostly used for library operations and services delivery in their respective university libraries. A one sample t-test was additionally conducted to determine which of these ICT-based facilities and resources are mostly used for library operations. The results from the one sample t-test analysis are given in Table 5.10.

Table 5.10: ICT-Based Facilities and Resources used most in University Libraries

ICT Facilities and Resources	Test value=2.0			
	t-value	df	p-value	Mean difference
OPAC	-15.262	312	.000	-.604
E-referencing	-2.800	312	.005	-.137
E-journals	-12.952	312	.000	-.508
E-books	-2.775	312	.006	-.150
Institutional repository	1.460	312	.145	6.645
Computer	1.650	312	.010	9.093
Scanner	3.171	312	.002	31.489
Projector	-4.585	312	.000	-.224
Telephone	-1.482	310	.139	-.087

CCTV	4.921	312	.000	.348
Printer	-12.818	312	.000	-.550
CD/DVD ROM	1.586	312	.114	.083
Pen drive	-8.317	312	.000	-.374
Video conferencing	1.206	312	.229	3.840
Radio	12.852	312	.000	.776
Digital camera	6.117	312	.857	.361
Television	4.943	312	.100	.304
The Internet	-21.185	312	.000	-.738
Fax machine	12.035	312	.000	.776
Electronic thesis and dissertation	-6.595	312	.000	-.342

Source: Field work, 2018

The results from the one sample t-test conducted revealed that twenty (20) items were listed as ICT-based facilities and resources mostly used. Out of these, ten (10) had a mean value above the hypothesized mean (2.0) with negative t-statistic values and mean differences whereas the other ten (10) had their mean values above the hypothesized mean with positive t-statistic values and mean differences. The analysis additionally revealed that, out of the twenty (20) variables, fourteen

(14) comprising OPAC**,** E-referencing, E-journals, E-books, scanner, projector, CCTV, printer, pen drive, radio, computer, internet, fax machine and electronic thesis and dissertation were statistically significant since their respective mean differences are statistically significant considering their corresponding p-values being less than 0.05.

On the other hand, the one-sample mean test showed that only six items which included institutional repository, video referencing, digital camera, television, telephone and CD/DVD ROM are statistically insignificant indicating they are ICT-based facilities and resources that are not mostly used in public university libraries in Ghana. It can therefore be affirmed from one sample mean t-test that, OPAC, E-referencing, E-journals, E-books, scanner, projector, CCTV, printer, pen drive, radio, computer, internet, fax machine and electronic thesis and dissertation are the main ICT-based facilities and resources that are used mostly in public university libraries in the country. Extra care must therefore be taken to maintain these ICT facilities in the libraries as their absence may affect library usage and library attendance.

5.4.5 Benefits of ICTs Application in Academic Libraries

Respondents were asked to indicate the extent to which they agree with some statements regarding the benefits of ICTs deployed in Ghanaian academic libraries. Table 5.11 presents the results of the findings of the benefits academic libraries derive from ICT facilities.

Table 5.11: Benefits of ICTs Application in Academic Libraries

Benefits of ICTs	Test value=3.0			
	t-	df	p-value	Mean difference
Remote access to information	-3.011	312	.003	-.101

Greater and easier retrieval of information	-7.534	312	.000	-.222
Availability of information anytime and anywhere.	-.424	310	.672	-.018
Easier preservation, manipulation and distribution information	-1.574	312	.117	-.056
Information creation in digital format	.592	312	.554	.021
Improve efficiency and effectiveness of library functions	-2.097	312	.037	-.069
Utilization the staff for provide better information services	-1.656	312	.099	-.056
Remove barriers of communication	4.559	312	.000	.203
Digitization of documents for preservation and space saving	.457	312	.648	.018
Online acquisition library materials	2.332	312	.020	.094
Availability information through the library homepage	2.976	312	.003	.104
Provision of access to library resources through the online catalogue	-2.040	312	.042	-.069
Communication through e-mails	3.606	312	.000	.136
Reduce moribund repetitive library routines	6.338	312	.000	.248

Source: Field work 2018

A one sample t-test was conducted to determine which of these statements is significant and can be regarded as a benefit of ICT in academic libraries. Seven (7) of them had a mean value above

the hypothesized mean (2.0) with negative t-statistic values and mean differences whereas the other seven (7) had their mean values below the hypothesized mean with positive t-statistic values and mean differences.

The analysis additionally depicts that out of the fourteen (14) variables, nine (9) items which comprises remote access to information, greater and easier retrieval of information, improve efficiency and effectiveness of library functions, remove barriers of communication and distance, and online acquisition of library materials were statistically significant. Again, the provision of information through the library homepage, provision of access to library resources through the online catalogue, communication through e-mails, and reduction in repetitive library routines were statistically significant since their respective mean differences are statistically significant considering their corresponding p-values being less than 0.05.

It can therefore be deduced from one sample mean t-test that remote access to information, greater and easier retrieval of information, improving the efficiency of library functions and the cost effectiveness of library operations, removal of all the barriers of communication, distance and time, online book shopping and publisher website, money and labour saving are some of the benefits of ICTs in academic libraries. Also, the provision of information through the library homepage, provision of access to library catalogue and database of other libraries through library networks, sending reminders through e-mails, and reducing moribund repetitive library routines are the main benefits of ICTs in academic libraries.

5.5 Procedures, Processes and Factors Influencing ICTs Adoption and Management in Academic Libraries.

Procedures and processes are required in the adoption, application, implementation and management of technologies, inventions and innovations. These procedures and processes are

therefore needed to be documented to ensure that they are followed and also serve as a guide for

future users and management of the deployed technologies. In view of this, respondents were asked

to indicate the best procedure and process for ICTs adoption and management in academic libraries

based on some statements presented to them.

5.5.1 Procedures and Processes for ICTs Adoption and Management

This part of the analysis features the extent to which respondents agree to some statements assumed

to be the best procedures and processes to adopt and implement ICTs in academic libraries. The

responses of the participants to this survey question is presented in Table 5.12

Table 5.12: Procedures and Processes for ICTs Adoption and Management

Procedures and processes	Test value=2.0			
	t-value	df	p-value	Mean difference
Identification of the need for ICTs	-4.533	311	.000	-.183
Development of policy and strategic plan for adoption of ICTs	-3.404	312	.075	-.104
Support of the top management	-2.953	312	.339	-.094
Commitment of staff	-2.940	312	.353	-.091
Identification of ICT facilities for automation	-4.487	312	.000	-.126

Acquisition of the ICTs tools	-4.911	312	.000	-.139
Implementation of ICT tools	-3.410	312	.306	-.101
Train staff to install and manage the ICT system	-8.218	312	.000	-.219
Creation of monitoring and evaluation system	-3.186	312	.159	-.094
Develop feedback system for ICT system	-4.257	312	.000	-.123

Source: Field work, 2018

In a similar manner, one sample t-test was conducted to determine which of these variables or statements are/is best procedure(s) and processes to adopt ICT in academic libraries. The results from the one sample t-test with respect to these procedures and processes depict that a total number of ten (10) variables were used for adopting and managing ICTs in academic libraries in public universities. All of them had a mean value below the hypothesized mean of 2.0. The one sample t-test value for the ten (10) variables used in the analysis was all negative from the Table 5.12 indicating that all the variables or statements had mean below the hypothesized mean.

The analysis additionally revealed that out of the ten (10) variables or factors assumed to be procedures and processes to adopting and implementing ICTs in academic libraries, five (5) items including identification of ICTs, identification of ICT facilities to be adopted for automation, acquisition of the identified ICT tools for implementation, training of staff to operate, maintain

and manage the ICT system as well as compliance and sustainability of ICT system were statistically significant since they were the only variables with their respective probability value less than the level of significance of 0.05. The result points out that identification of ICTs, identification of the need for ICT infrastructure/devices to be adopted for automation, acquisition of the identified ICT tools for implementation, training of staff to operate, maintaining and managing ICT system as well as compliance and sustainability of ICT system is the best procedures and processes in adopting, implementing and managing ICTs in public university libraries in Ghana.

5.5.2 Influence or Enablers on the Adoption and Management of ICTs

Respondents involved in the study were asked to indicate the extent to which they agree to some statements assumed to be factors or enablers influencing the adoption, implementation and management of ICT in public university libraries. The responses from respondents were obtained with the help of a four-point Likert scale. However, a one sample t-test was used to determine which of these variables serves as a significant factor or enabler influencing ICTs management in public university libraries. The results are presented in Table 5.13.

Table 5.13: Factors Influencing the Adoption and Management of ICT in Libraries

Factors	Test value=2.0			
	t-value	df	p-value	Mean difference
Vision and mission of the university library	-4.533	311	.000	-.183

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Need for effective and efficient operation and services	-3.404	312	.075	-.104
Availability of ICT policy	-2.953	312	.339	-.094
Availability of strategic plan for ICTs	-2.940	312	.353	-.091
Managerial styles of the library leadership	-4.487	312	.000	-.126
Support of university top management	-4.911	312	.000	-.139
Adequate financial resources	-3.410	312	.306	-.101
Adequate and standard ICT facilities	-8.218	312	.000	-.219
Skilled library staff in ICT	-3.186	312	.159	-.094
Attitudes of staff towards ICTs	-4.257	312	.000	-.123
Staff involvement in the ICT application	-1.000	312	.318	-.034
Constant power supply	.126	312	.900	.005
Monitoring and evaluation system	3.416	312	.001	.126
Institutional and technological infrastructure	.228	312	.820	.008
Organizational culture	2.508	312	.013	.088

Source: Field work, 2018

The results from Table 5.13 show that fourteen (14) variables were used as factors or enablers influencing the adoption, implementation and management of ICTs in public university libraries. Of these, seven variables had their respective means within the acceptable range (less than the hypothesized mean of 2.0) and the other seven variables also have their respective means above the acceptable range (greater than the hypothesized mean of 2.0).

The one sample t-test from Table 5.13 additionally revealed that among the fourteen (14) variables assumed to be factors or enablers influencing the adoption and implementation of ICTs in public university libraries, only four (4) comprising the vision and mission of the university and the library, monitoring and evaluation system and organizational culture proved to be statistically significant factors or enablers influencing the adoption, implementation and management of ICTs in public university libraries since their respective p-values were less than 0.05. This result indicates that the vision and mission of the university and the library, monitoring and evaluation system and organizational culture among others are the factors that significantly influence the adoption, implementation and management of ICT in public university libraries.

5.5.3 Procedures, and Processes for Management of ICTs in Academic Libraries

Table 5.14 indicates a one sample t-test on the extent to which respondents agree to some statements assumed to be procedures, processed and guidelines to ensure successful adoption and implementation of ICTs in academic libraries in Ghana.

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Table 5.14: Procedures and Processes for Management of ICTs in Academic Libraries

	Test Value = 2.0			
	T	df	Sig. (2-tailed)	Mean Difference
Vision to ensure successful ICT integration	-4.335	311	.000	-.128
Development of library ICT policy	-1.039	312	.300	-.034
Formulation of strategic plan for ICT integration	-1.669	312	.096	-.053
Well stated objectives for ICT integration	-.360	312	.719	-.011
Structured timelines for adoption and implementation	-1.986	312	.048	-.069
Support and corporation of library staff	-.772	312	.441	-.024
University management support	-1.874	312	.062	-.059
Functional library ICT management committee	-.840	312	.401	-.027
Collaboration with stakeholders	-2.288	312	.023	-.078
Budgetary allocation towards ICT purchase	-1.656	312	.099	-.056
ICT training programme for staff	-1.185	312	.237	-.053
Documentations to guide ICT implementation	-.991	312	.322	-.034
Absence substandard ICT equipment	-2.993	312	.003	-.110

Written reporting structures	-5.439	312	.000	-.187
Monitoring and evaluation system	-.881	312	.379	-.030
Feedback system	1.574	312	.117	-.056

Source: Field work, 2018

The one sample t-test value for all the sixteen (16) variables or statements assumed to be procedures, processes and guidelines to ensure successful adoption and implementation of ICTs from Table 5.14 were all negative, indicating that they had a mean less than or below the hypothesized mean of 2.0. However, five (5) variables or statements out of the sixteen with respect to the procedures, processes and guidelines for ensuring successful adoption and implementation of ICTs were statistically significant at 0.05 level of significance. These results indicate that the respondents involved in the study generally agree that a clear vision towards ICT to ensure successful integration in academic libraries, structured timelines for adoption and implementation, collaboration with relevant stakeholders, avoidance of substandard ICT equipment and written reporting structures are procedures and guidelines that significantly ensure successful implementation and the adoption of ICTs in academic libraries in Ghana.

5.5.4 Critical Success Factors for Managing Academic Library ICT System

The study further investigated the critical success factors in managing academic library ICT systems. Based on the rate of responses from respondents together with the application of a one sample mean t-test, the following results were obtained as captured in Table 5. 15

Table 5.15: Critical Success Factors for Managing Academic Library ICT system

Critical Success Factors	Test value=2.0			
	t-value	df	p-value	Mean difference
Library ICT policy	2.457	312	.015	19.027
Strategic planning	3.361	312	.001	34.957
Management support	-2.868	312	.004	-.094
Processes and procedures management	2.383	312	.018	.081
Availability of funds	-4.296	312	.000	-.139
Skilled personnel and human resources management	-4.976	311	.000	-.144
Teamwork	-1.914	312	.057	-.059
Staff/employing involvement and motivation	-3.026	312	.003	-.097
Training, education and professional development of staff	-5.633	312	.000	-.161
Stakeholder consultation and involvement	1.039	312	.300	.034
Effective communication with stakeholders	-1.669	312	.096	-.053

Source: Fieldwork, 2018

The results from Table 5.15 showed that eleven (11) variables were used as success factors for managing academic public university libraries of which seven (7) variables had their respective means within the acceptable range (less than the hypothesized mean of 2.0) with negative mean differences and other four (7) variables also had their respective means above the acceptable range (greater than the hypothesized mean of 2.0) with positive mean differences. The one sample t-test from Table 5.15 additionally revealed that among the eleven (11) variables assumed to be success factors for managing academic library ICT system in public university libraries in Ghana, the majority of the variables (8) were found to be statistically significant with their p-value being less than 0.05. This result indicates that with exception of teamwork, stakeholder consultation and effective communication, the rest of the variables which include library ICT policy, strategic plan, top management support, processes and procedures management, availability of funds were not considered as CSF. Others such as skilled personnel and human resources management, staff involvement and motivation, training, education and professional development of staff are affirmed as critical factors that can be used in managing ICT systems in public university libraries in Ghana.

5.6 Availability of Library ICT Policy and Strategic Plan for Adoption and Managing Academic Library ICT Systems.

Managing ICTs adoption and implementation require policies and strategic plan and documents to serve as a guide in the management process. This section of the quantitative data and analysis investigated the availability of library specific ICT policies and strategic plan for the management of ICTs applications in academic libraries.

5.6.1 Availability of ICT Strategic Documents to Guide ICT Management

Approved and documented policies, strategic plans, procedures and process manuals are required for current and future management of ICT applications in academic libraries. In view of this, the respondents in the study were asked to provide information about the availability of codified ICT policies for managing library ICT systems. In order to determine whether or not codified ICT strategic documents are available to guide ICT management, the study in this question employed chi-square goodness of fit test. Based on the application of the chi-square goodness of fit test, nine (9) variables were assumed to be codified ICT strategic documents available to guide ICT management in public universities in Ghana as presented in Table 5.16

Table 5.16: Availability of ICT Strategic Documents to Guide ICT Management

Items	Chi-square value	Df	Asymp. Sig. value
Library ICT policy	11.121	1	.001
Library ICT strategic plan	178.358	2	.000
University ICT policy	82.815	1	.000
University strategic plan	111.722	1	.000
Library ICT maintenance plan	.080	1	.777
Library ICT integration plan	1.153	1	.283
Standard operations manuals	.719	1	.397
Installation and maintenance manuals	.259	1	.611

| ICT training and development | 13.498 | 1 | .000 |
plan for library staff

Source: Field Work, 2018

Quantitatively, with respect to the rate of response towards the question "which of the following ICT strategic documents are you aware of?", the chi-square goodness of fit test through the asymptotic significant values of the respective items revealed that among the nine (9) variables library ICT policy, library ICT strategic plan, university ICT policy, university strategic plan and ICT training and development plan for library staff were the only documentations confirmed to be available to guide ICT management in public universities in Ghana. These aforementioned variables suggested documentations available to guide ICT management had all the asymptotic significant values to be less than the 5% level of significance.

5.6.2 ICT Documentation for Managing Library ICT System

In the same manner as the question above, this section focused on the documentations required for managing academic library ICT facilities. A one-sampled mean t-test was also conducted to assess the usefulness level of ICT documentations for managing ICT systems in public university libraries in Ghana. Table 5.17 constitutes the respondents' perception about the usefulness of the documents assumed to be ICT documentations for managing library ICT.

Table 5.17: ICT Documentation for Managing Library ICT System

Items	Test value=2.0			
	t-value	df	p-value	Mean difference

Library ICT policy	3.836	312	.000	.139
Library ICT strategic policy	4.780	312	.000	.177
University ICT policy	2.611	312	.095	.101
University strategic plan	2.160	312	.315	.085
Library ICT maintenance and renewal plan	5.330	312	.000	.209
Installation and maintenance manuals	5.436	312	.000	.216
Library ICT integration plan	6.209	312	.000	.257
Standard operations manuals	7.425	312	.000	.312
ICT training and development plan for library staff	1.712	312	.088	.065

Source: Field work, 2018

The test revealed that all the factors accounted for the usefulness of the suggested variables in terms of managing the academic library ICT system. Nine (9) factors assumed to be ICT strategic documents for managing library ICT were given to the respondents to rate, of which all of the factors had a mean above the hypothesized mean of 2.0. The one sample t-test statistic as well as the respective mean differences for all the nine (9) variables were positive indicating all the factors included in the test had a mean above the hypothesized mean (2.0). However, out of the nine (9) variables assumed to constitute ICT documentations for managing ICT, the majority representing (6) variables were statistically significant since their respective p-values were less than the level of significance 0.05 while for the remaining, only three (3) of were statistically not significant.

This result indicates that the documents which include library ICT policy, library ICT strategic policy, library ICT maintenance and renewal plan, installation and maintenance manuals, library ICT integration plan, and standard operations manuals can be assumed as the main useful ICT documentations that are used for managing library ICT systems mostly in public university libraries.

5.6.3 Stakeholder Consultation in the Development of Library ICT Policy

Developing strategic ICT policies needs the inputs and support of all stakeholders. Especially in academic library ICT policy formulation, the staff must be consulted if not directly involved. To find out if library staff are consulted in the policy development, the study used the binomial test to determine whether respondents were consulted in the formulation of the library ICT policy of their respective university libraries, and also to determine whether it is a must for all staff to be consulted in the formulation of policies for managing the library ICT system. The responses of the participants are presented in Table 5.18

Table 5.18: Stakeholder Consultation in the Development of Library ICT Policies

Question	Group	Response	N	Obs. prop	Test prop.	Exact sig.value
Were you consulted in the development of the library ICT policy for your university library?	Group 1	No	245	.78	.50	.000
	Group 2	Yes	68	.22		
	Total		313	1.00		
	Group 1	No	197	.63	.50	.000

Do you think all staff must be consulted in the development of policies for managing the library ICT system?	Group 2	Yes	116	.37
	Total			
			313	1.00

Source: Field work, 2018

The descriptive part of the test from Table 5.18 revealed that the majority of the respondents representing 78.3% of the total sample were not consulted with respect to the development of the library ICT policy while the remaining sixty-eight (68)representing 21.7% responded they were consulted in the development of the library ICT policies with the proportion of 0.22. The binomial test reveals a significant difference between the observed frequencies of responses from respondents involved in the research work. (i.e. **Exact Sig. value =0.000<0.05**). This result confirms what the majority said, which gives an indication that most respondents were not consulted in the development of library ICT policies of their respective university libraries.

Regarding whether all staff need to be consulted in the development of policies for managing library ICT systems, descriptively, one hundred and ninety-seven (197) representing the majority answered in the affirmative that all staff must be consulted when it comes to developing policies for managing library ICT with a proportion of 0.63 whereas the remaining one hundred and sixteen (16) with a proportion of 0.37said no. Based on the exact significant value for the Binomial test, it can be deduced that there exists a significant difference between the observed frequency of responses from respondents on both sides (i.e**. Exact Sig. value =0.000<0.05**). This therefore gives

the indication that the responses from the majority is supported, implying that when it comes to the development of policies.

5.6.4 Formulation and Implementation of Library ICT Policies and Strategic Planning

Formulating and implementing ICT policies and strategic plans, personnel with requisite skills, knowledge and experiences are expected to carry out such activities. Based on this assumption, this question in particular was aimed at eliciting information from the participants about those involved in the formulation and implementation of academic library ICT policies as tools to guide the effective management of the deployed ICT facilities. The analysis conducted on this question provides the frequency of responses responsible for the formulation and implementation of library ICT policies and strategic planning in their respective universities. Table 5.19 illustrates the rate of responses.

Table 5.19: Formulation and Implementation of Library ICT Policies

Responsible for the formulation and implementation of library ICT policies and strategic plan?

Item	Frequency	Percentage
Library committee	107	34.2
Library ICT team	185	59.1
The librarian	21	6.7
Total	313	100.0

Source: Field work, 2018

From Table 5.19 out of the three hundred and thirteen (313) involved in the study one hundred and seven (107) representing 34.2% said that the library committee is responsible for formulating and implementing library ICT policies and strategic plans. One hundred and eighty-five (185) respondents representing the majority (59.1%), on the other hand, responded that the library ICT team is responsible for implementing and formulating policies and strategic plan whereas only twenty-one (21) representing (6.7%) reported that the librarian is the one responsible for the formulation and implementation of library ICT policies and strategic plan in public university libraries in the country. The analysis of the result appears to indicate that the library ICT team has the sole responsibility to formulate and implement library ICT policies and strategic plans in public university libraries in Ghana.

5.6.5 ICTs Policy and Strategic Planning for Sustainable Management

Policies consist of mission, vision and strategic documents that guide the library's adoption of ICTs while strategic plans help translate the policies into an actionable framework for the achievement of the objectives of introducing the ICTs in the academic libraries. In view of this, the question sought to find how ICT policies, if they are available, have helped or will enhance the effective and sustainable management of the ICT facilities. With respect to how library ICT policy, strategic planning, processes and procedure have ensured sustainability in managing ICTs in university libraries, eight (8) variables assumed to be library ICT policies, strategic plans, processes and procedure were used and all had a mean above the acceptable range (less than 1.5) with positive mean differences. Results are captured in Table 5.20

Table 5.20: Policies and Strategic Plans for Library ICTs Adoption and Management

Items	Test value=2.0

	t-value	Df	p-value	Mean difference
Ensure the availability of ICT facilities and resources in academic libraries	.468	312	.640	.014
Provide avenue for maximum utilization of ICT facilities in academic libraries	1.350	312	.178	.043
Provide avenues for efficient and effective management of ICTs in the libraries.	2.309	312	.022	.072
Enhance monitoring and evaluation of library ICT system performance.	4.148	312	.000	.129
Guarantee sources of funding library ICT development and management	6.714	312	.000	.241
raining of library staff in managing the ICT	2.269	312	.024	16.065
Create awareness of the need to manage library ICT system.	5.692	312	.000	.190
Feedback mechanism to measure the impact of ICTs facilities	6.809	312	.000	.228

Source: Field work, 2018

The one sample t-test from Table 5.20 presents the eight (8) variables used as library ICT policies, strategic plans, processes and procedures to ensure sustainability in the management ICTs in public university libraries. Six (6) out of the eight (8) variables including the provision of various avenues for efficient and effective management of ICTs in the libraries, enhance planning mechanism for

monitoring and evaluating the performance library ICT system, guarantee to fund for library ICT development and management, ensure the development of a training scheme for the staff library in the management of ICT constitute significantly to library ICT policies, strategic plans, processes and procedures were used to ensure that there is sustainability in managing ICTs in public university libraries.

Others include awareness creation about the need to manage library ICT system according to internationally accepted standards and provide feedback for the mechanism to assess the impact of the deployed ICTs facilities were statistically significant indicating these items contribute significantly to library ICT policies, strategic plans, processes and procedures used to ensure that there is sustainability in managing ICTs in public university libraries.

5.7 Availability of Human Resources for Managing Academic Library ICT Facilities.

Skilled and knowledgeable staff are crucial for the successful management of ICT infrastructure in any academic library. This part of the quantitative questionnaire evaluated the availability of human resources for academic libraries ICTs management.

5.7.1 Human Resources to Manage Library ICTs

One of the critical ingredients of managing academic library ICTs are the availability and recruitment of qualified staff. In this respect questions in this section of the study aimed at providing empirical results on those who are supposed to be in charge of updating, upgrading, maintaining and managing the university library ICT facilities. The responses of the respondents are presented in Table 5.21

Table 5.21: Human Resources for the Management of Library ICTs

Items	Chi-square value	Df	Asymp. Sig. value
The University librarian	23.083	1	0.000
The systems librarian	28.834	1	0.000
The electronic resource librarian	2.329	1	.127
The library head of ICT	.157	1	.692
Staff from university ICT unit	.923	1	.337
The University ICT Team	3.479	1	.062

Source: Field work, 2018

Note: Asymp. Sig. value represents Asymptotic probability values and DF stands for degree of freedom

Based on the application of the chi-square goodness of fit test, six (6) different sets of personnel were assumed to be responsible for updating, upgrading, maintaining and managing the university library ICT facilities. With respect to the rate of response towards the question "who updates, upgrades, maintains and manages the university library ICT facilities?", the chi-square goodness of fit test through the asymptotic significant values of the respective items revealed that among six (6) items; only two (2) which include the University Librarian and the Systems of Librarian was assumed to be the people who update, upgrade, maintain and manage university library ICT facilities. These two (2) sets of people aforementioned based on the chi-square goodness of fit test as groups of people eligible for upgrading, updating, maintaining and managing university library ICT facilities had all the asymptotic significant values to be less than the 5% level of significance.

5.7.2 Personnel to Manage University Library ICT Systems

The study in this question also used the binomial test to determine whether or not the respondents do prefer the library staff to manage the ICT facilities in their respective public university libraries. Descriptively the binomial test revealed that the majority of the respondents (248) representing 79.2% affirmed with a major proportion of 0.79 that they do prefer the library staff to manage their respective libraries whereas the remaining sixty-five (65) respondents also representing 20.8% with a proportion of 0.21 responded they do not prefer the library staff to manage the university library ICT systems. The Binomial test reveals a significant difference between the observed frequencies of responses from respondents involved in the research work. (i.e. **Exact Sig. value =0.000<0.05**). The result confirms the response of the majority which gives the indication that respondents are satisfied with the library staff managing the university ICT library systems.

Table 5.22: Personnel to Manage University Library ICT Systems

Question	Group	Response	N	Obs. prop	Test prop.	Exact sig.value
Do you prefer the library staff managing your university library ICT systems?	Group 1	No	248	.79	.50	.000
	Group 2	Yes	65	.21		
	Total		313	1.00		

Source: Field work, 2018

5.7.3 Staff Knowledge and Competencies in ICTs

With respect to knowledge and competencies in ICTs, respondents were asked to rate their knowledge and competencies in ICTs. The analysis from Table 5.23 reveals that among the three hundred and thirteen (313) respondents surveyed, forty (40) respondents representing 9.9% responded that their knowledge and competencies in ICTs are excellent. Two hundred and two (202) respondents, representing the majority (64.5%) on the other hand said they have good knowledge and competencies in ICTs while seventy-eight (78) respondents also representing 24.9% rated the extent of their knowledge and competence of ICTs to be average. Only two (2) respondents representing 0.6% said their extent of knowledge and competence of ICTs is poor. This analysis points out that most staff within public university libraries have good knowledge and competence in ICTs.

Table 5.23: Staff Knowledge and Competencies in ICTs
How do you rate your knowledge and competence of ICTs in general

Response	Frequency	Percentage
Excellent	31	9.9
Good	202	74.4
Average	78	24.9
Poor	2	0.6
Total	313	100.0

Source: Field work, 2018

5.7.4 Skills and Knowledge for Library ICTs Management

University library staff are expected to be equipped with skills and knowledge in technology management if they are to manage ICTs applications efficiently. The survey conducted provides the frequency of responses from respondents on rating their skills and knowledge with respect to ICTs management. The results of the responses from the respondents are presented in Table 5.24

Table 5.24: Skills and Knowledge for Library ICTs Management
How do you rate skills and knowledge in terms of library ICTs management

Response	Frequency	Percentage
Excellent	40	12.8
Good	197	62.9
Average	74	23.6
Poor	2	.6
Total	313	100.0

Source: Field work, 2018

Table 5.24 shows that out of the three hundred and thirteen (313) respondents involved in the study, forty (40) respondents representing 12.8% said their skill and knowledge in terms of managing library ICT systems is excellent. One hundred and ninety-seven (197) respondents representing 62.9% also responded they have good skills and knowledge in managing ICTs systems while seventy-four (78) respondents representing 23.6% on the other hand made it known that they are rated average when it comes to managing library ICT with skills and knowledge. The remaining two (2) respondents representing the minority (0.6%) reported they have very poor skills and knowledge in terms of managing library ICT. The analysis in this section points out that

generally, staff within public university libraries have good skills and knowledge to manage ICT systems.

5.7.5 Training in Library ICT System Management for the Library Staff

The study in addition used the binomial test to determine whether respondents had any form of training on ICTs management in their respective university libraries. Table 2.25 presents the analysis of the training needs of library staff.

Table 5.25: Training in Library ICT System Management.

Question	Group	Response	N	Obs. prop	Test prop.	Exact sig.value
Have you had any form of training on ICT management in this university library?	Group 1	No	216	.69	.50	.000
	Group 2	Yes	97	.31		
	Total		313	1.00		

Source: Field work, 2018

On descriptive basis the majority of the respondents (216) representing 69.1% with a major proportion of 0.79 indicated that they had training in ICTs management in their university library whereas the remaining ninety-seven (97) respondents also representing 30.9% with a proportion of 0.21 responded they had no ICT management training as library staff. The Binomial test reveals a significant difference between the observed frequencies of responses from respondents involved in the research work. (i.e. **Exact Sig. value =0.000<0.05**). This result confirms what the majority

responded to, which thus gives the impression that generally the staff in Ghanaian public university libraries are trained in ICTs management.

5.7.6 Means of Skills and Knowledge Acquisition for ICTs Management

In academic institutions there are several ways library staff acquire skills, knowledge and professional development. The question in this section was to find the various means through which the library staff are trained to acquire skills needed to manage ICT facilities. A one sample t-test was conducted to determine which of the variables listed in Table 5.26 constitutes significantly means of acquiring skills and knowledge of ICTs management.

Table 5.26: Means of ICT Skills and Knowledge Acquisition for Library ICTs Management

Means	Test value=2.0			
	t-value	df	p-value	Mean difference
Through further and formal studies	.699	312	.485	.030
Through workshops, seminars and conferences	.849	312	.397	.027
Through self-study and regular self-practice	5.703	312	.000	.177
Training and continuous retraining	6.706	312	.000	.203
Through mentorship by supervisors	11.110	312	.000	.343

on-the job-training	2.700	312	.007	.085
Industrial training experience	12.844	312	.000	.468
Informal training	10.970	312	.000	.391

Source: Field work, 2018

Eight (8) items were assumed as means to acquire ICT skills and knowledge in order to manage library ICT facilities. All the eight items had a mean above the hypothesized mean of 2.0 with their respective mean differences being positive. The one sample t-test statistic value for all the eight (8) items was positive indicating all the items included in the test had a mean above the hypothesized mean (2.0). However, out of the eight (8) items assumed, six (6) were statistically significant since their respective p-values were less than the level of significance 0.05 while the remaining two (2) items were statistically not significant. This result indicates that self-study and regular self-practice, retraining, mentorship by supervisors, on-the-job training, industrial training experience and informal training are the main significant means of acquiring ICT skills and knowledge in order to manage library ICT facilities.

5.7.7 Skills and Knowledge required for Managing Academic Library ICTs.

This question aimed at eliciting information from the respondents about the skills and knowledge requirements of library staff to be able to manage ICT facilities deployed in academic libraries effectively and sustainably. The results of the findings are presented in Table 2.27

Table 5.27: Skills and Knowledge required to Manage Academic Library ICTs

Skills and Knowledge	Test value=2.0			
	t-value	df	p-value	Mean difference
General academic library management	30.853	312	.000	.704
Project management skills	30.901	312	.000	.807
Computer programming	30.722	312	.000	.717
Hardware maintenance	30.657	312	.000	.775
Systems management	32.148	312	.000	.650
Networking	30.722	312	.000	.717
Website/portal development	30.629	312	.000	.768
Metadata/electronic resources management	30.986	312	.000	.695
Policy formulation	31.083	312	.000	.823
Budgeting and fundraising skills	33.049	312	.000	.925
Managerial skills	30.676	312	.000	.724
Technical skills	30.656	312	.000	.727
Negotiating skills	34.219	312	.000	.966
Marketing and advocacy skills	32.066	311	.000	.885
Computer trouble shooting skills	30.594	312	.000	.749
Monitoring and evaluation skills	30.750	312	.000	.714
Mentoring and supervisory skills	29.070	311	.000	.744

Source: Field work, 2018

A one sample t-test was therefore conducted to identify the skills and knowledge the library staff require to manage academic library ICT facilities in public universities. In all, seventeen (17) variables assumed to be skills, knowledge and training requirements that one needed to manage an academic ICT library. Of these, no variable had a mean below the hypothesized mean of 0.5. The one sample t-test statistic values for all seventeen (17) variables were positive indicating that all the variables included in the test had a mean above the hypothesized mean (0.5).

However, based on the mean differences and p-values of the respective variables from the test, it can be deduced that these variables assumed to be skills, competences and training requirements for managing academic ICT library are all statistically significant since their respective p-values were all less than 0.05. This result shows that all the variables used in the one-sample mean t-test is significantly considered to be skills, competencies, knowledge and training the library staff require to manage academic library ICTs sustainably.

5.8 Hindrance to ICTs Adoption and Management in Academic Libraries

In every technological management situation, whether it is formal as in academic libraries or informal as in organizations, there are obvious challenges one may encounter. If these challenges are not identified for solutions, it will derail the objectives of the application of technologies. Based on this, the study sought to identify some of the common challenges the managers of the university libraries are likely to encounter in the management of library ICT system.

5.8.1 Hindrances to Adoption and Management of Academic Library ICT Facilities

The respondents were asked the likely challenges they may encounter in their attempt to adopt and manage library ICT facilities in their university libraries. Table 5.28 indicates or shows a one sample t-test with respect to the extent to which respondents involved in the study agree with some statements assumed to be hindrances to managing library facilities in Ghanaian public universities.

Table 5.28: Hindrances to the Adoption and Managing Library ICT System

Hindrances	Test value=2.0			
	t-value	df	p-value	Mean difference
Lack of library ICT policy and strategic plan	5.425	312	.000	.235
Lack of processes and procedures in ICT management	7.797	312	.000	.312
Lack of trained staff in ICT management	6.935	312	.000	.292
Resistance of staff library to adoption and management of ICTs	11.481	312	.000	.506
Inadequate funding to procure ICT facilities	1.689	312	.092	.065
Inadequate ICT infrastructure/ facilities	3.911	312	.000	.152
Irregular updates and maintenance of ICTs	7.282	312	.000	.283
Lack of technical skills ICTs in library staff	8.265	312	.000	.334
Technology phobia among some library staff	8.255	312	.000	.379

Lack of motivation among library staff	7.791	312	.000	.292
Resistance to change by the library staff	11.523	312	.000	.535
Lack of university management support	8.998	312	.000	.359
Poor Management style of library managers	10.761	312	.000	.510
Inadequate training in ICTs for library staff	8.155	312	.000	.340
Limited Training in ICTs required change	8.537	312	.000	.334
Irregular power supply	6.840	312	.000	.286
Lack of funds for training and development	6.707	312	.000	.254
Lack of consultation among stakeholders	9.741	312	.000	.388
Poor internet connectivity	5.645	312	.000	.235
Lack of monitoring and evaluation system	7.848	312	.000	.292

Source: Field work, 2018

In all, twenty (20) variables were given to the respondents involved in the study to assess the extent to which any of the variables can be a hindrance to managing library ICT facilities. The findings from Table 5.28 reveal that with the exception of inadequate funds and budget allocation to academic libraries to procure ICT infrastructure and other facilities all the other nineteen (19)

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variables were statistically significant with their respective p-values being less than the 0.05% level of significance. The implication is that apart from inadequate funds and budget allocation to academic libraries to procure ICT infrastructure and other facilities, all the other statements are significantly regarded as hindrances to managing library ICT facilities.

5.8.2 Measures to Overcome Hindrances to Library ICTs Management

With respect to measures to address challenges academic libraries face in ICTs implementation and management, eight (8) variables were used, and all had a mean within the acceptable range (less the 1.5) with negative mean differences. Table 5.29 presents the findings.

Table 5.29: Measures to Overcome Hindrances to Library ICTs Management

Measures	Test value=2.0			
	t-value	df	p-value	Mean difference
Formulation of policies and strategic plans	5.425	312	.000	.235
Regular fund for ICT management	7.797	312	.000	.312
Procurement of adequate ICT facilities	6.935	312	.000	.292
Policies for staff training and retraining	11.481	312	.000	.506
Support from the university management	1.689	312	.092	.065
Adequate financial support for training of staff in ICTs	3.911	312	.000	.152

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Effective communication with stakeholders	7.282	312	.000	.283
Flexible work culture to allow the acceptance of change in the university library system	8.265	312	.000	.334
Provision regular power supply	8.255	312	.000	.379
Efficient monitoring and evaluation system	7.791	312	.000	.292

Source: Field work, 2018

The one sample t-test from Table 5.29indicates that among the eight (8) variables assumed to be solutions to challenges faced by librarians in managing ICT facilities in academic libraries in Ghana, five (5) factors were statistically significant indicating that they constitute significantly to measures that can be laid down to overcome library ICTs management challenges. Those factors include regular and constant provision of funds for ICT adoption and management, procurement of high quality and adequate ICT facilities, policies for staff training and retraining, adequate provision of financial support for regular training of staff in ICTs, and effective communication at all levels in the academic library system

On the other hand, from the test in Table 5.29, only three (3) out of the eight ((8) variables which are formulation and implementation of policies and strategic plans, motivation, commitment and unflinching support from the management of the library and the university authorities, and quality and flexible work culture to allow the acceptance of change in the university library system proved to be statistically not significant with their p-values being greater than the level of significance

(0.05). This result points out that regular and constant provision of fund for ICT adoption and management, procurement of high quality and adequate ICT facilities, policies for staff training and retraining, adequate provision of financial support for regular training of staff in ICTs, and effective communication at all levels in the academic library system are the significant measures to overcome challenges to library ICTs management.

5.9 Strategies for Managing ICT System in Academic Libraries

In managing ICT facilities in academic libraries, there must be a benchmark or the accepted standard in the way it should be done. This is often referred to as accepted strategies. In order to develop a standardized way of managing ICT facilities in Ghanaian academic libraries, the study suggested some variables for respondents to share their views for possible consideration and acceptance as strategies for ICT management based on the Systems Theory adopted for the study.

5.9.1 Strategies for Managing ICTs in Academic Libraries

The respondents were asked to indicate from the list of variables what could be considered as the best strategies for managing ICTs applications in Ghanaian academic libraries. Accordingly, a one sample mean t-test was conducted to determine the best strategies for managing ICT facilities in academic libraries in Ghana, through a four-point Likert scale which included eight (8) different variables assumed to be strategies for managing academic library ICT facilities. The responses from the participants of the study are presented in Table 5.30

Table 5.30: Strategies for Managing Academic Libraries ICT System

Strategies	Test value=2.0			
	t-value	df	p-value	Mean difference
Collaborative Partnership stakeholders in ICTs management	-4.114	312	.000	-.113
Development of policies, strategic plans, procedures and manuals for managing ICTs	-3.112	312	.002	-.088
Recruitment and training of staff with skills to manage library ICT systems	-4.678	312	.000	-.139
Fund raising for procurement of ICT facilities	-.242	312	.809	-.008
Deployment of high quality and standard ICT facilities	-4.852	312	.000	-.136
Documentations of procedures and processes	-1.060	312	.290	-.034
Formulation of monitoring and evaluation sys	-.578	312	.563	-.018

Source: Field work, 2018

The one sample t-test statistic values for all the eight (8) variables were negative indicating all the factors included in the test had a mean below the hypothesized mean (2.0) with negative mean differences. However, out of the eight (8) variables assumed to be the strategies for managing ICT

facilities, four (4) of the variables which includes partnership and collaboration with stakeholders at all levels of ICTs adoption, implementation and management, development and approval of the required policies, strategic plans, processes, procedures and manuals for managing ICTs, recruitment and training of staff with requisite skills and knowledge for managing library ICT systems were statistically significant. Others are the available high quality and standard ICT facilities were statistically significant since their respective p-values were less than the level of significance 0.05 while the remaining four (4) variables were statistically not significant. This result implies that the factors or statements which include partnership and collaboration with stakeholders at all levels of ICTs adoption implementation and management, development and approval of the required policies, strategic plans, processes, procedures and manuals for managing ICTs, recruitment and training of staff with requisite skills and knowledge for managing library ICT systems, and the availability of high quality and standard ICT facilities can be suggested as the best strategic frameworks for managing ICT facilities in academic libraries in Ghana.

5.10 Summary of the Chapter

This chapter presented the results of the quantitative data that involved the responses from all the library staff. It was found that the paraprofessionals are made up of Diploma and Bachelor degree holders in librarianship. Others are professional librarians who are chartered librarians and postgraduate degree holders. The results from the quantitative data analysis centered on availability of ICTs in academic libraries, areas of ICT applications in libraries, ICT based resources in academic libraries, benefits of ICTs deployment in libraries, factors influencing ICTs adoption, procedures and processes for ICTs adoption and management, policies and strategic plans for ICT management in academic libraries and hindrances to ICTs management and solutions to the challenges.

CHAPTER SIX

ANALYSIS AND FINDINGS FROM THE QUALITATIVE DATA

6.1 Introduction

The previous chapter presented the findings of the quantitative data which involved the responses from all the library staff. Chapter Six presents the results from the second phase of data collection for the study. It consists of the interviews conducted with the University Librarians, as they provide first-hand information concerning ICT facilities management within Ghanaian academic libraries. These interviews were conducted one-on-one and face-to-face with all the five University Librarians separately on different days. Their responses and divergent views are clearly specified and presented in this section of the study. This chapter also includes observation and analysis of the availability of ICT facilities.

The objective of the interviews especially with the University librarians was to identify the key themes relating to ICTs management in academic libraries in Ghana. The variables that the interviewer solicited included the following:

   i)   the extent of ICTs diffusion in their libraries,

   ii) processes and procedures of ICTs adoption,

   iii) policies and strategic plans to guide ICTs management,

   iv) adequacy of ICTs funding; and availability of skilled personnel to ensure ICTs maintenance and management.

Furthermore, the University Librarians' attitudes towards ICTs adoption and management were also examined as well as their academic qualifications. The six thematic areas the Head Librarians were interviewed on are:

i) general information/biodata,

ii) status and level of ICTs application in their libraries,

iii) procedures and processes for ICT adoption and management,

iv) availability of policies and strategic plan guiding ICTs application and management,

v) issues of ICTs management, and

vi) barriers and solutions to managing academic library ICT facilities as captured in the interview schedule (Appendix B).

Table 6.1: Profiles of Interview Respondents

University	Gender	Qualification	Working Experience	Years on Current Position
UG	Female	PhD	12yrs	2yrs
KNUST	Male	PhD	25yrs	4yrs
UCC	Male	PhD	19yrs	1yr
UEW	Male	M.Phil.	25yrs	7yrs
UDS	Male	M.Phil.	21yrs	2yrs

Source: Field work, 2018. Full meaning of abbreviated universities is captured in Chapter Four under the section of population of the study.

As depicted in Table 6.1, five respondents were the University Librarians of the university libraries under study. Purposive sampling technique was used to select the respondents as discussed in chapter four (4). The University Librarians provided the researcher with more information to corroborate or debunk the findings from quantitative data collected and analysed from the library staff. Besides, they are at the helm of affairs of the management of the libraries and therefore

responsible for issues of policy formulation, implementation, library ICT facilities management as well as decision making processes.

The University Librarians who participated in the interviews provided the researcher with their detailed biodata. All but one of the participants in the interview were male which is an indication that academic libraries in Ghana are dominated by males when it comes to the appointment of the University Librarians. One remarkable finding was that out of the five respondents, the majority of them three (3) were Ph.D. holders in the Library and Information Science while the other two (2) had Master of Philosophy degrees in Library and Information Science. This indicates that all the University Librarians interviewed do have requisite qualifications and experience in academic library administration and are well versed in the provision of information on how the libraries ICTs are managed effectively and efficiently.

It also emerged from the interviews that the participants had acquired enough experience in ICT implementation and management as all of them are members of their various university ICT boards/committees where policies for ICTs application and management are formulated. Some of the respondents had worked in academic and research libraries for over 20 years. Hence, they are astute persons to provide answers to shed more light on ICT facilities management in academic libraries.

6.2 Status and Levels of ICTs Diffusion in Academic Libraries

This part of the interviews with the five the University Librarians (interviewees) was intended to get more information about the extent of ICTs applications in Ghanaian academic libraries. As stated above the interviews with the University Librarians were conducted one-on-one and face-to-face with all the five University Librarians separately on different days. The interviews with the

University Librarians on ICTs diffusion covered ICT-based resources in the libraries, ICT facilities deployed in the academic libraries, library functions and services supported by ICTs, and how the deployed ICT facilities have improved library operations and services. The results of the interviews revealed that all the academic libraries have integrated various kinds of ICT tools and ICT-based resources in their operation and services delivery. The interviewees enumerated ICT tools deployed in their libraries to include computers, CCTV cameras, biometric access control, digitization machines, laptops, telephones, internet, Wi-Fi, photocopiers, printers, scanners, digital cameras, smartphones, flash drives among others.

The result of the interviews revealed that some of the ICT-based resources available in the libraries are electronic or digital information resources such as e-books, e-journals, online databases, institutional repositories, OPAC, library management software like KOHA, Dspace, and the Internet. Furthermore, the responses in the interviews showed that ICTs have impacted library operations and service delivery, such that ICTs have been applied to almost all library functional areas except for one university which indicated their acquisition section is not covered by ICTs.

Ultimately, the result of the interviews indicated that ICT has transformed, enhanced and brought efficiency to academic library operations, thereby delivering better services to library users. As a result of the impact of ICTs on the libraries studied, one of the interviewees stated:

> *ICTs have improved services delivery, easier processing of library materials, support off-campus access to library resources, easier information retrieval, facilitates online communication and chat services with users of the library.*

Another respondent also stated the following;

ICT have become indispensable tools in our current library services. They have helped us

reach out to our numerous users who come to the library but do not find a seat/space due

to inadequate facility but they are now able to access the library resources in hostels,

homes and wherever they find themselves 24/7.

Generally, the results of the interviews revealed that all the academic libraries covered in this study have applied different types of ICT facilities in support of their operations especially routine functional areas.

6.3 Procedures and Processes for the Management of ICTs in Academic Libraries.

This section of the interviews with the heads of the libraries solicited information relating to the areas of ICTs adoption and management. The areas covered included procedures and processes involved in the application and management of ICTs in academic libraries in Ghana. Again, the section also gathered data on whether the procedures and processes for ICTs deployment and management are documented and made available to the entire library staff. The findings from interviews on procedures and processes for ICTs adoption and management in academic libraries revealed that the libraries follow certain procedures and processes which include the survey of current trends and best practices of technologies in academic libraries, review of current ICT facilities vis-à-vis new proposed system for cost-benefit analysis purposes, piloting of new technologies to be deployed even though most of these are not documented. One of the interviewees stated that:

As for us all our ICT projects are piloted and implemented in phases. This has been our

procedure in introducing ICT-based facilities and resources such as library automation

which we started from our cataloguing and circulation departments of the library.

It also emerged from the interviews that the libraries engage and collaborate with the ICT directorates of their universities on library ICT projects and also benchmark other analogous institutions. An interviewee indicated his library ICT implementation and management processes is captured in the library's strategic plan. The interviews showed that all the libraries lack well-documented procedures and processes for adopting, implementing and managing ICTs on their own. It was further revealed from the interviews that the libraries rather relied on the overall universities.

Two of the five respondents, indicated that some aspects of the ICT adoption, implementation and management are documented, while only one out of the five respondents stated the ICTs acquisition procedure and processes are documented but available to only the Senior Members in the library because they take part in the decision making. Another respondent revealed that the procedure for library automation is documented. The interviews with the respondents, therefore, revealed that most of the libraries ICT processes and procedures are undocumented, but rather the librarians make use of the overall university ICT policy processes and procedures. Furthermore, none of the five respondents could provide the researcher with a copy of the documented procedures and processes when requested. The implication is that academic libraries lack documented manuals to guide ICTs integration and management processes.

6.4 Policies and Strategic plans for the Adoption and Managing Academic Library ICTs.

Strategic documents are made up of written documents that have been approved by the university authorities to support academic library ICTs adoption and management. They include documents such as library ICT policy, ICT usage policies, vision and objectives of ICT applications, action plans and strategic plans. Codified policies and strategic plans establish a course of action which provides a guide toward achieving objectives of application and management of library ICT

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facilities. In order to find out the availability of strategic documents for library ICTs adoption and management, the University Librarians were interviewed on policy issues and the questions centered on the following;

i) availability of policies and strategic plans for implementing and managing library ICT facilities and resources,

ii) persons responsible for the formulation of the library ICT policy and strategic plans,

iii) whether library staff are involved in the formulation of the library ICT policies and strategic plans.

Providing answers to the above questions, all the five (5) respondents (university librarians) indicated that there were no ICT policies and strategic plans that are library specific but rather they depend on bits and pieces scattered in the university-wide ICT policy and strategic plans for the application and management of library ICT systems. One university librarian stated that;

"there is one in development. However, there is an overall University ICT Policy that guides our ICT deployment and management".

Concerning the question in respect of persons who are responsible for the design and formulation of library ICT policy and strategic plan, three (3) out of the five respondents reported that library ICT policy and strategic plan are designed and formulated by the library management in consultation with the university ICT directorate.

According to one of the three respondents, the library ICT Policy is formulated by

"the library board/committee, library management, library staff in collaboration with the overall university ICT committee".

On the other hand, two interviewees also observed that the library ICT policy and strategic plan are formulated by the library management committee which consists of senior members in the library. What seems astonishing, striking and contradicting about this finding is that all the interviewees have indicated their libraries do not have specific library ICT policies.

The findings from interviews with the University Librarians also revealed that in the event of any policy development, library staff at all levels take part and at the end, these documents are made available to the entire university community including the staff in the library.

The interviews further give an indication that when the library ICT policies and strategic plans are developed, they are made accessible not only to the university community but to the general public on the university websites. One of the five respondents indicated that;

"these policy documents when completed would be available on both the university and the library website after they had been accepted and approved by the university appropriate committees and authorities".

The results from the interviews with all the five (5) University Librarians indicated that the design, development and formulation of library ICT policies and strategic plans must be done in collaboration with all library staff, library committee/board and university ICT directorate, even though most of the interviewees pointed out that they do not have some of these policies in place at the time of the interviews. It was suggested by the respondents that the policy and strategic plan development must be bottom to up approach through the necessary consultation with a lower level staff so as to incorporate their views into the final policy document.

6.5 Issues in ICTs Management in Academic Libraries

This part of the interview related to the management of academic library ICT facilities. The respondents were asked to share their views on managerial issues such as the university management support in ICTs adoption, the level of university top management involvement in the library ICTs deployment and management, budgeting and financing for library ICT projects and adequacy of funding for library ICT projects. Other management issues respondents were asked questions on quality of staffing and their competencies in implementing and managing academic libraries ICT facilities, training and educational opportunities available to the library on ICTs management, and current professional training for library staff in supporting ICTs application and management. The presence of some of these issues stated above are crucial to a successful and efficient management of the library ICT system.

6.5.1 University Top Management Support

On the issue of university management involvement and support in library ICT facilities management, there were varied views from the respondents. Some indicated that their university management has limited involvement while others were of the stated that their university management is deeply involved in the library ICTs application and management. On the issues of the university's management involvement in the areas of library ICT policy development as well as strategic planning, one of the respondents indicated that:

 "the university management scrutinises and reviews library ICT policy, procedures and other guiding documents to make sure they are in tune with current trends in technological landscape".

Another respondent indicated that his university management has oversight responsibility for managing all sectors of the university including the library and its subunits of which the library

ICT system is part. Some of the respondents revealed that management involvement comes in various forms such as funding of library ICT projects through annual budget allocation towards the procurement of ICT facilities for the library. The five University Librarians identified allocation of funds to library ICT projects as the biggest support from the university management, even though the allocations are usually inadequate. Two of the interviewees also indicated that they see the approval of library ICT policies as a form of management support and involvement in the library ICT management process. The interviews again revealed the university management ensures that ICT infrastructure and other supporting facilities are upgraded when necessary. Finally, university top management support which is critical towards ICTs management in academic libraries in Ghana are not well-defined and documented.

6.5.2 Funding for ICTs Adoption and Management

The funding sources for the deployment and management of ICTs in the libraries came from the university budget. Funds are usually needed to upgrade ICT facilities and train staff with requisite skills to manage the deployed ICT tools. Further on funding for ICT integration and management, one respondent indicated that the sources of funding of the library ICT application and management are from the library's internally generated funds. Largely, it emerged from the interviews that funding for library technology application and management is through the university's budget allocation to the library. Interviewees also said that occasionally they get donor funding to support library ICT projects.

However, the University librarians expressed disappointment in the amount allocated to library ICT infrastructure. During the interviews, lack of adequate budget support was some of the issues the librarians repeatedly expressed concern about. The respondents lamented that the budget allocation towards ICT application and management is woefully inadequate, and therefore

suggested the need of alternative sources of funding to support the management of library ICT facilities. The suggestion from virtually all the five respondents was that students could be levied a small amount of money towards library ICT facilities and other ICT-based resources such as e-books, e-journals, among others in addition to the overall library budget.

6.5.3 ICT Infrastructure in Academic Libraries

The interviews collected information on the quantity and quality of the available ICT infrastructure and other technological facilities in the libraries from the University Librarians. The interviews revealed that the ICT facilities implemented in the academic libraries were inadequate in terms of quantity and quality. The indication is that most of the ICT infrastructure were obsolete; thus, they are too old and hardly updated, upgraded and replaced due to lack of expertise and funds. In terms of numbers, there were concerns of students' population outnumbering the available ICT facilities, especially desktop computers. These infrastructure challenges impact negatively on smooth application and management of ICTs in Ghanaian academic libraries.

6.5.4 Skilled Staff to Manage Academic Library ICT System

During the interview, participants responded to issues concerning availability of the requisite number of staff, their skills and competencies in ICTs. The participants provided information about the staff strength of the libraries in supporting ICTs implementation and management. The issue of staffing also brought about contrasting views. While two of the University librarians indicated that their staff are well-equipped with the requisite skills to deploy and manage ICT facilities in the libraries, others were of a different opinion.

Three (3) out of the five (5) University Librarians expressed concern about the competencies of the library staff to manage modern ICT equipment, and therefore suggested the need for training on current trends on ICTs application. One university librarian stated,

> *"I have very skilled staff for ICT "implementation".* But another librarian indicated that, *"my staff do not have all the ICT skills required for managing the [ICT] facilities there is still room for improvement".*

It was revealed that the library staff have been provided training and educational opportunities to develop themselves in ICTs application and management. The respondents indicated professional ICT skills training provided to the library staff include training on digitization, library automation, web-based library services and research data management. Other areas of ICT skills training for the library staff indicated by the respondents were the implementation of web 2.0, technology management and implementation, use of library Open source applications, general trends in information access and content preparation and archival.

On the whole, the findings from the interviews revealed that issues like staff skills and competencies for managing ICT implementation, funding for academic library ICT projects are inadequate towards modern ICT application and management.

6.6 Hindrance to Academic Libraries ICTs Management.

In every endeavour, there are challenges that one is bound to occur. This calls for solutions to ensure that these barriers are surmounted. This section of the interviews with the University librarians involved the identification of challenges in ICTs management, and the suggested solutions to overcome the hindrances to academic library ICTs management.

6.6.1 Hindrances to Academic Library ICT Facilities Management

The researcher interviewed the University Librarians on the various challenges they face in their attempt to introduce ICTs and barriers they encounter in managing the deployed ICTs in an academic library in Ghana. Concerning the barriers to ICTs management, it was revealed from the interviews that inadequate funding and the delays in the release of funds for the library ICT adoption and management were indicated as one of the major hindrances in academic library ICT management. Again, delays in the purchase and installation of ICT equipment, high cost of ICT facilities, the rapid changes in equipment and technologies were identified by the respondents as some of the barriers to library ICT management. Lack of ICT skills among the library staff were also indicated by the respondents as a hindrance to technology management in academic libraries. Also, inappropriate and sub-standard ICT infrastructure was also identified as part of the hindrances to ICT application and management. The absence of specific library ICT policies, strategic plans, procedure and process manuals were mentioned as hindrances to ICTs adoption and management in academic libraries. One of the respondents clearly expressed that,

> *"in my library, I am faced with huge challenges such as inadequate ICT expertise, inadequate ICT staff, lack of current and modern ICT facilities and technological equipment, and the absence of ICT policies and procedures".*

The findings from the interviews again, revealed that inadequate internet bandwidth, procurement issues and administrative bureaucracy sometimes slow down speedy of acquisition, installation, upgrade and maintenance of ICT devices and infrastructure in academic libraries. One of the challenges identified was the issue of lack of collaboration and partnership between the library and its stakeholders. Issues concerning library ICTs are fragmented and poorly coordinated.

Ultimately, from the responses to the interview questions, lack of funds is the major challenge in academic library ICT system management. There are inadequate funds to procure high quality standard ICT facilities, train staff and with requisite ICT skills, acquire Internet bandwidth as well as subscribe electronic resources.

6.6.2 Solution to Hindrances to Academic Libraries ICTs Management

The ICT adoption and management in academic libraries in developing countries are faced with several challenges such as inadequate funds, lack of the required ICT policies, and lack of ICT skills among the library staff. This section interviewed the five (5) University Librarians on how to overcome the hindrances to ICT adoption and management. The respondents were also asked to proffer solutions to the identified challenges. Regarding proposed solutions to the identified challenges of ICTs management, they proposed these solutions:

a. first on the issue of funding, the respondents suggested that adequate budget allocation and sustainable financial arrangement should be made to overcome this hindrance. For example, they proposed a dedicated budget line for the library ICT development and management. This budget line they suggested would be geared towards the acquisition and regular maintenance of library ICT facilities as well as training of staff towards sustainable library ICTs management. Again, the respondents suggested alternative funding of academic library ICT projects apart from the institutional budget. For instance, two out of the five respondents indicated:

    our library automation was wholly funded by Carnegie foundation of United States of America (USA). The funding included acquisition of Library Management System (LMS), purchase of hardware as well as training of the staff. All these were achieved through the writing of proposals to sources for project grants.

It was revealed by the respondents that through the writing of proposals for grants, libraries can seek alternative funding outside their traditional library budget allocation by the mother institutions.

b. Secondly, it emerged from the interview that the academic libraries required library ICT policies, procedure manuals and strategic plan referred to in this study as strategic documents to guide its application and management. The respondents suggested the need to carefully draft and implement ICT strategic documents purposely towards integration and management instead of depending on the university-wide ICT policy and strategic plans which do not fit the purpose as well as the vision and objectives of the libraries.

c. Thirdly, to overcome the challenge of manpower requirements for library ICT application and management, the respondents proposed the recruitment of staff with technical and ICT skills who are also knowledgeable in technology management. They also suggested continuous training and re-training of existing and newly recruited library staff in ICTs management. One of the respondents stated:

> *adherence to laid down policies, dedicated staff to implement policies when they are developed are some of the solutions to overcome the library ICT system management challenges.*

Furthermore, the respondents indicated that top management support and regular budgetary allocation towards library ICTs as well as periodic library ICT system audit as some of the solutions to the hindrances. Altogether, findings from the interviews revealed that to solve these challenges, there must be a holistic collaborative partnership among all stakeholders to ensure that academic library ICT systems management are given utmost priority if the universities are to benefit from investments in the library ICT systems.

6.6.3 Strategies for Adoption and Management of Academic library ICTs

The interviews also solicited the views of the respondents(the university librarians) on appropriate strategies for managing academic library ICT systems which was factored into the proposed framework for managing the system.

a) Concerning appropriate strategies for managing academic library ICT systems, all the five (5) respondents indicated that the libraries should formulate their own ICT policies and procedures (strategic documents) to guide library ICT project implementation and management. One of the respondents stated:

> *that the best strategy is that of adherence to the laid down rules and procedures, draft and approved policies and also staff must be trained with the requisite ICTs and they must be dedicated to the implementation and maintenance of library ICT facilities.*

Another respondent opined that the best strategy is to elicit the support of all stakeholders through a collaborative partnership approach, thus the library working with the ICT directorate and other stakeholders to comprehensively formulate strategic documents that are all-encompassing for library ICTs management. Two of the respondents in interviews also stated that:

> *the library needs to collaborate and partner with all stakeholders such as the library committee members, IT staff and the top university management to solicit their support and needed inputs in the design, formulation, drafting and implementation of the needful policies, procedures and strategic plans for library ICTs adoption and management.*

Again, the required inputs such as, the provision of adequate budgeting support for the purchase high quality ICT facilities and recruitment, training of the library staff contemporary technological skills in the ICTs management were some of the suggestions from the respondents as the appropriate strategies for academic library ICT system management.

b) On the strategies for managing library ICT systems, the university librarians were of the opinion that the universities must develop library specific ICT policies and other necessary procedures, and documentation to guide library ICTs adoption, usage and management. One of the librarians stated that

'collaboration with stakeholders is very crucial especially with that of the university top management and the library committees, we need to bring everybody on board and get their support'.

Furthermore, one university librarian indicated that the best strategy should be the creation of a complete ICT section/unit within the library to focus on developing the library ICT infrastructure, sourcing for alternative funding in addition to the library budget in support of ICT projects. Finally, the interviews revealed the need to have library ICT team as part of the strategy to manage ICT facilities as well as training and retraining of library staff on current trends on ICTs.

6.7 Observation of ICT Facilities in Academic Libraries

The purpose of this study was to investigate how ICT facilities adopted and deployed in Ghanaian academic libraries could be managed through the development and use of appropriate policies, strategies and procedure manuals. One of the objectives of this study was to examine the level of ICT diffusion in Ghanaian university libraries. The researcher, therefore, visited the various universities and observed the ICT facilities deployed in the libraries. The observation checklist

(Appendix C) was used to determine the availability of ICT facilities in the university libraries concerned, areas of library operations and services supported by ICTs, availability of ICT based resources, the conduciveness of the working environment as well as how comfortable the working tools such as computers, chairs and tables are.

6.7.1 Availability of ICTs in Academic Libraries

The researcher personally visited the university libraries sampled for the study. During the visit it was observed that all the five libraries have appreciable levels of ICTs deployment that support the core functions of the libraries. Some of the core functions were acquisition, cataloguing and classification, circulation, library catalogue (OPAC), Ask Librarian, E-referencing, institutional repository, budgeting and general administration. ICT tools such as computers, digitisation equipment, video conferencing tools, printers, scanners, photocopiers, laminators, laptops, telephones, televisions, CCTV set, RFID systems, barcode scanners and printers, digital cameras, digital security alarm systems were available in the five libraries studied. One of the universities had a complete laboratory equipped with magnifiers and other ICT devices as well as braille for the visually impaired persons.

6.7.2 Areas of ICT Application in Academic Libraries

It was observed that ICT facilities were applied to support technical services of the libraries. For instance, operations like cataloguing and classification, acquisitions, bibliographic control, serials control and management were all automated. ICTs, for instance, CCTV and RFID were deployed for the library security to control theft and mutilation of the materials. The reference sections of the libraries and their activities were also covered by ICTs applications. For example, the five libraries have 'Ask Librarian' page, and social media platforms such as Facebook, WhatsApp, RSS feed, telephone among others to chat and interact with the library users for reference services.

The circulation departments of the five university libraries and other routine activities were also observed to have been covered with ICT applications. It was observed that most of the libraries have their materials barcoded and the circulation activities are barcode controlled for check-in and check-out. The researcher further observed reprographic facilities like photocopiers, duplicators, printers, scanners, laminators among others deployed in the libraries for duplication and preservation of the information materials. Further, it was observed that ICTs were used by the libraries for communication, information sharing, scholarly communication and information dissemination. For example, emails, social media, library bulletin among the library staff and library users as well especially for reservation of library materials and overdue notifications. Finally, it was observed that the general administrative setting of the libraries was automated and ICT dependent and the libraries entrances had technology-based access control.

6.7.3 ICT Based Resources in Academic Libraries

As part of the study and data collection process, the researcher visited the various university libraries to investigate the availability of ICT based resources in the libraries. These are library and information resources that are ICTs and technology dependent. Findings from the observation revealed that all the five university libraries had various types of resources that were ICT based. These resources include electronic journals, e-books, OPAC, institutional repositories, E-reference services, digital archival, online databases among others. It was observed that most of the ICT based resources, for instance, the electronic journals and electronic books were provided through a consortium called CARLIGH since all the universities studies were members. It emerged that as a prerequisite to join the consortium, member institutions must have adequate, proper and high standard ICT facilities. This is because the electronic journals, electronic books and other digital databases subscribed through CARLIGH depend on ICT infrastructure for their accessibility. It is

unequivocally accepted absence of high quality and robust ICT facilities will have negative impact on the library resources, since member institutions invest a huge financial resources in subscribing to the electronic resources yet library users may not have access to the resources. Even though the five institutions do not have equal ICT infrastructure, however they had appreciable level of robust ICT facilities to provide resources and deliver quality services to the library patrons.

6.7.4 Conduciveness of the Working Environment

During the study visit, the researcher observed the working environment where ICT tools have been deployed. It was observed that two of the universities' environments were not conducive enough. The tables and chairs were too old and not specifically designed for computer use. However, the other three libraries had modern and purpose-built furniture for ICT usage. The other two libraries do have clumsy and crowded environment making movements very difficult, especially designated areas for learning and research commons. There were ergonomics issues due to the wrong furniture meant for staff use and operations of the ICT facilitates deployed in the libraries. The libraries were air-conditioned and the illumination as well as the ventilation well equally perfect befitting a modern library.

6.7.5 Staff Attitude, Skills and Knowledge in ICTs

One aspect of the academic library ICTs management that was observed during the visit to the libraries by the researcher was the library staff attitude, skills and knowledge towards ICTs management. It was observed that the library staff showed a positive attitude towards ICT use and management as well as their interactions with the users of the ICT facilities and resources. Most of the skills and knowledge of staff in ICT use and management were good as they demonstrated how to use the ICT facilities in operations and services delivery. It was, however, observed that the most of the library staff do have challenges in the usage of some of the ICT devices especially

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troubleshooting problems. The researcher's observation and interaction with some of the library staff in the five universities libraries revealed lack of skills in technology management. The findings from the observation show that most of the library staff especially senior members and senior staff have adequate ICT skills and knowledge to be able to manage the deployed ICT infrastructure in Ghanaian academic libraries. However, the observation and perusal of the libraries' documents, websites and interactions with the staff revealed a lack of library ICT policies, procedures and strategic plans purposely for ICTs adoption and management.

6.8 Summary of the Chapter

This chapter presented the analysis and the findings from the qualitative data of the study. It includes interviews with the informants; thus, the five university librarians from the five universities libraries as well as the researchers' observation of the ICT facilities, the environment and managerial documents. The findings from the qualitative data related to the status of ICTs diffusion, procedures and processes for ICTs adoption and management, policies and strategic plans for ICTs application and management, barriers and solutions to ICTs adoption and management, strategies and framework for ICTs management, areas of ICTs application, ICT based resources, conduciveness of the working environment and finally the staff attitude, skills and knowledge towards ICTs management. The next chapter presents the discussions of the findings of the study combining the quantitative and qualitative data presented in Chapters Five and Six.

CHAPTER SEVEN
INTERPRETATION AND DISCUSSION OF THE FINDINGS

7.1 Introduction

The previous Chapter presented the analysis of the qualitative data collected from the five University Librarians and the observation results as well as document analysis. The Chapters Five and Six made up of the presentation of the quantitative and the qualitative data respectively. The quantitative data were obtained from the survey of the entire library staff through a set of questionnaires. The qualitative data were made up of interviews with the University Librarians and observation of the various university libraries involved in this study. The University Librarians were interviewed on issues ranging from the availability of library ICT policies and strategic plans for ICTs adoption and management to procedures and processes for ICTs deployment. Other areas covered in the interviews were funding and staffing for ICTs management, barriers hindering ICTs management, solutions to the barriers as well as a framework for the adoption and management of ICTs in Ghanaian academic libraries application and management.

Chapter Seven presents the interpretation and discussion of the findings of this study. The discussion is carried out taking into consideration the research objectives, the review of the literature and the proposed model/framework presented in chapters two and three of this study.

The purpose of this study was to investigate the managerial processes and strategies involved in the ICTs adoption, application and management in Ghanaian academic libraries. In this chapter the discussion is made up of the integration of the two main kinds of data, thus quantitative data and qualitative data forming mixed-method data discussion. The discussion of the findings from the study was presented under these themes in the research objectives and the research questions

which comprises ICT facilities in academic libraries, ICT based resources in academic libraries, factors influencing ICTs adoption and management, benefits and impacts of ICTs on academic library operations and services delivery. Other areas covered in the discussion include the availability of policies and strategic plan for ICTs application and management in academic libraries, human resources for academic library ICT integration and management, funding for academic library ICTs application and management, barriers to academic library ICTs integration and management, strategies for academic library ICTs adoption and management. Finally, the proposed model/framework for ICTs integration and management is proposed.

7.2 ICT Facilities in Academic Libraries in Ghana

This section of the Chapter discusses ICT facilities deployed in academic libraries from the perspective of the entire library staff as well as that of the University Librarians. ICT facilities in academic libraries include ICT infrastructure, ICT based resources and other ICT tools as well as ICT devices that provide a platform for contemporary academic libraries to reach users with their information needs outside the four walls of the libraries. The current revolution in academic libraries globally has necessitated the application of ICT facilities in the operations and services delivery to the user communities to enhance easier, speedier and efficient use of information (Esew and Shrivastava, 2018). ICTs have nowadays become the panacea for information processing, communication and sharing challenges that bedevilled librarians and information professionals. As a result, academic libraries in Ghana have adopted various ICT facilities to assist them to deliver efficient and effective information services to their academic communities. Hence, the need to investigate and interpret the findings from the survey with the library staff about ICTs application in academic libraries in Ghana. To assess the availability of ICTs in the academic libraries studied, the views of all library staff and that of the University Librarians of the university

libraries involved in the study were sought in Chapter Five (quantitative data analysis) and Chapter Six (qualitative data analysis) respectively.

The ICT facilities available in academic libraries under study as the findings revealed include but not limited to ICT infrastructure that comes in various types and forms such as computers, networking systems, the internet and intranets as well as cellular and satellite technologies. Other facilities are tools/resources like CD/DVD-ROMs, pen drives, scanner, projector, printer, smart board, fax machine, multi-media tools, digital camera, videos/audio recorder and photocopiers, as well as ICT-based resources or information resources available and accessible through ICT such as CAS and SDI services, OPAC, electronic books and electronic journals, full-text databases, bibliographic databases and institutional repositories. The indication is that academic libraries in Ghana involved in this study do have an appreciable level of ICT facilities integrated into their operations. Indeed, the findings through the survey, interviews and observations indicated a high level of ICT applications in the libraries under study.

7.2.1 ICT Infrastructure available in Academic Libraries

The ICT infrastructure is the main technological platform for the provision of digital and other electronic information services to meet the needs of modern university library users. A robust and high standard ICT infrastructure is the backbone of efficient ICT systems in academic libraries nowadays. In Ghanaian academic libraries, the basic ICT infrastructure includes computers of all types, the internet and networking, telecommunications as well as software facilities among others. The combination of these infrastructure has provided academic libraries with technological systems for information communication and knowledge sharing (Fidelis, 2018). As a result of this information obtained through the survey questionnaires and interviews about the kind of technological infrastructure in libraries.

The findings from both the survey with the library staff and the interviews with the University Librarians revealed that all the university libraries in Ghana have implemented various types of ICT infrastructure in their libraries, but they vary from library to library. With significant evidence from the Chi-square test as well as what the majority said per the observed values, the survey findings showed that academic libraries studied had deployed computers which are connected to the internet through a well-connected network system.

Again, the findings as shown in section 5.3.2, on Table 5.8 of Chapter Five revealed that cellular technology, satellite technologies, intranet and bandwidth are some of the ICT infrastructure implemented in university libraries studied. Similarly, the findings from section 6.2 of the interviews in Chapter Five and the study site observations concurred the findings from the survey with the library staff, that ICT infrastructure deployed to support the academic libraries operations include fiber optic cables for the networking and the internet connectivity, computers, satellite technology, cellular technology, video conferencing infrastructure, library security system such as closed-circuit television system among others.

Further, the findings from the survey respondents and interviews confirmed that the academic libraries involved in the study have the following technologies; computers, network facilities and the internet, display screen technologies and software as the main components of the library ICT infrastructure for their information systems.

These findings indicate that appreciable level of ICT infrastructure has been deployed in the Ghanaian academic libraries studied. The ICT infrastructure which includes technologies such as telecommunication technologies like telephony, cable, satellite, TV and radio, computer-aided conference tools such as video conferencing has helped academic libraries meet the demands of modern users. Quite apart from the above enumerated, ICT infrastructure in the libraries under

study also include digital technological facilities such as computers of all types, networking technologies including the internet, world wide web and intranet. Still various software applications like KOHA, Alexandria, Virtual used as Library Management Systems (LMS) available in the academic libraries have also ensured a seamless connection to information sources thereby facilitating remote access to library resources.

The findings indicated the Internet and Intranet had a Chi-square value level of p-5 and above which confirms that these two ICT facilities were predominately present in the academic libraries studied. This underscores the importance of the Internet plays in a modern-day library environment and how it has influenced the library profession. The Internet and intranet connect users of the libraries to volumes of digital information in the library using their mobile devices such as smartphones, tablets, Ipads, phablets and laptops outside the libraries (Mensah & Owusu-Ansah, 2018). The internet and other telecommunication networks have transformed the information landscape for the academic libraries to demonstrate their value and remain relevant in academic communities by adopting and integrating ICTs in their services delivery. In most of the universities, it was observed that all the computers were networked and connected to the Internet as well as the provision of Wi-Fi-internet. The internet, especially Wi-Fi-internet, has become the centre of attraction to the students in the use of academic libraries. Therefore, the impact of the deployment of Wi-Fi internet access in the libraries cannot be discounted as a means to increase the patronage of modern academic libraries.

The findings confirm the study by Ponelis and Adoma (2017) that revealed that ICT infrastructure has facilitated libraries automation which has not only enhanced library operations but it has ensured seamless access to library resources and information sharing in academic communities. With the shift from print materials to dependent on the Internet and digital information, the

provision of ICT infrastructure for scholarly communication and information sharing and services, academic libraries have the onerous task of acquiring and utilising various forms of ICT facilities to meet the demands of modern library users. These inherent advantages have occasioned the rapid acquisition and integration of ICT tools in Ghanaian academic libraries (Ibrahim, et al, 2017). Academic libraries in Ghana have recognised the need for the deployment of ICT high standard infrastructure as a precursor for remote access to library resource possible as well as to improve the general performance of library operations. Finally, the availability of ICT infrastructure in these libraries could also be attributed to the efforts on the part of the libraries to respond to the need of modern library users by providing the platform for deployment of information in digital formats. This calls for a strong commitment from the universities stakeholders for the development of library ICT policies and investment in ICT infrastructure to ensure that standard technological facilities are acquired and implemented in support of the library operations through the provision of online access to information.

7.2.2 ICT Tools/Resources available in Academic Libraries

While the availability of appropriate ICT infrastructure serves as a pipeline for information transmission in libraries. There is a need for the availability of ICT tools, gadgets, devices and resources to ensure collection, preservation and better distribution of the library information resources to the stakeholders of the library.

Both the survey findings as captured in section 5.3.4, Table 5.10 and that of the interviews revealed the most common ICT tools and gadgets available in Ghanaian academic libraries to include a computer, CD/DVD-ROMS, scanner, projector, television, telephone, printer, smart board, fax machine, the Internet, cellular technology, multi-media tools, CCTV, pen drive, digital camera, videos/audio recorder, photocopiers and others. Again, except for a Fax machine, radio and RFID,

the findings revealed all the other ICT facilities listed in the questionnaire could be found in public university libraries in Ghana. The Chi-square goodness of fit test clearly shows that ICT facilities such as personal computers, photocopiers, printers, CD/DVD-ROM, scanner, projector and laptop are the most dominant among the deployed ICT tools in Ghanaian academic libraries. The evidence from the results of the findings indicated that the library staff confirmed the availability of ICT tools and other technological devices in the academic libraries under study. The university librarians also admitted that the Ghanaian academic libraries have deployed different kinds of ICT tools and resources with the personal and desktop computers being the most common ICT devices found in the libraries. The most constant thing observed was that all the libraries do have internet available for the use of the patrons and staff of the library. However, the common issue and concern raised by the university librarians was the amount of internet bandwidth for the use of the internet smoothly.

The findings confirmed the widely held view that computers especially, personal computers of all types are the most common and first ICT tool every library that wants to automate its core functions acquires first. Again, it indicated that the computer is a basic ICT equipment that can be easily acquired to support library operations and services delivery in any academic community. However, during the observation, there was no opportunity to test the functionalities of the ICT facilities implemented in the libraries studied, but it was noticed that most of the ICT tools were being used by the library patrons and the staff especially desktop computers as well as laptops. This development certainly could be attributed to the pro-activeness on the part of the libraries to provide the appropriate platform to their user community to access information in multimedia format. Nowadays most library materials are born-digital. It is therefore imperative that the libraries provide appropriate technologies for the preservation and accessibility of such

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information containing materials. Again, modern academic library users are digital natives and prefer digital information in their academic pursuits. This has compelled most academic libraries in Ghana to integrate ICTs into routine activities to satisfy the needs of their user communities.

The findings agreed with the study by Owusu-Ansah and Adjei (2015) who found that academic libraries in Ghana have deployed different types of ICT hardware devices for their operations and services delivery. Similarly, a study by Saleem et al (2013), revealed that several ICTs have implemented in university libraries for various functions such as housekeeping, general administration, budgeting and financial management. Shukla and Sialai (2016) also support the need to have requisite ICT facilities implemented in libraries of academic institutions with the assertion that ICTs have changed the role of librarians as information keepers to knowledge management and communication agents.

As indicated in Chapter Two, of this study, Mingle (2014) was specific in his study that academic libraries especially those in polytechnics have adopted various forms of ICT tools into the technical services units of the libraries for cataloguing and classification as well as the circulation of library materials. Application of ICT facilities facilitate regular and constant flow information in university libraries in a digital format which enhances teaching, research and scholarship in the academic environment. Indeed, the availability of PCs, laptops, video conferencing facilities, photocopiers has assisted in easing the burden of researchers, library users in accessing library materials remotely at a quick fast pace (Igwe, 2013).

Furthermore, the findings reflect the views of several researchers and other studies about the ubiquitous nature of ICTs in modern academic libraries. Igwe, (2013); Uddin and Hassan, (2012); and Ibrahim et al, (2017) all have postulated in their studies availability of different types of ICTs in university libraries globally and support the need to have efficient ICT system. The interviews

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in Chapters Six of the study, with the University Librarians, also confirmed the availability of different kinds and formats of ICTs which have been integrated into their library's operations and information resources utilisation. The findings from the interviews with the Head Librarians show that the available ICTs have helped change and shape the skills and knowledge of the librarians to be able to manage them sustainably.

Also, the findings indicated clearly that library leadership has recognized the potentials of computers and other ICT tools in transforming and revolutionized library services and information delivery. The development in computer technologies has had an immense impact on the storage, preservation and retrieval of information in academic libraries. Thompson (2012) in his study analysed computer used among students at California State University San Marcos Library. He identified types of computers in the library to include desktop computers and laptops as well as hardware and software as forms of computers. Thompson further revealed that most of the participants of the research indicated their preference for using the library computers in the libraries since they would be able to solicit the assistance of the library staff as they accessed information. The fast-changing nature of technology has necessitated the increased manufacturing of sophisticated computers which make computers acquired few years easily become obsolete thereby putting libraries to irreparable loss. Therefore, it is the expectation that library ICT technologies are updated and replaced regularly.

According to Mensah and Owusu-Ansah (2018), academic libraries must adopt modern and standard ICTs as a matter of importance due to the challenges manual libraries have been exposed to with the emergence of ICTs. As the evolution and proliferation of different types of technologies have posed huge challenges to the traditional role and functions of libraries. It is therefore fit and proper for contemporary managers of university libraries to provide the required ICT tools for the

automation of their core functions to remain relevant and attractive to their academic communities. The findings imply that academic libraries in Ghana are making rapid strikes in converting all their rich physical data into a digital library through the adoption of ICTs implementation of library management software.

7.2.3 ICT-Based Resources in Academic Libraries

The main focus of this section was to find out the various ICT based information resource and services provided in the university libraries under study for their users as consequence of the application of ICTs. ICT based resources are the information containing resources or library materials whose accessibility is largely dependent on technological tools and ICT devices. Without these resources' ICT infrastructure and other technological devices would not be of a necessity to academic libraries. Access to ICT based resources is the main reason for ICTs application in academic libraries. According to Hancthate and Sawant (2018), modern academic libraries have experienced an increasing collection of electronic resources as a result of ICT integration.

The findings of the study in section 5.3.3 Table 5.9 revealed that ICT-based resources and services available in Ghanaian academic libraries were positive with the common ones included CAS and SDI services, OPAC, electronic books and electronic journals, full-text databases, bibliographic databases, CD/DVD ROM and institutional repositories. The quantitative data revealed that the ICT based resources and services deployed in the academic libraries have lessened the burden of librarians and their patrons from the difficulties of going through a huge volume of print materials in search of pieces of information. The findings from the Chi-square goodness of fit test also indicated that except for E-query, all listed ICT based resources in the questionnaire were available in the academic libraries studied.

ICT resources are the basis or the reason for ICTs application in academic libraries globally as library users have come to rely mostly on electronic information since they want to have access to library resources outside the library. This finding is an indication that academic libraries in Ghana are not left behind in terms of deployment and integration of ICT based resources and services in library operations and services. These resources enhance the workflow of the library and its staff, thereby providing faster access to information and knowledge (Bhoi, 2017). With ICT based resources, the libraries can provide open access to their holdings all year round. These ICT based resources have remarkably brought about an innovative way of information dissemination in Ghanaian academic libraries. These resources open various information handling and dissemination opportunities to the library staff and users, making access to and use of information fast and quicker in and outside the libraries. This finding is an indication that academic libraries in Ghana are hybrid libraries with both print and digital documents coupled with a wide range of services such as reprographic services among others.

This confirmed the findings of Owusu-Ansah and Adjei (2015) who reported that these ICT based resources are common in Ghanaian academic libraries through the efforts of the national consortium CARLIGH. Again, the finding is in line with the study by Hanchate and Sawant (2018) who found out that ICT based library services in academic libraries to include the internet, email, electronic books, electronic journals, CD/DVD-ROM, audio-visual, among others. ICT based resources ensure that academic libraries provide satisfactory services to meet the information needs of their users. This finding presents a picture of the growth of technologies as the drivers of modern academic library services in Ghana. In addition to the quantitative data, the interview with the University Librarians and the observations revealed that electronic books (e-book) and electronic journals (e-journals) have become the preferred source of learning materials for both the

faculty and students in academic environments. It emerged that the taste for the digital format of the information has necessitated the need for academic libraries to acquire more ICT based resources. The integration of ICT based information resources has created seamless access to research materials in digital format making information and knowledge acquisition quicker and efficient. The development of technologies such as CD/DVD-ROM, external hard drives, as well as pen drive/flash drives, has made information portable no matter the quantity and volume of books, as they could be carried on CD/DVD-ROM easily.

The study revealed that OPAC and e-journals were some of the ICT-based library resources mostly used in the academic libraries covered in the study as per the findings from the quantitative data. Similarly, the interview results in section 6.2 of Chapter Six and the observation in section 6.7 of Chapter Six affirmed and concurred the quantitative survey data about the popularity of the OPAC and e-journals usage among the libraries studied. The availability of ICT-based resources confirms the progress that has been made by Ghanaian academic libraries for the past decades in providing information in digital formats through ICTs adoption (Akussah, Asante & Adu-Sarkodee, 2015).

However, the inadequacy of ICT devices like computers to access ICT-based resources have been identified as some of the challenges for the exploitation of resources available to the libraries. Most studies especially the one by Ani, et al (2016) identified lack of adequate computers and ICT based resources in many university libraries in Africa, but the finding from this study makes an exceptional case for Ghanaian university libraries. The study has revealed the adequacy of ICT based resources and services in academic libraries in Ghana especially from the quantitative data in Chapter Five, Table 5.9.

Indeed, the findings revealed that ICT based resources have improved immensely the services delivery of academic libraries in the discharge of their core routine duties by making information

available to users timely as and when they need it. Gradually, ICT based electronic information has become a major information resource in Ghanaian university libraries. It is therefore imperative that academic libraries invest more in ICT based resources to be able to thrive in the fast-changing information and technological academic society. And also, to ensure that care is taken to maintain these ICT facilities in the libraries because their unavailability may affect the overall library attendance and usage, as academic libraries find new ways of reaching out to users with information products and services.

Finally, it emerged that ICT integration in Ghanaian academic libraries has brought enormous benefits to the libraries. As the findings revealed in Chapter Five Table 5.11, ICTs have brought benefits such as easy access to information remotely, efficiency in services delivery, easier preservation, manipulation and retrieval of information and easier communication among others. This finding is equally confirmed by interviews and observation that ICTs have removed the repetitive moribund library operations and removing barriers of communication. The implication is that academic libraries can provide information in digital format and assigned the library staff to equally important library services like the delivery of information literacy courses in the classroom. This will ensure that the library patron would be equipped with skills to make maximum use of the library resources, as most of the routine activities are carried out efficiently through the support of ICTs.

7.3 Factors Influencing ICTs Adoption and Management in Academic Libraries

ICTs have been accepted and recognised as a game-changer in university libraries. ICTs have provided cutting-edge solutions to numerous challenges bedevilled information services delivery in academic libraries. As a result, modern academic libraries have introduced ICTs into their operations. Several factors accounted for the ICT adoption and the need for proper and efficient

management ICT facilities in academic libraries to maximise benefits inherent in their application. This section discusses factors that influence ICTs integration in academic libraries found in Ghanaian public universities.

7.3.1 Vision and Mission of the Academic Library

Some of the several factors that influence ICTs application in university libraries are the vision and mission of the libraries which must align with that of the university the libraries serve. The findings from the quantitative data in Chapter Five Table 5.14 section 5.4.3 revealed that the vision and mission of the university and that of the library influence ICTs integration and management. This indicates that the vision and mission of the university and that of the library are of significant value in the process of ICTs implementation and management in Ghanaian public university libraries. These factors are the fundamental basis of ICTs adoption in academic libraries since the vision and mission give the directions of the university and that of the library. The vision and mission inform the kind of ICT infrastructure and devices to deploy in the libraries. Again, the vision and mission of any academic library are directly geared towards achieving the overall objectives of the libraries and that of the needs of their stakeholders especially its prime users. They provide future directions of the entire university including its subunits which include the library. Achievement of the university and the library vision and mission in the contemporary libraries, therefore, involves the use of ICTs to ensure that users have easier and fast access to current and relevant information from online sources and in digital formats. The vision and mission are the inspiration and motivation that encourage the leadership and staff of the university and the library provides the technologies that deliver seamless access to information all year round.

The finding confirms views expressed by various researchers captured in Chapter Two of this study about the need to draft a workable and achievable vision and mission for the university

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library to serve as a guide for ICTs applications in university libraries. This finding supports the study of Association of College and Research Libraries' (2004) which states that libraries of all types must formulate vision, mission, objectives, and set goals to serve as a framework for their operations and services including ICTs applications. Similarly, Onoriode et al, (2012) also posit that vision and mission of the libraries should be aligned with those of the parent institutions guide library ICT integration and management. Odhiambo (2004) in his paper about ICT policy indicates managing ICT resources is a daunting task and therefore requires clearly defined vision, mission, and objectives as a factor for successful ICTs adoption and management. It means that acquisition, deployment, and management of ICTs in academic libraries should conform to the vision and mission of their parent universities.

7.3.2 Availability of ICT Policies and Strategic Planning

Other factors such as the availability of ICT policies and strategic plans were revealed as factors that influence ICTs adoption and management in academic libraries. Library ICT policy and strategic planning were considered enablers that influence the successful integration and management of ICT in Ghanaian university libraries. The quantitative data analysis in Chapter Five, sections 5.4.1and 5.4.4, Tables, 5.12 and 5.14 revealed that ICT policies and strategic planning are of utmost importance for ICT application and management in academic libraries in Ghana. However, the quantitative data considered these strategic documents less important influencers in the process of ICT adoption and management as compared with the vision and mission, monitoring and evaluation system and organisational culture. But the qualitative data from the interviews revealed otherwise. The University Librarians through the interviews indicated that policies and strategic planning are the most crucial factors that influence the academic library's

ICT adoption and management. Policies and strategic plans are the working documents that guide and shape the overall processes and operations of the library ICT facilities management.

Findings from both quantitative and qualitative data analysis indicated that all variables do influence ICTs adoption, implementation and management in academic libraries in Ghana. ICT policies and strategic planning are required to guide the current and future direction of the ICT applications (Onoriode et al, 2012). Again, they help identify sources of funding, the kind of staff to recruit, training needs and the requirement for staff as well as technological infrastructure to acquire and implement. Even though library ICT policies and strategic planning were indicated to be influencers of ICTs adoption and management in academic libraries it emerged that all libraries studied do not have policies and strategic plans purposely formulated for library ICT implementation. The finding is amazingly in variance with the study by (Onoriode et al, 2012) averred that policies and planning are pivotal if libraries are to achieve the required benefits in ICTs application. They further stated that the absence of policy and strategic planning leads to haphazard adoption of ICTs in libraries and therefore face implementation and managerial challenges. It is therefore acknowledged that to commence deployment of ICTs in libraries there must be policies to guide its implementation and management and the entire process must also be planed ahead strategically to ensure easy, effective and efficient integration and management.

7.3.3 Availability of Standardized and Adequate ICT Infrastructure/Facilities

ICT infrastructure and other technological facilities provide a platform where academic libraries deliver a high-level quality of information and services to support teaching and learning by overcoming geographical barriers to improve access to learning resources. Standardised and adequate ICT infrastructure and tools are most of the important factors that influence successful ICTs management. To give a push to the automation of library functions and digitisation of library

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resources. The ICT infrastructure is the major component of the academic library ICT system and the success of the ICT application in libraries' hinges of quality and adequacy of the deployed ICT tools.

The findings of the analysis of quantitative data in Chapter Five of this study Table 5.13 established that the adequate and standard of both the university and the library technological play a pivotal role in the efficient application and management of ICTs in Ghanaian academic libraries. The quantitative data do not rate ICT infrastructure than other variables in terms of 'enablers' or factors that influence ICTs adoption and management in academic libraries in Ghana. However, the analysis from the qualitative data, on the other hand, rates the ICT infrastructure most of the important influencers of academic library ICT adoption and management. The University Librarians who are directly in charge of the ICT application and management in university libraries indicated that the quality, quantity and standard of ICT facilities and technological tools are relevant influencers in ICT integrations. It, therefore, means for academic libraries to adopt and manage ICT systems effectively; consideration should be given to the availability, nature, quality, quantity and standard of ICT infrastructure.

The findings agreed with a study by Gani (2014) that found that the availability and accessibility to high-quality computers and other peripherals were some factors that influence successful ICTs and e-library management in academic libraries. Similarly, Ismail et al, (2018) also affirmed that the presence of the required quantity and quality of ICT infrastructure ensure the sustainable management of ICTs in university libraries. Al-Azawel, Parslow and Lundqvist (2016) opine that one important component to be implemented in ICTs and e-learning applications in public universities is ICT infrastructure. They identified ICT infrastructure to include various networks, computers, hardware and software, servers and others since their absence hinders smooth e-

learning including e-library. Finally, ICT infrastructure/facilities have been recognised as 'enablers' for the adoption and management of the academic library ICT system in Ghanaian HEIs.

7.3.4 ICT Skills and Knowledge among Library Staff

One significant factor that influences ICTs adoption and management in academic libraries is human capital. The availability of staff with requisite skills, knowledge, and the right attitudes towards ICTs management. From the findings, both quantitative and qualitative, the need for staff with skills and knowledge ICTs were highlighted as an important factor that influences ICTs adoption and management in academic libraries. The interview results, in particular, revealed that lack of staff with the right skills and attitude does have a negative influence on the overall library ICT projects; therefore, for academic libraries to embark on ICT application, staff appropriate skills, knowledge and required competencies must be recruited. Again, the skills, knowledge, attitude and leadership style among the library directors were revealed as important factors in the integration and management of ICTs in the libraries under study. The university library director's ability to recruit, train and commandeer the library staff towards successful ICT project has been indicated as some of the factors that influence its management in academic libraries.

The findings are clearly in line with the study of Al-Fadhli, Corrall and Cox (2016) which revealed that one significant factor towards successful ICT adoption in academic libraries is attitude, skills and knowledge and the right leadership of library managers. The finding also supports the findings of Attuquayefio and Addo (2014) that found that good staff attitude, technical skills, proper training and confidence as some of the factors that ensure smooth adoption of ICTs in higher education in Ghana including their libraries. This implies that for efficient adoption and management of ICTs academic libraries must have staff with the right frame of mind, best attitude and requisite skills, knowledge and experiences in technology integration and management. Staff

with adequate training, technical knowledge, confidence and good attitude ensure sustainable library ICT deployment and their successful management.

7.3.5 Adequate Financial Resources

Funds are the oil that lubricates the academic library's ICT system. Sufficient financial resources and adequate budget allocation, especially towards library ICT project, is considered the most critical factor that influences ICT adoption and management. The results from the study as shown in section 5.4.4, Table 5.15 of Chapter Five revealed adequate financial resources allocation towards library ICT is the one major factor that influences the adoption and management of library ICTs. The findings further indicated that all the activities concerning ICTs management revolve around regular release and allocation of funds by the financiers of the university library. The implication is that without the adequate and timely release of funds, the libraries cannot purchase quality and quantity ICT infrastructure required, there will be no training for staff and no regular upgrade, update and maintenance of the deployed ICTs.

This finding confirmed the study of Awour, Rabah and Maake (2013) who found that in Kenya university libraries funding is an important factor which ensures effective ICTs adoption in institutions of higher learning. They indicated that the lack of proper funding sources for library ICT projects becomes a hindrance to ICT adoption in academic libraries. Similarly, Gani (2014) found that availability of funding towards the acquisition of ICT facilities, electronic resources and recruitment and training of staff are critical factors that influence library ICTs integration and management.

7.3.6 Monitoring and Evaluation System

ICTs adoption, implementation and management do come with a lot of impediments as well as several challenges. One of the most important and the only way to identify these challenges and find solutions to improve effective and efficient ICTs integration and management in academic libraries is through monitoring and evaluation system.

The findings of the study in section 5.6.7, Table 5.27 in Chapter Five revealed that monitoring and evaluation system and organizational culture are factors for ICTs implementation and management in Ghanaian public libraries. Again, the organisational culture which was considered as one of the significant factors for ICTs adoption, implementation and management in Ghanaian academic libraries.

The findings from the interviews with the University Librarians in Chapter Six of this study confirmed the quantitative data collected through the questionnaire administered to the library staff about the need to have monitoring and evaluation system in place for ICTs integration and management. Indeed, it is obvious from the findings that in managing academic library ICT system, monitoring and evaluation system play a major factor, as it helps examine the implementation process and its impact on the library system. It also provides a platform to audit the investment into academic library ICT system to measure cost-benefit analysis of the huge investment into ICTs integration thereby determining whether an ICT system is operating achieving results as intended.

As established in Chapter Five and Six of this study, the findings from both the quantitative and qualitative data indicated the availability of ICT facilities and ICT based resources in the Ghanaian university libraries as clearly revealed in the above. However, it is important to ensure that the deployed ICTs function as anticipated and a mechanism must be put in place to monitor the ICT system performance. Monitoring and evaluation system, therefore, provides an avenue to keep

track of and manage the performance of the academic library ICT system. Again, the monitoring and evaluation system serves as a measuring tool for the University Librarians to assess if set targets for ICTs adoption and management are being achieved. Indeed, effective monitoring and evaluation system provides new ideas for reexamining, restructuring, refining, and readjusting, retooling and refurbishing the library ICT system/facilities and other supporting infrastructure. This particular finding, therefore, indicated that there is no mechanism to track, assess and evaluate how the deployed library ICT system is performing. It also implies that academic libraries in Ghana do appreciate the need to have a system for checking on the progress of their ICTs integrations in their library operations and services library.

This finding is collaborated by studies in ICTs adoption and management in educational institutions including their libraries. Rodríguez et al, (2009) report that the monitoring and evaluation system provides the needed data to adjust and improve ICT in educational projects to determine whether the projects are achieving set objectives.

The monitoring of ICTs adoption and management in the academic libraries involves the examination of how is being implemented, while evaluation assesses the impact of the deployed ICTs in the academic library on its services and operations (Rodríguez et al, 2009). However, it was established through the interviews with the University Librarian as well as through the documents that academic libraries involved in the study do not have any documented system for the monitoring and evaluation of the deployed ICTs in the libraries. Such system monitoring and evaluation are done in an ad hoc manner, whenever there is a challenge with the operation and usage of the ICT system.

Finally, it is acknowledged that financial resources, quality and adequate ICT infrastructure, teamwork, good leadership and skilled staff in ICTs and modern technologies are the factors that influence successful ICTs management in Ghanaian academic libraries. It can be concluded that well-stated vision and the mission of the university and the library's good monitoring and evaluation system leadership style and skilled librarians in ICT, sufficient financial resources are the actors that help in successful ICTs management. However, on the part of some library staff especially para-professionals, institutional and technological infrastructure, regular power supply, attitudes of staff towards ICTs and technologies, adequate and standard technological tools and ICT facilities were not counted and considered by the library staff to have a significant influence on academic library ICTs adoption and management. However the University Librarians of the university libraries studied think otherwise. They are of the view that availability of ICT policies and strategic plans, leadership, skilled librarians in ICT, sufficient financial resources are factors that highly influence ICTs adoption, implementation and management in academic libraries.

7.4 Influence of ICTs on Academic Libraries Operations and Service Delivery

This section discusses the overall benefits of ICTs on Ghanaian academic libraries. The discussion centres on the benefits and positive impact ICTs have had on the academic library functional areas and services delivery to the library staff and patrons.

7.4.1 ICTs for Improved Library Operations

The analysis of the results shown in section 5.3.5 Table 5.11 in Chapter Five indicates positive benefits and impact of ICTs on academic libraries adoption of ICTs as well as the management of university libraries ICT systems. On the various benefits and impacts ICTs have on academic libraries operations and service delivery in the context of Ghanaian university libraries, the findings revealed that ICTs have brought a lot of benefits to Ghanaian academic libraries and have

impacted their operations and services delivery. Nine out of the fourteen (14) variables were significant which indicated the benefits and impact ICTs have on the academic libraries since their respective mean differences are statistically significant considering their corresponding p-values being less than 0.05. It emerged from the findings that ICT has ensured improved efficiency in library functions, the cost-effectiveness of library operations. It has removed barriers of communication in terms of distance especially with the library stakeholders such as booksellers, publishers and vendors of library resources which include online book purchasing, easy access to publisher website to keep abreast of current information materials available. Other benefits and impacts of academic library ICT system from the findings are the provisions and access to information through the library homepage, availability and access to the library catalogue and databases of other libraries through library networks, sending of overdue reminders to patrons through e-mails, and reduction in the repetitive library routines in academic libraries.

Indeed, it is clear that ICTs in academic libraries in Ghana has provided seamless and easier access to information resources on the part of the library users making their information acquisition and usage less burdensome. However, on the part of the library staff, the findings imply that ICTs have modernization library operations and library systems making services delivery fast, quick and easier. Again, the importance of this finding is that library professionals and academic libraries appreciate the positive impact ICTs in university libraries and that more resources would be allocated for their acquisition and management.

However, the findings show that the availability of information to anyone, anywhere, anytime and even on the desktop of library users, easy to capture, store, manipulate and distribute information as well as the creation of information in digital format is not benefited by the quantitative data analysis ICTs in academic libraries. This particular finding is out of the ordinary and does not

agree with findings several studies that have identified the above variable as some of the benefits of ICTs integration in academic libraries. For instance, studies by Husain and Nazim (2015) and that of Ponelis and Adoma (2018) found that ICTs provide a platform for information capturing, storing and distribution and that with ICTs information could be accessed anytime and anywhere by academic library users outside the academic library buildings. On the other hand, the results of the interview revealed that ICTs have overwhelmingly improved academic library operations such as online cataloguing and classification of information materials, easier stakeholders engaged, provision of information in digital format as well as the development of virtual, electronic and digital libraries among others. Though this particular finding appears not in line with several studies, it finds solace in Kasalu and Ojiambo's (2012) studies about the application of ICTs in collection development in Kenya's Private University libraries. Their study was about the availability of ICTs in the studied university libraries, yet there was an inadequate application of the ICTs to the library collection development thereby denying the library the benefits of the ICTs integration.

7.4.2 ICTs for Improved Library Services Delivery

ICTs applications in academic libraries have influenced information services delivery positively. Findings from the study in Chapter Five Table 5.11 revealed that ICTs integration into Ghanaian public university libraries has ensured easier retrieval of information by the library staff and the patrons. It also emerged that library users have access to information resources all round the clock without necessarily visiting the libraries in person. The findings further indicated in section 5.3.5 and on Table 5.11 of Chapter Five, that ICTs have removed barriers of communication in terms of distance especially with the library and its patrons. The findings again indicated that with the

deployment of ICTs information is available to the library users anywhere, anytime and even on their desktops outside the main library building.

The results from the interviews in section 6.2 of Chapter Six also highlighted the positive influence of ICTs on the services delivery of academic libraries in Ghana. The findings from the interviews confirmed the survey data that through the OPAC, the libraries provide access to their information resources available in the library stock to user communities online outside the library building and opening hours. The findings imply that academic libraries in Ghana have leveraged ICTs to improve the overall service delivery they offer stakeholders such as all-year-round information provision, quick and online references, online reservation and renewal of library materials. ICT integration will ensure repetitive works are handled by technologies and the library staff can be deployed to deliver other services like information literacy skills training.

It is obvious from the findings and the observations during a visit to the universities under study that ICTs have impacted positively on the operations of the libraries and enhanced technologies management deployed in the academic libraries. Finally, the finding is a clear indication that ICTs provide benefits to modern academic libraries operations and they have impacted positively academic library functions, services delivery as well as the image and skills level of information professionals.

7.5 Critical Success Factors for Managing Academic Library ICT System

Having identified the various ICT facilities in Ghanaian academic libraries and the benefits they provide to the libraries in the previous sections, the study further establishes the critical success factors (CSFs) for managing these ICTs in the public university libraries. The findings from Chapter Five Table 5.15, revealed that library ICT policy, strategic planning, top university

management support, processes and procedures management, adequate funding, skilled personnel, staff involvement and motivation, training and professional development of staff are critical factors when it comes to managing ICT systems in public university libraries in Ghana. Findings from the results as captured on Table5.15 indicated the above variables as the 'enablers' or 'drivers' for successful academic library ICT system management. They are described as critical success factors (CSFs). Again, CSFs are the established needs and their availability ensure that the academic libraries are able carry out their functions effectively. The indication is that these critical success factors must be available to ensure that the academic library ICT system is implemented and managed successfully. It can therefore be inferred from the findings that their absence will be an obstacle to ICTs management in academic libraries. As noted by Heeks (2004) the absence of the identified factors can affect negatively the library ICT system, whereas their presence will facilitate the success of the library ICTs implementation and management.

7.5.1 Policy and Strategic Plan for Library ICT System

The findings of the study as shown in section 5.4.4, Table 5.15 of Chapter Five revealed that successful library ICT project management requires the availability and guidance of policy and strategic plan through the entire process of the ICTs adoption, implementation and management. Policies and strategic plans are some of the most important documents formulated to guide and give direction to the decision to introduce ICTs to academic libraries. These library ICT policies and strategic plans often capture the vision and future direction of the university libraries which necessitated in the application of technologies into the library system. The findings from the quantitative analysis in Chapter Five, Table 5.15 and the interviews all highlighted library ICT policy and strategic plan as CSFs. However, the interviews and document analysis revealed that the academic libraries involved in the study lacked purposeful and library specific ICT policy and

strategic plan. The University Librarians during the interviews indicated that since the libraries have not developed library-specific ICT policies and strategic plans, they depend on the piece and pieces of the university-wide ICT policies scattered in various documents. The implication is that the ICT policy and strategic plan used by the university libraries studied are not 'fit for purpose'. These policies and strategic plans do take into consideration the peculiar needs of library ICT systems.

7.5.2 University Management Support and Stakeholders Collaboration

Another important CSF identified in the study is the support from the university top management. The results from Table 5.15 indicated that respondents' rate top management support as very critical if academic libraries are to achieve their objectives for deploying ICTs. Management support is pivotal in library ICTs adoption and management because the management of the university provides the required funding for the acquisition of all ICT infrastructure and other tools as well as the approval of all the policies and strategic plans developed by the library board for implementation. The interview with the Head Librarians also revealed the important nature of the university top management support the planning, design, adoption, implementation and management of the library ICT system. The findings from the interviews in section 6.6.2 of Chapter Six revealed that the librarians have patronized and gained the support of the management of their various universities the required budget allocation towards library ICT deployment and management. The implication is that without the top management support and collaboration from other stakeholders nothing gets done in this context. This means that academic libraries will struggle to get the needed funding for ICTs application and management. This finding corroborates the study of Yeh and Walter (2016) which found out that top-level management had been involved from start to the end integration of ICT and other technologies into the academic library. The

findings from the interviews revealed that a complex library-system integration requires strong leadership that provides support in terms of funding, training for staff and technological infrastructure. They further affirmed top management support as the most important of CSFs in ICTs integration and management. Having the top management support ensures that decisions concerning library ICT systems have the backing of appropriate authorities. The findings also put emphasis on organizational culture where certain policies, values and actions such as a computer or technological skills are made part of every employee in the organization.

7.5.3 Sufficient Funding for Academic Library ICTs Management

It also emerged from the survey responses that availability of sufficient funds is CSF in ICTs management. Findings from both the survey in 5.7.2, Table 5.29 of Chapter Five and interviews showed in section 6.6.2 of Chapter Six indicated that adequate funding is required for the acquisition of adequate and quality ICT facilities such as computers, printers, scanners, photocopiers, networking, the internet and bandwidth as well as electronic resources like e-books, e-journals and other online databases. The findings also revealed sufficient funds are needed to recruit, train and retrain the library staff with requisite ICT skills. The implication, therefore, is that insufficient funding will affect smooth and sustainable adoption and management of ICT in the selected academic libraries. This finding clearly confirms the study by Batane and Motshegwe (2012) that revealed that the acquisition, implementation and management of modern ICT infrastructure required a lot of financial resources in terms of networking of the various local area networks, modern computers and other technological equipment. This finding confirms a study by Amkpa and Abba (2009) who asserted that academic library ICT projects required huge capital outlay for the acquisition of equipment as well as installation, maintenance, recruitment and training of manpower for management and sustainability. From the interview's responses, it was

clear that the old issue of lack of funding is still persisted and inhibits smooth integration and management of ICTs in Ghana.

7.5.4 Staff Motivation and Involvement in Library ICT Project

The findings of the study shown in section 5.4.4, Table 5.15 of Chapter Five revealed that staff involvement and motivation was CSF in academic library ICT system management. The involvement of the employees of the libraries from the onset makes them feel part of the project and therefore own it. They wholeheartedly accept responsibilities for the failure or success of the project. Employees' involvement and motivation can be in the form of training by equipping the staff with new skills in ICTs application, maintenance and management as well as financial rewards. Lack of or absence of staff motivational factors, technological skills has been identified as hindrances to ICTs adoption and management in HEI in developing countries such as Ghana (Batane &Motshegwe, 2012). It is, therefore, crucial to ensure these variables are put in place in proper order for effective management of the academic library ICT system. These factors are pivotal in the successful management of ICTs in academic libraries, while their absence will negatively influence the academic library ICTs system application.

7.6 Policies and Strategic Plan for ICTs Adoption and Management in Academic Libraries.

According to Gichohi (2015) for modern academic libraries to achieve their set goals in terms of change management, behavioural change, innovations, the building of competitive information centre and the integration of ICTs required strategic supportive policies.

In this study, policies, strategic plans, planning, operating manuals, vision, mission, goals objective procedures and processes are described as strategic documents. These strategic documents provide a sound management system that guides how the library ICT systems should be carried out in

terms of their integration, maintenance and management. These strategic documents must be institutionalised and aligned with the overall vision, mission and objectives of their parent institutions. Successful technology integration and management require strategic documents to able to establish the adoption and implementation processes, identify systems requirements as well as human resources required in addition to cost estimates. This has necessitated the need to discuss and interpret the findings on the availability of strategic documents, policies and strategic plans to support ICTs management in the Ghanaian university libraries.

The findings from Tables 5.16 and 5.20 in Chapter Five revealed that library ICT policy, library ICT strategic plan, university ICT policy, university strategic plan and ICT training and development policy for library staff were the documentations considered to be important to guide ICT adoption and management in academic libraries. This indicates how Ghanaian academic libraries are attached to the policies, strategic plans, procedures and operational manuals as strategic documents that underpin ICTs adoption and management. As a result of the pivotal role of ICT in modern academic libraries its integration and management should be guided by strategic documents such as library ICT policies, strategic plan, procedures and operation processes. The availability of strategic documents helps in the effective function and management of the ICTs application. This finding supports the study by Husain and Nazim (2015) who found that ICTs application and use in Indian academic libraries require policies, adequate funds and proper planning.

To harness the benefits of the huge investments made into ICTs acquisition, policies therefore must be formulated, procedures properly planned and documented to protect the ICT resources to ensure their sustainability. As pointed out in Chapter Two of this study Del Guidice et al, (2010)

see technology management as involving policies, strategic plan and process development to guide ICTs integration in order to take advantage of the numerous benefits therein.

The findings confirm a study by Venkatraman (2010) who states that ICT policy is required to ensure that both internal and external operations are successfully protected. On a similar note Igwe (2013) postulates that the pragmatic approach in ICT integration and management should be underpinned and guided by the academic library's parent University and national ICT policies and that of strategic plans. Though the findings indicated the importance of strategic documents in the context of ICT management. However, the interviews with the Head Librarians and documents analysis revealed that these strategic documents were not available in the academic libraries under study. This implies that these academic libraries are implementing technologies without any proper guiding documents and therefore adoption and management of ICTs are done haphazardly. It is therefore obvious that Ghanaian academic libraries do not put in place plans for their ICT adoption and management. This will result in their inability to foresee future crises but rather be reactive instead of proactive and will "playing catch up" (Onoriode, et al, 2012). The findings show clearly that academic libraries and their librarians do not need reminders about the requirement of appropriate policies, planning and strategies in place for ICTs application and management. Finally, the findings show that there is a strong awareness about the need to draft and develop policies and strategic plans to guide ICTs adoption and management in academic libraries in Ghana.

7.7 Human Resources for Academic Library ICTs Integration and Management

The study assessed and evaluated the human resources available in the libraries under study. The results of the study from section 5.6.1 Table 5.21 of Chapter Five that the chi-square goodness of fit test through the asymptotic significant values of the respective items revealed that the University Librarians and the Systems Librarians are the people who are responsible for updating, upgrading, maintaining and managing university library ICT facilities. The findings revealed that the staff in the university libraries have the required skills, knowledge, experience and qualification needed to manage ICT facilities and infrastructure available in academic libraries in Ghana.

Again, the findings revealed that the majority of the respondents (248) representing 79.2% of the total population involved in the study affirmed (with a major proportion of 0.79) that they prefer the library staff to manage the library ICT system. This implies that the library staff trust in their ability to manage ICT facilities and infrastructure effectively if given the required training and motivation. It also emphasises the notion that the library staff understand the library system and, therefore, should be responsible for the management of the deployed technologies in the libraries instead of being handled by the institution's IT personnel or IT departments.

From the survey in Chapter Five Table 5.21, it emerged that most staff within public university libraries have fairly good knowledge and competence of ICTs with few having excellent levels of ICTs knowledge, skills and competence. This finding indicated that university libraries are doing the needful by having the intention to recruit and train staff with requisite skills needed to manage their ICT systems. This corroborates the position of Onoriode et al (2012) that for effective and efficient ICTs implementation and management, the library staff knowledge, skills and competence in ICT must be enhanced, and these should be as a result of lack of requisite ICT

knowledge at an appreciable level. It will ensure that ICT integration and management are carried out expertly.

However, the University Librarians during the interview session indicated otherwise. It was revealed by the University Librarians that the majority of their staff do not possess the requisite ICT knowledge and skills needed for ICT application and management in academic libraries. It was gathered that the library staff lack basic computer literacy skills including troubleshooting skills. This according to the university librarians is hampering smooth ICT management. As a result, in the universities IT staff are taking charge of the deployment and management of the library ICT system. This finding corroborated that of Mirza and Arif (2016) who found that the majority of library and information science personnel in Pakistani universities lack requisite ICT skills and knowledge to adopt and manage ICT facilities. What this means is that if the situation continues the LIS professional will be replaced with IT professionals of the universities studied. Similarly, studies by Enakrire and Ocholla (2017) and Agboh (2015) found lack of required human capital, inadequate ICT skills, staff attitude in ICT integration and inadequate professional staff as some of the obstacles and hindrances towards ICTs application and management.

7.7.1 Training Needs for Academic Library Staff in ICTs Adoption and Management.

On the issue of training in library ICTs management, it was revealed that the majority of the staff in the selected Ghanaian public university libraries are trained on ICTs management. The analysis from chapter five Table 5.21, of Chapter Five, revealed that a sizeable number of the staff in the university libraries have had the opportunities to train themselves in ICTs management. This particular finding also revealed that the library staff undergo training and continuous development in ICTs through the informal systems like self-study and regular self-practice, in addition formal training and retraining through workshops, seminars, conferences and mentorship by supervisors.

This finding is supported by the analysis of interviews with the University librarians who disclosed that various means are being explored to train and equip the library staff with new skills in ICT adaptation and management. The finding agrees with Oladele and Oyelude's (2014) study which asserted that library staff need further training and retraining to acquire new skills for ICT application and management. They also appreciated mentorship as a form of career development in academic libraries for ICT integrations.

Again, it emerged that the skills, knowledge competences and training requirements for managing academic library ICT system may include computer programming, systems management, project management skills, hardware, software and networking management, website/portal development and policy development. Other skills and training needed include metadata/electronic resources management, technological skills, negotiating skills, marketing/advocacy skills, computer troubleshooting skills and monitoring and evaluations.

This finding revealed that the first step of ICTs management has been taken. Thus, the identification of the knowledge and skills gap that needed to be tackled is to offer the staff with the required training skills for effective management of library ICT systems. It revealed that the library staff are aware of their knowledge gap and therefore can identify and proffer the required solutions to enable them acquire the needed further continuous development programmes to fill the gaps.

The finding affirmed the urgent need to equip library staff with technical skills to manage their library ICT system successfully. Bamidele et al. (2013), Cobblah (2015), Yamoah, E.E (2014) have found in their studies the need for training and continuous professional development as ways to enhance staff motivation, skills and productivity. The finding is in line with the study of Gutsche

(2010) which states that modern librarians must acquire new skills to be able to fit and operate effectively in the modern digital and technological era. Staff skills, knowledge and competence in ICTs are very crucial for all technology applications and management. Employees' ICT skills and knowledge must be one major priority for academic library ICTs adoption and management, and therefore mechanism must be put in place for the recruitment of skilled personnel with requisite skill set.

Finally, the findings confirm Husain and Nazim (2015) assertion that in this digital age, librarians must be equipped with the requisite knowledge and skills in all aspects of ICTs and technological management to be able to provide efficient and effective integration and management of all deployed technologies, else their jobs would be taken over by IT personnel. The implications of the findings are that university library leadership as well as the university top management needs to ensure that policies are developed towards continuous professional development of the library staff in ICTs. This has become necessary as a result of dynamic ways ICTs and technologies keep changing by the day. Librarians must therefore stay abreast of the latest trends, developments and changes that ICTs bring to be able to serve their academic communities satisfactorily. Increasing digital literacy among library staff is one of the surest ways for sustainable and successful academic library ICT system management.

7.8 Funding for Library ICTs Adoption and Management

Integration and management of ICTs academic library system require sufficient, regular and sustainable funding towards the acquisition, upgrading and maintenance of ICT facilities and infrastructure as well as staff training (Mirza & Arif, 2016). Funds are the oil that lubricates the academic library ICT system for optimum operations and are needed to acquire material as well as recruit human resources required in academic library ICT projects.

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The results from the analysis revealed that ICTs adoption and management in academic libraries are funded from the general library budget. Findings from both the questionnaire survey in Chapter Five Table 5.25 and interviews indicated that current allocation from the overall university library budget towards ICT management is woefully inadequate. The study has revealed that the availability of funds is considered as one of the CSFs for ICTs adoption and management. The interviews with the University Librarians in section 6.5 and 6.6.2 of Chapter Six disclosed the release of the funds for ICTs activities from the academic libraries budgets is irregular; it delays unnecessary which invariably affects the smooth management of the library ICT system. The interviewees were unanimous that there was no dedicated budget line towards the acquisition of new and modern ICT equipment in the library's budget. This lack of funds solely for library ICT application affects the capacity building of the library staff in handling ICTs maintenances and management.

This finding is in line with Ubogu (2019) who noted that ICTs management requires adequate financial resources to support ICT facilities, devices and infrastructure acquisition. ICTs such as personal computers, server computers, and digital cameras, reprography tools such as scanners, photocopiers, printers as well as software and Internet resources are capital intensive projects for libraries small budgets to accommodate. These ICT facilities and resources are very expensive and not available locally in developing countries. Academic libraries in Ghana need foreign currency to procure such facilities from the developed world. It was revealed from the interviews in Chapter Six that due to inadequate and irregular funding that most of the expected ICT projects have not been able to carry out. Insufficient funds, the study revealed, that have impacted negatively on the quality of ICT resources available in the library's studies, they are hardly updated and upgraded on time.

A study by Awour, Rabah and Maake (2013) found that funding is a major factor in staff development as sufficient financial resources are required to train staff in ICT skills through further studies, participation in seminars, conferences and workshops. Lack of training programmes for staff as a result of inadequate financial resources will eventually, affect the effective management of ICT facilities in academic libraries. It implies no funds are allocated in the library budget solely for regular and emergency updates and upgrades of facilities. This, according to Tiwari and Sahoo (2013) has become a hindrance to ICTs adoption and implementation. In their study, they found that inadequate financial allocation to the libraries toward ICT implementation is a major barrier ICTs development and management in Indian University libraries. In supporting this assertion, Okon and Ogbodo (2014), found out that lack of funds has a negative impact on the smooth application and use of ICTs in Nigerian University libraries. They intimated that due to financial constraints Nigerian university libraries are not being connected to national project called NgREN, and out of over 600 higher educational institutions only 29 had been able to connect to the node of the project.

The need for adequate budgetary allocation to library ICT-based system management must be the priority in ICT management processes. Alternative sources of funding must be explored to raise the required funds to support the traditional budget allocation to the libraries. Academic library ICT-based system is a new dispensation that should be treated differently as technology keeps on changing everyday which demands more to update and change the equipment regularly. A complete budget line dedicated to ICTs application and management should be created for the library by the university management. This budget would be used to fund the acquisition of library ICT infrastructure and other equipment, maintenance of the ICT system as well as staff training to carry out the technical and managerial aspects of the system.

7.9 Hindrances to ICTs Adoption and Management in Academic Libraries in Ghana

ICTs adoption and management in academic libraries in especially developing countries like Ghana face numerous challenges. These challenges are multifaceted as well as intertwined, and the major one among them is the lack of library ICT policy and inadequate funding. As a result of these challenges, the libraries risk losing the benefits technological investments bring to the libraries. The interrogation of the hindrances to ICTs integration and management revealed nineteen (19) out of the twenty (20) variables listed in the survey questionnaire to be barriers to successful ICTs implementation and management in Ghanaian academic libraries. These hindrances are discussed below.

7.9.1 Absence of Strategic Documents and Strategic Policy Direction

As noted in Table 5.28 in Chapter Five, the absence of strategic documents which include library ICT policies, strategic plans, processes, procedures and guidelines were ranked as major barriers to ICTs application and management in libraries. The finding means the absence of the above variables negatively affects the deployment and management of ICTs in the selected academic libraries. As stated in Chapter Two of this study, policies and strategic plans are the blueprint that guides the directions of ICTs management in academic libraries. Processes, procedures and guidelines ensure that ICT application and management are properly documented for future upgrades, updates and proper maintenance. The management of academic library ICT implementation and operation include a wide spectrum of activities such as defining principles, approaches, assigning of roles and the formulation policies. Others are development of ICT strategies and management processes, management of data and information infrastructure, managing the continuity of the library daily operations and all these activities must therefore be codified for future reference.

However, the interviews with the University Librarians in section 6.4 and 6.6.1 of Chapter Six, indicated the selected academic libraries for study do not have a library specific 'strategic documents' for the adoption and management of ICTs. They rather depend on the university-wide ICT strategic documents which do not cater for the peculiar needs of the university libraries. It therefore means that ICT adoption, implementation and management in the libraries studied were being carried out with no directions and in an ad-hoc manner. This finding is at complete variance with the views of Block (2017) who proposed in his 'managing library technology' that any library adopting the technology of any type or form including ICTs must assess the big picture (vision and mission), examining the technology system (existing policies, processes and procedures as well as the infrastructure), people and technology budget (skilled manpower and financial resources). These must be guided by library ICT policy and strategic plans since they will help in assessing the state of the library's ICT system and the need for improvement in terms of funding source, staffing and technological infrastructure.

7.9.2 Limited Financial Resources

The most important barrier to successful ICTs integration and management in academic libraries is the lack of adequate funding. Findings from the questionnaire survey, on the Table 5.28, in section 5.7.1, Chapter Five revealed that insufficient funds and budget allocation for ICT infrastructure were not ranked as a major hindrance to ICT application and management. The implication of finding inadequate budgetary allocation is considered as a barrier to library ICTs adoption and management. This particular finding appears to be out of the ordinary, since the issue of the inadequate financial resource has been identified by several studies as the bane on ICTs application in Sub-Saharan Africa, including Ghana. It also revealed that the respondents involved in the questionnaire survey Table 5.28, in section 5.7.1, Chapter five are not involved in library

budgetary preparation and therefore are oblivious of financial challenges their libraries face. This is because the findings of the interviews with the Head Librarians proved contrary to that of the survey. The interviews with the University Librarians in Chapter Six revealed that the major challenge of ICT application and management is the insufficient library budget.

The findings 5.28, section, 5.7.1, in Chapter Five, revealed irregular update, upgrading and maintenance of the deployed library ICT facilities due to limited and irregular funds. This in the end results in the inefficient library ICT system which might not be able to serve the purpose and objective that informed the ICT application. The implication is that the academic library ICT system will be ineffective, inefficient, unsuccessful, unsustainable and difficult to deliver its mandate of making information easily available to library users. This particular finding is attributed to limited financial resources to upgrade the obsolete ICT equipment and the lack of trained ICT personnel or library staff with limited ICT skills to update and maintain the library ICT-based system. There must be a mechanism by the university authorities as a whole and the library manager in particular to identify alternative ways of raising the needed financial resources to support the library ICT system implementation and management. Since the availability of adequate funds ensures that ICTs adoption and management in academic libraries are executed to perfection, quality infrastructure could be purchased and staff trained and equipped with the skills and knowledge in ICTs.

7.9.3 Inadequate ICT Infrastructure

Table 5.28, section 5.7.1, in Chapter Five captures the inadequate ICT infrastructure, substandard ICT facilities and poor internet connectivity as barriers to successful ICTs integration and management in university libraries in Ghana. The library staff through the survey questionnaire indicated inadequate and insufficient ICT facilities in their libraries. Again, as shown in 6.7.3 of

Chapter Six, it was observed that not all library users had access to computers to use due to insufficient desktop computers as well as sitting spaces for patrons to their personal laptops.

According to the interview results, ICT infrastructure, especially the internet connectivity is the backbone of the academic library ICT system. Therefore, poor internet connectivity, inadequate internet bandwidth, poor and substandard ICT facilities defeat the purpose of having an academic library ICT system in the first place since users cannot benefit from the investments made. Even though the findings revealed the deployment of basic ICT facilities in the majority of the libraries, the ICT equipment seem to be insufficient as compared to the number of users. The findings of the study on inadequate ICT infrastructure is in agreement with the study of Adeleke and Olorusola (2010) and Etebu (2010) who found that inadequate ICT facilities were one of the major barriers to academic libraries ICTs application. It is evident that adequate and standard ICT infrastructure, as well as enough bandwidth is required to ensure that academic libraries provide a constant and seamless information resource to meet the research and scholarly needs of their users. While adequate ICT facilities and the internet serve as the backbone and platform for launching and providing digital library services in higher education institutions libraries, yet personnel with technological skills to execute the library ICT project are of crucial importance when it comes to library ICT management.

7.9.4 Inadequate ICT Skills and Knowledge among Library Staff

One of the major hindrances identified was inadequate ICT skills and knowledge among the library staff. From the analysis of the survey data in Table 5.28, selected staff in the academic libraries possess an average level of ICT skills and knowledge. The majority of the respondents in the quantitative data analysis indicated that they needed training in modern ICTs. Similarly, the interviews with the University Librarians revealed that one of the main challenges they face in ICT

management is the lack of the required human capital. As indicated from the interviews in Chapter Six the majority of the library staff possessed a low literacy rate in ICT skills. As noted in Table 5.28, lack of trained staff in ICT management and technical skills among library staff were considered as some of the barriers to ICTs adoption and management. Further the findings, especially the interviews, revealed that inadequate education and training opportunities and limited skill training in ICTs for library staff ranked as the major obstacles to its integration and management in academic libraries.

What this means is that staff of the libraries under study lack the requisite ICT skills required for the integration and management of technologies in academic libraries. Inadequate or lack of ICT skills and knowledge, therefore leads to technophobia, apathy and resistance to technology adoption as well as resistance to change on the part of the library staff. In their study, Nakhoda and Tajik (2017), surveyed factors that influence the resistance of university libraries staff to technological change in libraries of Tehran University. They found among 11 factors that the need to retrain and relearning is a factor that influences resistance to technological adoption and management in university libraries. Appropriate steps must be taken to motivate the staff to be trained and equipped with ICT and technological skills as well as digital literacy to minimise technophobia and resistance to ICT application.

7.9.5 Lack of Commitment and Support of the University Management

The biggest support a library and library leadership will require in ICTs implementation is the university's top management support. The university top management provides all financial, materials and human resources for academic library ICT implementation and management processes. The library ICT project would be a failure if top management of the universities does not appreciate the need to support such initiative to information in digital format. However as

indicated in Table 5.28, the studied libraries revealed that top university management has been a hindrance to ICT integration.

The implication is that the absence of top management support and collaboration becomes a major constraint to the success of the academic library ICT project. The analysis of the interview in Chapter Six of the study confirms the findings in Chapter Five. The University Librarians of the selected universities for the study revealed that their libraries do not receive the needed support as compared to the other sectors, units, departments when it comes to institutional budget allocations. They expressed dissatisfaction about library issues including ICTs applications given the required attention but treated as a secondary matter. It is therefore imperative on the part of library leadership to seek the support and approval of the university top management and other stakeholders before the commencement of the ICT project in academic libraries.

7.9.6 Leadership and Managerial Style

In respect of leadership and management style of librarians and library authorities, the findings as indicated in Table 5.28 of section 5.7.1, revealed that management style of library leadership has an impact on ICTs implementation and management processes. The leadership style of the university Librarians must be accommodating, all-embracing and involve all staff in the ICT adoption and management throughout stages of the ICT project implementation. The expectation is that the leadership style of academic library managers should be of teamwork and bottom-up approach whereby all constituent members of the library are consulted in the implementation and management for them to feel part of the project and therefore own it. This will highly reduce resistance and apathy among the library staff which are revealed in Table 5.28 of section 5.7.1, as a hindrance to academic library ICTs management. The interviews revealed that most ICT related issues are handled by senior members and few IT staff in the library because of its speciality. It

was revealed that not all the library staff members are involved in the decisions on ICT implementation and management. The implication is that not all the ideas of staff members are harnessed for effective management of ICT facilities in the studied libraries. Such situations bring about apathy on the part of the staff who felt ignored and therefore will not contribute to the success of the library ICT integration. Poor leadership or management style may lead to poor communication which creates resistance on the part of some of the staff. When staff are not consulted and properly informed through effective communication, they tend to resist the change being introduced.

This finding confirms the earlier view of Oyelude & Oladele (2014) who opine that leadership and managerial style of some university librarians have impacted negatively on ICT adoption and management due to their overzealous posture without consultation of the rank and file of the library staff. Similarly, Leysen & Boydston (2009) indicated that the posture, nature and quality of library managers can either ensure staff dissatisfaction or satisfaction, which has repercussions on successful implementation of the library ICT system. On the brighter side, there has been an opportunity for the university librarians to have one-on-one engagements with their staff over the decision to either include or exclude them in the ICT implementation and management process, however the librarians gave explanation about exclusion and assured the excluded staff that their services would be still needed.

7.9.7 Lack of Monitoring and Evaluation System

The result from Table 5.28 of section 5.7.1 indicated that the library staff viewed the lack of monitoring and evaluation system as a hindrance to academic library ICTs application and management. This implies that the selected study sites or academic libraries do not have a well-crafted documented, monitoring and evaluation system to assess the performance of the deployed

ICTs in the university libraries. The outcome of the interview with the University Librarians in Chapter Six support the findings that the academic libraries lack monitoring and evaluation system and do not have a formal means for assessing the progress or otherwise of the implemented ICT system. This approach to ICT assessment would be in a reactive mode creating unnecessary peril as problems could not be anticipated and detected early enough and solutions proffered.

Monitoring and evaluation provide library managers with a system that assesses the progress of the library ICT system to ensure that the set objectives of ICTs adoption have been achieved. According to the university librarians, the various stages in the library ICT adoption and management are constantly monitored and evaluated to identify emerging problems, and corrections made as and when it is necessary to ensure that the investments into the library are protected.

7.10 Measures to Overcome Library ICTs Adaption and Management Challenges

ICTs adoption and management in academic libraries may encounter several barriers that need to be surmounted to ensure they are managed effectively and sustainably. To deal with the numerous challenges facing library ICTs management in public university libraries, the study sought to find out from the respondents how the identified challenges could be surmounted. The following solutions were proposed as some of the measures to overcome barriers and to ensure effective academic library ICT management.

7.10.1 Development of Strategic Documents

The results as shown in Table 5.29 of section of 5.7.2 revealed that formulation and implementation of policies and strategic plans are some of the proposed solutions to ICTs adoption and management in Ghanaian academic libraries. It also emerged from the interview that the

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academic libraries require library ICT policies, procedure manuals and the strategic plan referred to in this study as strategic documents to guide library ICT's application and management. The strategic documents which include, library ICT policy, strategic plans, staff development policy for ICTs application, procedures and process manuals are needed to guide the smooth integration and management of deployed ICTs. The university librarians suggested the need to carefully draft and implement ICT strategic documents purposely towards library ICTs integration and management instead of depending on the university-wide ICT policy and strategic plans which do not fit the purpose as well as the vision and objectives of the libraries.

The findings of the study on strategic documents are in line with the studies of Mingle (2014) and Onoriode, Ivwighreghweta & Akpojaro (2012) which recommended the formulation of ICT policy and strategic planning to guide ICTs application, use and management in libraries. These authors argued that academic libraries in Sub-Saharan Africa should develop policies, strategic plans, manuals, procedures to serve as a guiding document for ICTs acquisition and implementation. This finding of the study, therefore, confirms that the university libraries in Ghana need to develop policies for the implementation of ICTs management.

7.10.2 Provision of Adequate Funding

In response to this issue, the result in Table 5.29 points out that there should be regular and constant provision of adequate funds for ICT adoption and management and adequate provision of funding for training programmes in ICTs for library staff. Again, findings from the interviews in 6.6.2 of Chapter Six suggested that adequate budget allocation and sustainable financial arrangements should be made to overcome this hindrance. For instance, the University Librarians during the interviews proposed a dedicated budget line for the library ICT development and management. This budget line, they suggested, should be geared towards the acquisition and

regular maintenance of library ICT facilities as well as training of staff towards sustainable library ICTs management. Again, the university librarians suggested alternative funding of academic library ICT projects apart from the institutional budget. They indicated that this could be done through the writing of a proposal for grants. Libraries can seek alternative funding outside their traditional library budget allocation by the mother institutions.

The findings indicated that with adequate financial resources allocation, academic libraries should be able to solve most challenges of library ICTs management. Prompt and adequate release of funds for the acquisition of ICT equipment and other technological infrastructure, as well as their installation, would be a major step in ICTs integration and management in academic libraries. The successful library ICTs and technology management depends on the prompt, timely and adequate release of funds (Husain & Nazim, 2015). The availability of adequate funds will help address several of the challenges faced by academic libraries in their attempt to integrate ICTs and modern technologies into library operations and service. A regular source of funding is important to provide support and facilitate the acquisition of ICT facilities and software, and to recruit qualified personnel as well as train staff with multi-skills for managing library ICT systems.

Besides acquisition of ICT equipment and training of Staff with ICT skills, funds are also required to motivate the library employees in terms of good salary and allowances for taking up additional responsibilities as a result of ICTs introduction. This finding corroborates the study of Tarhini, Tarhini & Tarhini (2018) that found out that funding is very important in information technology adoption and implementation in higher educational institutions. They suggested that for smooth IT adoption and implementation academic institutions must develop a long-term budget and identify sources of funding to support the adoption process and ensure a regular flow of funding. In the opinion of the University Librarians adequacy of financial resources will help eliminate most of

the hindrances in managing the academic library ICT system. Finally, the finding revealed, especially on the part of the University Librarians that funds are the oil that lubricate the wheel of library ICT system; therefore, most challenges confronting the university librarians in their attempt to deploy and manage ICTs could be solved through the provision of adequate funding.

7.10.3 Availability of Adequate and Standardized ICT Infrastructure

Findings from Table 5.29 of section 5.7.2, indicated that the availability of adequate ICT infrastructure, standard ICT facilities and fast internet connectivity are considered as some of the effective solutions to successful ICTs integration and management in university libraries in Ghana. High-quality standardised ICT facilities are the basic tools for the academic library ICT system. Again, every ICT deployment will require high-speed internet connectivity to be able to deploy and access ICT-based information resources such as e-journals, e-books and other online databases. The library staff through the survey indicated inadequate and insufficient ICT facilities in their libraries.

Further, the results of the interviews, as shown in section 6.7.3 of Chapter Six, also indicated that all library users need to have access to computers especially sufficient desktop computers any time they visit the library. They suggested the need to acquire laptops as well as adequate sitting spaces for patrons to use their own personal laptops.

According to the interview results, ICT infrastructure, especially internet connectivity, is the backbone of the academic library ICT system, therefore, the provision of high-speed internet connectivity, adequate internet bandwidth, and standard ICT facilities is non-negotiable to achieve the goals for the integration of ICTs in academic libraries. Even though the findings revealed the deployment of basic ICT facilities in the majority of the libraries, yet this ICT equipment seems to

be insufficient as compared to the number of users. Therefore, adequate computers, networking connectivity, adequate internet bandwidth must be provided to ensure quick, fast and easier access to ICT-based information resources. The findings of the study on adequate ICT infrastructure is in agreement with the study of Adeleke and Olorusola (2010) and Etebu (2010) who found out that adequate ICT facilities were one of the major panaceas to academic libraries ICTs application. It is evident that adequate and standard ICT infrastructure as well as enough bandwidth is required to ensure that academic libraries provide a constant and seamless information resource to meet the research and scholarly needs of their users. While adequate ICT facilities and the internet serve as the backbone and platform for launching and providing digital library services in higher education institution's libraries, software and personnel with technological skills are needed to carry out the project effectively and timeously.

7.10.4 Policies for Training and Development of Staff in ICTs.

The results from this study as captured in Table 5.29 of 5.7.2 revealed that the availability of policies for staff training, retraining and development of staff, provision of adequate financial support for regular training of staff in ICTs were considered as some of the solutions to the hindrances to academic library ICT deployment and management. The findings also revealed that staff understanding of training and development of library ICT policies as well as the strategic documents will provide guidelines for those responsible for implementing the ICTs and ensured that the library ICT system is managed efficiently. This implies that the availability of staff with requisite ICT skills and knowledge is a panacea to barriers in an academic library ICTs adoption. It therefore means that there should be a deliberate effort through the development of policies and provision of the required funding for equipping the library staff with ICT skills.

The outcome of the interviews from section 6.6.2 of Chapter Six suggested there should be the recruitment of staff with technological and ICT skills, who are knowledgeable in technology management. The result of the study also indicated continuous training and re-training of library staff as some of the ways to overcome barriers in ICTs maintenance and management. Again, on the part of the University Librarians, during the interviews, it was revealed that training the staff with ICT skills and knowledge helps eliminate technophobia and resistance to technology introduction in the libraries. Competence, skills and knowledge in ICTs will therefore boost the confidence of library staff to enable them to manage ICT facilities sustainably. Finally, the findings on how to remedy the hindrances to ICTs management revealed that besides the availability of financial resources, one major factor is education and training of library staff with relevant ICT and new technical skills as well as attitudinal change. With the right education and right skill set, library staff will feel comfortable and independent to handle library ICT equipment, troubleshooting and any maintenance issues, thereby reducing completely resistance to technology adoption.

7.10.5 The University Top Management Support

The result of the analysis shown in Table 5.29 of 5.7.2 indicated that unflinching support from the management of the library and the university authorities is important in the management of ICTs in academic libraries. It revealed that the university provides financial support, institutional backing, and the enactment and approval of all including library ICT strategic documents. Therefore, the support of the university top hierarchy is of paramount importance to the application and management of ICTs in academic libraries. Again, the result of the study as shown in section 6.6.2 of Chapter Six from the interviews with the university libraries also indicated that support from top management of the universities is one of the major impetus for solving barriers to

academic library ICTs deployment and management. Further, it was discovered from the interviews that the university top management approves every policy, document and indeed progrommes and projects for implementation within the universities studied. This implies that their support is very critical in the smooth implementation of ICTs in academic libraries. This finding supports Laudon & Laudon (2014) who believe that support from top management ensures timely allocation of resources in terms of funds, human and technical expertise, and technological infrastructure to enhance smooth ICT application and management. Finally, the finding also corroborates the study of Sirma, Obegi & Ngacho (2014) that examined factors that influenced the implementation of computer-based information systems in Kenyan universities. In its findings, the study revealed that top management support and approval were of paramount importance in the adoption of information systems in institutions of higher learning, especially in Kenya.

7.10.6 Monitoring, Evaluation and Feedback System

The findings in section 5.7.2 and Table 5.29 revealed that effective systems for monitoring, evaluation and feedback are some of the mechanisms needed to ensure successful and sustainable management of ICT tools in academic libraries studies. Monitoring and evaluation provide library managers with the platform to assess the performance of the library ICT system. This will lead to generating data that goes back to the system as feedback to re-evaluate, re-engineer and improve the ICT system. It was revealed through the interviews that the deployment of ICT facilities and resources in academic libraries come with challenges. Monitoring and evaluation (M&E) have therefore been recognised as the best way to identify and improve technology adoption and electronic resources usage challenges in libraries (Rosenberg, 2008).

Similarly, the finding corroborates the study of Gathoni et al. (2011) that the M&E system is an important mechanism for assessing and evaluating the purpose of ICTs applications and their

impact on library operation, services and the user population. This implies that the M&E system will provide the needed platform for the university librarians and the stakeholders to ensure that the objectives of ICTs adoption are being achieved.

7.10.7 Effective Communication with Stakeholders

Again, the findings, as shown in Table 5.29 of 5.7.2 in Chapter Five, indicated that one of the solutions to academic library ICTs management is clear, effective and unambiguous communication with all the stakeholders. This implies that from the start of the library ICT project, stakeholders must be informed about the entire project processes and their roles spelled out if any. With this, the library leadership gets the buy-in of everybody especially the employees of the library. Effective communication help create awareness about the potential benefits of the library ICT project and serves as an advocacy tool to solicit the university's top management support and raise funds in aid of the academic library ICTs management. Stakeholder collaboration and partnership could be achieved through effective communication and advocacy.

This finding is in line with several studies especially the one by Chan (n.d.) which revealed that the success of ICT application in educational institutions will require stakeholders' support. The stakeholders, especially the library staff, must be engaged at all levels of the ICT management process. The effective communication at all levels in the academic library system is the significant measures to overcome library ICT management challenges

Finally, the findings of the solutions to ICTs adoption and management in libraries in public universities in Ghana shown in Table 5.29 of 5.7.2 in Chapter Five and the findings of the interviews from section 6.6.2 of Chapter Six revealed other issues such as regular and alternative power supply like the acquisition of standby generators since the electricity through the national

grid is erratic. This implies that for academic libraries to benefit from ICTs application, the library administrators must procure standby power generators that will serve as backup power to that of the national grid. This enables the library stakeholder to benefit fully from the ICT facilities deployed in Ghanaian academic libraries.

In a nutshell, it can be concluded that it is important to note the solution to most of the barriers of academic library ICTs integration and management centres around providing adequate funding and to a large extent the need to equip the library staff with skills and knowledge in ICTs. However, some issues of adherence to policies, dedicated staff to implement policies and strategic plans are recommended as some of the solutions.

7.11 Framework for ICTs Adoption and Management in Academic Libraries.

The analysis of both quantitative and qualitative data of the study in Chapters Five and Six as well as the discussion of the findings in Chapter Seven lends support to the adoption and the use of Systems Theory (ST)'by Ludwig von Bertalanffy in 1928, which has been adapted by several researchers for organisations, systems and technology adoption and management such as Batane & Motshegwe, (2012) and Alter, (2018).

This study's suggestion of the approach to ICTs adoption and management in academic libraries based on a systems theory is therefore justifiable as a result of the findings of the study so far. The System Theory has already been described in Chapter Three of this study views an organisation such as academic library ICT as a system which has its subsystems and goals to achieve. The system theory as adopted in this study has four key elements which include Inputs, Processes, Outputs and Feedback. These variables interact with each other in system environments. The four elements were adopted as guidelines for the adoption and management of ICTs in academic

libraries in Ghanaian public universities. However, this study proposes two major variables which are that strategic documents and stakeholder partnership/collaboration to improve the adoption and management of academic library ICT systems in public universities in Ghana.

The inputs are made up of the resources required for the academic library ICT system successfully. Findings of the study in section 3.2.2 of Chapter Three revealed that in general the inputs which include financial resources, human resources, technological infrastructure are needed for the library to run successfully. These inputs form the basis of academic library ICT system adoption and management processes. For instance, funds are needed to acquire ICT facilities and other technological infrastructure, recruit and train staff as well as organise seminars and workshops to sensitise stakeholders about the need for ICTs adoption and their successful management.

The results of the study shown in section 5.4.2, Table 5.13 in Chapter Five and section 6.6.2 of Chapter Six revealed that issues such as financial resources are a major ingredient needed for technology implementation in academic libraries. Others are human resources with the requisite skills needed to deploy, upgrade, update, maintain, run, exploit and manage the ICT facilities and infrastructure system academic libraries. Quality and skilled staff in ICT and new technologies are required to carry out all the academic library ICT integration and all the managerial processes of ICTs adoption. Again, it emerged from finding that technology infrastructure is the platform on which library ICT system runs. ICT infrastructure such as hardware and software facilitate information gathering, processing, storing, retrieving and dissemination.

The findings from section 5.4.3, Table 5.14 of Chapter Five and section 6.3 in Chapter Six in this study also revealed that the implementation and management of the academic library ICT system require processes and procedures to be followed to ensure that success is achieved. The processes identified in this framework are procedures, instructions, rules, regulations, and operations that

regulate and guide technology adoption and its management in academic libraries. Furthermore, the literature section 3.4.3 in Chapter Three, indicated that outputs are the final products that come out of the academic library ICT system as a result of the processed inputs. The outputs of the academic library ICT system are the result of improving efficiency in ease of information processing and dissemination, all-day round availability of information, timely delivery of information and remote access to library resources outside the library. The feedback as described in this framework refers to the processes of evaluating the library ICT system to assess the efficacy of the deployed technologies in the academic library. It is clear from the findings that monitoring and evaluation should be put in place to elicit feedback from the library ICT system to help assess whether the set goals have been achieved. This will in the end inform the future development and improvement in library ICT system.

Findings from this study as shown in section 5.7.2, Table 2.59 in Chapter Five and section 2.4.1 of the literature review, indicated that academic libraries require well-crafted strategic documents such as library ICT policy, library ICT strategic plan, operations and procedure manuals for library ICT management and policy for the staff development in ICTs for ICTs adoption and management. These library ICT policy documents form the basis for the identification of the vision and the mission of the technologies adoption in an academic library and successful management.

For an efficient and successful adoption and management of ICTs in academic libraries, it is imperative that the libraries develop policies and strategic plans that capture the vision and mission statements that spell out the library's plan towards the expectation of technologies. These policy documents outline the elements that are required to achieve the vision and mission of the university as well as that of the library. These elements are the inputs, processes, outputs and feedback, and they must be underpinned by well-crafted strategic documents. These strategic documents must be

aligned and integrated into the wider university ICT policy and strategic plan. The policies and strategic plan serve as a guide in the identification of proper and sufficient inputs for the library ICT system project. The strategic documents serve as the guiding principles in identifying the various sources or alternative sources of funding apart from the normal library budget allocated by the university library. Plans, processes, procedures and operational manuals are also strategic documents required to regulate and guide academic library ICT management towards achieving the set goals.

However, the academic libraries studied lack purposely developed library ICT policies, plans, procedures and operations manual to guide ICT application and management. But the library administrators relied on the university-wide strategic plan and ICT policies. The challenge is that these documents are not crafted with the overall academic library, vision, mission and objectives in perspective and in consideration.

Further, to ensure efficient, successful and sustainable application and management of ICTs in academic libraries in Ghana, there must be a collaborative partnership between the library and its staff, university management, library boards and the university ICT directorate. This is referred to as **Stakeholder Collaborative Partnership** in academic library ICT system management.

The findings from the study in section 3.2 of Chapter Three and section 6.6.2 of Chapter Six revealed that, library ICT policy, library ICT planning, procedures and operational manual development requires collaboration and partnership with the stakeholders of academic libraries. Again, findings from the study in section 3.2 in Chapter Three and section 6.6.2 of Chapter Six also revealed that respondents believe the absence of effective collaboration and partnership with various constituents in the universities affects the successful management of academic library ICT systems.

In this study, the stakeholders were identified to include top university management, library boards or committees, IT units and departments in the universities and library staff. Academic library managers must partner and collaborate with all the stakeholders to organise and regulate ICT resources for their optimum utilization. For example, the university top management provides financial resources for the acquisition of technological devices and other ICT infrastructure. Collaborating and partnering with the university top management ensures that library ICT project management issues received the needed support such as adequate budget allocation. Stakeholders such as library board or committees, ICT directorate or unit, as well as the library staff, contribute to the formulation and development of library ICT policies, staff education and training planning, strategic plans and operation manuals for ICTs adoption and management.

A collaborative partnership with stakeholders ensures that the views of all concerned in the academic communities are captured to enrich the formulation of academic library ICT policies, strategies, planning and operations manual. Collaborative partnership in academic library ICTs implementation and management guarantees stakeholders buy-in to ensure ICT project sustainability. As already intimated in the literature review section, lack of effective collaborative partnership among the stakeholders and ICT project implementers about the projective objectives usually fail most technology integration and management in academic libraries.

A collaborative partnership with the library stakeholders would significantly assist in preparing and developing strategic documents to guide academic library ICT system management, identify alternative sources of funding and procedures for technologies application as well as training programmes for the library staff. Creating and maintaining good relationships with both external and internal stakeholders requires collaboration and partnership towards a shared value of the academic library ICT system. Stakeholder collaborative partnership is indispensable for the

adoption, maintenance and management of ICTs in academic libraries in public universities in Ghana. Finally, collaborative partnerships with stakeholders will ensure that stakeholders understand and support academic library ICTs management with needed resources in terms of finances, needful policies, strategies, skilled manpower and technological infrastructure.

Based on the above discussion and the literature review, it is clear that Academic Library ICT System management should have these elements:

- strategic policy direction (strategic documents): library ICT policy, library ICT strategic planning, ICT policy for training of staff,

- inputs: finances, manpower, technological infrastructure/tools,

- process: rules & regulations, people, technical, procedure and operational manuals,

- output: information products and services,

- stakeholders' collaborative partnership.

The above discussed variables or elements are the various CSF that comes together to form a framework for successful academic library ICT system adoption and management as illustration in the researcher's proposed model for this study.
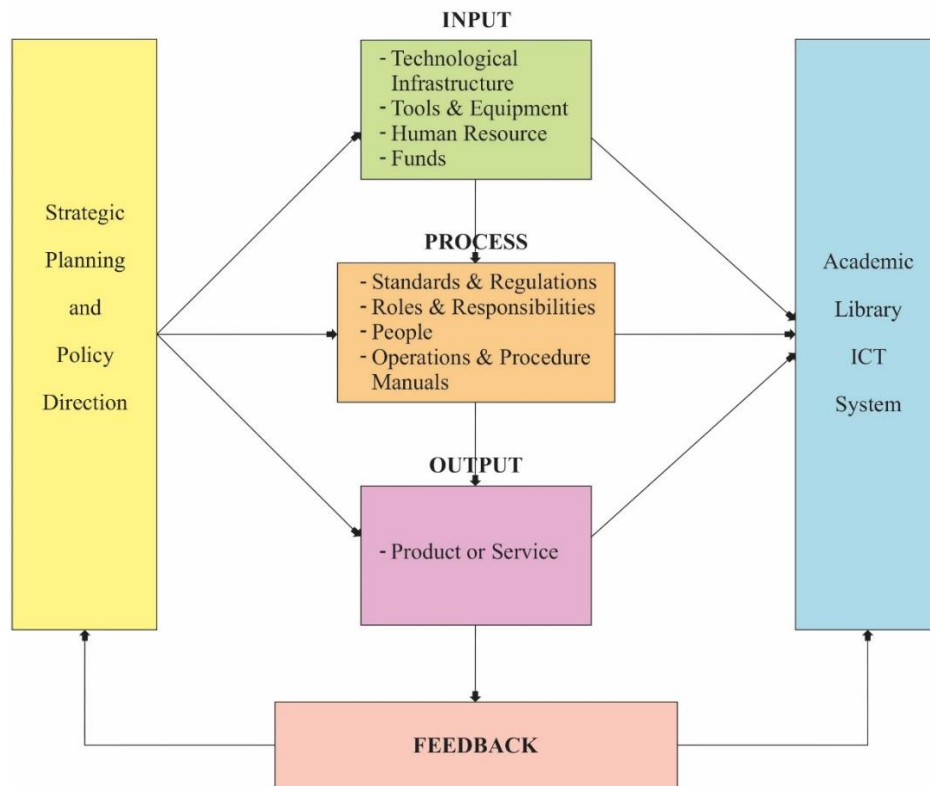
Figure: 7.1 Model for Academic Library ICTs Adoption and Management.

7.12 Conclusion of the discussion

It is clear from the findings of the study that academic libraries in Ghana have integrated various kinds of ICT facilities in their operations and services delivery ranging from acquisitions, cataloguing, classifications, user education, bibliographic control, serials control, reference services, access and information retrieval, document delivery services to reprographic services. Similarly, there are a variety of functions in academic libraries that depends heavily on ICTs such as digitization projects, information and materials archival, materials and space reservations, research support among others. The levels of the library staff skills and knowledge in ICTs application and management can be described as adequate to manage ICTs deployed in the libraries. The striking issue was the absence of policies and strategic plans to guide ICTs

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application and management. There are several possible reasons that could be ascribed to this general result. For example, the rush to copy from other academic libraries and haphazard adoption of ICTs in the libraries without proper planning which eventually leads to implementation and management challenges.

7.13 Summary of Chapter Seven

The chapter covered the discussion of the data presentation and analysis in Chapters Five and Six. This chapter addressed two main critical components of the study. The first is the survey questionnaire made up of quantitative data analysis and its overall impact on the study was discussed. The result is that quantitatively ICT facilities have been deployed in the libraries studied. Secondly, qualitative data gathered through interviews with the University Librarians affirmed the quantitative data about the appreciable level of ICT infrastructure in Ghanaian academic libraries. However, the management challenges of lack of ICT policies, strategic plans, lack of documented procedures and processes were identified. Other barriers militating against ICT adoption and management include limited financial resources, lack of skilled manpower and lack of top university management support. Finally, the chapter proposed a framework for the management of academic library ICTs.

CHAPTER EIGHT
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

Chapter Seven involved the discussion of the findings of the study based on the data in Chapters Five and Six. Chapter Eight presents the summary of the findings of the study, the conclusions, and makes recommendations derived from the findings and discussions and their implications on the management of ICTs in Ghanaian public universities libraries.

This purpose of this study was to investigate the managerial processes and challenges in terms of conception, policies, planning, implementation and strategies involved in ICTs adoption, in order to formulate strategies for their management in Ghanaian academic libraries. In this study, ICTs infrastructure and other technological facilities deployed in academic institutions' libraries are referred to as "Academic Library ICT System (ALIS)" which includes the various components ICTs integrate into the operations of academic library and the delivery of its services. The components of this Academic Library ICT System are made up of various technological devices, technological infrastructure, networking systems and their various types, the internet connectivity as well as ICT-based resources such as online databases, electronic journals and books. The ALIS also include the various technological inputs, strategic policies, processes and procedure manuals and library technology-based products and services as well as manpower to exploit, execute and manage the ICTs efficiently and effectively. Based on the problem statement, as indicated in section 1.2 of Chapter One of this study, the context of the study in section 1.3 of Chapter one and having adopted the research framework discussed in Chapter Three, the study sought to achieve these specific objectives:

1. review and explore the status and level of ICT diffusion in Academic Libraries in Ghana;

2. audit the procedures, processes and factors that influence ICT adoption and implementation in Academic Libraries in Ghana;

3. examine the institutional policies, strategies and human resource that are in place and available for the adoption, implementation and management of ICTs in Academic Libraries in Ghana;

4. investigate factors that hinder the adoption and management of ICTs in Academic Libraries in Ghana;

5. suggest solutions for adoption and management ICTs in Academic Libraries in Ghana.

To achieve the objectives, four main quantitative and qualitative instruments of sources of information were designed to collect data for the study. The data gathering instruments used in the study for both quantitative and qualitative data were; questionnaire, interviews, direct observation and document analysis. These instruments provided significantly valid and concrete data for the study as well as meaningful analysis and discussion. The questionnaire was administered and a total of 313 were received from the academic library staff of the five public universities libraries. Interviews were used on Head Librarians from the five public universities to gather qualitative data for the study. The direct observation and document analysis, also, supported the qualitative data. The two forms of data were combined in the study as mixed-method research. The mixed-method study was conducted sequentially. The quantitative data was collected first using a closed-ended questionnaire and followed by qualitative through the use of semi-structured interviews with the Head Librarians for clarification, confirmation or rejection of the quantitative data provided by the library staff. The direct observation and document analysis also assisted in the confirmation or rejection of data analysis of both the questionnaire and the interviews. The quantitative and

qualitative data were analysed, interpreted and the results presented in Chapters Five and Six but the overall findings of the study were integrated and interpreted together in the discussion section of the study in Chapter Seven.

8.2 SUMMARY OF THE FINDINGS

This section gives the details of the research findings derived from the discussion of the results.

8.2.1 ICT Facilities in Academic Libraries

1. The results of the study indicate that the university libraries studied have deployed various kinds of ICT facilities. Some of the common ICT facilities available in the public university libraries include personal computers, the Internet, printers, CD/DVD-ROM, telephone, projector, photocopy, pen drive and intranet. However, it was observed that ICT tools were inadequate compared with the library patrons who queue to use ICT facilities in the libraries especially personal computers. The main components of ICTs in academic libraries are the computers of all kinds, shapes and sizes.

2. The ICT facilities used most include printers, telephones, CD/DVD-ROMS, scanners, projectors, laptops, pen drives, the internet and photocopiers.

3. Lack of adequate computers affects the regular and reliable access to the library ICT-based resources especially current information in digital format such as electronic journals, electronic and other databases.

4. Despite the inadequacy of ICT facilities, the library staff were satisfied with the ICT tools implemented in their libraries since they support their operations effectively. However, there were plans in advance to acquire more and modern ICT facilities to support library operations and service delivery.

5. Besides the inadequacy of ICT facilities, the findings revealed that some of the ICT tools in the Ghanaian university libraries were not in proper working condition and, therefore, they are not operating efficiently at the optimal level as expected.

6. The reasons provided for 8.2.1.5 above were that there is a lack of regular update, upgrading and maintenance of the library ICT systems resulting in obsolete ICT facilities, thereby hindering effective and efficient management.

8.2.2 ICT-Based Facilities and Resources in Academic Libraries

1. The findings from the results of the study shown in Table 5.9 of Chapter Five indicate that several types of ICT-based resources were available in academic libraries in Ghana. The respondents of the study identified ICT-based resources deployed in the libraries to include electronic journals, electronic books, OPAC, institutional repository, electronic thesis and dissertations, reprographic services, email, web portals, world wide web and social networking tools/applications. They are modern ICT-based resources available in academic libraries to support research and scholarly activities.

2. The findings of the study as shown in Table 5.10 in Chapter Five indicate that OPAC, E-referencing, E-journals, E-books, scanner, projector, CCTV, printer, pen drive, radio, computer, the internet, fax machine and electronic thesis and dissertation are the main ICT-based facilities and resources were used mostly in public university libraries in Ghana.

3. The findings from the study have shown that institutional repository, video referencing, digital camera, television, telephone and CD/DVD ROM are ICT-based facilities and resources have been implemented in academic libraries studied; however, they were not used in library operations and service delivery. The reason being that most of these ICT facilities such as CD/DVD-ROM, telephone and digital camera have been overtaken by

smartphones and pen drives; as a result, their usage is limited. On the other hand, the institutional repository is a new phenomenon that is now catching up in Ghanaian academic communities.

4. All the university libraries under study have integrated ICTs in their routine operations such as serials control, acquisition, OPAC (online cataloguing), circulation and general administration.

8.2.3 Procedures and Processes for ICTs Adoption, Implementation and Management

1. The analysis of the results as shown in Table 5.11 in Chapter Five, points out that identification of ICT facilities to be adopted for automation, acquisition of the identified ICT tools for implementation, training of staff to install, operate, maintain and manage the ICT library were some of the procedures and processes for the library ICTs adoption and management.

2. Development of feedback system to assess the compliance and sustainability, monitoring and evaluation of the library ICT system has been identified as one of the best procedures and processes to adopt and implement ICTs in public university libraries.

3. It was observed from the analysis of the data in Chapter Five and the literature review that standard operating procedure, as well as processes manuals and guidelines, are some of the strategic planning processes for ICTs adoption and management in academic libraries in Ghana.

4. It also emerged that all the academic libraries studied do not have any documented procedures, processes and standard operating procedure manuals to guide the library ICT implementation and management.

8.2.4 Factors Influencing ICTs Adoption and Management

1. It is evident from the findings of the study that several reasons influence ICTs adoption and their successful management in academic libraries in Ghana, especially public university libraries.

2. The results as shown in Table 5.12 establish that respondents to quantitative questionnaire considered half of the fourteen (14) which include a vision and mission of the university and the library, attitude and managerial styles of library leadership, support of the university top management, adequate and standard technological tools/ICT facilities were influencers of ICTs management. Others include the attitude of staff towards ICTs and other technologies, monitoring and evaluation system and organizational culture proved to be statistically significant factors or enablers influencing the adoption and implementation of ICTs in public university libraries.

3. The interview results, on the other hand, indicated that ICT policy, library ICT strategic plan, adequate and regular financial resources, skilled library staff in ICTs, staff involvement and commitment in the ICT application and constant power supply were significant factors that influence ICTs adoption, implementation and management in the academic libraries in Ghana.

8.2.5 Benefits and Impacts of ICTs on Academic Libraries Operations and Services Delivery

1. From the study, it is evident that ICTs integration in academic libraries have impacted positively on the library operations and brought a lot of benefits to the libraries, their staff and their user communities.

2. The findings from the study especially the analysis of the quantitative data suggests that remote access to information, faster and easier information retrieval, online literature

searches, the establishment of institutional repositories and provision of quality and timely access to information are some of the benefits of ICTs in academic libraries.

3. The **r**esult has shown that ICTs have made library operations such as information dissemination and communications, acquisition of information materials, processing of information resources and circulation and other library routine procedures easier, faster and time-saving.

4. Findings of the study show that ICTs have improved the performance and efficiency of the libraries and librarians in their operations and services delivery.

5. The results, especially from the interviews, show that ICTs have brought the libraries new information services such as the institutional repository and data management.

6. From the results of the study, the impact (of the ICTs deployment in academic libraries) is seen to be faster, easier, efficient and effective of which library functions are carried out thereby saving time for stakeholders' engagement.

7. The results revealed that academic libraries provide their resources through modern technologies, such as the use of Wikis, Really Simple Syndication Feed (RSS Feed) and Quick Response Code (QR Code).

8.2.6 Critical Success Factors (CSF) for Managing Academic Library ICT System

1. The results from Table 5.15 shows that availability of ICT policy, development of library ICT strategic plan, top university management support, processes and procedures management, availability of adequate funds are some of the CSF for managing academic library ICT system.

2. It is evident from the findings that skilled personnel and human resources management, staff involvement and motivation, staff training programmes, continuous education and

professional development of staff are some of the CSF that can be used in managing ICT systems in public university libraries in Ghana. However, the results of the study indicate that teamwork, stakeholder consultation and involvement, effective communication among all stakeholders which are pivotal to ICTs integration and management were not considered as CSF required in managing ICT systems in public university libraries in Ghana.

8.2.7 Policy and Strategic Plan for ICTs Adoption and Management in Academic Libraries

1. The results from the study as shown in Table 5.16 indicate that library ICT policy, library ICT strategic plan, library ICT maintenance and renewal plan, installation and maintenance manuals, library ICT integration plan, and standard operations manuals are the main useful ICT documentation that are used for managing library ICT systems mostly in public university libraries. However, the findings from the study indicate there are no library ICT policies and strategic plans specific to academic libraries in the university libraries studied. This, therefore, does not provide avenues in terms of policies, strategic plans, procedures and processes to address adequately issues relating to academic library ICTs adoption and management.

2. Despite the lack of these policies the results of the study as shown in Table 5.19, indicated that library ICT policies and strategic plans provide platforms for efficient and effective management of ICTs in the libraries. They enhance the planning mechanisms for monitoring and evaluating how the library ICT system is functioning and performing and, guarantee sources for funding library ICT development and management in the academic library.

3. The findings show that library ICT policies and strategic plans ensure the development of training schemes for the training of library staff in managing the ICT. They help create

awareness about the need to manage the library ICT system according to internationally accepted standards and feedback mechanism to measure the impact of the deployed ICTs facilities and management tools ensure that there is sustainability in managing ICTs in public university libraries.

4. The results from the study findings show that the staff library is preferred in the formulation and implementation of academic library ICT policies, library ICT strategic plans, processes and procedures. It was indicated that all library staff from top management to lowest staff should be consulted in the formulation and implementation of the various library ICT strategic documents for the management of library ICTs system.

8.2.8 Human Resources for Academic Library ICTs Integration and Management

1. The results of the study from Table 5.20 show that the Head of Librarians and the Systems Librarian are responsible for the update, upgrade, maintenance and management of the university library ICT facilities.

2. Results from the study indicate that skills and knowledge in website/portal development, hardware and network installation and maintenance, electronic resources management, computer troubleshooting and programming are requirements of knowledgeable and well-trained staff for ICTs management.

3. The result from Table 5.22 points out that most staff (64.5%) within the public university libraries fairly have good knowledge and competence of ICTs in general.

4. The findings from Table 5.25 indicates clearly that the library staff do have training in library ICTs management. The majority (216) of the library staff (69.1%) have had training in ICTs management in their university library whereas the remaining (30.7%) had no ICT management training.

5. The results show that the library staff acquire ICT skills and knowledge through, self-study and regular self-practice, formal training, mentorship by supervisors, on-the-job-training, industrial training experience and informal training.

6. The findings of the study as shown in Table 5.26 shows clearly that skills required in library ICTs management include general academic library management, project management skills, computer programming, hardware maintenance and network systems management. Besides, the following are required for the management of academic library ICT system, thus website/portal development, metadata/electronic resources management, policy formulation and implementation. Other required skills include budgeting and fundraising skills, managerial skills, technical skills, negotiating skills, marketing and advocacy skills, computer troubleshooting skills, monitoring and evaluation of ICT systems performance, mentoring and supervisory skills.

8.2.9 Funding for Academic Library ICTs Adoption and Management.

1. The results from the analysis of both quantitative and qualitative show that ICTs adoption and management in academic libraries are funded from the general library budget. Findings show that the funds from the university library budget for ICTs management are inadequate since the libraries do not receive the expected 10% of the university's recurrent budget.

2. The findings of the study have revealed that the availability of funds is considered as one of the CSFs for ICTs adoption and management. The findings of the study show that the release of funds for the ICTs activities from the academic libraries' budgets is irregular and it delays unnecessarily which invariably affects the smooth management of the library ICT system.

3. Results from the study show that there was no dedicated budget line purposely towards the acquisition of new and modern ICT equipment in the libraries' budget. It also emerged that there was no budget line for the capacity building of library staff in handling ICTs maintenance and management issues especially simple troubleshooting challenges.

8.2.10 Hindrances to ICTs Adoption and Management in Academic Libraries

1. The findings of study are that lack of library ICT policies and strategic plans, lack of processes, procedures and guidelines in ICT management militate against effective adoption and management of the academic library ICT system.

2. Results of the study show that inadequate funds and budget allocation to academic libraries affect the procurement of high-quality ICT infrastructure and other technological facilities. Similarly, inadequate funds have impacted negatively on staff training programmes.

3. Results from the study showed that there was a lack of regular training of staff in ICT management which results in lack of managerial and technical skills in ICTs among library staff. There is the issue of techno-phobia among some library staff that has affected their motivation, confidence and self-development in ICTs adoption and management.

4. Results show inadequate education and training opportunities in ICTs for library staff and, therefore, the training provided on library ICTs is limited in meeting the required change needed, which invariably affects the staff skills and knowledge in policies formulation and implementation.

5. The study also found lack of consultation among stakeholders especially on the part of the library staff in ICT adoption processes, which have resulted in resistance to adoption and management of ICTs as well as resistance to change by the library staff.

6. The results as shown in Table 5.27 indicate some barriers as inadequate ICT infrastructure and substandard ICT facilities and poor internet connectivity that prevent online training opportunities i.e. webinars. The study also found that irregular updates, upgrading and maintenance of ICTs as well as irregular power supply as hindrance to ICTs adoption and management in academic libraries.

7. The findings of the study as indicated in Table 5.27 has shown that there was a lack of commitment and support from the university top management, which is in top level CSF academic library ICT system management. Again, it was found that leadership and management style of library managers is not encouraging this has demotivated the library staff and stifle innovation.

8. The findings of the study as shown in Table 5.27 also indicated the lack of monitoring, evaluation and feedback system library ICT system which makes a proper assessment of the library ICT project difficult were observed to be some of the constraints in academic library ICTs management.

8.2.11 Solutions to Hindrances to Academic Library ICTs Adoption and Management.

1. The results of the study indicate that the availability of a well-crafted and approved strategic documents such as library ICT policies and strategic plans, processes and procedure manuals serve as a guide for academic library ICT system adoption and management challenges.

2. Results of the study shown in Table 5.28 indicate availability and procurement of high quality and adequate ICT facilities. It is expected that if adequate ICT infrastructure is provided the challenge of lack of enough technological devices will be overcome.

3. The findings of the study revealed that regular and constant provision of adequate funds for ICT adoption and management is one of the best solutions to hindrances of academic library ICTs management. This will offer the libraries the opportunity to acquire quality, standard and adequate library technologies as well as train staff with requisite ICT skills and knowledge to manage the library ICT system.

4. It emerged from the findings of the study that well-crafted staff development policies towards the academic library ICTs management for staff training and retraining would be a motivation for the staff in managing library ICT infrastructure effectively and efficiently. Again, adequate provision of financial support for regular training and continuous professional development of library staff in ICT is considered as a panacea to barriers of library ICT management.

5. Results of the study as shown in Table 5.28 indicates that commitment and support from the top management of the library and the university are considered as the best of all solutions to barriers to library ICTs adoption and management. This is because the university top management provides policy, procedural, training and especially financial support towards academic library ICT system management. The top management of the libraries offers technical and managerial leadership towards ICTs adoption and management.

6. The findings from the study recognized effective communication at all levels in the academic library system as well as collaboration and partnership with stakeholders as measures to overcome hindrances to library ICT management.

7. However, the results of the study did not consider quality and flexible work culture to allow the acceptance of change in the university library system as a solution to hindrance in academic library ICT management.

8.2.12 Strategies for Managing ICTs in Academic Libraries

1. Results from the findings of the study showed that one of the best strategies for managing academic library ICT system is the collaborative partnership with all stakeholders of the library community. This will ensure that the library gets the support of all members of the academic community for the integration and management of the technologies.

2. Findings of the study as shown in Table 5.30 indicate that the formulation of policies, strategic plans, processes, procedures and manuals are some of the strategies for managing academic library ICT systems in Ghana public universities.

3. The results of the study indicated that the recruitment of skilled staff in ICTs and the training of staff with the requisite skills in ICTs applications were considered as some of the strategies needed in managing the academic library ICT system.

4. The findings of the study indicated that the ability of the library managers to raise funds outside the traditional library budget for the procurement of ICT facilities as well as train library staff must be one of the best strategies in managing academic library ICT system.

5. The results of the study showed that the availability of high quality and standardize ICT infrastructure is also considered as the best strategic framework for managing ICT facilities in academic libraries in Ghana.

6. On the other hands, the results of the study showed that proper documentation of work procedures and processes, library ICTs output must be fortified to meet user expectation

and the formulation of monitoring, evaluation and feedback system were not considered strategies for managing the academic library ICT system.

8.3 CONCLUSIONS OF THE STUDY

The conclusions are based on the summary of the research findings enumerated in 8.2 of this section of the study which is presented in line with the study objectives and the themes that emerged out of the analysis of the data and the results.

8.3.1 Conclusions on ICT Facilities/Infrastructure

The acquisition, implementation and use of ICTs in academic institutions have become indispensable in the present era of information explosion and technological advancements. ICTs and modern technologies are the most effective tools for enhancing services to library users in academic communities. Based on the findings summarised in 8.2.1, 8.2.2, and in reference to objective 1.4.1.1, this study concludes that:

a. Most university libraries in Ghana have integrated ICTs into service operations for effective and efficient library and information services delivery. Findings on the status and level of ICT diffusion in academic libraries in Ghana have demonstrated that public university libraries have deployed various types of ICT facilities in the functional areas of the libraries. For example, functional areas such as cataloguing and classification, circulation, institutional repository, reference services, communication and information sharing, budgeting and general administration are supported by ICT. This has ensured speedy dissemination of information and library services to the user community as well as easier and efficient acquisition and processing of information materials by the library staff. The study identified the most common ICT facilities in academic libraries to include a

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computer, CD/DVD-ROM, scanner, projector, Library management software, pen drive, digital camera video/audio recorder, intranet, photocopy, laptop, the Internet, cellular, multi-media tools. This implies that academic libraries in Ghana are integrating modern technological devices into their operations. It has also revealed that ICT tools available in the five academic libraries are mostly computers of all types and audio-visual tools that use to support routine operations of the libraries.

b. Although ICT facilities have been deployed in the libraries, they are inadequate and most of them are obsolete due to lack of regular upgrading and maintenance. This situation affects the effective exploration of the library resources to the benefits of their users. However, it could be concluded that the library staff were at least satisfied with the ICT facilities in libraries which have to ease their burden in information processing, preservation and dissemination.

c. All the university libraries use ICT facilities to provide ICT-based resources such as e-journals, e-books, electronic thesis and dissertation, institutional repository, OPAC, e-lists, social networking, Audio-visual services, reprographic services, online searching, email, extranet, web portals, world wide web, web publishing, file sharing. But RSS, RFID and e-QUERY which are modern ICT based resources used by libraries were not available in Ghanaian academic libraries. Also, ICT-based facilities and resources mostly used are OPAC, e-referencing, e-journals, e-books, scanner, projector, CCTV, printer, pen drive, radio, computer, the Internet and electronic thesis and dissertation. However, of the utmost importance is having high quality, standard and robust ICT facilities in place to facilitate effective and efficient library ICT system use and management.

d. The libraries studied agreed that ICTs application in academic libraries is beneficial in the provision of library services. Some of the benefits of ICTs to academic libraries revealed in the study include remote access to information, greater and easier retrieval of information, improve efficiency and effectiveness of library functions and the removal of barriers to communication and distance. Others are the online acquisition of library materials, the provision of information through the library homepage, provision of access to library resources through the online catalogue, communication through e-mails, and reduction in repetitive library routines. These benefits inherent in ICTs have necessitated the rapid integration of modern technologies in academic libraries in Ghana. Despite the enormous benefits that ICTs have on academic library functions, lack of policies and proper planning will result in the waste of resources invested in their application.

8.3.2 Procedure and Processes for ICTs Management in Academic Libraries

The study results on the procedures, processes and standard operating procedure revealed that the libraries and librarians recognized the importance as well as the need to have procedures, processes and standard operating procedures to facilitate the libraries' ICTs integration and management. Based on the findings summarized in 8.2.3 and in reference to objective 1.4.1.2 the study further concludes that:

a) the best procedures and processes to adopting and implementing ICTs in public university libraries are the identification of ICT facilities to be adopted for automation; acquisition of the identified ICT tools for implementation; training of staff to operate; regular maintenance of ICT system as well as the sustainability of the ICT system.

b) considering the findings summarized in 8.2.3.4, the academic libraries in Ghana do not have library specific ICT based procedures, standard operating procedures and processes

manuals, instead they depend on the university-wide ICT based strategic documents for the adoption, deployment and management of library ICT systems. It is concluded that academic libraries develop ICT policies and strategic plans for adoption of ICTs, court the support of the university top management; and ensure the library staff are involvement and committed to ICT projects, develop monitoring and evaluation system for ICTs and develop a feedback system for the purpose of managing library ICT system. It is also concluded that, having these procedures, standard operating procedures and processes manuals well-formulated and documented, ultimately contributes to the efficient and effective management of the academic library ICT system which invariably also gets reflect in successful and sustainable library operation and services in the university libraries in Ghana.

8.3.3 Critical Success Factors for ICTs Adoption and Management.

The successful adoption, implementation and management of ICTs in academic libraries are certainly underpinned by several factors. The absence of these factors therefore has dire consequences on the operations of the library and the efficiency of the deployed technologies. Based on results of findings from both the qualitative and quantitative data summarised in 8.2.6 and with reference to objective 1.4.1.4, the study concludes that:

a) the factors that facilitate smooth ICTs management in public university libraries include the vision and mission of the university and that of the library, monitoring and evaluation system and organizational culture. Others were attitude and managerial styles of library leadership, support of the university top management, adequate and standard technological tools/ICT facilities, the attitude of the staff towards ICTs and other technologies.

b) factors such as support and corporation among library staff, university authorities support, functional library ICT management team/committee, collaboration with stakeholders, sufficient budget allocation towards ICT, a well-developed ICT training programme for staff and formulation strategic plans for the academic library ICT integration is considered as CSF for ICTs adoption and management in academic libraries. These are the components of the academic library ICT system. Their availability, quality and quantity ensure successfully application and management of the library ICT system. They are the inputs and the process that leads to the output of the ICT facilitated academic library products and services.

c) the results of the findings summarized in 8.2.7 conclude that most of the CSF elements especially policies, strategic plan, staff training policy, monitoring and feedback systems that are library specific were absent in the libraries studied. The unavailability of most of these CSF elements implies that the academic libraries are implementing ICT facilities haphazardly without guiding principles and measurement tools to evaluate the performance of efficiency and effectiveness. The result is that such a situation leads to a waste of financial resources invested in technological tools and devices as well as manpower. In a situation where these factors are available, they must be of the current standard, revised and updated regularly, budget allocation towards ICTs must be adequate and technological tools must be of high quality and meet the internationally accepted standards. The research therefore concludes that academic libraries in Ghana as per the results and discussions of the study deploy ICTs without the required and expected CSF that could sustain and ensure effectiveness and the efficiency of library ICT projects.

8.3.4 Availability of Strategic Documents

One of the major objectives of the study was to establish the availability of policies, strategic plans, strategies, human resource and funds for the adoption, implementation and management of ICTs in academic libraries in Ghana. Taking into consideration the summarized findings of the study in section 8.2.6 and 8.2.6 as well as objective 1.4.1.3, the study concludes that:

a) strategic documents or strategic policy direction, which include library ICT policies, strategic plans, operational manuals, that provide strategic policy direction play a very crucial role in the management of the academic library ICT systems.

b) besides the lack of operating procedures and processes manuals, all the five academic libraries involved in the study did not have library ICT policies, ICT strategic plans for the library as well as policies to train staff in ICTs and other modern technologies. The lack of library ICT policies and strategic plans therefore result in the lack of vision, objectives and direction for the future development, integration and management of ICTs in the five university libraries studied. This situation therefore affects the effective management of the library ICT systems due to lack of policies and strategic plans to guide and give direction for proper implementation of the ICT facilities in the libraries studied. The ICTs adoption, implementation and management therefore are unplanned and haphazard.

c) the university libraries involved in the study as indicated above do not have purposely crafted library ICT policies but rather relied on their university-wide ICT policies and strategic plans which do not take consideration the specific needs, requirements and problems that are library. This kind of general or university-wide ICT policies do not touch holistically on library technologies but a small aspect of the library ICT systems. The result

is the ad-hoc and uncoordinated management of the library ICT systems and its related challenges.

8.3.5 Hindrances to Academic Library ICTs Adoption and Management

The technology adoption and management in developing countries like Ghana is bound to face challenges. This study therefore identified some hindrances that face Ghanaian academic libraries in their ICT systems management. Based on the findings of the study summarised in section 8.2.10 and with reference to objective, 1.4.1.4, the study concludes that:

i) the absence of strategic documents for the integration and management was identified as a major hindrance to the successful and sustainable management of academic library ICT systems in university libraries in Ghana. It is also concluded that the absence of library specific ICT based strategic documents such as library ICT policy, ICT strategic plan, ICT operating procedures and process manuals. This situation clouds the current and future direction of the ICT application since there will be no vision, mission and stated objectives to guide the library ICT system management process.

ii) with the exception of Head Librarians and the Systems Librarians, the majority of the academic library staff lack requisite ICT skills, knowledge and competences required for the integration and management of the ICT facilities. This lack of skills and knowledge has affected efficient and smooth management of the ICT system in Ghanaian academic libraries resulting in frequent breakdown of computers. Despite all the training opportunities given them to improve their skills and knowledge in ICTs, they lack requisite advanced technological skills, competences and knowledge to manage ICT facilities deployed in academic libraries. Due to that, the head librarians and the systems librarian were the only people eligible for upgrading, updating, maintaining and managing

university library ICT facilities. This is as a result of lack of policy for the training of staff specifically in ICTs integration and management. It is also concluded that the lack of regular training for staff in ICTs was a major barrier to technology adoption and management in Ghanaian academic libraries that have generated into apathy, technology phobia, low motivation and self-development among library staff leading to resistance to change by the library staff. Overall, the study concluded that staff ICT skills and knowledge are not good enough to enable them manage academic library ICT system successfully.

iii) most of the academic libraries studied faced the challenge of funding in ICTs application and management. The five academic libraries have limited financial resources which have immensely affected ICTs management in the libraries. The institutional budget allocation to the libraries is inadequate. It also concluded that there was no budget line in the university library's annual and recurrent budget solely dedicated to library ICTs development and management. Inadequate budget allocation for ICTs development has an escalating effect on all components of the academic library ICT system. The issue of limited financial resources has negatively impacted on the acquisition of adequate, quality and deployment of ICT infrastructure, development of library ICT policies as well as regular training of staff in ICTs. Finally, the study concludes that academic libraries in Ghana do not receive 10% of their parents' institutions recurrent budget as expected which has affected the operations of the libraries immensely with its concomitant effects on the library ICT system specifically.

iv) the university libraries involved in the study lack adequate ICT infrastructure and there were substandard and obsolete ICT facilities due to irregular updates, upgrades and

maintenance of ICTs as a result of lack of funds to replace faulty and malfunctioning computers, lack of training and skills and knowledge in ICTs management.

v) it is again concluded that irregular power supply and poor internet connectivity as a result of low bandwidth were some of the hindrances to academic library ICTs management in Ghana. This was evident in the breakdown of some ICT facilities as a result of erratic power fluctuations and low the slow downloads of digital files because of a lack of adequate internet bandwidth.

vi) the academic libraries studies did not have codified monitoring, evaluation and feedback system to help assess the progress of library ICT deployment and implementation process. The lack of monitoring, evaluation and feedback implies that it was difficult to measure if the desirable results and objectives were being achieved.

vii) lack of commitment and support from the university top management, leadership and the management style of library managers, lack of motivation and self-development among library staff were identified among some of the challenges faced. Overall, the findings from the study concludes that there was a lack of collaboration, consultation, absence of staff involvement and partnership between the libraries and their stakeholders. This was evidence in the library staff preference for library staff to manage the ICT system, the evidence was also adduced by most library staff indicating they were not consulted in the deployment and implementation of their library ICT systems.

8.3.6 Strategies for ICTs Adoption and Management

To ensure efficient management of ICT facilities and also to overcome barriers to ICTs adoption and management in Ghanaian academic libraries, the study suggested strategies in this direction and therefore the libraries and librarians agreed on the need to identify best strategies for successful

academic library ICT system management. Concerning the strategies for successful and sustainable academic library ICTs adoption and management, as indicated in sections 8.2.11, 8.2.12 and in reference to objective 1.4.1.5, the study concludes that:

i) there should be available a well-crafted and approved strategic documents such as library ICT policies and strategic plans, processes and procedure manuals to serve as a guide and direction for current and future academic library ICT system adoption, implementation and management.

ii) the availability and procurement of high quality and adequate ICT facilities considered as the best strategic framework for managing ICT facilities in academic libraries in Ghana. It is expected that if adequate ICT infrastructure is provided, the challenge of lack of enough technological devices would be surmounted.

iii) the regular and constant provision of adequate funds for ICT adoption and management is one of the major strategies and solutions to hindrances of academic library ICTs management. The availability and dedicated budget line for ICTs development and management will offer the libraries the opportunity to acquire quality, standard and adequate library technologies as well as train staff with requisite ICT skills and knowledge to manage the library ICT system.

iv) formulation of staff development policies towards the academic library ICTs management for staff training and retraining would be a motivation for the staff in managing library ICT infrastructure efficiently. Also, section 8.2.12.3, concludes that the recruitment of skilled staff in ICTs and the training of staff with the requisite skills in ICTs applications were considered some of the strategies needed in managing the academic library ICT system. Again, it is concluded that the adequate provision of financial support for regular training

and continuous professional development of library staff in ICT is considered as a panacea to barriers of library ICT management.

v) the commitment and support from the top management of the library and the university are considered as the best of all solutions to barriers to library ICTs adoption and management. This is because the university top management provides financial support for the formulation of policies, procedural, training towards academic library ICT system management. The top management of the libraries also offer technical and managerial leadership towards ICTs adoption and management.

vi) that one of the best strategies for managing academic library ICT system is the collaborative partnership with all stakeholders of the library community. This ensures that the library get support of all members of the academic community for the integration and management of the technologies, effective communication at all levels in the academic library system as well as collaboration and partnership with stakeholders as measures to overcome hindrances to library ICT management.

vii) the results conclude that proper documentation of work procedures and processes together with library ICTs output must be fortified to meet user expectation and the formulation of monitoring, evaluation and feedback system. These strategies were not considered for managing the academic library ICT system

8.4 RECOMMENDATIONS

Based on the conclusions of this study, as outlined in section 8.3 above this section recommends some solutions towards achieving efficient and effective adoption and management of ICTs in Ghanaian academic libraries in public universities.

This study therefore recommends as follows:

8.4.1 Recommendation on the Provision of ICT Facilities in Academic Libraries

As a mechanism to integrate high standard quality and adequate ICT facilities in Ghanaian academic libraries the following steps are recommended:

1. The academic libraries should conduct technology needs assessment to evaluate the required number of technological tools such as computers viz-a-viz the number of potential library users of the ICT facilities as well as the quality of ICT tools to be deployed as the first step in academic library ICTs management process. This will provide the actual picture of what is needed to be acquired in terms of numbers and specifications which inform the budget allocation towards library ICTs acquisition. Adequate and robust ICT infrastructure as well as unlimited access to Internet bandwidth will ensure remote access to library resources through the provision of proxy servers to CARLIGH resources subscribed by Ghanaian academic libraries.

2. The library managers and the university management must provide proper networks, adequate computers and other network tools and ensure these ICT hardware facilities improve the technological infrastructure-based network in Ghanaian academic libraries. This will provide a strong network for the running of the various library management software and the deployment of library ICT-based information resources. The university top management must be ready to provide regular and adequate budget allocation towards ICT infrastructure to enhance the effectiveness of the academic library ICT system. This will therefore help enhance access to ICT facilities and other technologies by the library staff and users to improve the academic library operations and services delivery in the university communities.

3. It is recommended that more financial resources should be allocated towards the subscription of library ICT-based information resources in tandem with the improvement

of ICT infrastructure. The library ICT-based resources could be accessed by the library patrons outside the library building. This will help cater for the huge gap between the library facilities and the growing number of the student's population observed by the researcher.

8.4.2 Strategic Documents for the Adoption and Management of ICTs in Academic Libraries

Strategic policy direction (strategic documents) which is made up of library ICT policies, library ICT strategic plans and ICT staff training and development policy is required to ensure effective and efficient ICTs adoption and management (Owusu-Ansah, et al., 2018), in public university libraries in Ghana. The success of every ICT implementation in organisations especially in academic libraries depends on the availability of a well-formulated ICT strategic documents involving library ICT policy, strategic plan and planning (Nebeolise, 2013). From the findings, the study concludes that the absence of strategic policy direction is a major challenge hindering effectiveness and sustainability in Ghanaian academic libraries ICTs management. Specifically, the study's recommendation on strategic documents are as follows:

1. that academic libraries in Ghanaian universities develop their strategic documents dedicated solely to the needs of the academic libraries to cover the vision, mission and objectives of ICTs integration and management in the libraries.

2. there must be specific ICT strategic documents such as policies well-crafted towards technological needs, the acquisition of ICT tools and other technological infrastructure, identification of staff ICT training needs and planning for public university libraries in Ghana.

3. university libraries in Ghana should develop policies and strategic plan towards ICTs adoption and management and revise them regularly to meet the changing technology trends.

4. academic libraries ICT strategic documents especially policies should serve several purposes, such as outlining the rationale, the goals and the vision for introducing ICTs into the academic library systems as well as the benefit of the new technologies to the libraries and the academic communities as a whole.

5. the library ICT policy should ensure that all individual efforts are geared towards the overall objectives of the university libraries' shared vision as clearly outlined in the library ICT policy and strategic plan. The absence of policies means that the university library ICT infrastructure funding and budgets become irregular and unsustainable.

6. the library ICT policies and strategic plans of the academic libraries in Ghana should be in tandem with the strategic objectives of the universities. This will help the academic libraries to develop their mission and vision including library ICT and technology policies to guide them to achieve their goals in line with the overall university ICT policy.

7. the staff in the academic libraries should be involved in all the processes of developing the strategic documents so that they can offer library specific suggestions and solutions that will make the library ICT policies and other documents relevant to the needs of academic libraries and their staff.

8. the university library ICT policies and the strategic plans should spell out the processes, guidelines and procedures that will delineate roles and responsibilities of all categories of library staff in the ICT management process.

9. the academic library managers in Ghanaian public universities should put in place measures to ensure that all library staff are made aware of the availability of the strategic documents. Again, the academic libraries' staff should be made aware in the drafting and implementation of the strategic documents through seminars, staff meetings and workshops.

10. the head librarians or library directors in Ghanaian academic libraries must ensure that all aspects and components of the library ICT policies and strategic plans are fully implemented so that the full dividends of technology adoption and management would be achieved in the long haul.

11. finally, there is a need to deliberately and continuously strengthen, update and revise the library ICT policies of all the academic libraries studied. All library management decisions, processes and directives on ICTs integrations must be documented and incorporated into the library's operating procedures manual. This will help facilitate easier operations and maintenance of the library ICT system and also serve as a guide for current and future staff who will manage the system.

8.4.3 ICT Skills and Knowledge Development and Training for Academic Library Staff

The technical know-how of university library staff is relevant for the successful ICT integration and management in modern academic libraries (Omeluzor & Oyovwe-Tinuoye, 2017). ICT skills and knowledge of the academic library are pivotal for the effective and efficient exploitation of deployed technologies in university libraries in Ghana. University library staff need continuous professional development and education and training in ICTs to keep them abreast of modern and new trends technologies in hardware and software to enable them to offer professional services to

the library user community. Therefore, the capacity building of the university library staff is required to manage the library ICT facilities desirably. The findings of the study identified a gap in ICT skills set among the staff in the university libraries studied. This section makes the following recommendations regarding ICT skills and knowledge training for academic library staff. The recommendations are as follows:

1. Managers of academic libraries in Ghanaian universities should conduct an effective needs assessment to identify the ICT skills gaps among the library staff to design training programmes to educate and train them in the needed ICT skills set.

2. Public university libraries in Ghana should institute measures to provide regular and adequate training and retraining in ICT skills and knowledge for their staff to enable them to fit into a current digital society and enhance their capacity in managing library ICT systems. The library staff are trained to be proactive to anticipate emerging technological changes that will affect the future of the academic library ICT system. Librarians' ability to anticipate and respond to these emerging technology trends and act accordingly to sustain their relevance in academic communities they operate.

3. University library managers should develop library ICT education and training policy that aims at equipping library staff with new trends and developments in technologies in the areas of modern hardware and library software as long term measures to close ICT deficiency among the staff. The policy should seek to recruit new staff with requisite qualification, skills and technical know-how to fill the current existing gap as short and medium-term measure.

4. The training and education of the academic library staff should gear towards current and future skills needs of the staff in managing library ICT infrastructure. However,

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training and education should not only target the skills gap but also the attitudinal change of the library staff that will help reduce technophobia as well as resistance to change.

5. The mode and method of training of the university library staff in ICTs should be simple and comprehensible to ensure that they can easily assimilate whatever is delivered to them. The training can be delivered through seminars, workshops, conferences and online tutorial videos and they must be relevant to level and functions of every library staff member.

6. Public university library managers in Ghanaian universities should allocate at least 10% of their recurrent budget to educate and train staff in ICTs and modern technologies. The university library managers should identify alternative funding sources outside the library budget through the writing of proposals for purposes of providing continuous training and retraining programmes for their staff.

7. To reduce the cost of training the library staff in ICT, the university libraries should collaborate with their computer science departments and ICT directorate to design and organize in-house training programmes purposely to equip the academic library staff with needful skills set for ICTs management.

8. The academic library should offer information literacy (IL) training to their staff and other stakeholders besides the training in hardware and software. IL will help library staff acquire skills to navigate the various information sources available in academic libraries as a result of ICTs adoption. Again, IL will help them understand how library electronic resources are organized to facilitate search, retrieval and access for their users.

9. The academic libraries in Ghana should establish a team made up of all stakeholders that would be responsible for the ICT skills training activities of the library staff. This team should include the staff of the library, ICT directorates and the computer science or IT academic departments as well as the universities human resources units that will be responsible for assessing the training needs of library staff and the organisation of regular and continuous training programmes which should be under the supervision of the head librarians.

10. The academic libraries should offer scholarships and other sponsorships packages to young up and coming librarians who have an interest and passion for ICTs and modern technologies to pursue further studies. With the understanding of the library and ICTs such persons would be in a better position to manage the library ICT systems effectively. In all, training programmes should be documented for reference and future use for internal training of library staff to reduce costs.

8.4.4 Availability of ICT Infrastructure in Academic Libraries

Academic libraries in Ghana require strong, robust and standard ICT infrastructure for efficient and sustainable library ICTs adoption and management. Standard, quality and adequate ICT infrastructure will enable academic libraries to cope with growing information and technology needs of staff, users and system in the digital age (Mirza & Arif, 2016). On the issue of ICT infrastructure in Ghanaian academic libraries the following are recommended:

1. Academic libraries in Ghana should acquire adequate ICT infrastructure to ensure all functional areas of the academic libraries are fully automated for optimal performance of the various library operations.

2. The academic libraries should implement standardised hardware and software applications to ensure interoperability with other libraries locally, nationally and internationally for consortium building, easier communication and resources sharing.

3. The academic libraries should provide high-quality ICT infrastructure such as local area networks (LAN), good Internet services as well as wireless networks to facilitate uninterrupted access to web resources and services such as Web-OPAC, e-journals, e-books among others. This will ensure all-round and remote access to the library resources specially to benefits of distance and online students.

4. Academic libraries should invest in ICT and other technological infrastructure. There should be dedicated budget line purposely for ICT infrastructure development since the infrastructure is the backbone of the library ICT system. For instance, there should be monthly payments for the Internet bandwidth and funds should be provided for regular update of the obsolete infrastructure.

5. Academic libraries in Ghana should train their staff in IT or recruit permanent IT professionals to be trained as systems librarian to manage the entire academic library ICT systems. Ghana Library Association (GLA), the Consortium of Academic and Research Libraries in Ghana (CARLIGH) and the Committee of University Librarians and Deputies in Ghana (CULD) should come together to set standards for ICT infrastructure requirements for academic libraries as well as ICT training needs of library staff in Ghanaian academic libraries. These standards must form part of the membership of these associations CARLIGH, GLA, CULD and NAB academic libraries accreditation standards.

8.4.5 Provision of Adequate Financial Resources for Library ICT System Management

The financial resource is one of the key components of the inputs for successful ICTs management in academic libraries. Funding for ICTs in academic libraries studies is limited. Lack budgetary allocation in the library 's budget for ICTs has negatively affected the retooling of the library ICT system. Inadequate reskilling of the library staff in ICT and modern technologies had been attributed to a lack of funds. Indeed, academic libraries in the developing world, including Ghana, are faced with financial challenges in adopting technologies to automate the core functional areas (Ubogu, 2019). The following is therefore recommended as measures to overcome funding challenges:

1. Universities' top management should allocate adequate financial resources towards ICT adoption and management since the survival of the university libraries depends on the availability of adequate financial resources to acquire the ICT infrastructure such as networked computer terminals and computers, Wi-Fi, Internet bandwidth and proprietary library management software.

2. The academic library managers should have a separate and dedicated budget line for library ICT development. This has become necessary since ICTs and new technologies are now an integral part of the modern academic library system and therefore should be given the needed attention in terms of infrastructure and staff to man them.

3. Academic library management should allocate 4% of the institutions' 10% budgetary allocation to libraries towards ICT development and management. Even though this 4% is inadequate, it will ensure a regular, constant and reliable flow of funds towards upgrade and update to sustain the existing library ICT infrastructure.

4. Academic libraries should source for alternative funding opportunities outside the main institutions' library towards library ICT development. This could be done through the writing of a proposal to funding agents/institutions for grants in the context of automating and modernising their core functions and service delivery as well as capacity building of library staff in ICTs.

8.4.6 Strategies for the Management of Academic Library ICT System.

The change ICTs have brought to academic libraries are fast, vast and profound especially in developed nations. This change has ensured that libraries provide fast, efficient and sustainable services to their patrons. Academic libraries in Ghana appreciate the significant role ICTs play in their operations and have taken the path of automating their core functions through the application of technologies. However, the ICT adoption and management come with a lot of challenges including lack of strategic documents, lack of requisite personnel, limited funds and lack of university management support that must be surmounted. The following strategies are recommended as the strategies to overcome hindrances to ICT management in Ghanaian academic libraries:

1. Critical success factors should be considered as a condition predicated on successful adoption and management of the academic library ICT system. The critical success factors should include the availability of strategic policy direction which is made up of strategic documents such as library ICT policy, library ICT strategic plan, operating procedures manual, adequate financial resources, standardised ICT infrastructure and skilled staff.

2. There should be short- and long-term strategic plans and policies covering library ICT security policy, Internet and electronic resources use policy, staff training and development policy all geared toward library ICTs development. The policies and strategic plans should

be reviewed regularly taking into consideration exigencies of the time and new trends in technological environment.

3. The academic library managers and university management should train as well as recruit library staff who are multi-skilled and knowledgeable in ICTs implementation and management. It is recommended that library schools in Ghana should design their curriculum and syllabi to incorporate ICTs management in libraries.

4. Academic libraries should formulate framework as a model for ICTs adoption and management in academic libraries in Ghana. The framework should incorporate all the elements of the critical success factors.

5. There should be **collaborative partnership** among all the stakeholders of the academic libraries to ensure successful and sustainable ICT system's management in Ghanaian academic libraries where all concerned are brought on board for efficient framework in managing the adoption, implementation and maintenance of ICTs. It is therefore the expectation of the researcher that the proposed model for academic library ICT system management would be adopted by Ghanaian academic libraries to ensure collaborative and holistic adoption, implementation and management of academic library ICT facilities.

8.4.7 Framework for ICTs Adoption and Management in Academic Libraries.

The analysis of the responses from the research participants both quantitative and qualitative as well as the discussion of the findings, shows that academic library ICTs adoption and management should include these elements as a framework:

1. strategic documents (strategic policy direction): library ICT policy, library ICT strategic planning,

2. inputs: finances, manpower, technological infrastructure,

3. process: technical, procedure and operational manuals,

4. output: information products and services,

5. stakeholders' collaborative partnership.

The availability of these variables in quantity and quality would be able to ensure, efficient and sustainable management of ICTs and other technologies in Ghanaian university libraries and if possible academic libraries in developing countries. In a nutshell the new proposed model or framework for the adoption and management of academic library ICT system is made up of the following elements strategic policy direction, stakeholder collaborative partnership, input, process, output and feedback. The framework/model is adapted to show the link between the dependent and independent elements or variables in ICTs adoption and management. In this study dependent variables in ICTs adoption and management in academic libraries provide measures to the challenges of ICTs management. Independent variables the study examined includes the availability of appropriate ICT tools and infrastructure as well as funds and manpower (inputs), the procedures and operational manuals, roles and responsibilities (processes), and benefits, products and services (output), and finally the perception of the staff as well as their attitudes towards the deployed ICT system (feedback). From the discussion of the findings, these elements or variables are assumed to have both negative and positive influence on academic library ICTs adoption and management. However, if the positive components are adhered to, it will help bring effective, efficient and sustainable management of academic library ICT systems in Ghanaian public university libraries.

8.5 Policy Implications of the Study

The study among others explores the state and levels of ICT diffusion and examines the institutional policies, strategies and human resource that are available for the adoption, implementation and management of ICTs in academic libraries in Ghana.

The study also focuses on the factors that hinder the adoption and Management of ICTs in academic library culminating in the design of a Ghanaian public university library.

The finding of the study brought to the fore some challenges militating the adoption, implementation and management of ICTs in the University libraries in Ghana. These, therefore, draw some policies implications for the various stakeholders of academic libraries, i.e the Government and, or its agencies, the University authorities, the library management as well as the library staff of the academic institution of the study. This section, therefore, presents policy recommendations for the various identified stakeholders.

8.5.1 Policy Recommendation for Government and, or its Agencies

The summary of the findings shows ICT adoption and management in Ghanaian university libraries have been haphazard and uncoordinated as they lack policy guidelines. It is therefore expected that the Academic Library's ICT Policy should be formulated by government agencies: NAB and NCTE in charge of tertiary education to guide ICT adoption and management in Ghanaian academic libraries to ensure effectiveness and sustainability. A policy framework will help streamline ICT adoption, implementation and management in academic libraries. This policy framework which would be an important step to ensure the achievement of the objectives of ICT application in academic libraries, must be prepared through extensive consultation with university librarians, ICT experts and other stakeholders with diverse experiences. The library's ICT policy should provide the necessary platform for a holistic as well as systematic ICT integration and

management in Ghanaian academic libraries. The policy should provide guidelines in terms of budgetary allocation in the institutional budget towards ICT development and management. Government through NAB and NCTE should provide standards and/or guidelines for all HEI's in terms yearly percentage (%) of budget allocation towards acquisition of ICT facilities for Ghanaian University Libraries as well as exempt universities from taxes on the importation of ICT equipment. NAB and NCTE as part of the policy must insist that all tertiary academic institutions seeking accreditation adopt the national library ICT policy so as to ensure that standardization of ICT infrastructure in Ghanaian academic libraries.

Further, the government, through relevant agencies must develop strategies for academic library ICT competency development among library staff in academic libraries in Ghana. The strategies for library ICT competency have to be standardised for all university libraries in Ghana aimed at improving upon low ICT skills of library staff. Such strategies may include seminars, workshop and conferences where ICT skills could be taught to equip the library with the requisite skills that need to be applied within the context of work environment.

Furthermore, at the national level, the government should set ICT competency standards for the university librarians and other library staff. Given the high calibre requirement of both the university librarians and other library staff in the modern technological and digital environment in which libraries operate, there is the need to set ICT competency standards for the library staff. The application of such standards will allow librarians to seamlessly adapt, integrate and manage ICTs in academic libraries.

8.5.2 Policy Recommendation for the University Authority

At the institutional level, the universities should set a clear vision captured in the library's ICT strategic plans for ICT integration strategies for the university libraries and this vision in the

library's ICT policy and strategic plan must be shared by all members of the university community. The policy's vision and mission will be to create the library's technology system that empowers the stakeholders to change the library operations and services delivery for the better. Ideally, the university librarian and the library staff are required to formulate and champion library's ICT policy and strategic plans, however the policy's vision itself should not be formulated by the library team alone. It is crucial to pull all stakeholders together including university management, faculty members, students, and the library, and this will allow everyone within the academic community to contribute to the formulation of the strategic vision by contributing their knowledge, skills, and experiences to help build a strong academic library ICT system that is effective and sustainable. This will ensure that the university and in particular the library always draw strength from the diversity from its stakeholders and welcome the entire community to impact in the library's ICT policy and strategic plan. Out of the policy and strategic plan will come the design to develop the library's ICT Masterplan on its own. That is, ICT Masterplan of the university library should be formulated and customized to fit into the overall vision and ICT policy of the university. The Masterplan should spell out the processes and procedures involved in the library ICTs adoption and management to ensure that the ICT system implementation follows the accepted standard. This will invariably make sure that efficiency and effectiveness are achieved.

Using the proposed framework in this study, there must be development of a framework for ICTs adoption and management in academic libraries in Ghana to collaboratively design ICT with all stakeholders. This framework would be used to identify the various sources of funding for library ICT projects, technological infrastructure and the training needs of the library staff. When ICT is perceived by the stakeholders as tools to meet information services delivery goals, they are then more likely to support ICT adoption, integration and management in the libraries.

8.5.3 Policy Recommendation for the LIS Professional Association, i.e. Ghana Library Association (GLA)

The Ghana Library Association (GLA) is expected to development sufficient guidelines and policies for professionalisation of academic library staff in ICTs taking into cognisance IFLA ICT guidelines and that of other long-standing LIS professional association such as ALA. Through this policy guidelines the capacity of Ghanaian academic library staff could be improved tremendously to manage university libraries ICT systems. GLA can formulate policy capturing the professional requirements to work in university libraries in terms of ICT competencies are pertain in other jurisdictions like CILIP in UK. GLA can also advocacy through policy guidelines for the deployment of high standard ICT facilities in all the academic libraries in Ghana in order to improve information services delivery.

8.6 The Expected Impact of the Findings on ICT Management in Academic Libraries.

1. This research study is expected to contribute to the existing body of knowledge on ICTs adoption and management especially in Ghanaian academic libraries as it is novel in how deployed ICTs are managed.

2. The findings of the study serve as a guide to university librarians, university authorities, IT personnel, researchers as well as students in their attempt to adopt technologies in libraries and also undertake research studies on the topic in Ghana.

3. The suggested recommendations, if implemented will help improve future adoption and management of ICTs in the university libraries in Ghana.

8.7 Suggested Areas for Further Research

The present study concentrated on ICTs management in five public university libraries in Ghana instead of all ten public university libraries. This will definitely bring about limitations in the findings of the study. It is therefore recommended the study could be extended to cover both public and private universities in Ghana.

It is recommended that further studies should be carried out on the impact and challenges of lack of skilled manpower on ICTs management in academic libraries.

8.8   Summary of Chapter Eight

Chapter Eight presents the summary of the findings of the study, the conclusions, and makes recommendations derived from the findings and discussions and their implications on the management of ICTs in Ghanaian public universities libraries. The summary of the findings encapsulates issues on ICTs in Ghanaian academic libraries, procedures and processes for ICTs adoption and management, critical success factors for managing ICTs, policy and strategic plan for ICTs adoption and management and hindrances to ICT adoption as well as strategies for ICT adoption and management in academic libraries. The conclusions are based on the summary of the research findings and covers areas such as ICT infrastructure in academic libraries, procedures and processes for ICTs adoption and management, strategic documents for ICTs management and strategies for ICTs adoption and management. Based on the conclusions of the study the recommendations were on the provision of adequate ICT infrastructure, the need for the formulation of strategic policy documents for ICTs management, skills and knowledge for ICTs adoption and management and financial resources for the management of library ICTs as well as the framework for ICTs management, and the policy implications of the study.

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APPENDEX

INTERVIEW SCHEDULE FOR HEAD LIBRARIANS

College of Human Science

Faculty of Arts

Department of Information Science, University of South Africa

MANAGING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) AT ACADEMIC LIBRARIES IN SELECTED PUBLIC UNIVERSITIES IN GHANA

The interview schedule is designed for you as the Head Librarian of this university. It is aimed to solicit your views about the extent of diffusion of ICTs in your library as well as processes and procedures of ICTs adoption and their management in your university library.

Section A: General Information

1. Gender…………………………………………………………………………………

2. Name of University……………………………………………………………………….

3. How long have you been working in this library/university……………………………….

4. How many years have you been on your current position as Head……………………

Section B: Status and level of ICTs diffusion in academic libraries

1. Please kindly state ICT facilities available in your university library?……………………
   …………………………………………………………………………………………
   …………………………………………………………………………………………

2. Which areas of library operations in your university library is ICT applied?……………….
   …………………………………………………………………………………………
   …………………………………………………………………………………………

3. Enumerate some of the ICT-based resources available in your university library?………

…………………………………………………………………………………………………
…………………………………………………………………………………………………

4. Do you think the application of ICTs has helped in your university library operations, services and management…………………………………………………….
…………………………………………………………………………………………………
…………………………………………………………………………………………………

5. Comment on the effectiveness of the ICT facilities available in your university library.
…………………………………………………………………………………………………
…………………………………………………………………………………………………

Section C: The procedures and processes for library ICTs adoption, implementation and management in academic libraries.

6. Please can you explain some of the procedures and processes you use for adopting, implementing and managing ICT systems in your library?………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

7. Are these procedures and processes for the adoption and management of library ICTs documented and available to all library staff.…………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

Section D: Availability of Library ICT Policies and Strategic plans for Adoption and Managing Academic Library ICT System.

8. What policy and strategic plan exists for guiding the adoption and management of your library ICT   facilities?………………………………………………………………
…………………………………………………………………………………………………

9. What library ICT policies do you use as the Head of Library in managing your university library ICT systems? ……………………………………………………
…………………………………………………………………………………………………

10. Who are responsible in the formulation of the library ICT policies and strategy plan?
…………………………………………………………………………………………………
…………………………………………………………………………………………………

11. Are the library staff involved in the formulation of library ICT policies? ………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

12. Are these policies codified and made available to the library staff and general public?
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…………………………………………………………………………………………………
…………………………………………………………………………………………………

Section E: Issues of Academic Library ICT Management

13. Is the university management actively involved in the library ICT facilities management?
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…………………………………………………………………………………………………

14. To what extent does your university top management support the library in managing its ICT systems?………………………………………………………………………………………
…………………………………………………………………………………………………

15. How are your library ICT application and management projects funded?…………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

16. Is the library allocated with enough financial resources for ICTs implementation and management?……………………………………………………………………………………
…………………………………………………………………………………………………

17. To what extent are your staff competent and qualified to implement and manage your library ICT facilities?...
…………………………………………………………………………………………………
………………………………………………………………………………………………..

18. Are the library staff exposed to training and education opportunities to equip them with requisite skills to manage the library ICTs?……………………………………………..
…………………………………………………………………………………………………
………………………………………………………………………………………………..

19. What current trends of the library profession are the library staff trained in supporting ICTs applications and management……………………………………………………..
…………………………………………………………………………………………………
………………………………………………………………………………………………..

Section F: Barriers and solutions to successful ICT facilities management in academic libraries in Ghana

20. What are some of the hindrances you encounter in managing ICTs in your library?..........
…………………………………………………………………………………………………
…………………………………………………………………………………………………

21. Can you suggest some of the solutions to the identifiable challenges that you face in managing your library ICT systems?...

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22. What do you suggest should be the appropriate strategies for adopting and managing academic library ICT systems?...

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23. What should be appropriate framework for managing academic library ICT system?.........

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SURVEY QUESTIONNAIRE FOR LIBRARY STAFF

College of Human Science

Faculty of Arts

MANAGING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) AT ACADEMIC LIBRARIES IN SELECTED PUBLIC UNIVERSITIES IN GHANA

Department of Information Science, University of South Africa

Dear Respondent,

I am **Kwabena Osei Kuffour Adjei** a PhD Candidate of the above-named Department and the University conducting a research on the **"Managing Information and Communication Technologies (ICTs) at Academic Libraries in Selected Public Universities in Ghana".** The purpose of this research is to examine how academic libraries adopt and manage ICT facilities and other technological system, and to develop framework for managing ICT systems efficiently and effectively in Ghanaian academic libraries.

Please, I kindly ask for your time to complete the questionnaire based on your knowledge, experience and operations in the field of librarianship and as Staff of the selected institutions for the study. Your frank feedback will be an important contribution to this study. Please be assured any information provided will be kept confidential and solely for the purpose of this study.

 Thanking you in advance for your time and participation in this research.

Yours sincerely,

Kwabena Osei Kuffour Adjei

Researcher/PhD Student

kaoseikuffour@gmail.com. 0208133857; 0242065767

Please I humbly request you to give your consent by signing this form to indicate that you have agreed to participate in this research and the data collected from you could be used in this research and future studies. Should you need any clarifications concerning the research or any of the questions kindly contact me through this kaoseikuffour@gmail.com.

SECTION A: BIO-DATA

Please tick where appropriate in each of the following questions

1. Gender: Sex: Male   [ ], Female [ ]

2. Age:

20- 29yrs	[ ]
30- 39yrs	[ ]
40- 49yrs	[ ]

60 and above [ ]

3.   University Library affiliated to:

University of Ghana Library   [   ]

University of Cape Coast Library   [   ]

University of Education Library   [   ]

University for Development Studies Library   [   ]

Kwame Nkrumah University of Science and Technology Library

[   ]

4. ……………………………………………Department/Unit in the library ………………………

5. Please indicate your Highest Academic Qualification: (e.g. Bachelor of Library & Information Science, Masters of Library and Information Science and PhD...........................

6 Position/Rank: Please indicate……………………………………………………………….

7.**Work Experience:** How many years have you served in this university library?

(i)   1-5yrs

(ii) 6-10yrs

(iii) 11-15yrs

(iv) 16-20yrs

(v)   21-25yrs

(vi) 26yrs and above

SECTION B: THE USE OF ICTs FOR THE SUPPORT OF LIBRARY OPERATIONS AND SERVICES

Please tick in appropriate column in any of the following responses ranging from I to section V. For instance -SA (strongly agree), A(agree), D(disagree), SD (strongly disagree).

Part I: KNOWLEDGE OF THE USE OF ICTs IN ACADEMIC LIBRARIES

8. ICT facilities in academic libraries are use supporting the following operations

S/N	ICT Use in Academic Libraries	SA	A	D	SD
1	Processing of library materials (Cataloguing and Classification)				
2	Web-based reference services				
3	Communication and sharing of information within library				
4	Circulation of library materials and serial control				
5	Library security system				
6	Budgeting and Acquisition of information materials				
7	Selective Dissemination of Information				
8	Reprographic				
9	Collection development				
10	General Administration				

Others please indicate…………………………………………………………………………

Part II: AVAILABILITY OF ICT FACILITIES IN ACADEMIC LIBRARIES

9. Which of the following ICT facilities are available or not available in your library? AV(Available), NA (Not Available).

S/N	ICT facilities	AV	NA
1	Computer		
2	CD/DVD-ROM		
3	Scanner		
4	Projector		
5	Television		
6	Telephone		
7	Printer		
8	Smart Boards		
9	Fax machine		
10	The Internet		
11	Cellular technology		
12	Multi-media tools		
13	Library Management Software		
14	CCTV		
15	RFID		

16	Radio		
17	Pen drive		
18	Digital Camera		
19	Video/Audio recorders		
20	Intranet		
21	Photocopy		
22	Laptops		

Others please indicate……………………………………………………………………………

PART III: AVAILABILITY AND UTILIZATION OF ICT-BASED RESOURCES IN ACADEMIC LIBRARIES

10. Which of the following ICT-based resources are available in your university library?

S/N	ICT-Based Resources	AV	NA
1	E-journals		
2	E-books		
3	Electronic Thesis and Dissertation		
4	Institutional Repository		
5	OPAC		
6	RFID		
7	E-Query		
8	E-Lists		
9	Social Networking		
10	Audio-Visual Services		
11	Reprographic services		
12	Online Searching		
13	Email		
14	Extranet		
15	Web portals		
16	World Wide Web		
17	Web publishing		
18	Filesharing		
19	Word Processing		

Others please indicate……………………………………………………………………………...

11. Which of the following ICT-based facilities and resources are mostly used for library operations and services in your university library?

S/N	ICT-Based Facilities/ Resources	Mostly Used	Used	Less Used	Not Used
1	OPAC				
2	E-Referencing				
3	E-Journals				

4	E-Books				
5	Institutional Repository				
6	Computer				
7	Scanner				
8	Projector				
9	Telephone				
10	CCTV				
11	Printer				
12	CD/DVD ROMs				
13	Pen drive				
14	Video conferencing				
15	Radio				
16	Digital Camera				
17	Television				
18	The Internet				
19	Fax Machine				
20	Electronic Thesis and Dissertation				

Others please indicate…………………………………………………………………………

12 The following are various benefits or influence academic libraries enjoy through the application ICTs on the daily functions, operations and services.

S/N	Benefits of ICTs in Academic Libraries	SA	A	D	SD
1	Remote access of information				
2	Greater and easier retrieval of information				
3	Information available to anyone, anytime, anywhere, and at users' desktop.				
4	Easy to capture, store, manipulate and distribute information				
5	Information creation on digital format				
6	Improve the efficiency of library functions; and improve the cost effectiveness of library operations.				
7	Utilize the staff for providing better information services				
8	Removal of all the barriers of communication, distance and time.				
9	Digitize the documents-for preservation and for space saving.				
10	Online book shopping and publisher's website help in quality collection development and are time, money and labour saving				
11	The available information can be provided through the homepage				
12	Provide access library catalogue, databases of other libraries through library networks.				
13	Send reminders through e-mails				
14	Reduced moribund repetitive library routines				

Others specify please…………………………………………………………………………

PART IV: PROCEDURES, PROCESSES AND FACTORS INFLUENCING ICTS ADOPTION AND IMPLEMENTATION IN ACADEMIC LIBRARIES

13. Which of the following the procedures and processes can be seen as best ways to adopt and implement ICTs in academic libraries?

S/N	Procedures and Processes for ICTs Adoption and Implementation	SA	A	D	SD
1	Identification of the need for ICTs				
2	Development of policy and strategic plan for adoption of ICTs				
3	Seek support of the top management				
4	Seek the involvement and commitment of staff				
5	Identification of ICT facilities to be adopted for automation				
6	Acquisition of the identified ICTs tools for implementation				
7	Implementation of the adopted ICT tools				
8	Training of staff to operate, maintain and manage the ICT system				
9	Create monitoring and evaluation tool kit to assess the success of ICTs				
10	Create a feedback system to assess the compliance and sustainability of ICT system				

Others specify please……………………………………………………………………

14. Which of the following factors or 'enablers' influence the adoption and Implementation of ICTs in your university library?

S/N	Factors Influencing ICTs adoption and Implementation	SA	A	D	SD
1	Vision and mission of the university and the library				
2	The need to ensure effective and efficient operation and services				
3	Availability of ICT policy				
4	Availability of strategic plan for ICTs				
5	Attitude and style of library leadership				
6	Support from the university authorities				
7	Sufficient financial resources				
8	Adequate and standard technological tools and ICT facilities				
9	Skilled librarians' and library staff in ICTs				
10	Attitudes of staff towards ICTs and technologies				
11	Staff involvement and commitment in the ICTs application				
12	Regular power supply				
13	Monitoring and evaluation system				
14	Institutional and technological infrastructure				
15	Organisational culture				

Others specify please……………………………………………………………………

15. Which of the following are the procedures, processes and guidelines to ensure successful adoption and implementation of ICTs in academic libraries in Ghana.

S/N	Procedures, Processes for ICTs adoption and Implementation	SA	A	D	SD
1	Clear vision towards ICT integration in academic libraries				
2	Development and regular update of library ICT policy				
3	Formulation of tactical and strategic planning for academic library ICT integration				
4	Well stated objectives for ICT integration in academic libraries				
5	Structure timelines for adoption and implementation				
6	Support and corporation among library staff				
7	University authorities support				
8	Functional library ICT management team/committee				
9	Collaboration with relevant stakeholders				
10	Regular and constant budget allocation towards ICT purchase and upgrade				
11	A well developed and codified ICT training programme for staff				
12	Develop necessary documents to guide adoption and implementation				
13	Avoidance of substandard ICT equipment				
14	Written reporting structures				
15	Constant monitoring and evaluation system				
16	Well structured feedback system				

Others specify please………………………………………………………………………

16.What are critical success factors in managing academic library ICT system

S/N	Critical success factors for managing academic library ICT system	SA	A	D	SD
1	Library ICT Policy				
2	Strategic Planning				
3	Top Management Support				
4	Processes and procedures management				
5	Availability of funds				
6	Skilled personnel and human resource management				
7	Teamwork				
8	Staff/employing involvement and motivation				
9	Training, education and professional development of staff				
10	Stakeholder consultation and involvement				
11	Effective communication among all stakeholders				

Others specify please…………………………………………………………………………

PART V: AVAILABILITY OF LIBRARY ICT POLICY AND STRATEGIC PLAN FOR ADOPTION AND MANAGING **ACADEMIC LIBRARY ICT SYSTE.**

17. Are aware of any codified documents which available that guide the adoption and management library ICT system, i.e library ICT Policy or Strategic plan?

        Yes   [   ]

        No   [   ]

18. If your answer to **Question 16** above is **Yes,** which of the following are you aware of and available at your university library?

S/N	Availability of Codified ICT Strategic Documentations to Guide ICT Management	AV	NA
1	Library ICT Policy		
2	Library ICT strategic plan		
3	University ICT policy		
4	University strategic plan		
5	Library ICT Maintenance and Renewal Plan		
6	Library ICT Integration Plan		
7	Standard Operations manuals		
8	Installation and maintenance manuals		
9	ICT training and development plan for library staff		

19. If your answer to **Question 16** above is **Yes**, which of the following ICT strategic documents are useful for ICTs management in your university library?

S/N	ICT Documentation for managing Library ICT System	Most Useful	Useful	Less Useful	Not Useful
1	Library ICT Policy				
2	Library ICT strategic plan				
3	University ICT policy				
4	University strategic plan				
5	Library ICT Maintenance and Renewal Plan				
6	Installation and maintenance manuals				
7	Library ICT Integration Plan				
8	Standard Operations manuals				
9	ICT training and development plan for library staff				

20. How did you get to know about the Library ICT Policy strategic plan, processes and procedures of your university Library ICT System?

(1) I participated in their development   [   ]

(2) Through Staff Meeting   [   ]

(3) Through Staff Seminar   [   ]

(4) Through Sensitisation programme   [   ]

(5) They are at the Library Website   [   ]

(6) Copies were distributed to Staff Members   [   ]

21. Were you consulted in the development of the Library ICTs policy and the strategic plan of your university library?

(1) Yes

(2) No

22. If your answer to **Question 20** above is **No**, do you think all staff must be consulted in the development of policies for managing library ICT system?

(1) Yes

(2) No

23.If your answer to **Question 21** above is **Yes**, please explain why?..
....
....

24. How has Library ICTs Policies, strategic plan, processes and procedures ensure the sustainability in managing ICTs in your library?

S/N	ICTs Policies, Strategic Plan for Sustainable Management	SD	A	D	SD
1	They ensure the availability of ICT facilities and resources in the academic libraries				
2	They guide and provide avenue for maximum utilisation of available ICT facilities in academic libraries				
3	They provide various methods and avenues for efficient and effective management of ICTs in the libraries				
4	They enhance planning mechanism for monitoring and evaluating the how the library ICT system is function and performing				
5	They guarantee sources of funding library ICTs development and management				
6	They ensure the development of training scheme for the training of library staff in managing the ICTs				
7	They have created awareness about the need to manage library ICT system according to Internationally accepted standards				
8	They provide feedback mechanism to assess the impact of the deployed ICTs facilities and management tools.				

Others specify please…………………………………………………………………………………

25. Who are those responsible in the formulation and implementation of library ICTs policies and strategic plan in your university library?

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26. In what ways do you think library ICT policy, strategic plan and procedures could improved adoption and management of ICTs in your university library?

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PART VI: AVAILABTLITY OF HUMAN RESOURCES, LIBRARY STAFF ICT SKILLS AND TRAINING NEEDS FOR MANAGING ACADEMIC LIBRARY ICT FACILITIES.

27.Who update, upgrade, maintain and manage your university library ICT facilities? Please tick as many as appropriate.

S/N	Human Resources to manage library ICTs	
1	The Head Librarian	
2	The Systems Librarian	
3	The Electronic Resources Librarian	
4	The Library Head of ICT	
5	Library ICT Team	
6	Staff from University ICT unit	

28. Do you prefer the library staff managing your university library ICT system?

(1) Yes

(2) No

29. If your answer to **Question 28** above is **Yes**, do you think the library staff do have the requisite skill, qualification, knowledge and experience to manage the library ICT system?

(1) Yes

(2) No

30. If your answer to **Question 28 and 29** above is **No**, who should manage the library ICT system and, Why? Please explain

……

……

……

31. How do you rate your knowledge and competencies of ICT in general?

(1) Excellent   [   ]

(2) Good   [   ]

(3) Average   [   ]

(4) Poor   [   ]

(5) Very poor   [   ]

32. What is your skills and knowledge of ICTs adoption and management in libraries?

(1) Excellent   [   ]

(2) Good   [   ]

(3) Average   [   ]

(4) Poor   [   ]

(5) Very poor   [   ]

33. Have you been given any form of training on ICTs applications and management in this university library?

(1) Yes

(2) No.

34. If your answer to **question 33** is **Yes**, which of the following means through which library staff are trained to acquire ICT skills and knowledge to use in managing library ICT facilities?

S/N	Means of skills and knowledge acquisition for ICTs management	SA	A	D	SD
1	Through further and formal studies				
2	Through workshops, seminars and conferences				
3	Through self-study and regular self-practice				
4	Retraining				
5	Through mentorship by supervisors				
6	On the training				
7	Industrial training experience				
8	Informal training				

Others specify please…………………………………………………………………………

35. Which of the following areas skills and knowledge training do library staff required to be able to manage academic library ICTs effectively and efficiently? Required=R, Not Required= NR

S/N	Training and Staff Development Required	R	NR
1	General academic library management		
2	Project Management skills		

3	Computer Programming		
4	Hardware Maintenance		
5	Systems Management		
6	Networking		
7	Website/portal development		
8	Metadata/Electronic Resources Management		
9	Policy development		
10	Budgeting and fundraising skills		
11	Managerial skills		
12	Technical skills		
13	Negotiating skills		
14	Marketing and Advocacy skills		
15	Computer trouble shooting		
16	Monitoring and evaluation of ICT systems performance		
17	Mentoring and supervisory skills		

Others specify please…………………………………………………………………………

PART VII: CHALLENGES THAT HINDER ICTs ADOPTION AND MANAGEMENT IN ACADEMIC LIBRARIES.

36. The following are barriers to successful and efficient ICTs management in academic libraries.

S/N	Hinderance to managing library ICT facilities	SA	A	D	SD
1	Lack of implementation of Policy and strategic planning				
2	Lack of processes, procedures and guidelines in ICT management				
3	Lack of trained staff in ICTs management				
4	Resistance of staff library to adoption and management of ICTs				
5	Inadequate fund and budget allocation to academic libraries to procure ICT infrastructure and other facilities				
6	Inadequate ICT infrastructure and substandard ICT facilities				
7	Lack of regular update, upgrade and maintenance of ICTs				
8	Lack of managerial and technical skills ICTs among library staff				
9	Technology phobia among some library staff				
10	Lack of motivation and self development among library staff				
11	Resistant to change by the library staff				
12	Lack of commitment and support from the top management				
13	Leadership and management style of library managers is not encouraging				
14	Lack of education and training opportunities in ICTs for library staff				
15	Training provided on ICTs is limited to meet the required change				
16	Irregular power supply				
17	Lack of funds for training and professional development				

18	Lack of consultation among stakeholders				
19	Poor Internet connectivity that prevent online training opportunities i.e. webinars				
20	Lack of efficient monitoring, evaluation and feedback system				

Others specify please…………………………………………………………………………

37. Which of the following could help overcome the challenges faced in adoption and managing ICTs in academic libraries?

S/N	Measures to overcome library ICTs management challenges	SA	A	D	SD
1	Formulation and implementation of policies and strategic plans				
2	Regular and constant provision of funds for ICTs adoption and management				
3	Procure of high quality and adequate ICT facilities				
4	Sustainable policy for staff training and retraining				
5	Motivation, commitment and unflinching support from top management of the library and the university.				
6	Provision of financial support for regular training of staff in ICTs				
7	Effective communication at all levels in the academic library system				
8	Quality and flexible work culture to allow the acceptance of change in the university library system				
9	Purchase of standby generators to provide regular power supply				
10	Efficient monitoring, evaluation and feedback system				

Other recommendations to overcome the challenges faced by librarians in managing ICTs in academic libraries …………………………………………………………………………

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PART VIII: SUGGESTED FRAMEWORK FOR MANAGING ICT SYSTEM IN GHANAIAN ACADEMIC LIBRARIES.

38. The best framework for managing ICT facilities in academic libraries in Ghana must include the following critical elements.

S/N	Framework for managing ICTs in academic libraries	SA	A	D	SD
1	Partnership and collaboration with stakeholders at all levels of ICTs management				
2	Development and approval of the require policies, strategic plans, processes, procedures and manuals for managing ICTs				
3	Recruitment and training of staff with requisite skills and knowledge for managing library ICT system				

4	Development of scheme to raise funding from within and outside the university for procurement of ICTs infrastructure and other devices				
5	The necessary ICT inputs must be available and must be of high quality and standard				
6	Proper documentation for work process in converting ICT inputs to outputs must be formulated and codified				
7	The library ICTs output must be fortified to meet user expectation and should be sustainable.				
8	Formulation and codification of monitoring, evaluation and feedback system to ensure that the ICT system achieves it set goals.				

39. Which do you suggest as the appropriate strategies for adopting and managing academic library ICT facilities effectively and efficiently……………………………………………………

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40. Which do you suggest is the appropriate framework for managing academic library ICT system?…………………………………………………………………………………………………

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SCHEDULE FOR OBSERVATION

College of Human Science

Faculty of Arts

Department of Information Science, University of South Africa

MANAGING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) AT ACADEMIC LIBRARIES IN SELECTED PUBLIC UNIVERSITIES IN GHANA

Observation Methods

The researcher, during the visit to the selected academic libraries in Ghana observed the followings in the libraries:

A. The availability and extent of ICT facilities diffusion in the libraries.
   - (i)   Find out if the ICT facilities are available
   - (ii)   Areas of library operations and services ICTs are applied
   - (iii) Availability of ICT- based resources
   - (iv)   The quality of ICT tools deployed

B. The availability of library ICT policies, strategic plans and other manuals
   - (i)   Peruse all the necessary and available documentations geared towards ICT adoption and management.

C. Interact of staff and their working environment
   - (i)   Ask staff about challenges they in managing library ICTs
   - (ii)   Ask them of their skills and competencies
   - (iii) Working environment
   - (iv)   Conduciveness
   - (v)   Comfortability of working tools such as computers, chairs and tables, and others.