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# DIGITAL TECHNOLOGY ACCEPTANCE IN TRANSFORMATION OF UNIVERSITY LIBRARIES AND HIGHER EDUCATION INSTITUTIONS IN KENYA

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## Introduction and background information

Digital revolution is powering and creating a wide array of information and knowledge products and services in organizations depend upon the state of the art of information communication technology systems. Development in digital systems has provided technological solutions for academic institutions and information management organizations to access education and knowledge in virtual environments. Higher education and learning institutions across the globe have developed digital technology platforms so as to realize and achieve the goals of the millennium culture and social value. This development affects university libraries because of their perceived role in creation, management, diffusion and utilization of information and knowledge (**Makori, 2012**). Applications of digital technologies and social computing are fundamental electronic planning solutions not only in institutions of higher learning but also information and knowledge based organizations. **Modern** digital information environment and global internet access are transforming and changing the role of higher education and learning and information management institutions through institutional repositories for capturing and preserving the intellectual knowledge (**Ezema, 2013, Shukla & Poluru, 2012, Zaman et al, 2011**).

Popularity of the digital environment and internet of things (IoT) or internet of everything (IoE) are impacting on all aspects of academic and educational practices because of their central responsibility and significant role in supporting research, learning, information and knowledge activities in universities and libraries. In the contemporary world, digital technologies has transformed and changed the role of information professionals, although university libraries face immense challenges of big or gigantic data repositories (**Lu et al, 2011**) and inadequate innovative new information technologies (**Ezema, 2013**). Modern information communication technology provides digital components and systems that support information organizations rather than inhibit the use of social computing and electronic resources, although institutions of higher learning have been grappling with management of intellectual output such as theses, dissertations, teaching materials, research and journal articles (**Radojicic & Jeremic, 2012**). Academic and research institutions, and information management organizations as mass centers of intellectual and scholarly communication are involved in creation and dissemination of knowledge through global digital initiatives that are embedded and supported by libraries (**Chimezie, 2012**). Ultimately, the purpose of this study was to determine the preparedness of university libraries and information professionals in the modern digital revolution and transformation, and provide knowledge on how to be compliant. The study examined digital technologies and its applications, popularity of the digital environment, modern information environment, and information professional responsibilities and accountability.

## Research context

This empirical study was conducted in five selected higher education and learning representing three **public and two private university libraries**. In Kenya, the Commission for University Education is in the process of harmonizing the two sectors into one, although public universities are well funded and supported. In the latest web ranking of higher education institutions, Kenyan public universities emerged among the top (**Webometrics Ranking, 2015**). In addition, the university libraries have developed effective digital repositories that enhance the global visibility and attention of the academic and research outputs. The libraries provide information and knowledge that support the goals and objectives of the academic institutions.

## Statement of the problem

In the modern digital environment, institutions of higher learning are supposed to provide the necessary informational and technological facilities and tools to support research, teaching and learning practices. The pervasiveness of the digital revolution in university libraries and knowledge centers makes information professionals the core and focus of research, teaching, learning and academic activities. With the applications of digital technologies and internet resources transforming the nature and role of university libraries, information professionals need to provide systems that are compliant in offering quality services to the customers. Central to the debate of digital revolution and transformation in university libraries is the quality of information services and return on investment and technology acceptance. In this context, university libraries and information professionals are concerned with socio-economic, political and moral responsibility with respect to the development and applications of digital technologies. Modern university libraries need to provide innovative digital systems to enable the institutions and customers access timely and relevant information and knowledge resources. If for any reason, the huge investments made in the development and installation of modern digital technologies are not well utilized then the resources will just be wasted. In other words, the digital transformation represents the modern technological requirements that are necessary in universities and libraries, although the extent to which this is achieved is of great importance in academic institutions. With digital technologies available in variety of formats including mobile computer devices it becomes quite challenging for university libraries and information professionals to provide quality services.

## **Purpose and objectives of the study**

The purpose of this study was to determine the extent to which universities libraries expose a variety of cutting edge digital technology systems to support the development of higher education and learning practices in Kenya. The study was guided by the following objectives to:

- i. Investigate the applications of digital technologies used in university libraries to support education, research and learning practices.
- ii. Determine the types of digital technologies and information resources available in university libraries.
- iii. Examine the changing nature of university libraries in institutions of higher learning.
- iv. Determine fundamental skills and competencies needed by information professionals in the modern digital environment.

## **Research questions**

- i. Which applications of digital technologies are provided by university libraries to support education, research and learning practices?
- ii. What types of digital technologies and information resources available in university libraries?
- iii. Which are the indicators of digital technologies and systems in university library and information centers?
- iv. How does the digital revolution transform and change the nature of university libraries in institutions of higher learning?
- v. What are fundamental skills and competencies needed by information professionals in the modern digital environment?

## **Literature review**

Focus of the literature review is organized on four domain areas within the digital transformation and the changing nature of university libraries in higher education: digital revolution and transformation, modern education and learning, applications of digital technologies, and higher education and information organizations. The review highlights intertwined aspects of modern technological and social computing systems, exploring such themes as digital technologies, e-Learning, webometrics ranking, electronic resource planning systems, social media interfaces and innovative practices associated with new electronic revolution.

## **Digital revolution and transformation in higher education**

### **Modern developments of digital education and learning**

The information revolution has exponentially brought modern emerging trends in the field of education as exemplified through use of digital technologies, internet of things and mobile computer devices such as smartphones and tables. Development of e-learning is relatively new aspect of academic and educational system in the curriculum implementation whose main purpose is to ensure sustainable practice of higher education and learning. Practice of e-learning is achieved through applications of digital technologies and social computing that promote and enhance effective pedagogy and teaching methods. The curriculum content, teaching and learning practices are presented through social computing systems. E-learning is the provision of education and teaching using the integration of information communication technology, internet and enterprise cloud computing systems. With technology moving out of the lab and into classroom, digital technologies is immensely affecting teaching and learning practices with techn tools such as websites, educational games, simulations, ipads, Chromebooks, GAFE and other geeky devises (**Jacqui, 2015 & West & Bleiberg, 2013**). Modern digital education and learning practices presents variety of information and knowledge resources including canva educational, iPad in education, skype, YouTube edu and Google for education (**Atsalaki, 2015, Ferriter, 2015, Markton, 2014, Wilson, 2014**). These digital technologies have changed the face of teaching and learning environments in universities and libraries promoting and providing unlimited opportunities to education among students and lecturers. Consequently, the lecturers and students are able to access information and knowledge resources from the comfort of the available digital technologies.

Practice of e-learning practice includes a wide range of ICT applications and strategies for exchanging information and gaining knowledge such as video conferencing, mobile computer devices, internet and web and electronic resources (**Zaman et al, 2011**). For effective and sustainable development of e-learning in higher education, the lecturers must be knowledgeable competent in the use of technology and pedagogical aspects, although studies indicate general lack of skills among the professionals (**Kandiri, 2012 & Ayere et al, 2010**). E-learning is one of the most rapidly pedagogical areas of teaching in education where the online curriculum is delivered in digital pedagogical method different from the traditional approach, but whose major factor of success depends upon the lecturer's technical competency. Kenyan government strategies to implement and use e-learning practices are hindered by majority of the institutions that have not effectively adopted the digital platforms. Indeed, evidence suggests that in most institutions, the usual teaching and curricula approaches still remain unchanged, while the technology is typically poorly adopted and underused in the lecture rooms. Implementation of ICT in higher learning institutions is a complex process that involves providing the fundamental technological solutions, knowledge, skills and competencies, supportive management and administration, financial resources, and curriculum restructuring (**Zaman et al, 2011**).

### **Modern digital information in university libraries**

## **Webometrics analysis and ranking of elite universities**

In the contemporary academic environment, webometric studies promote global access to knowledge and develop the academic, scientific and educational capabilities of higher education institutions, universities and libraries (**Webometrics Ranking, 2015: 2014**). With the rapid development of the internet, there is need for assessing the public web visibility in terms of its implications for university management, planning, and governance (**Lee & Park, 2012**), because of the impact of universities' web sites in generation and dissemination of scholarly research outputs. Webometrics ranking of world universities is the evaluation and rating of higher education institutions based on web impact factor to promote the visibility and open access publication of scientific results. This involves maintaining institutional repositories, promotion of open access, academic and research profile, collaboration with other universities and online communities (**Shukla & Poluru, 2012**). Digital repositories provide information and knowledge of local content of academic and research within and beyond the university borders. In addition, digital repositories have promoted Kenyan universities in the global ranking of academic and research institutions with the University of Nairobi leading in Eastern and Central Africa (**Webometrics Ranking, 2015: 2014**).

Information and knowledge management systems and digital sources such as e-books, e-journals and social media have rapidly gained prominence in university libraries. The hallmarks of great libraries include globalization of information, knowledge management systems, massive digitization, adoption of technological solutions, applications of emerging technologies and mobile computers devices (**Makori, 2012 & Imo & Igbo, 2011**). Modern learning resource centers in the universities provide conducive teaching and learning environments to the academic community – scholars, faculty, information professionals and students through appropriate informational sources and technological tools (**Makori, 2012**). Kenyan university libraries are increasingly adopting and using digital technologies including radio frequency identification technology and electronic resource planning systems so as to provide one-stop access to information, knowledge, big data and e-content. Repository ranking assists students to make informed decisions and access information for research work (**Hou et al, 2012**). Institutions of higher learning operate in the global and repository ranking are published on regular basis with the aim of informing students, scholars and knowledge seekers while administrators use the information for bench marking against competitors (**Hazelkorn, 2011**).

Rankings of higher education institutions and world elite universities attract a great deal of attention from the general public, politicians included, hence the demand for more 'democratic' rankings (**Rauhvargers, 2011**). Report highlights that the global league tables indicate few hundred universities that are the 'best' in the world leaving out thousands of 'normal' ones involved in special training and conducting fundamental or applied research. The current rankings disease seems to have created a need to be ranked, because if the institution is not in the tables – then the institution doesn't exist'. Report suggests that existing rankings cannot provide a diagnosis of the whole higher education system,

because much attention is given to elite or top research universities only. In addition, current global rankings provide little useful information on issues such as the quality of teaching and learning, accessibility, regional involvement, involvement in lifelong learning, cost efficiency and others, hence the need to develop international transparency tools for all higher education institutions.

### **Internet of things economy**

Digital revolution has led to the growth of big data, cloud computing, mobile pervasiveness, innovative learning methods, wireless devices, exponential growth of information, internet of things or internet of everything, portals and vortals, massive automation, electronic resources, social media, multimedia applications in organizations. Universities across the world have adopted information communication technology systems in order to create conducive environment for students to engage in learning and gain access to information resources (**Shukla & Poluru, 2012, & Zaman et al, 2011**). In institutions of higher learning, enterprise electronic planning systems provide cloud and social computing resources, effectively transforming and changing the nature and role of university libraries and information professionals who manage and translate business functions and operations in the organizations. Consequently, university libraries provide and support information and knowledge in regard to development of education and learning practices, social, cultural, political, economic and moral values. The fundamental mandate is to provide high quality information and knowledge products and services (print and electronic) while developing innovative systems to support the academic community of scholars - staff and students (**Makori, 2012**). University libraries generate and advance knowledge for the development of the society and betterment of humanity.

Information communication technology (ICT) has facilitated institutions of higher learning to be custodians of intellectual and capital knowledge assets. In universities, integration of ICT in learning helps to strengthen the importance of education to the increased networked society and enhances its quality by creating active process of learning and teaching that is linked to real life (**Zaman et al, 2011**); and increases students' motivation, provides better access to information and sharing of resources, and helps students to think and communicate creatively (**Kahn et al, 2012**). University libraries can manage and support knowledge assets in digital or electronic formats through content management and distribution of information systems. Digital technologies have the potential to enhance the quality of teaching, learning and research productivity through information and knowledge services such as e-content and e-resources - e-books, e-journals and online databases. Faced with the need to publish the ever-increasing amount of content generated by institutions of higher learning, libraries must be proactively involved in publishing practices being the source and traditional providers of knowledge.

### **Digital information and communication landscape**

In the modern education and information environment, universities and libraries need to implement advanced technological systems as the necessary requirements for e-research, e-teaching and e-learning. Virtual libraries exemplified in universities provide interactive multimedia applications attractive to the digital natives for teaching, learning and knowledge purposes. In addition, virtual library provides the interface to information and knowledge resources on the internet, online databases and software (**Kawatra, 2013**). Study on the preparedness of libraries to provide research culture and learning values through ICT based systems indicates that higher education institutions lack the necessary information infrastructure, social computing and internet resources (**Adeleke & Olorunsola, 2010**). Modern digital information and communication methods for sustainable development of higher education and learning have transformed teaching and research practices through adoption and use of open and distance learning (ODL), integrated learning information management systems, M-learning, online education venture, virtual campus, flipped classrooms, video conferencing technology, e-learning software, smart card technology and cloud enterprise planning systems.

### **Massive data and information resources**

Technological penetrations and applications witnessed in information and knowledge based organizations has greatly reduced the digital divide in higher education and learning. Applications of the internet of things, is the other ground breaking digital technologies that have greatly changed the information needs and desires in university libraries. Responding to this kind of threat and challenge, most university information organizations across the world have begun to study and create advanced management models for digital libraries, and all these strategies try to make reference to the advantages of search engines and avoiding the inherent weakness of such solutions, to realize the electronic culture and social value (**Men-Xing et al, 2010**). Indeed, most academic libraries have digital and internet information resources to supplement the print collections. Internet economy connects academic institutions, business organizations, faculty and students, provides instant access to information and knowledge, online discussion and chats, electronic transfer facilities, texting and messaging, as well as video and news. Internet and web based technologies widely applied for academic and research purposes include social media, information networking and online searching.

Several studies indicate increased adoption and usage of social media technology in higher education including university libraries (**Davis, 2012, Shirky, 2010, Barnes & Lescault, 2011**). Social media technology refers to web-based and mobile applications that allow individuals and organizations to create, engage, and share new user-generated or existing content, in digital environments through multi-way communication, notes Davis. In the rapidly growing academic and educational community, the most powerful and prominent social media platforms are Facebook and Twitter (**Makori, 2012, Davis, 2012, Barnes & Lescault, 2011**). Davis notes that Facebook allows users to create profiles; interact with each other; expression of interests and discovery of commonalities between users; and build and maintain connections and invite others to join a community. Twitter social media interface



enables users to share a limited amount of user-generated content, quickly and easily, to an extensive number of other users. Social media is transforming businesses and users communicate with one another through connectivity and speed of the internet (**Rupak et al, 2014**). This new internet-enabled “voice of mass” is creating a shift in the communication paradigm that affects every aspect of our society, adds the authors.

In higher education, social media interfaces forms part of the digital technologies that the academic community and the information professionals need so as to provide and support quality research, teaching and learning services. Marketers and businesses are rushing to online social media sites because that is where customers, suppliers, prospective employees, and other stakeholders are to be found in the current business world (**Rupak et al, 2014**). Social media platforms encourage sharing and exchange of information and knowledge, communication functions, promotes marketing of information services, connections, recruitment of students, community and outreach programmes. Indeed, social media technology has suddenly lowered the costs of collaborating, sharing, and producing, thus providing revolutionary new forms of interaction and problem-solving (**Shirky, 2010**). It is not surprising that all different kinds of organization across the world are trying to integrate social media with the various aspects of business processes and operations (**Rupak et al, 2014**)

### **Innovative technologies and multimedia systems**

Developing innovative technologies and multimedia stems are reshaping the nature of education and knowledge in academic institutions and information organizations into the digital global economy through electronic repositories, voice recognition software, broadband, mobile devices and advanced robotics. Digital repositories provide universities and libraries with e-branding strategies and opportunities for global visibility and attention through the publications of research outputs coming from Africa on the internet. Internet and web resources are gigantic data repositories and facilitators for information acquisition and retrieval (**Lu et al, 2011**). Technology holds the greatest potential of opening and increasing educational and informational opportunities beyond institutional or organizational borders. Digital economy has brought tremendous transformation and change in information management organizations, although Africa as a whole is yet to completely embrace new information technologies, and as a result research outputs and local contents in form of theses and dissertations are completed and buried in individual university libraries to the extent that it is only available to very few scholars (**Ezema, 2013**).

### **Managing the digital information environment**

In the rapidly increasing digital environment, information professionals and lecturers must have the requisite knowledge, skills and competencies in order to deliver quality research,

teaching and information services. Several studies highlight that the major challenge facing digital revolution in African higher education is lack of adequate knowledge, skills and competencies on the human resources (**Kandiri, 2012, Manduku et al, 2012, Zaman et al, 2011, Ayere et al, 2010**). Similarly, this is the case where the information infrastructure is poor and the institutional structures are weak to support advanced digital technologies, hence the need for education and training. The applications of digital technologies in library information systems and e-learning and e-research are majorly influenced by intellectual and capital assets. In order to manage the digital environment effectively, information professionals need knowledge, skills and competencies in knowledge management, electronic resource planning systems, social computing and digital technologies, identification and creation of opportunities through business entrepreneurship practices, innovation and creativity, proactive marketing and promotion strategies, collaboration and partnership, leadership skills, information literacy skills, and informetrics (**Anyangwe, 2012, Belzile, 2010, Canadian Association of Research Libraries 2010**).

Digital libraries are organizations that provide the resources including specialised staff to select, structure, offer intellectual access to interpret, distribute, preserve the integrity of and ensure the persistence over time of collections of digital works that are readily and economically available for use by the defined community or set of communities (**Fox, 2011: 13**). Digital revolution has changed the role of university libraries, information professionals and the academic staff, in addition to knowledge resources being made available in various formats such as online, electronic and web based resources. Information professionals and academic libraries have the fundamental role in managing and supporting digital knowledge resources and systems (**Anyangwe, 2012 & Zaman et al, 2011**). The contemporary digital environment needs sound knowledge and practical skills on how to manage and provide timely and relevant information in relation to the goals and objectives of higher education institutions, because of the issues associated with quality services and international standards. Higher education institutions and university libraries need effective planning strategies on implementation of technological systems, development of internet of things applications and training human resources.

### **Empirical and intellectual studies**

Empirical studies have been conducted in different parts of the world regarding the extent to which the digital revolution and transformation is influencing academic, business and information organizations. In addition, there are countless research publications on applications of digital technologies in the academic, information and knowledge environments. Digital technologies are the integral part of all aspects of human life e-learning, e-information, e-knowledge, have telemedicine-agriculture, e-business and e-government. Many business organizations in the United States of America have adopted cloud computing solutions in the increasing digital environment (International Data Corporation, 2013 & Gens, 2012)). Similarly, literature review on social media technologies provided the conceptual frameworks for understanding the use of these innovative systems among college students and postsecondary institutions in the America (**Shukla et**

al, 2012). Studies have also been conducted in China regarding preferences for Facebook website (Heng-Li, 2014), Middle East and North Africa on the social media and the social movements (Farid, 2013), and social media in governance practices (Anne, 2013). Literature review has indicated inadequate baseline studies in relation to digital transformation and the changing nature of university libraries in institutions of higher learning in the Kenyan context. Most studies have investigated related issues of information technology but not within the modern applications of digital technologies such as webometrics, cloud computing, tablets and ipads.

## **Research methodology**

### **Research design**

This quantitative research design used selected institutions of higher learning from public and private sectors in Kenya, to ascertain the extent to which universities and libraries are providing cross cutting edge digital technologies to support education and learning practices. The study design gathered information from the academic community, information professionals and customers in order to gain better understanding on the changing nature of university libraries in the modern digital environment and global internet economy. In addition, the design was anchored on the information, opinions and ideas of the sampled respondents representing the major stakeholders in the education and learning practices in universities and libraries.

### **Target population**

The study broadly and primarily targeted the stakeholders in the academic community. First, it targeted information professionals normally involved in management of university libraries and affiliated agencies. Secondly, it involved systems librarians charged with the responsibility of handling and supporting information communication technology and social computing platforms in the libraries.

### **Sampling strategy and techniques**

In total, the study used 120 respondents representing the information staff, information technology and computing as well as customers. This study involved first, fourth (40) information professionals involved in providing knowledge to support academic and research activities in the universities. Secondly, it used ten (10) systems librarians who support and maintain information communication technology and social computing systems in the libraries. Thirdly, the study included seventh (70) customers or clients as the recipients of the institutions of higher learning - universities and libraries. Finally, three (3) and two (2) public and private universities respectively were included in the study, based on the assumption that the former consists of many institutions that are well funded and supported by the government and international community. In this empirical design, the

respondents and units of study were purposively selected because the aim was to get first hand information from the direct stakeholders and beneficiaries.

## **Data collection methods and approaches**

### **Questionnaire**

Data and information collection was conducted using two major tools - questionnaire and document/desk review guide. Questionnaire tool was used to collect in-depth information on perceptions and experiences of respondents on the domain areas of digital revolution and transformation, modern education and learning, applications of digital technologies, and university libraries and information organizations. The questionnaire also sought to collect information on the challenges faced in the modern digital environment. This was used to obtain data regarding the extent to which the university libraries and information professionals are providing digital innovative technological solutions to support education and learning practices.

### **Document review/desk review guide**

The study utilized current academic literature drawn from reputable information and knowledge sources. These included journal articles e-databases such Emeraldinsight, Jstor, Wiley and Ebscohost. Prominent weblogs and social media interfaces were also reviewed to find out the current issues regarding digital transformation and university libraries and information organizations. In this context, the method allows for better insights into current and extensive information regarding applications of digital technologies in knowledge management practices in higher education institutions.

### **Data analysis and presentation**

Multiple aspects of data and information obtained through questionnaire and desk review guide were analyzed and organized into relevant themes and presented using tables and percentages.

### **Discussion of findings**

Objective number one of the study sought to investigate the applications of digital technologies used to support education, research and learning practices in the university library. The respondents indicated and ranked the applications of digital technologies used to support education, research and learning practices in academic and research institutions as well as information management organizations (university libraries and information centers). Top leading digital brands widely applied in higher education and information management institutions include both modern and traditional technological solutions. **Mobile computer devices preferably portable digital gadgets (laptops and tables), hand-held ones (smart phones and personal digital assistants)** and e-learning platforms were

ranked among top leading digital brands for enhancing learning, information and knowledge in information organizations. Adoption and usage of these technological brands has increased significantly among the digital natives although traditional information sources such as **internet and web resources, and electronic information still maintain the lead in online transactions (80%)**. Digital repositories and information portals with **78%** each were rated second followed by social media interfaces of Facebook and Twitter applications with equal percentage of **77%**. The two social media technologies are widely used in academic institutions and information management organizations. Detailed information in order of priority is as indicated in the **Table 1 below**.

In the digital environment, many stakeholders in education and information management are proactively involved in use of mobile computer technologies to handle and support learning, generation and diffusion of content. These digital devises provide seamless access to learning, information and knowledge globally, and this perhaps explains their increased penetration and usage in academic institutions and information organizations. In the modern education environment, it is too much beneficial for universities and libraries wishing to push and expand new opportunities in education, learning, information and knowledge but is hindered by lack of physical facilities and resources. Numerous digital technologies - canva educational, iPad in education, skype, YouTube edu, Google for education, mobile computer devices, internet and web and electronic resources (**Atsalaki, 2015, Ferriter, 2015, Markton, 2014, Wilson, 2014, Zaman et al, 2011**), and social media interfaces (**Davis, 2012, Makori, 2012, Shirky, 2010, Barnes & Lescault, 2011**) are widely applied to access education, learning, information and knowledge.

**Table 1: Acceptance of Digital Technologies in University Libraries**

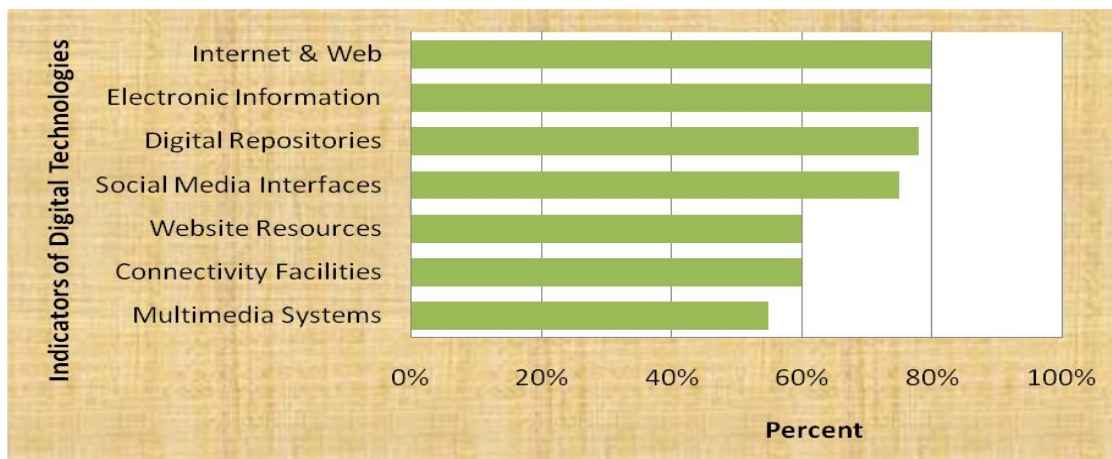
<b>ACCEPTANCE OF DIGITAL TECHNOLOGIES</b>		<b>PERCENT</b>
1.	Internet and web	80%
2.	Electronic information	80%
3.	Digital repositories	78%
4.	Information portals	78%
5.	Social media interfaces	77%
6.	Mobile phones	77%
7.	E-learning platform	75%

Popularity of the modern environment, have increased pace of innovation and creativity of digital technology applications in academic institutions, information management and business organizations (**Rupak et al, 2014, Chimezie, 2012, Ezema, 2013, Radojicic & Jeremic, 2012, Shukla & Poluru, 2012**). Entrance of many innovative digital applications helps to deploy new products and services quickly and within the reach of the staff and students, so as to access information and knowledge more effectively alongside traditional ones. Digital globalization of education and knowledge has made the internet the core knowledge resource for academic community in universities and libraries. **Internet of things** provides access to big gigantic data and information resources through Google documents and

applications, electronic books, journals and databases, digital repositories and the web. Digital environment has increased and promoted the pace of innovation and creativity through development of new products and services available at low cost.

There are numerous factors driving increased use of digital technologies in academic and information management organizations. First, digital applications provide low cost options for accessing and dissemination education, research, information and knowledge due to limited financial resources (Zaman et al, 2011). Second, digital technologies offer better and cost-effective means to connect with the students and staff using internet based distributed systems. Third, increased applications of digital technologies have helped to expand and provide new opportunities in academic institutions and information organizations through e-learning initiatives Jacqui, 2015, West & Bleiberg, 2013, Zaman et al, 2011). Finally, increased growth of the internet coupled with reliable, high-speed broadband connectivity at inexpensive rates is driving and encouraged organizations and individuals to use digital gadgets. Digital technologies have been widely accepted and applied in all aspects of human life in the society and organizations.

Objective number two sought to determine the types of digital technologies and information resources available in university libraries. The purpose was to examine the types and indicators of digital technologies and information resources available in university library and information centers. Top leading types of **digital technologies and information resources in the university library include** internet, digital repositories (theses & dissertation), e-information (e-journals & e-books), social media interfaces, website, connectivity and multimedia systems. In the Figure 1 pg. 13, the respondents identified the types and indicators of **digital technologies with internet as the top leading resource and followed by digital repositories.**



**Figure 1: Types and Indicators of Digital Technologies in University Libraries**

Third objective of the study was to examine the changing nature of university libraries in institutions of higher learning. Respondents noted **unanimously** on the changing nature and role of university libraries in the ever increasing digital environments. In this context,

the university libraries have adopted and implemented numerous approaches that provide one-stop access to educational, informational, technological needs to the customers such as social computing facilities, internet and web based resources, electronic information, information portal, digital repositories, modern information environment, social media communications, multiple information formats, and multimedia applications.

The study also study established challenges facing the institutions in areas of information infrastructure and professional skills and competency (**Adeleke & Olorunsola, 2010**). Adequate information infrastructure and connectivity and speed of the internet (**Rupak et al, 2014**) are among the biggest platforms to proper utilization of digital technologies and information resources in academic institutions and affiliated organizations, although there are measures to address the risks. Lack of enough social computing facilities, inadequate information infrastructure, weak institutional and physical structures, lack of enough information resources, and inadequate knowledge, skills and competencies impact negatively in usage of digital technologies. Majority of the respondents were comfortable and satisfied with the levels of access and utilization of digital and information resources in libraries.

Objective number four was to determine fundamental skills and competencies needed by information professionals in the modern digital environment. In this context, the study sought to find out the extent to which information professionals are prepared in the rapidly changing digital environment. The study established that the academic and non-academic community of faculty, scholars and information professionals need the following fundamental skills and competencies - teaching, learning and pedagogical methods, information and digital literacy skills, informetrics and citation analysis, electronic resource planning systems, and business entrepreneurship practices (**Anyangwe, 2012, Belzile, 2010, Canadian Association of Research Libraries 2010**).

## **Conclusion and Recommendations**

### **Conclusion**

- Modern educational environment implies that academic institutions need to provide adequate information infrastructure to support access to education, learning, information and knowledge resources through digital technologies, internet of things applications, digital repositories, mobile computer devices and social media technologies (Facebook, Twitter and YouTube). Digital environment provides e-learning, e-research, e-information and electronic repositories and therefore must be enhanced through modern technological resources and facilities such as social cloud computing and internet connections.
- Mobile computer applications and social media technology are growing rapidly among the millennium and new generation of youths or digital natives. Academic institutions and information organizations must pay attention to the growth and relevance of digital platforms that have been used successfully in branding business

organizations as well as political and social mobilization activities. Usage of these systems and solutions has expanded educational, information and knowledge opportunities beyond traditional borders of organizations.

- Digital natives (millennium and new generation of students) in higher education are composed of mainly young youths and adults whose access to education and knowledge depends upon digital platforms. Higher education institutions and information management organizations must provide products and services that suit the needs and demands of this clientele.
- Digital environment and internet of things economy are part of the larger teaching, learning and knowledge sharing ecosystem in higher education institutions and information management organizations. Digital technologies is expanding the boundaries and creating new roles and directions for business practices in higher education and information organization.

### **Recommendations**

- Modern trend of digital technologies and their applications in enhancing and promoting education, learning and knowledge practices has changed the nature and role of information management organizations. Acceptance of digital technologies as fundamental elements in all sectors of the economy and society (education, research, scholarship, medicine, government and business) is indeed important in their adoption and usage.
- Digital environment implies that academic institutions and information management organizations must adopt and implement digital technologies to expand and create new opportunities to education, learning and information resources through electronic resource planning and cloud computing systems.
- Academic institutions and information management organizations need to provide adequate financial resources for the development and growth of digital gadgets and repositories, internet resources and mobile computer applications.
- Education and knowledge environments in academic institutions have immensely changed and organizations must provide innovative digital technologies to reduce the digital divide and increase learning opportunities to the millennium and new generation of students.

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## QUESTIONNAIRE FOR RESPONDENTS

### BACKGROUND INFORMATION

1. Name of information management institution .....
  1. Public University
  2. Private University
  
2. Profession/occupation .....
  1. Academic staff
  2. Non-academic staff
  3. Student

### ACCEPTANCE OF DIGITAL TECHNOLOGIES AND INFORMATION MANAGEMENT

3. Indicate the applications of digital technologies used to support education, research and learning practices in the university library.

APPLICATIONS OF DIGITAL TECHNOLOGIES	FREQUENCY
1. Internet and web	
2. Electronic information (e-journals and e-books)	
3. Digital repositories	
4. Information portals	
5. Social media interfaces	
6. Mobile computer devices	
7. E-learning platform	

4. Rank the following applications of digital technologies in terms of their importance to you using the scale of 6=Extremely Important, 5=Very Important, 4=Important, 3=Somewhat Important, 2=Not Important, 1=Don't Know/Not Applicable.

IMPORTANCE OF DIGITAL TECHNOLOGIES	6	5	4	3	2	1
1. Internet and web						
2. Electronic information						
3. Digital repositories						
4. Information portals						
5. Social media interfaces						
6. Mobile computer devices						
7. E-learning platform						

5. Select from the list below the types and indicators of digital technologies and information resources available in the university library.

<b>INDICATORS OF DIGITAL TECHNOLOGIES</b>	<b>FREQUENCY</b>
1. Internet and web	
2. Electronic information	
3. Digital repositories	
4. Social media interfaces	
5. Website	
6. Connectivity facilities	
7. Multimedia information systems	

6. Show the digital revolution and transformational changes exhibited in the university library.

<b>NATURE AND ROLE OF UNIVERSITY LIBRARY</b>
1. Social computing facilities
2. Internet and web based resources
3. Electronic information resources
4. Information portal & hub
5. Local content information – digital repositories
6. Modern information environment
7. Social media communications
8. Multiple information formats
9. Multimedia information applications

7. Indicate the fundamental skills and competencies needed by information professionals in the modern digital environment.

<b>PROFESSIONAL SKILLS AND COMPETENCIES</b>	<b>FREQUENCY</b>
1. Teaching, learning and pedagogical methods	
2. Information and digital literacy	
3. Electronic resource planning systems	
4. Business entrepreneurship practices	
5. Informetrics & citation analysis	

### CHALLENGES OF DIGITAL REVOLUTION

8. Select from the list below the challenges you have faced regarding effective utilization of digital technologies and information resources

CHALLENGES/RISKS	FREQUENCY
1. Lack of enough social computing facilities	
2. Inadequate information infrastructure	
3. Institutional and physical structures weak	
4. Lack of enough information resources	
5. Inadequate knowledge, skills and competencies	

### STRATEGIC MEASURES TO MITIGATE RISKS AND MYTHS

9. Kindly propose strategic measures to mitigate the identified risks above

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