A Review of Factors Influencing End-users Adoption and Usage of Digital Libraries in Academic Libraries

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Abstract
The proliferation of Digital libraries in the 21st century has attracted attention of scholars especially from the information science field. Over the years, scholars have studied DL from applicability, functionality and usability point of views. Findings from such studies have generated a lot of discussions that have shaped the development of digital library the world over. Despite the development of DL, its adoption and usage by end-users have generated a lot of concern especially from the library practitioners. However, studies that focused on factors influencing adoption and usage have only reported pockets of individual findings without a comprehensive view of factors at play. This systemic literature review is therefore an attempt to bring together previously disjointed streams of studies to help shed more light on the factors influencing adoption and usage of DLs.

Introduction

The advent of Digital Library (DL) has revolutionized the way information is generated, processed, and disseminated. Before the emergence of DL, the selection of teaching and learning materials was limited to print resources that were available either at the local academic or public library. However, with the advent of DLs, physical and geographical barriers to learning resources have been eliminated. DL now allows teachers and students to take advantage of a wider range of materials beyond the physical collection in libraries. This has enhanced learning and increased the value of the learning process (Wingard, 2004).

The change in the ways of accessing information brought about by the advent of DLs has attracted attention of scholars from diverse fields of studies. For example, researchers from Engineering and Computer Science have been more concerned about the design, functionality and usability of DLs (Candela, 2003; Fox, 2002), while researchers from the information science are more interested in the usage of DL services (Alajmi, 2014; 2018; Ahmad & Abawajy, 2014).

The present study which is situated in the information science domain is designed to review studies on the usage of DL services with a view to identifying factors influencing adoption and usage of DL. This research objective is in line with the observation of Liu and Luo (2011) who asserted that "to provide effective DL services, designers and managers need to have good understanding of the factors that influence use and non-use of digital libraries" (p.3). Therefore,

this paper presents a comprehensive overview to stimulate further research towards unraveling factors militating against effective usage of DL services.

Literature Review

In the wake of the digital revolution in the late 20th century, information science scholars have studied the new DL from applicability, functionality and usability point of views. Several factors have been identified as having relationship with application functionality and usability of DL (Hong et al., 2002; McMartin et al., 2008; Hong *et al*., 2011; Liu and Luo, 2011; Nazari, et al., 2013; Khan & Qutab, 2016; Alajmi, 2018). For example, Hong *et al.* (2002) through technology acceptance model constructs (perceived usefulness and perceived ease) identified a set of factors which affect adoption and usage of DLs. They grouped such factors into: individual differences (domain knowledge, computer self-efficacy and experience), system interface characteristics (terminology, screen design and navigation) and organizational context variables (relevance, system accessibility and visibility). These characteristics have been viewed as major factors influencing adoption and usage of DL services (Belkhamza & Wafa, 2011; Khan & Qutab, 2016 & Alajmi, 2018).These characteristics will be examined for a better understanding of their influence on adoption and usage of DLs.

Individual differences, Adoption and Usage of Digital Library

Studies have examined effects of individual differences on technology acceptance, for example computer self-efficacy (Chau, 2001; Hong *et al.,* 2002; Ramayah & Aafaqi, 2004) knowledge of search domain (Hong *et al.,* 2002; Thong et al., 2004; Ramayah, 2006), computer experience (Thong *et al.,* 2004; Ramayah, 2006), and demographic variables (Lu, Yu, & Liu 2006; Aharony, 2015). According to Chen, Czerwinski and Macredie (2000), individual differences have diverse range of aspects which include, personality, cognitive abilities, cognitive style, gender, age, and domain knowledge. In the same vein, Potosky and Bobko (2001) found that the individual's personal relationship with computers, attitudes about computers use, and general attitudes about computers in society are significant predictors of their perceptions about computers.

Hong *et al.* (2002) in their study on "determinant of user acceptance of digital library" examined the effect of three individual differences; domain knowledge, computer self-efficacy and experience on user acceptance of DL. The findings of the study show that the three individual differences have significant effects on the perceived ease of use of digital libraries. In a similar study on users' personality and perceived ease of use of DL, Nov and Ye (2008) established relationship between individual computer self-efficacy and computer acceptance.

Morris, Venkatesh, and Ackerman (2005) studied the moderator effects of age and gender on the relationship between various user perceptions and acceptance, based on Theory of Planned Behaviour. Individual reactions and technology use behaviour were studied over a six-month period among 342 workers being introduced to a new software technology application. Their results revealed that individual adoption and use of technology differed based on age. In a similar study, Lu, Yu, and Liu (2006) examined effects of gender and age differences on individual decisions about Wireless Mobile Data Services (WMDS) in China, the study confirmed the influential nature of age and gender differences in relation to the decision pattern of WMDS adoption in China. It also showed that age had both strong direct and moderating effect on major

casual relationships towards WMDS adoption intentions. Similarly, Morris *et al.* (2005) investigates the influence of gender and age differences on technology adoption and the findings of their study showed that gender differences in technology perception is more pronounced among older workers, while there is no significant differences among younger workers .

In another dimension, Baker, Al-Gahtani and Husbona (2007) employed the Theory of Planned Behaviour (TPB) to examine the effects of gender, age and education on new technology implementation in Saudi Arabia. The study which was based on surveys completed by 1,088 Saudi knowledge workers, validated TPB and accounted for 37 percent of the variance in behavioural intention among Saudi knowledge workers. However, the findings of the study show that there were no statistically significant differences of age and gender.

Individual knowledge and awareness of the available new technology have been found to influence adoption. For example, Rehman and Ramzy (2004) investigated the awareness and use of electronic information resources among health academics in a Kuwait University. The findings of their study showed that lack of awareness and computer literacy skills were the main barriers to adoption and usage of electronic resources. In another dimension, Renwick (2005) investigated knowledge and use of electronic information resources by the Medical Sciences Faculty at the University of the West Indies. It was found that the faculty had high awareness of the available e-resources, but had a low use of specific resources, supporting the suggested problem of under-utilization. Many respondents were of the opinion that e-resources were important, although many still expressed a need for training. Over 60% felt that a workshop with a hands-on component was the preferred format for training. It was recommended that there should be greater promotion of the library's e-resources. Also in a study on use of electronic resources among academics at the University of Karachi, Ansari and Zuberi (2010) found out that a large majority of respondents (78.5 percent) know little about electronic resources. This was attributed to lack of training as they learn mainly by trial and error.

Utulu and Bolarinwa (2009) examined Nigerian academics' adoption of open access initiatives as authors and readers of scholarly resources. The study was necessitated by the growing need to have the number of Nigerian scholarly publications increased on the internet and accessible to scholars around the world through the use of open access initiatives. Academics of two first generation Nigerian universities were selected for the study using convenient sampling technique. Questionnaire was used to find out the extent of academics' awareness and use of open access initiatives as authors and readers of scholarly works. Two hundred and fifty questionnaires were distributed in the two universities out of which 189 copies were returned, while 180 copies were found to be useable for the study. It was revealed that the respondents were more aware of the pre-print and open access journal initiatives than the post-print initiative. In terms of the use of open access initiatives, although the study revealed insignificant use among the academics, academics in sciences showed more promise of adopting open access initiatives as authors and readers of scholarly resources than their counterparts in the humanities.

Popoola (2008) examined awareness and use of library information products and services in South-West Nigerian universities. Systematic random sampling method was used to select 446 faculty members from a population of 4,459 across nine (9) universities. A questionnaire formed the major instrument for data gathering. The response rate achieved was 89.7% percent and the

reliability coefficient of the questionnaire used was 0.72. The study found that there was a significant difference in the level of faculty awareness of available library information products and services between Assistant Lecturers to Lecturers I and senior lecturers to Professors. In addition, they did not have sufficient knowledge of those library products and services pertinent to their teaching and research activities. The survey also revealed that the level of knowledge of faculty staff had positive relationship with the frequency of use. The findings of Popoola corroborated Asemi and Riyahiniya (2007) who asserted that awareness of the existing library electronic resources is crucial in influencing usage of the resources.

However, the assertion that awareness leads to usage was challenged by Baro, Endouware and Ubogu (2011) based on the findings of their study. They argued that though awareness may lead to usage of a database, this is not always the case. They reported that awareness of their respondents about digital resources was more than usage. For example, Baro *et al.* (2011) found that whilst 23.2% of respondents were aware of Medline database only 17% used it. Also, while 60.8% were aware of HINARI, only 38.8% used it. In another study conducted in United States of America, McMartin et al. (2008) explored the use of digital library among faculty members and instructors of 119 higher education institutions in USA. The finding of the study showed that most of the experienced faculty members do not rely on the digital library for their research needs. In order to correct this type of disconnection, Poopola (2008) recommended that user education programmes coupled with planned public relations should be implemented as means to improve awareness and usage of digital resources among students and faculty.

System Characteristics, Adoption and Usage of Digital library

System characteristics have been identified as a category of external variables that are capable of influencing users' intention to adopt new information system (Hong *et al,* 2002). Ittersum *et al.* (2006) classified the characteristics of new information system that influence its acceptance into two main categories: usage characteristics and outcome-of-usage characteristics. Usage characteristics relate to the actual usage of the technology and include perceived ease of use (Davis 1989) and perceived compatibility (Rogers, 2003). Outcome-of-usage characteristics relate to the benefits of using the technology such as relative advantage, fun and enjoyment, or image. According to Ittersum *et al*. (2006), most of the technology characteristics studied in the literature originated from Davis (1986), Rogers (2003), and Moore and Benbasat (1991) which include the following:

- *Perceived compatibility* - the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters;
- *Perceived complexity* - the degree to which an innovation is perceived as difficult to understand and use;
- *Perceived ease of use* - the degree to which the potential adopter expects a technological innovation to be free of effort in use;
- *Perceived image* -the degree to which potential adopters believe the adoption of an innovation will bestow them with added prestige in their relevant community (i.e., relative advantage);

- *Perceived observability* - the degree to which the results of an innovation are visible to others;
- *Perceived relative advantage* - the degree to which an innovation is perceived to be superior to current offerings;
- *Perceived result demonstrability* -the degree to which the benefits and utility of an innovation are readily apparent to the potential adopter;
- *Perceived trialability* - the degree to which an innovation may be experimented with on a limited basis;
- *Perceived usefulness*- the extent to which a technological innovation is expected to improve the potential adopter's performance;
- *Perceived visibility* - the degree to which an innovation is visible during its diffusion through a user community; and
- *Perceived voluntariness* - the extent to which innovation adoption is perceived to be under the potential adopter's volitional control.

Hong *et al.* (2002) investigated the effect of three system characteristics (relevance, terminology, and screen design) on intention to use digital libraries. These sets of system characteristics were found to have a positive relationship with adoption and usage of DL. In a similar study, Ramayah (2006) developed and tested a model which incorporated important elements of the Technology Acceptance Model developed by Davis (1989) and a model proposed by Thong *et al.* (2002) on factors associated with the ease of use of online libraries. The findings of the study show that interface characteristics such as terminology, screen design and navigation were the most influential predictors of ease of use, followed by organizational context, relevance of the system and accessibility. The study recommended exclusion of technical terms and jargon to enhance ease of use of digital libraries, and that digital library designer should give priority to clear terminology to provide effective communication of system instructions and responses to users.

Tibenderana (2010) used the UTAUT model developed by Venkatesh *et al.* (2003) to investigate the adoption of Information Communication Technology (ICT) services in eight university libraries in Uganda. The study collected 445 usable data from university library end-users across the eight universities. Results showed that 'relevance' and 'social influence' have significant effects on intentions to use e-library services. Results further show that university communities in Uganda are inclined to use electronic library services due to social demands, relevance of services, available facilitating conditions and benefits they expect from the services.

Similarly, Jeong (2011) employed technology acceptance model (TAM) and flow theory as theoretical frameworks to investigate Korean elementary students' perceptions and behavioural intention towards e-library called booktobi. Survey research approach was employed for the study. The results of this study revealed four major findings. First, interface characteristics (in terms of terminology, screen design and navigation) can indirectly influence the perceived usefulness via the perceived ease of e-library system use. Second, system characteristics (in terms of relevance and system quality) can directly influence the perceived usefulness of e-library systems. Three, system quality can positively influence both perceived usefulness and the perceived ease of e-library system use. These findings highlight the importance of e-library system characteristics and in particular, system quality.

In a recent study, Nazari, Khosravi, and Babalhavaeji (2013) employed Rogers' diffusion theory to examine the effect of perceived innovation attributes of the online databases on the rate of adoption. The study used survey research method. A survey instrument was distributed to a total of 351 faculty members from the 8th Zone of Islamic Azad University (IAU) in Tehran, Iran. The findings confirmed that the respondents perceived relative advantage (Correlation Value 0.64), compatibility (Correlation Value 0.65), complexity (Correlation Value -0.57), trialability (Correlation Value 0.31), and observability (Correlation Value 0.53), all of which are related to adoption and use of online databases.

Institutional Characteristics, Adoption and Usage of Digital Library

Institutional characteristics such as availability of facilities, technical support and training have been identified as some of the factors that can predict adoption and usage of technology (Hsiao *et al.,* 2009; Putzer &Park, 2010; Lin, et al., 2012). The organizational context of any new information system is an aspect which has been increasingly recognized in recent years as a vital determinant of system success (Belkhamza & Wafa, 2011). For instance, Dadzie (2005) examined access and usage of electronic resources at the Ashesi University, Ghana. The study found that general computer usage for information access was high because of the University's state-of-the art IT infrastructure. Usage of some internet resources was also very high, whilst the use of scholarly databases was quite low. The low patronage was attributed to inadequate information about the existence of these library resources.

In the same vein Lin *et al.,* (2012) asserted that characteristics of the environment, technology, organization and support from top management are all critical factors that influence adoption and usage of technology. In the same light, availability of DL enabling facilities such as information technology according to Haliso (2011) enhances service provision to library clientele, thereby encourages adoption and usage of the system.

Lack of these enabling facilities has been attributed to the failure of DL services. According to Thong *et al.* (2002: 217) the potential reason for DL success in one university and failure in another "could be that in the successful university, the students can easily access the system from any computer on campus. While in the unsuccessful university, the digital library is only accessible from a limited number of designated machines". Training and experience can clarify the benefits of the technology and as such increase acceptance (Amoako-Gyampah & Salam, 2004; Deng, Doll & Truong, 2004) as well as help reduce system failure.

Academic Environment, Adoption and Usage of DLs

One of the factors that influence adoption and usage of technology is the environmental context. Academic libraries operate in diverse social environments. As such they are not isolated from the existing environmental policies and dynamics. According to Alessandra and Schreyer (2002) government through policy can support increase in the adoption of technology by increasing the availability of ICT applications to individuals and organizations within the public, business and educational sectors of the economy. As noted by Wilson (2003), policy and institutional reforms are the critical success factors for growth in ICT penetration rates within developing countries whose governments currently face a myriad of policy options. Studies have shown that innovations diffuse differently depending on the country's socio-cultural environment (Kumar, 2009; Tornatzky & Fleischer 1990).

There are two environmental contexts that influence the information services of academic libraries: internal and external environments. Changes in the external environment affect the organization's internal environment. However, internal organizational training and technical support are significantly associated with adoption behaviours (Hsiao *et al.,* 2009; Putzer & Park, 2010). "Library operates in complex and changing external environments, which frequently produce new challenges which must be controlled to ensure the library's future survival and success" (Babalhavaeji & Farhadpoor, 2012: 281).

Over the years libraries have been tagged as the sole provider of repository of knowledge, but with the evolution of internet and World Wide Web in the 1990s, the age long privilege of library serving as the sole repositories for published information came to an end. According to De Rosa *et al.,* (2005) libraries are losing their role as "primary information provider" as users turn to search engines as their starting point to do research. How these changes affect adoption and usage of digital library has not been fully investigated.

Conclusion

The review provided a comprehensive overview of factors influencing end-users adoption and usage of digital libraries in academic libraries. Generally, there is dearth of research targeted on factors hindering adoption and usage of technology and digital libraries in particular. However, the findings of some of the reviewed studies identified factors hindering adoption and usage of DL services, while the majority of the studies on adoption and usage of DL resources identified lack of facilities and inadequate training programme as major hindrance to adoption of DL, a study conducted in USA where there are enabling facilities to access DL, identified negative attitudinal factor as hindrance to adoption of digital library (McMartin et al, 2008). This finding corroborated Popoola's (2002) assertion that negative attitudes of potential users contributed to the slow progress of digital library in Nigeria.

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